



**حولية دائرة الآثار العامة**

**المجلد الثالث والأربعون**

**عمّان**

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**المملكة الأردنية الهاشمية**

### **لجنة التحرير**

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### **قيمة الاشتراك السنوي**

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## System of Transliteration from Arabic

### Consonents

ء	' (except where initial)	ض	d
ب	b	ط	t
ت	t	ظ	z
ث	th	ع	'
ج	j	ف	gh
ح	ḥ	ق	f
خ	kh	ك	q
د	d	ل	k
ذ	dh	م	l
ر	r	ن	m
ز	z	هـ	n
س	s	ط	h
ش	sh	و	w
ص	ṣ	ي	y
ة	a or at	هـ	a or ah

### Long Vowels

اى	ā
و	ū
ي	i

### Short Vowels

ا	a
و	u
ي	i

### Common Nouns

تل	Tall	دير	Dayr
جبل	Jabal	عين	'Ayn
خرابة	Khirbat	وادي	Wādī

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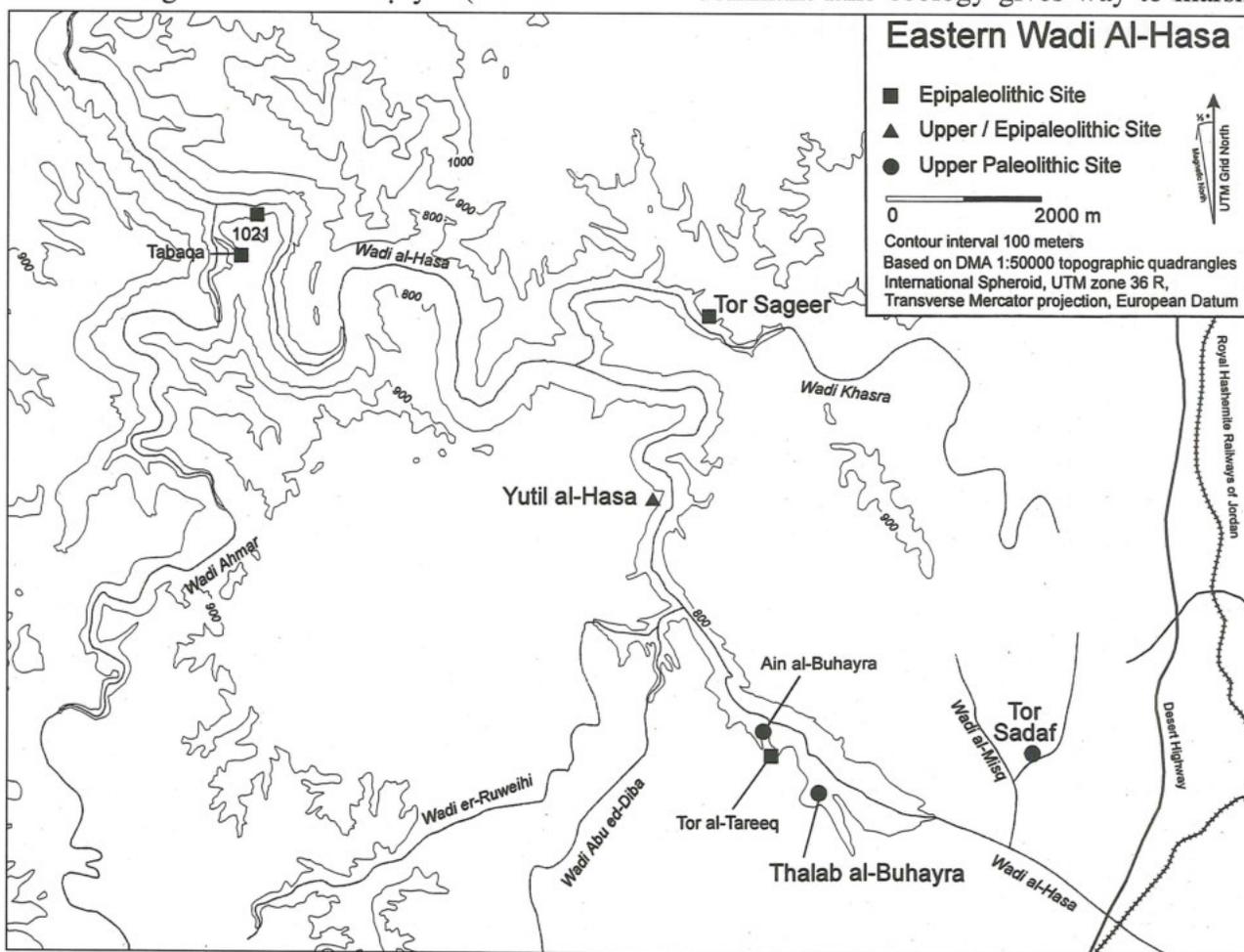
# THE EASTERN AL-HASA LATE PLEISTOCENE PROJECT PRELIMINARY REPORT ON THE 1998 SEASON

by

Nancy R. Coinman, Deborah I. Olszewski, Kholood Abdo, Todd G. Clausen, Jason B. Cooper, Jason R. Fox, Maysoon al-Nahar, Edward Richey, and Leslie S. Saele

The Eastern al-Ḥasa Late Pleistocene Project (EHLPP)<sup>1</sup> conducted its second field season from 24 May to 5 July, 1998. There were two major objectives for the second season: (1) Continued excavations at Ṭor Ṣadaf (WHNBS 8), Ṭor Ṣageer (WHNBS 242), and Yutil al-Ḥasa (WHS 784), and (2) Initial testing at Thalab al-Buḥayra (EHLPP

2), a site discovered during the 1997 season (Fig. 1). This season's excavations reflect the project's larger research objectives that are focused on investigating changing hunter-gatherer settlement patterns and technology during the late Pleistocene, a climatic period in the eastern al-Ḥasa during which a dominant lake ecology gives way to marsh/



1. Location of site.

1. The EHLPP Team was directed by Deborah I. Olszewski (Bishop Museum, Honolulu) and Nancy R. Coinman (Iowa State Museum) and included K. Abdo, T. Clausen (Iowa State University), J. Cooper (LAAS, Seattle), J. Fox (Iowa State University), M. al-Nahar (Arizona State University), E. Richey (Arizona State University), and L. Saele

(Iowa State University). The representative from the Department of Antiquities was Jihad Darwish. Funding was provided by Grant No. SBR9618766 from the National Science Foundation and the Wenner Gren Foundation. This is EHLPP Contribution No. 5.

pond conditions after the Last Glacial Maximum (LGM) ca. 18/17,000 bp (Olszewski and Coinman 1998). A diversity of paleolithic site types and localities, lithic technologies, and exploited fauna characterize the Upper Paleolithic and Epipaleolithic cultural periods (ca. 40,000 to 11,000 bp) in and around Pleistocene Lake al-Ḥasa. Excavations during the 1998 season included in-depth excavations and testing at three Upper Paleolithic Ahmarian sites and two Epipaleolithic sites, which are identified as Madamaghan and Early Natufian.

### **Excavations at Ṭor Ṣadaf (WHNBS 8)**

(N. R. Coinman, J. Fox, T. Clausen and L. Saele)

The Ṭor Ṣadaf rock-shelter was first located during the 1992 WHNBS season (Clark *et al.* 1992) and subsequently tested in 1997 by Olszewski's team, which revealed a previously undocumented presence in the al-Ḥasa of the early Upper Paleolithic (Olszewski *et al.* in press), a techno-complex identified as the Early Ahmarian elsewhere in southern Jordan (Henry 1995; Coinman and Henry 1995; Kerry 1997; Williams 1997), the central Negev (Marks 1977, 1981; Marks and Ferring 1988), and the Sinai (Phillips 1988, 1994; Gilead 1991; Gilead and Bar-Yosef 1993). Excavations during 1998 season were conducted over a period of 18 days from 26 May to 18 June, and were focused on expanding the two 1997 test units (K2 and K5) by opening six additional units (K1, K3, K4, L2, L3 and L5) contiguous to the 1997 units in order to provide a broad exposure of the deeply stratified cultural deposits.

The Ṭor Ṣadaf rock-shelter is part of an east-facing oyster bed formation on the west side of a low-order drainage leading southwest to the Wādī al-Misq which currently drains directly into the Wādī al-Ḥasa. Pleistocene Lake al-Ḥasa may have extended up the Wādī al-Misq, but it is unlikely from available evidence that the lake extended be-

yond the secondary al-Misq tributary to Ṭor Ṣadaf. No evidence of remnant marls occur in the tertiary drainage on which Ṭor Ṣadaf is located. In addition to the geoarchaeological study of Ṭor Ṣadaf and its microenvironment by J. Schuldenrein, systematic sampling for pollen and macrobotanical remains are expected to provide the necessary evidence for reconstructing the local paleoenvironment around Ṭor Ṣadaf. From a preliminary standpoint, the occupation of this locale during the early Upper Paleolithic - possibly earlier than 40,000 bp, as well - appears to represent an adaptation that is not associated with the lake proper and includes a dietary emphasis on fauna that were different from the later large mammals more closely associated with a lake ecology at 'Ayn al-Buḥayra (WHS 618) and Thalab al-Buḥayra (EHLPP 2) (see below).

Excavations at Ṭor Ṣadaf were conducted in 1 x 1 m units using 5 cm or less arbitrary levels with all sediments screened through 3mm mesh. All artifacts and faunal remains larger than 2 cm were mapped by levels, providing spatial documentation of all level assemblages. The sediments at Ṭor Ṣadaf are extremely consolidated in most subsurface areas with fossilized oyster shell debris in abundance throughout all levels, as well as sediments infused with a sulphur-like odor indicative of spring seepage. The resulting exposure was a 2 x 5 m block excavated to decomposing bedrock approximately 1.1 m below the surface at the dripline and approximately 0.6 m below the surface just outside the rock-shelter.

The cultural deposits at Ṭor Ṣadaf can be grouped into two temporal units: The upper Levels 1-14 (Natural Levels I-III) are attributable to the Early Ahmarian, while Levels 15-20 (Natural Levels IV and V) demarcate a transitional technological stage that evolves out of the local Mousterian and are separated stratigraphically by a significant cobble layer extending horizontally approximately 2.5 m from the back wall of

the rock-shelter at approximately 0.7 m below the surface. The sediments contained below this cobble layer are less compacted silty clay, yellow brown in color (10YR 5/6). The lithics within these levels are distinctly transitional and different from the overlying, temporally later Early Ahmarian.

The lithic assemblages at Țor Țadaf are relatively discrete units and may be grouped into the lower transitional assemblage (Levels 15-20) and the upper Early Ahmarian assemblage (Levels 1-14). The lower levels contain considerably denser lithic assemblages in which the cores and debitage in general are dimensionally very large when compared to the stratigraphically higher Early Ahmarian blade assemblages. A total of 19,649 lithics were recovered from the 1998 excavations (Table 1) in which the frequencies of retouched pieces, debitage, cores, and shatter were relatively similar throughout the six excavation units, although cores are relatively more frequent in the unit of L5 (1.1%). Retouched pieces (tools) comprise an average of 1% of the overall assemblage ranging from 0.7 - 1.5% across the different units. Tools are dominated by endscrapers (33.2%) and retouched bladelets (21.4%) and burins (13.7%). Diagnostically sensitive tools of the Early Ahmarian comprise 9.7% of the retouched assemblage. Other tools include notches, denticulates and various retouched pieces.

The lowest cultural assemblage (Levels 15-20) precedes stratigraphically and technologically the Early Ahmarian and exhibits

well-defined transitional characteristics that include a mixture of Middle Paleolithic Mousterian Levallois elements with early Upper Paleolithic core and blade attributes. Thus, the lowermost assemblage at Țor Țadaf documents an *in situ* technological transition from the Mousterian to the Early Ahmarian. At this preliminary stage, this transitional assemblage appears to be similar to the Boker Tachtit transition (Marks 1983), and quite similar to the Wādī Aghar transitional assemblage at the south Jordan site of J433 (Coinman and Henry 1995: 192-193). This technological transition is reflected in the replacement of radial Mousterian cores by single platform cores. Cores, platform preparation, and blank forms within the lowermost cultural levels are often mixed, exhibiting: (1) radially flaked, discoidal (turtleback) cores in which Levallois blanks were removed; (2) Levallois flakes and elongated blades with multifaceted prepared platforms and converging-Y dorsal scar patterns; (3) single platform cores with unafaceted platforms that exhibit irregular scalloped platform edges with no platform preparation or edge regularization; (4) blanks with large unafaceted platforms that replicate the scalloped edges of the single platform cores; (5) flakes and elongated blades that display Levallois converging dorsal scar patterns in conjunction with large unafaceted scalloped platforms. The transitional assemblage contrasts markedly with the Early Ahmarian assemblage in its technology, typology and overall dimensional characteristics of the debitage.

**Table 1.** Lithic assemblage from Țor Țadaf (WHNBS 8) in percentages.

	K1	K3	K4	L2	L3	L5	TOTAL
CORES	.8	.7	.7	.7	.9	1.1	.8
DEBITAGE	80.5	76.9	78.1	77.5	76.7	78.3	77.4
SHATTER	17.2	21.3	20.4	21.1	21.5	19.8	20.8
TOOLS	1.5	1.1	.8	.7	.9	.8	1.0
TOTAL N	1505	5646	2459	3740	5093	1206	19649

The upper levels (1-14) contain a lithic assemblage that is primarily Early Ahmarian, although earlier transitional debitage described above occurs in some of the lower Early Ahmarian levels. The Early Ahmarian core technology is represented by cores that feature single and opposed platforms with blade and bladelet removals. Core platform edges are regularized, and the associated platforms on blades are small and most likely removed with a punch. The debitage is dominated by narrow blades and bladelets with small punctiform platforms. El-Wad points are the most distinctive retouched tools found at ʿTor ʿSadaf and are similar to points found in other Early Ahmarian sites, such as ʿTor Aeid (J432) and ʿTor Hamar (J431) in south Jordan (Coinman and Henry 1995; Williams 1997) and some of the Boker A el-Wad points (Marks 1977; Jones *et al.* 1983: 299), exhibiting abrupt to semi-abrupt retouch around the proximal edges and often grading into fine retouch around the distal tips. Retouch may occur on both obverse and inverse surfaces, with the latter less frequent. After only preliminary in-field analyses, more in depth study should highlight the similarities and differences in retouch and size with Early Ahmarian points from Ksar Akil (Bergman 1981; Azoury 1986), the Lagaman sites (Bar-Yosef and Phillips 1977), Kadesh Barnea (Gilead and Bar-Yosef 1993), and the Abū Noshra sites in south Sinai (Phillips 1988).

The fauna at ʿTor ʿSadaf have not been identified to date, but the assemblage is limited and only moderately well-preserved, consisting almost exclusively of medium-sized mammals in which the bone fragments are thin-walled, dense, and smooth. Only a few teeth have been recovered. In general, however, the faunal assemblage is very different from that recovered previously at the late Upper Paleolithic site of ʿAyn al-Buḥayra (WHS 618) where the fauna are exclusively large mammals (e.g., *Bos* and *Equus*), are heavily fossilized, and include

large numbers of teeth (Olszewski *et al.* 1998; Coinman and Olszewski in press; Coinman 1990, 1993, 1997a,b; 1998).

### **Preliminary Excavations at Thalab al-Buḥayra (EHLPP 2)** (N. Coinman, T. Clausen, J. Fox and L. Saele)

The Upper Paleolithic site of Thalab al-Buḥayra (EHLPP 2) was discovered in 1997 (Olszewski *et al.* 1998) and is located east of the al-Ḥajj road along the southwestern edge of Pleistocene Lake al-Ḥasa where remnant marls are well-preserved. The site is a large open site extending some 160 m (NE/SW) by 50 m (E/W) which straddles the intersection between a sloping *hamada* and the lacustrine marls - what would have been a series of ancient shorelines of Pleistocene Lake al-Ḥasa. The majority of the site appears to be stratified within the upper 0.5 m of the marls, extending horizontally into the marls some 40 m beyond the preserved "shoreline." The site may have extended upslope in the past, but this area of the site is now represented by a dense scatter of patinated lithics on a greatly deflated surface. On-going erosion of the marls has resulted in the exposure of distinct buried cultural strata in actively developing gullies. Fossilized large mammal bones, teeth, and lithic artifacts are eroding out from well-defined horizontal strata. To date, three different stratigraphic units have been identified in the marls which may document at least three separate occupations.

Initial investigations of the site were conducted over a period of eleven days from June 19 to July 3 and included in-depth mapping, surface collections, and subsurface testing at three areas of the site - Loci C, E and J. Subsurface excavations were located in these loci because eroding strata indicated the most promising intact cultural materials (Locus C and Locus E) or because surface densities on or near intact marls were high (Locus J). Buried cultural strata were uncovered in separate elevational bands within the marls in the

three different loci under study.

The faunal remains are comprised primarily of large fragments of splintered long bones, articular ends, a number of phalanges, and complete molars of large herbivores such as *Bos* and *Equus*. The presence of large numbers of fractured bone and skeletal elements of a restricted number of animal species suggests rather short episodes of butchering activities. Lithic and faunal material most often occurred within one or more of three types of soil discolorations. Faunal remains at Locus C were most often found within yellow-orange soil discolorations, some of which may be due to the process of bone decomposition. Some areas of Locus C were characterized by dark grey-brown sediments that appear to contain ash, charred bone and a few fragments of charcoal, and although these darker sediments are clearly the result of burning, formal hearths were not identified in this area of the site. Probably the most interesting of the soil discolorations is associated with a red mineral (possibly hematite) in which 15-20 cm wide lenses of red discoloration occur, generally in association with lithics rather than bone. Small nodules of this mineral approximately 4-6 mm in size were recovered and taken as samples. Red mineral lenses also occur in association with buried cultural assemblages at all three of the loci tested. They do not occur in the exposed marl stratigraphy where artifacts are not visible. Thus, the use of red mineral within the context of butchering activity and/or lithic reduction seems apparent, although the precise function is unknown.

The lithic assemblages recovered during the 1998 season at Thalab al-Buḥayra totaled 8,397 lithics with surface collections representing 13.6% of the total (Table 2). Lithic artifacts recovered from Thalab al-Buḥayra are variable across and within the site. Systematic surface collections at three loci reflect a very diverse assemblage of lithics. Additionally, a higher percentage of

**Table 2.** Lithic assemblage from Thalab al-Buḥayra (EHLPP 2) in percentages.

	Locus C	Locus E	Locus J	Total
CORES	1.6	.9	2.4	1.3
DEBITAGE	82.5	85.3	83.2	84.5
SHATTER	10.7	12.3	12.8	12.1
TOOLS	5.2	1.5	1.5	2.1
TOTAL N	1508	5696	1193	8397

retouched pieces were recovered from the surface than the subsurface test units (Tables 3-5). The surface assemblages invariably contain an unusually high number of cores of various sizes, generally with single and opposed platforms for producing blades and bladelets, although a few examples of large, radially struck discoidal cores were also collected. The majority of tools in the surface collections are burins and scrapers made on a variety of large and small blank forms. Six Ksar Akil scrapers

**Table 3.** Lithic assemblage from Locus C at Thalab al-Buḥayra (EHLPP 2) in percentages.

	Surface	K3	K4	L3	L4	Total
CORES	2.8	.4	2.3	1.4	1.0	1.6
DEBITAGE	81.9	86.9	84.7	67.9	85.9	82.6
SHATTER	9.0	10.8	6.7	25.8	7.4	10.7
TOOLS	6.3	1.9	6.3	4.8	5.6	5.1
TOTAL N	288	268	352	209	391	1508

**Table 4.** Lithic assemblage from Locus E at Thalab al-Buḥayra (EHLPP2) in percentages.

	Surface	B5	C5	D5	Total
CORES	4.9	.7	.8	.3	.9
DEBITAGE	73.0	79.9	83.2	91.0	85.3
SHATTER	17.3	17.9	14.8	7.6	12.3
TOOLS	4.7	1.5	1.2	1.1	1.5
TOTAL N	486	857	1827	2526	5696

**Table 5.** Lithic assemblage from Locus J at Thalab al-Buḥayra (EHLPP2) in percentages.

	Surface	I18	J18	Total
CORES	6.7	.35	.82	2.5
DEBITAGE	72.8	87.7	88.6	83.2
SHATTER	15.9	12.0	10.2	12.8
TOOLS	4.6	-	.4	1.5
TOTAL N	372	576	245	1193

were recovered this season from surface contexts, bringing to a total of eight the number of scrapers with this very distinctive micro-denticulated retouch (Azoury 1986). While no Ksar Akil scrapers were recovered from the subsurface test units, other tools with similar micro-serration were found, indicating that this unusual retouch was used on a variety of tool blank forms.

Of the three loci where subsurface excavations were conducted, Locus E produced the densest, most diverse assemblages, representing 68% of the total, while the Locus C assemblage was more limited and the least diverse (Tables 3 and 4). Cores and retouched tools can generally be attributed to an early to middle Upper Paleolithic technology and typology. Many of the tools occur on large, thick blanks with a number of carinated scrapers and thick burins observed, but in general, the subsurface testing this season has recovered an assemblage that is most closely associated with the Ahmarian.

### *Locus C*

Locus C is located in the southern portion of the site near the interface of the hamada slope and the marls. Here, a relatively wide, steep-sided gully has exposed an impressive stratum of cultural material along the northern side of the gully. Systematic surface collections in 1m<sup>2</sup> units were made in the area of the proposed excavation to minimize impact to the surface assemblage during excavation. Four contiguous 1 x 1 m units (L3, L4, K3 and K4) were excavated in this locus in order to maximize contextual information on artifact distributions and relationships. The upper 0.4 m in these units comprised essentially sterile sediments, with the exception of the surface, that could be removed in bloc to expose the artifact-bearing levels, which were then excavated in 5 cm levels. All sediments were screened through 3 mm mesh and sampled for macrobotanical remains, pollen, and phytoliths. In

addition, a diversity of soil matrices were sampled to enhance our understanding of the systemic and post-depositional processes. All cultural material was meticulously mapped in each level, providing visual distributions of lithics, bone, teeth and associated soil characteristics.

The stratigraphy at Locus C consists of Natural Levels I-V. Levels I-III are sterile marl formations overlying the artifact-bearing Level IV, while Level V consists of underlying sterile silty clay. Level I represents loose decomposing marl sediments approximately 0.25-0.30 m thick which contain a high density of crusty marl nodules in a background matrix of light brown silty sand. Level II is 0.10-0.15 m thick and is comprised of extremely consolidated grey to yellow-white marl sediments. Level III, between 0.10-0.15 m thick, is a darker grey-brown clay and appears to contain some marshy organics expected at a shoreline. Level IV (arbitrary Levels 3, 4 and 5) is the main artifact-bearing level, between 0.10 and 0.15 m thick. Within this cultural zone, dense remains of large mammal bone and teeth and lithic artifacts were recovered, most of which were flat-lying.

The Locus C assemblage is dominated by large mammal bones and teeth and lithics that suggest a limited spectrum in terms of the reduction sequence, representing what can best be described preliminarily as butchering activity along the ancient shore of Pleistocene Lake al-Ḥasa over a fairly limited time period. Core reduction appears to be limited with a proportionately higher frequency of retouched tools. Burins are completely absent from the Locus C subsurface bone and tool assemblages, while endscrapers dominate the assemblages. Thirty-two endscrapers were recovered, the majority (25) found in two units (L4 and K4). Clearly, endscrapers were associated with primary butchering activities, possibly with the extraction of marrow from the narrow channels of bones.

*Locus E*

Locus E is located towards the middle of the site along the ancient shoreline and is similar to Locus C in that an eroding cultural stratum is visible in the exposed profile of a steep gully. At this locus, three contiguous 1 x 1 m units were opened along the northern edge of an eroding gully where the visible cultural stratum is located in the preserved marl at a higher elevation than at Locus C. A cultural zone of dense lithics and bone extends from approximately 0.10-0.30 m below the modern marl surface, making this cultural stratum stratigraphically and temporally later than the buried cultural assemblage at Locus C. No microstratigraphy within this zone can be detected so that it represents an accumulation of lithic reduction activity in association with faunal remains that are small, fragmented and only moderately well preserved. However, some spatial differences have been detected in the distribution of equid teeth. Unit D5 at this locus contained eight complete equid teeth in two 5 cm levels, in contrast to only one complete tooth and small fragments in the adjacent two units, B5 and C5. Again, all cultural material in each 5 cm arbitrary levels was meticulously mapped to provide contextual maps of lithic and bone distributions. Two hearths were uncovered at this locus. Hearth 1 was located along the southern boundary of units C5 and D5, eroding out onto the slope of the gully, consisting of a spread of fine charcoal, cemented marl and ash sediments, fire-cracked rock, and a series of small cobbles demarcating the southern side of the hearth. Hearth 2 was uncovered in the adjacent northern corners of B5 (NE) and C5 (NW). This hearth became clearly visible in the excavated profile as a dish-shaped lens of charcoal and burned sediment. Only the southern half of the hearth was present in the two units and consisted of a limited number of cobbles and fire-cracked rock associated with fine charcoal, ash sediments,

and burned bone.

The lithic assemblages in the three excavation units at Locus E are fairly similar in the diversity of elements representing the reduction sequence. Cores are well-prepared single and opposed platforms for the production of blades and bladelets. Debitage recovered from the three units reflects a proportionately higher (60%) frequency of blades/bladelets rather than flakes. The technology reflected in the sophisticated blade cores and small punctiform platforms on blades and bladelets suggest an Early Ahmarian affiliation. Although only two complete el-Wad points were recovered, 11 other retouched point fragments or proximal blade/bladelet fragments with retouch along the right obverse side were recovered, which may represent this type of point. Seventeen endscrapers and two burins occurred almost exclusively in units C5 and D5.

*Locus J*

A third area was tested at Locus J on the northern perimeter of the site where dense surface artifacts are associated with intact marls. Two 1x1m units (J18 and J18) were placed atop a marl 6 m from the interface of the marls and the hamada slope in an attempt to uncover *in situ* cultural deposits within the marls. The cultural stratum was located underneath an uppermost exposed marl sediment (Natural Level I) that consists of loose decomposing chunky marl nodules in a silty sand (10 YR 6/3). A relatively thin horizontal cultural stratum (Natural Level II,) was revealed between 0.15 and 0.25 m below the surface (Arbitrary Levels 2-3). The cultural stratum was embedded in a relatively more consolidated marl sediment (10 YR 7/3) and was underlain by a sterile stratum of very fine white consolidated marl (10 YR 7/2). Beneath the white marl sediments is another sterile natural level (IV) that contrasts distinctly with the overlying marl sediments,

consisting of a bright yellow-brown fine silty clay (10 YR 6/4).

Lithic and bone densities are low at Locus J relative to other subsurface units at the site. One dense cluster of lithics in I18 consisted of a core and associated debitage (Feature 1), including large numbers of primary, secondary and tertiary flakes and blades. A total of 322 associated flakes, blades, bladelets, trimming flakes and one core comprised this single knapping episode. Locus J appears to represent the latest in a series of temporally different occupation episodes along the ancient shoreline that came to be embedded at varying elevations in the now remnant marls.

The site of Thalab al-Buḥayra is difficult to interpret on the basis of limited preliminary investigations, but the nine subsurface test units during the 1998 season have revealed a lakeshore locality that may have been reoccupied over a period of time and appears to fit within the early to middle Upper Paleolithic. The presence of Ksar Akil scrapers and el-Wad points strongly suggests an Early Ahmarian affiliation, although there is a variety of lithics on the surface that may represent a much longer span of time in which prehistoric hunter-gatherers were using this locale. To date, no spring has been located at the site, although certainly these Upper Paleolithic sites were situated where fresh water springs occurred, given the likelihood that Pleistocene Lake al-Ḥasa was saline. Perennial springs are present at 'Ayn al-Buḥayra (WHS 618) in precisely the same lakeshore context as Thalab al-Buḥayra, but the signature tufa spring formation of WHS 618 has not been identified at this new site.

#### **New Test Excavations at Ṭor Ṣageer (WHNBS-242)** (M. al-Nahar, J.B. Cooper, K. Abdo, and D.I. Olszewski)

The small rock-shelter of Ṭor Ṣageer was first tested in 1997 (Olszewski *et al.* 1998). As described previously, it is located in the

Wādī al-Khasra, a major tributary of the Wādī al-Ḥasa and was first recorded during the survey of the north bank of the Wādī al-Ḥasa during 1993 (Clark *et al.* 1994). The rock-shelter is approximately 17 m above the present Wādī al-Khasra drainage, and faces south-southeast. A total of 12 days between 26 May and 8 June, 1998, were spent testing the site during this field season.

Four 1x1 m units (B3, B4, D3, and E4) were excavated to bedrock, about 0.70-0.75m below ground surface. All are within the dripline of the rock-shelter. Two of these units (B4 and E4) extend the 1 x 2 m excavation (Units C4 and D4) of the 1997 field season to a 1 x 4 m exposure. Units B3 and D3 are northern extensions of the B4 and D4 units, toward the back of the rock-shelter. A total of 8,574 lithic artifacts were recovered from the four units excavated this season, bringing the total number of lithic artifacts recovered from the site to 13,421. The lithics are Early Epipaleolithic in typology and technology. Moderately large quantities of bone also were recovered, including teeth, phalanges, proximal and distal shaft ends, and shaft midsections.

The site was subjected to vandalism following the first day of work. During the first day, we removed the backfill in Units C4 and D4, and began the excavation of arbitrary Level 1 in Units B4 and D3. When we returned on the second day, vandals had infilled the open C4 and D4 units with large rocks, as well as with a portion of the upper deposits of Units B4 and D3. Unit B4 suffered the most extensive damage, with the loss of the upper 0.35 m in a 1 x 0.5 m area. The vandalized deposits were screened and the cultural materials were recovered, although these cannot be assigned to particular levels subsequently excavated in these units.

Three units (B3, D3, and E4) had 14 arbitrary levels, while Unit B4 had 16 arbitrary levels. Depending on the unit, these arbitrary levels correspond to three to five natural strata, as well as to Feature 3. Rodent dis-

turbance was noted in several of the units, but was much less extensive than in Unit C4 from the 1997 field season. Most rodent disturbance was confined to the upper 0.25-0.35 m of deposits, which as noted in previous reports (Olszewski *et al.* 1998), also contained evidence of cultural disturbance.

Unit B3 is characterized by three natural layers, in addition to a roof spall lens, and the deposits of Feature 3. Levels 1-3 comprise Layer I, which is a very pale brown, loose dusty silt. It includes abundant gravel-sized rock, goat dung, and twigs. The roof spall lens is contained within Layer I and is represented by Level 4. This lens is comprised exclusively of limestone fragments. Natural Layer II (Levels 5-8) is a brownish yellow, loose, dusty silt with larger cobble inclusions, as well as gravel-sized rock, goat dung, and twigs. The base of this layer is moist in composition. Levels 9-14 form Layer III, a very pale brown, loose dust silt with abundant twigs and cobbles. Rodent disturbance accounts for this configuration of materials. Levels 11-13 in the Feature 3 area of the unit were excavated and screened separately from the rodent disturbed portions of the unit. The Feature 3 area is a very pale brown, very compact silty clay with occasional cobbles. Other characteristics include burnt rock, pockets of compact ash, charcoal, and areas of loose ash. Level 14 (Feature 3) was present only in the eastern half of the unit and immediately overlying bedrock.

Four natural layers and Feature 3 comprise the stratigraphy of Unit B4. Layer I (Levels 1-2) is a very pale brown, very loose, silt with gravel-sized rock, twigs, and rootlets. Layer II (Level 3) is a very pale brown, slightly more compact silt with a higher gravel-sized rock component. Levels 4-7 comprise Layer III, a brownish yellow, loose silt, with some gravel-sized rock. There is a matting of twigs within this layer, representative of rodent activity. Layer IV (Levels 8-9, and portions of Levels 10-15)

is a brownish yellow, relatively compact silty clay with limestone and ash flecking. The gravel-sized rock component decreases compared to Layer III. Portions of Levels 10-15 also comprise Feature 3. As previously described for Unit B3, Feature 3 is a very pale brown, very compact silty clay. In Unit B4, there is more variability in color, with some areas also a pale brown. Pockets of very compact ash, areas of loose ash, and charcoal occur in a series of small lenses within Feature 3.

In Unit D3, arbitrary Levels 1-4 correspond to natural Layer I. This layer is a light brownish yellow, loose, silty loam with some cobbles, as well as gravel and pebble-sized rock. Levels 5-6 are within Layer II, a brownish yellow silty loam that is slightly compact. It includes gravel and pebble-sized rock, as well as some cobbles and charcoal flecks. The back of the rock-shelter extends into the unit by about 0.30 m in the northwestern portion of the unit. Arbitrary Levels 7-12 correspond to Layer III, which is a light brownish yellow, slightly compact, sandy silt. Other characteristics include abundant gravel-sized rock and charcoal flecking. The back wall of the rock-shelter continues to slope southward in the unit, resulting in coverage of about 0.50 m of the unit by the base of Level 12. With the exposure of bedrock (and rock-shelter back-wall) across about half the unit, the final two levels (Levels 13-14), which correspond to Layer IV, are found only in the southern half of the unit. These are a very pale brown, strongly compacted silty sand. Gravel-sized rocks are a major constituent, as are limestone inclusions.

Five natural layers characterize the stratigraphy of Unit E4. These were excavated in 14 arbitrary levels. Natural Layer I is represented by arbitrary Level 1. It is a light yellowish brown, loose, loamy silt, with gravel and pebble-sized rock and cobbles. Levels 2-4 comprise Layer II. This stratum is also light yellowish brown, loamy silt, but

more compact than the preceding layer. Both gravel-sized rock and cobbles continue to be components. Natural Layer III is represented by Levels 5-9. This layer is a brownish yellow, loamy silt, with an increased sand and gravel-sized rock content. The upper portion of the layer is moderately compact, while the lower portion of the layer is somewhat more loose and more moist. Levels 10-14 correspond to Layer IV, which is a very pale brown, relatively compact, silty sand with dense limestone and gravel-sized inclusions. The compaction of the sediment increases as proximity to bedrock increases. Red ochre flecking and staining also is present in the lowest portion of this layer, immediately above bedrock. Portions of Levels 11-12 are within Layer V, which is a very pale brown lens of very compact, silty sand with dense limestone and gravel-sized rock inclusions.

The discovery of Feature 3 is especially intriguing. Its dimensions are roughly 1 x 0.50 m, with a maximum thickness of 0.20m. It is present in Units B3 and B4, as well as Unit C3 (unexcavated). The pockets of very compact ash are white in color and indicate episodes of intense burning. Given the thickness of the feature and its characteristics, it is likely that it represents a series of hearths constructed over some period of time. Charcoal was relatively abundant, and was collected for radiocarbon dating. Both bone and lithics were also recovered from Feature 3. Fire-affected rock, burnt lithics, and burnt bone are additional characteristics. The base of the feature rests directly on bedrock, and there are small areas of ochre staining immediately above bedrock.

Evidence for the "occupation zone" first reported in Olszewski *et al.* (1998) was supplemented by the new excavations. The deposits immediately above bedrock in Units B3, D3, and E4 all yielded red ochre staining in small areas. These lower levels of the deposits from all units also contain a rel-

atively sizable lithic and bone assemblage, much of which is flat-lying. The 1997 excavations suggested that spatial differences in activities existed, with more core reduction and hammerstones in the Unit D4 area. This observation was supported by the recovery of an additional hammerstone in Unit E4 (adjacent to Unit D4).

The lithic assemblage from Tor Şageer is characteristically Early Epipaleolithic in typology and technology. Microburin technique is used to segment bladelets, which are then fashioned into a variety of very narrow nongeometric forms. These include La Mouillah points, numerous arched backed bladelets, and backed and truncated bladelets. Of some interest is the presence of a very small number of finely retouched bladelets (Ouchtata retouch) and of a small number of Qalkan points. Backed microliths comprise about 71% of the tool assemblage, while retouched pieces are about 11% of the assemblage. Other tools, such as endscrapers and burins are less common. A general view of the overall composition of the assemblage is shown in Table 6.

Trends first registered during the 1997 season (Olszewski *et al.* 1998) appear to continue. There is evidence for spatial differentiation in activities within a relatively small area; hammerstones and core reduction are more prevalent in the eastern portion of the rock-shelter (Units D4 and E4). Much of the debitage is large in size, perhaps indicating less emphasis on the production of microliths at this site. Unlike the 1997 season, however, microburins were

**Table 6.** Lithic assemblage from Tor Şageer (WHNBS 242) in percentages.

	UNIT B3	UNIT B4	UNIT D3	UNIT E4
CORES	0.6	1.1	1.8	1.7
DEBITAGE	78.1	83.2	76.7	79.8
SHATTER	17.0	10.4	15.7	12.9
TOOLS	4.3	5.2	5.8	5.5
HAMMERSTONES	-	-	-	0.1
TOTAL N	2121	3301	1498	1654

more numerous in the deposits excavated this season. The Feature 3 hearth region indicates repeated and sustained use of the rock-shelter during the Early Epipaleolithic, marking it as a favored locale for habitation. Charcoal recovered from this feature will be helpful in establishing the period of use, and for establishing baselines for similar lithic assemblages from the sites of Yutil al-Ḥasa (WHS 784) and Ṭor at-Ṭariq (WHS 1065) (Neeley *et al.* in press).

**New Test Excavations at Yutil al-Ḥasa (WHS 784)** (J.B. Cooper, M. al-Nahar, E. Richey, K. Abdo, and D.I. Olszewski)

Yutil al-Ḥasa was recorded during survey of the south bank of the Wādī al-Ḥasa by MacDonald *et al.* (1983). The site was first tested in 1984, yielding a late Upper Paleolithic occupation in Areas A and B (Clark *et al.* 1987, 1988; Olszewski 1997). In 1993, the site was tested again, when other areas were opened up. These yielded an Early Epipaleolithic occupation (Areas C and E) and a Late Epipaleolithic occupation (Area D) (Clark *et al.* 1994; Olszewski 1997; Olszewski *et al.* 1994). Excavations during the 1998 season occurred over a period of 16 days between 10 June and 3 July.

The site is a collapsed rock-shelter situated about 10 m above the wadi channel. The wadi begins to narrow in this section of the drainage in transition from the lake and marsh plain characteristic of the eastern basin of the al-Ḥasa. The deposits are preserved primarily due to enormous boulders (rock-shelter roof fall) that cover much of the slope. A spring tufa is located across the wadi from the site, indicating the presence of fresh water. In addition, water seeps likely were present at the site based on the presence of sulphur permeated deposits in Areas A and C.

One of the goals of the 1998 field season was to renew excavations in areas representative of the major chronological periods

known to exist at the site. In each case, the old units from the 1984 and 1993 seasons were emptied of backfill and excavations continued in them. In addition, one new unit was opened in each of the areas. These were located adjacent to the existing units. In Area A (late Upper Paleolithic), Units A (1984) and A98-1 were excavated. Unit A98-1 is immediately south of Unit A. In Area C (Early Epipaleolithic), Units C (1993) and C98-1 were investigated. Unit C98-1 is immediately west of Unit C but offset slightly to accommodate a full 1 x 1 m excavation unit. Finally, in Area D (Late Epipaleolithic), Units D (1993) and D98-1 were excavated. Unit D98-1 is immediately east of Unit D. Both of these units reached bedrock. Unless noted otherwise, all units are 1 x 1 m in size. Discussion of the excavations will be presented chronologically.

**The Late Upper Paleolithic Component**

The 1984 excavations revealed two hearths, the uppermost of which was radiocarbon dated to 19,000 + 1300 bp (UA-4396) (Clark *et al.* 1987, 1988; Olszewski *et al.* 1990). The top 0.60 m of Unit A were excavated during the 1984 season. The stratigraphy and lithic assemblages reported here represent those below 0.60 m. Natural Layers VI and VIII include arbitrary Levels 11-17. Layer VI is a very pale brown, very fine and extremely compact, silty, sandy clay. Layer VIII is a yellow, very compact, fine, silty clay with some gravel-sized rock. An extremely compact, light brownish grey, sandy, silty, clay with fine limestone (Level 12A) occurred within these layers. It appears to represent an occupation surface. Feature 3 is present in Levels 14-16. Layer IX (Level 11) is a yellow silty, sandy clay, with cobbles. Layer X (Levels 18-19) is a yellow sand with several small boulders. Most levels in Unit A included some charcoal.

Unit A98-1 had 17 arbitrary levels within

seven natural strata. Layer I (Levels 1-3) is a yellowish brown, loamy silt with rootlets, gravel-sized rock, cobbles, and boulders. Levels 4-6 comprise Layer II, a light yellowish brown, moist, loose to slightly compact loamy silt. This layer includes abundant gravel-sized rock and is characterized by iron staining, likely related to water seepage. Layer III is a small pocket of yellowish brown, loamy silt with abundant gravel-sized rock and ash. It includes portions of Levels 3-5. Layer IV (Levels 7-13) is a light yellowish brown, very compact, sandy, silty clay with abundant cobbles and gravel-sized rock. Levels 14-17 are within Layer V, a very pale brown, very compact, mineralized, silty, sandy clay; iron staining is also present. This layer is a possible "occupation surface." Layer VI (Levels 14-16) is a pale brown, very fine and extremely compact silty, sandy clay with abundant gravel-sized rock. Layer VII (Levels 14-17) is a light yellowish brown, moderately compact, silty sand with cobbles and small boulders. Layers V, VI, and VII occur as contiguous layers across the lower portion of the unit.

One feature (Feature 3) was identified in the eastern portion of Units A and A98-1, at approximately Levels 14-16. It is an area of dense bone with some lithics that also was distinguished by ash, gravel-sized rock, and cobbles. Some of the bone is burnt. The feature occurred in proximity to several small boulders, although these did not appear to be deliberate components of the feature.

Both bone and lithics were abundant throughout many of the levels excavated in Units A and A98-1. The most common tool type are finely retouched bladelets (Ouchtata retouch). Retouched pieces are also relatively common, but other tools such as endscrapers, burins, and notch/denticulates tend to be relatively rare. A total of 5,141 lithic artifacts were recovered from Area A during this season. An overview of the assemblage is presented in Table 7. Combined

with the assemblage from the 1984 season, there is a grand total of 10,365 lithic artifacts.

In addition to the two hearths located during the 1984 season, the most interesting discoveries this year included the presence of at least two probable occupation surfaces. The upper surface appears to coincide with the Feature 2 hearth, and is characterized by abundant bone and lithics, particularly a large number of cores. A lower occupation surface is typified by abundant trimming flakes and shatter.

### The Early Epipaleolithic Component

The 1993 excavations in Unit C exposed about 1.3 m of deposits (Clark *et al.* 1994). The upper portion was heavily stained with iron and magnesium, typical of water seepage. With the excavation of adjacent Unit C98-1, and the time available, it was not possible to extensively excavate Unit C below the 1993 limit. Two arbitrary levels were opened in Unit C during this season. They correspond to an extremely compact, very pale brown to yellow clay with some sand. Cobbles and gravel-sized rock are additional components.

Unit C98-1 was excavated in 26 arbitrary levels that correspond to three natural strata. Layer I (Levels 1-2) is a brownish yellow, very loose silt with numerous gravel-sized rock and cobbles. Some mixture with later materials occurs, as there are a few pottery sherds, as well as patinated lithics from the upslope Late Epipaleolithic deposits, present in these levels. The majority of the

**Table 7.** Lithic Assemblages from Area A. Yutil al-Ḥasa (WHS 784) in percentages.

	Unit A	Unit A 98-1
CORES	0.8	1.9
DEBITAGE	71.2	72.3
SHATTER	26.2	22.3
TOOLS	1.8	3.3
HAMMERSTONES	-	0.1
TOTAL N	1670	3471

assemblage, however, is Early Epipaleolithic in age. Fossil shark teeth are an additional constituent. Levels 3-18 comprise Layer II, a moderately compact, silty clay that is variable in color due to areas of heavy iron and manganese staining. Colors range from a very pale brown to a strong brown to dark brown. Inclusions consist of abundant cobbles and gravel-sized rock, as well as some small boulders. The upper portion of this layer (Levels 3-11) exhibits relatively poor bone preservation, while the lower portion (Levels 12-18) has exceptionally good bone preservation. Lithics are still Early Epipaleolithic in age. Layer III is yellow, compact clay with some silt and sand. There are also gravel-sized rocks and some cobbles. The base of the stratum contains numerous small boulders. Bone preservation is poor, and the lithic assemblage contains elements which differ from the upper deposits.

Except for the lowest deposits in Units C98-1 and C, the lithic assemblage is typical of the Early Epipaleolithic period, with numerous, very narrow, backed microliths. The dominant forms are La Mouillah points, backed and truncated bladelets, and arched backed bladelets. There are also numerous examples of microburins. Tools such as endscrapers, burins, notch/denticulates, and retouched pieces are rare. Of some interest is the lithic assemblage from the lowest levels, which is characterized by finely retouched bladelets (Ouchtata retouch) and inversely retouched bladelets (Dufour bladelets). These tool types are generally considered typical of the Upper Paleolithic, and may indicate that the deposits of Area C contain two distinct chronological periods. An overview of the assemblage is given in Table 8. A total of 6,066 lithic artifacts were recovered from Area C this season. Combined with the assemblage from the 1993 season, there are a grand total of 12,183 lithic artifacts from Area C.

Excavations in Area C reached about

**Table 8.** Lithic Assemblage from Area C, Yutil al-Hasa (WHS 784) in percentages.

	UNIT C	UNIT C 98-1
CORES	-	0.4
DEBITAGE	69.7	65.8
SHATTER	28.4	29.4
TOOLS	1.9	4.4
TOTAL N	102	5964

1.5m below ground surface. In elevation, this depth is approximately 0.50 m above the top deposits of the Upper Paleolithic in Area A. It would be interesting to know if continued excavations in Area C would have resulted in reaching a definitive Upper Paleolithic occupation. There was, however, tentative evidence that bedrock was reached in the NW quad of Unit C98-1, and subsequent excavation in Area C may not have been possible below a few more levels.

### The Late Epipaleolithic Component

During the 1993 excavations, an Early Natufian occupation was revealed in Area D of the site (Clark *et al.* 1994; Olszewski 1997). The majority of the artifacts were recovered from the upper portion of the deposit, and there was a preliminary indication that an earlier component might exist in the lower portion of the excavated deposit. This area was reopened because the Natufian is uncommon in the al-Hasa drainage, having been located previously only at Tabaqa (WHS 895) and at WHS 1021 (Byrd and Colledge 1991; Byrd and Rollefson 1984; Olszewski *et al.* 1998).

Renewed excavation in Unit D revealed that the 1993 excavations had terminated only slightly above bedrock. Two arbitrary levels were dug this season before bedrock was reached across the unit. Both levels correspond to a natural layer of light yellowish brown, moderately compact silt. This layer was characterized by abundant angular limestone which represents material decomposing from the bedrock substrate.

A total of 18 arbitrary levels, corresponding to four natural strata, were excavated in Unit D98-1. Natural Layer I roughly comprises Levels 1-4. It is pale brown, fine, loose silt, with angular gravel-sized rock, as well as some cobbles. Layer II is a series of discontinuous pockets of grayish brown, loose silt with gravel-sized rock. Portions of Levels 5-6 correspond to this level. Levels 5-12 correspond to Layer III, a light yellowish brown, slightly compact silt with angular gravel-sized rock. Some rodent activity was observed in this layer. Layer IV (Levels 13-18) is a yellowish brown, moderately compact silt with clay, that is characterized by angular cobbles. A moderate amount of charcoal was collected from Level 13, and a feature (Feature 4) was recorded in Level 15.

Feature 4, a small pit measuring 0.08 m in diameter and 0.05-0.07 m in depth, was uncovered in Level 15. A small number of lithic artifacts and burnt bone were recovered from its fill.

Bone preservation in Units D and D98-1 was poor and most of the sample is small and fragmentary. A total of 2,704 lithic artifacts were recovered this season. Combined with the 1993 excavations, Area D yielded a grand total of 3,548 lithic artifacts. Lithics were most common in the upper 0.20 m of the deposits of Unit D98-1 (these deposits in Unit D were removed during the 1993 season). The lithic artifacts are characteristically Early Natufian, with Helwan lunates, Helwan retouched bladelets, and microburins. There are also a considerable number of abruptly backed lunates. Notch/denticulates and retouched pieces are the most common other tools, while endscrapers, burins, borers, and truncations are very rare. An overview of the assemblage is given in Table 9. The Natufian lithics are heavily patinated, which contrasts with the small quantities of lithics recovered from the lower deposits, which are not patinated. The assemblage from the lower deposits is

too small to reliably assign to a separate component, but the tantalizing possibility remains that an earlier component is also present in Area D.

### Concluding Remarks

The 1998 EHLPP field season resulted in the accomplishment of several major goals of the project in which extensive new areas of four sites were investigated. Together with the artifactual, paleoenvironmental, and geomorphological data collected during the 1997 season, we expect to increase our understanding of the changing paleoecological adaptations of hunter-gatherers in the eastern al-Ḥasa basin. Excavations at Ṭor Ṣadaf have extended the chronology of occupation during the Upper Paleolithic and documented an important technological transition from the late Middle Paleolithic to the early Upper Paleolithic. The identification of another, early to middle Ahmarian, site at Thalab al-Buḥayra (EHLPP 2) adds to our growing understanding of lacustrine adaptations along the southern shoreline of Pleistocene Lake al-Ḥasa across the approximate 40-20,000 bp time range (see also 'Ayn al-Buḥayra [WHS 618] in Olszewski *et al.* 1998). Continued excavations at the small rock-shelter of Ṭor Ṣageer have reinforced our initial documentation of repeated occupations of small rock-shelters away from the lake area during the Early Epipaleolithic. Similarly, the occupations at Yutil al-Ḥasa emphasize the continued use of this series of rock-shelters from ca. 20,000 bp through the early Natufian during

**Table 9.** Lithic Assemblage from Area D, Yutil al-Ḥasa (WHS 784) in percentages.

	UNIT D	UNIT D 98-1
CORES	-	2.2
DEBITAGE	73.5	81.2
SHATTER	17.3	11.2
TOOLS	9.2	5.3
TOTAL N	98	2606

periods of changing ecological conditions as the Pleistocene came to an end.

The research conducted to date in the eastern regions of the Wādi al-Ḥasa promises to enhance our understanding of the terminal Pleistocene and aid in developing appropriate models for the inland regions of the Levant, as well as strengthen the overall picture of Jordan's prehistory.

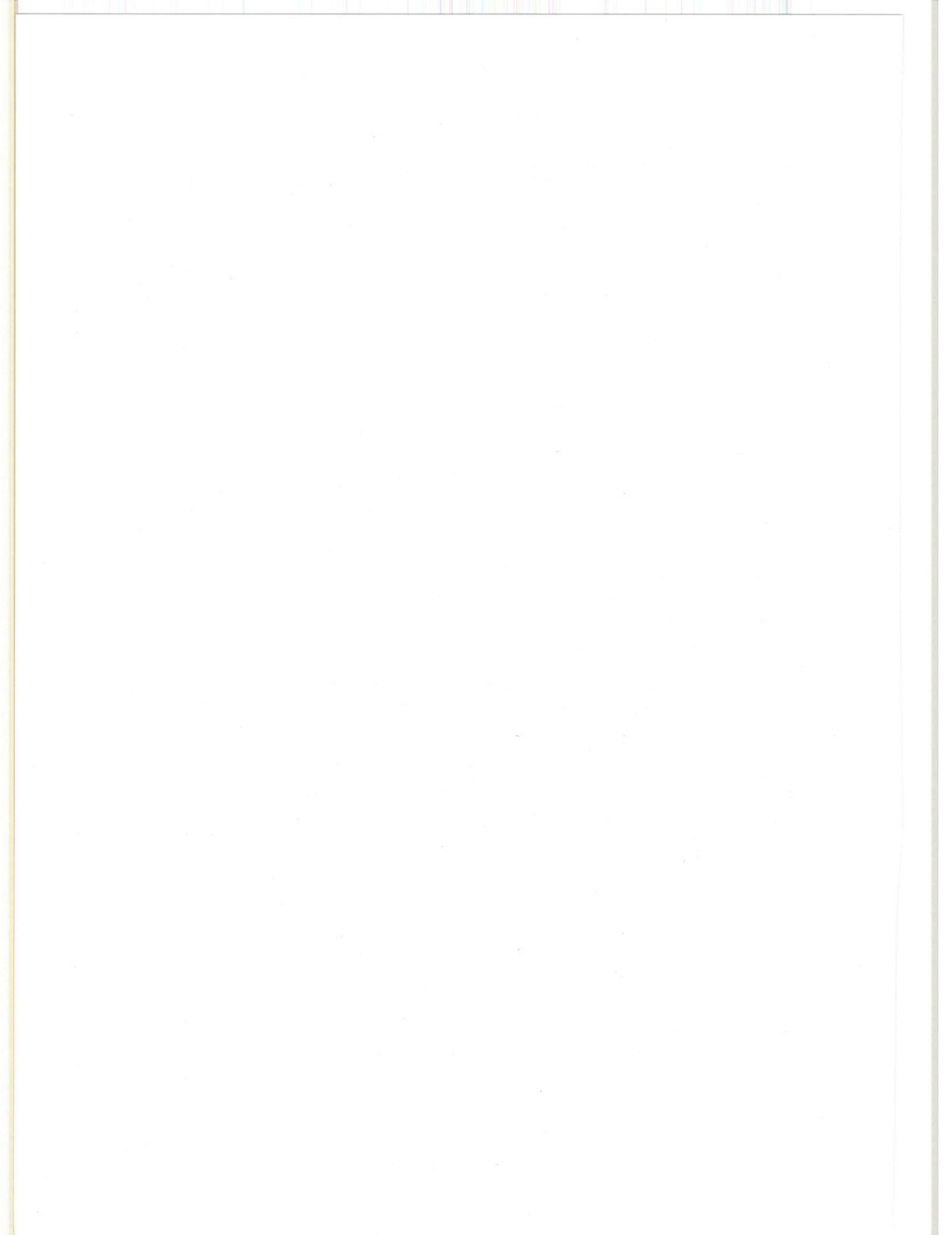
N.R. Coinman  
D.I. Olszewski  
K. Abdo  
T.G. Clausen  
J.B. Cooper  
J.R. Fox  
M. al-Nahar  
E. Richey  
L.S. Saele

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# AN EPIPALAEOLITHIC SEQUENCE FROM WĀDĪ ḤĪSBĀN IN THE EAST JORDAN VALLEY

by

Phillip C. Edwards, M. John Head and Phillip G. Macumber

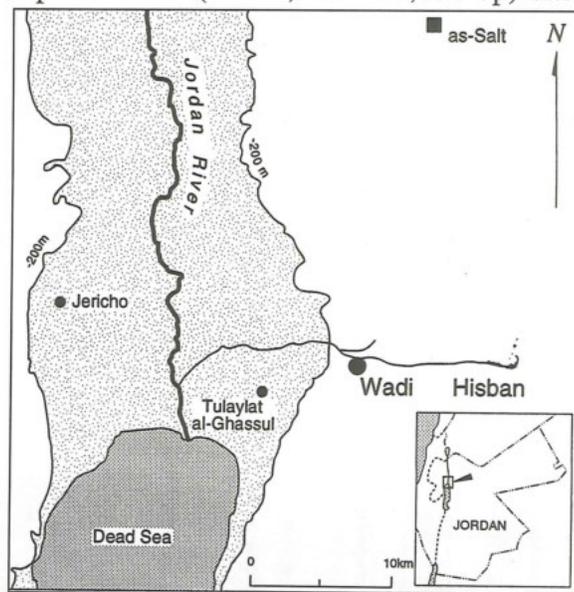
## Introduction

This report describes excavations at a sequence of three new Epipalaeolithic sites in Wādī Ḥisbān (Fig. 1), located along a two-hundred metre stretch of the wadi's north bank in the east Jordan Valley (Fig. 2). The locale lies intermediate between the village of ar-Rawḍa to the north and Tall Iktanū to the south (Figs. 3-4). Although several sites are evident in the wadi terrace sections in this area, manifest as small bands or isolated cases of chert artefacts, our investigations concentrated on the sampling of three sites stratified in the top two metres of the terrace.<sup>1</sup> These three sites are *in situ*, rich in artefacts, horizontally bedded and superimposed. Additionally, the upper two revealed surface signs of stone constructions.

Before excavation, retouched artefacts eroding from the terrace indicated that the whole sequence dated from the middle to late Epipalaeolithic, concluding with the uppermost Natufian site. Excavation of the sites was inaugurated in order to provide

data about several key issues:

- prior to this project, no *in situ* Late Epipalaeolithic (ca. 14,500 - 10,000 bp) sites



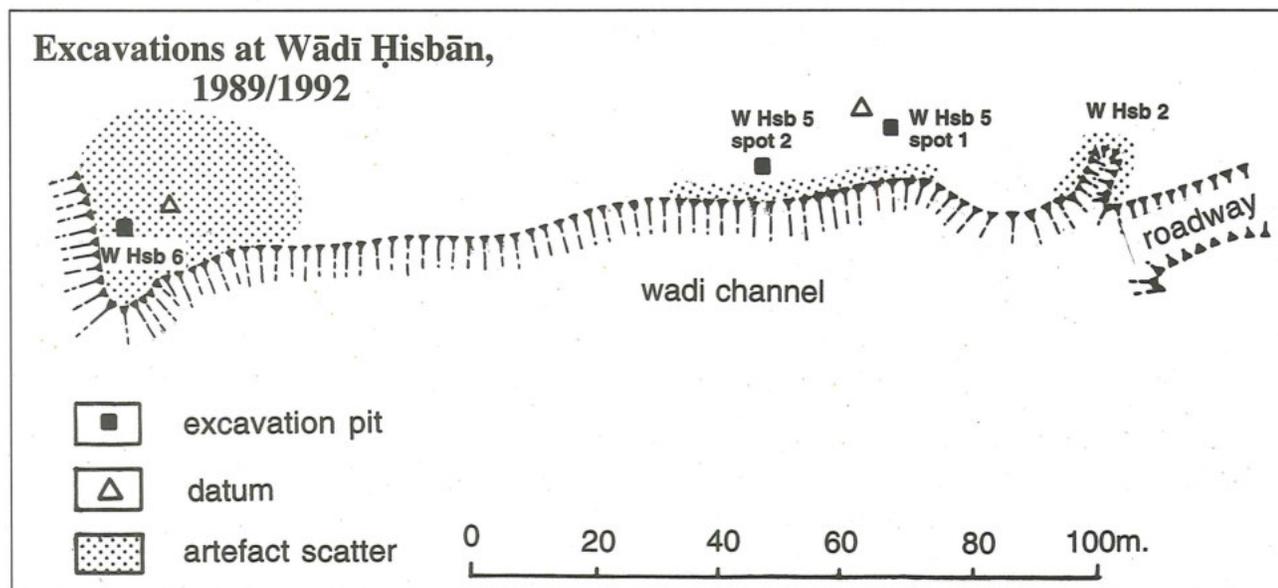
1. Location of the Wādī Ḥisbān Epipalaeolithic sites in the east Jordan Valley. The shaded area within the *zor*, or Jordan River flood plain, indicates land below the -200 m contour. This is close to the -180 m contour which marks the greatest extent of Pleistocene Lake al-Lisān.

1. Wādī Ḥisbān 2 was discovered by Phillip Macumber in the spring of 1989, and excavated by Phillip Edwards in December of that year. The work at Wādī Ḥisbān 2 was carried out by Edwards on behalf of the Department of Antiquities of Jordan, through the courtesy of the then Director-General of Antiquities Dr Ghazi Bisheh. The excavation team included Department of Antiquities representative Mr Ali Sa'idi, Abū Isa, Abū Sami, Sa'ad Yusuf Khashan, Musa'ad Yusuf Khashan, Abū Afif, and Abū Fawzi. The excavations were funded thorough an Australian Research Council (ARC) fellowship held by Edwards at the Department of Archaeology, University of Sydney.

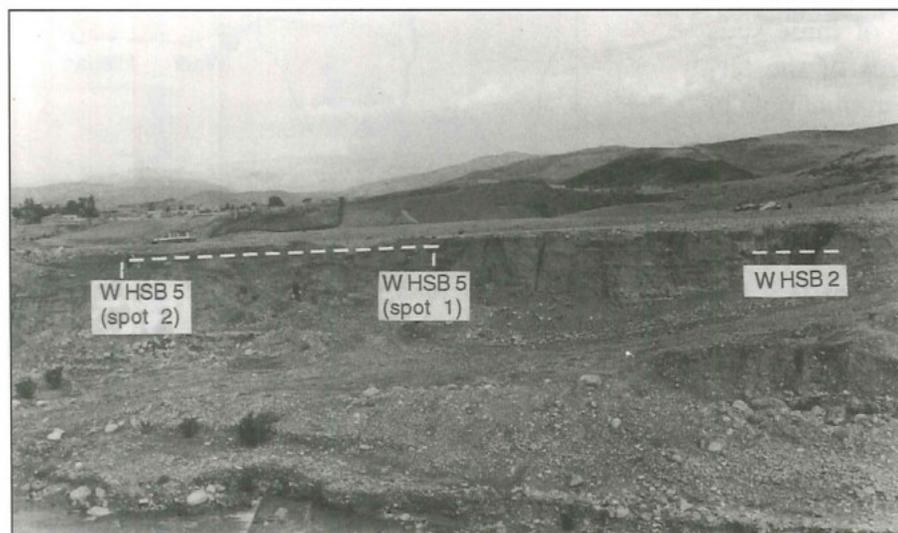
Further survey by Macumber and Edwards in December 1991 clarified the potential of the two overlying sites Wādī Ḥisbān 5 and Wādī Ḥisbān 6. These were excavated by a small La Trobe University excavation team directed by PCE and including Dr Susan Colledge and Dr Louise Martin,

in December 1992. The excavation team also included Abū Isa, Abū Sami, Sa'ad Yusuf Khashan, Musa'ad Yusuf Khashan, Abū Afif, Abū Nasim and Abū Fawzi. The work was approved and encouraged by the former Director-General of the Department of Antiquities of Jordan, Dr Safwan Tell and assisted by Department of Antiquities representative Mr Ali al-Khayyat. This work was funded by a La Trobe Central Starter Grant and Small ARC Grants.

The authors are most grateful to Dr Kay Prag for her encouragement to work on these sites located within her study area in the environs of Tall Iktanū and for her ongoing assistance and provision of valuable information about the area. We would also like to thank Dr Jonathan Mabry for providing information about the area. Finally, thanks are due to Mr Wei Ming and Mr Rudy Frank of the La Trobe University School of Archaeology: Rudy for photographic work and Ming for the stone artefact drawings.



2. Location of the Epipalaeolithic sites on the north bank of Wādī Ḥisbān.



3. Relationship of Wādī Ḥisbān 2 to Wādī Ḥisbān 5 on the north bank of Wādī Ḥisbān.



4. Relationship of Wādī Ḥisbān 5 to Wādī Ḥisbān 6 on the north bank of Wādī Ḥisbān, with ar-Rawḍa village visible in the background.

had been excavated in this part of the East Jordan Valley. This sequence promised to fill an archaeological lacuna in the region for this crucial period in Levantine pre-history.

- these sites promised to extend the chronological coverage of the East Jordan Valley Epipalaeolithic sequence (ca. 19,500 - 14,500 bp, Edwards *et al.* 1996) we had excavated further north in Wādī al-Ḥammeh during the 1980s.
- the lower altitude of the Jordan Valley at its southern end generates conditions of lower rainfall and greater aridity than obtained for Wādī al-Ḥammeh in the moister region to the north. Consequently the areas differ markedly with respect to climate, geology and flora, raising the prospect that human adaptations during the Late Pleistocene near the Dead Sea might have varied significantly from contemporaneous ones in Wādī al-Ḥammeh.
- archaeobotanical and faunal remains might be recovered, yielding subsistence data relatively rare for the pre-Natufian period.
- settlement data might be obtained, providing comparisons to terminal Pleistocene trends towards sedentism, for example, in nearby complex residential Natufian sites, such as Tall as-Sulṭān (Jericho) and Wādī al-Ḥammeh 27.
- radiometric dating of the top of the Wādī Ḥisbān terrace levels might bear on data already obtained by Macumber in Wādī al-Ḥammeh regarding the desiccation of Lake al-Lisān (Macumber and Head 1991). At the time of their occupation the cluster of sites would have overlooked the lake (see Fig. 1), the shore of which is estimated to have lain about two kilometres to the west at an altitude of 180 m bsl (Neev and Emery 1967).

### Excavation Methodology

From lowest to uppermost, the three sites were designated Wādī Ḥisbān 2, Wādī Ḥisbān 5 and Wādī Ḥisbān 6 respectively<sup>2</sup> (see Figs. 2-4). Throughout the project, excavation proceeded by natural stratigraphy, complemented by smaller artificial units (usually five centimetres) to retain finer-scale vertical control. A natural stratigraphic deposit is here termed a 'Locus', and an artificial excavation unit a 'Unit', so that the term 'Locus 1.10' refers to the tenth artificial unit in the natural deposit 'Locus 1'. The locales of the various excavation pits are called 'Spots', so that for example the two excavation pits for Wādī Ḥisbān 5 are termed 'Spot 1' and 'Spot 2'.

All sediments were routinely wet-sieved in the adjacent wadi through 3 mm mesh. Additional nested-sieve samples were taken using five mesh sizes ranging from 0.5 to 25mm (all the tabulated data in this report derive from the 3 mm sieve residues). All sites were sampled for charred botanical fragments by bucket flotation in Wādī Ḥisbān.<sup>3</sup>

The shape and depth of the excavation pits varied with each site depending on conditions of access. The uppermost site Wādī Ḥisbān 6 was accessible through a straightforward pit, (initially 2 x 1 m and continuing deeper as a 1 square metre pit; Figs. 2 and 7). The middle site Wādī Ḥisbān 5 was approachable by sinking a 1 square metre pit into the deposit at 'Spot 1' (Fig. 5). The laterally extensive cultural horizon of this site was further investigated 20 m to the west by excavating a 1m broad pit ('Spot 2') through the outcrop (see Fig. 2). The lowermost site Wādī Ḥisbān 2 was only accessible by sampling the cultural stratum along an outcrop in the terrace wall (Fig. 6). Deep excavation back into the terrace face was impracticable

2. The site numbers 2, 5 and 6 were allocated to these sites in order to conform to the site survey numbering system developed by Dr Kay Prag for the area.

3. Flotation and charred plant identifications were

carried out by Dr Susan Colledge. Disappointingly preservation was not good enough to yield any diagnostic botanical samples; however enough charred material was collected to enable these samples to be submitted for AMS carbon dating.



5. Excavation at Wādī Ḥisbān 5, Spot 1. Stone hearth (F. 1) is stratified in the rear wall of the pit, above the dense artefact layer visible as the darker band of sediment.



6. Artefact rich sediment at Wādī Ḥisbān 2.

here since the deposits were strongly cemented.

## Wādī Ḥisbān 2

### Site Characteristics and Stratigraphy

Wādī Ḥisbān 2 is the lowermost site in

the sequence. Prior to its discovery in 1989 a deep gully gouged into the bank, probably associated with nearby roadworks (Fig. 2), had serendipitously exposed the site. A rich band of lithics and burnt animal bone some thirty centimetres thick extends in outcrop (Fig. 6) ten metres laterally from east to west along the wadi terrace.

The enclosing sediment is a dark yellowish-brown (10YR 4/4) silty clay. It contains fossil large benthonic foramenifera (*Nummulites sp.*) at low frequencies (ca. < 0.1% by weight of sediment), reflecting their alluvial transport from parent Late Cretaceous/ Eocene limestones that comprise the foothills of the Jordanian plateau immediately to the east. No structural features were encountered in the excavations, however they were unlikely to have been recovered even if present because the excavated sample was very small. The only possible remnant structural feature was a single burnt limestone cobble which may have constituted part of a hearth.

Sediments were dug from the exposed cutting in the 1989 season. Although a small volume was excavated due to the intractability of the deposits (Table 1), the site proved to be extraordinarily rich, containing 135,044 lithic fragments per cubic metre. The high mean artefact density may be ac-

**Table 1.** Characteristics of Wādī Ḥisbān Epipalaeolithic sites.

	Wādī Ḥisbān 2	Wādī Ḥisbān 5 spot 1(Loc.1.9-1.13)	Wādī Ḥisbān 5 spot 2 (Loc. 1.7-3.1)	Wādī Ḥisbān 6 Loc.3.1-5.4
Site altitude	- 149.1 m.	- 146.9 m.	- 147.9 m.	- 150.1 m.
Excavated volume	0.09 m <sup>3</sup>	0.25 m <sup>3</sup>	0.11 m <sup>3</sup>	0.36 m <sup>3</sup>
Estimated site area				
Constructed features	-	stone hearths	-	stone hearth
Flaked stone artefacts (Total no. of pieces)	12,154	4,101	2,450	2,883
Flaked stone artefacts (Total weight)	5,068 g	1,766	798 g	1,349
Flaked stone artefacts (Density of pieces)	135,044 / m <sup>3</sup>	16,404 / m <sup>3</sup>	22,272 / m <sup>3</sup>	8,008 / m <sup>3</sup>
Flaked stone artefacts (Density by weight)	56,311 g / m <sup>3</sup>	7,062 g / m <sup>3</sup>	7,255 g / m <sup>3</sup>	3,747 g / m <sup>3</sup>
Animal bone (Total no. of fragments)	8,154	894	1,166	995
Animal bone (Total weight)	665 g	49 g	54 g	176 g
Animal bone (Density of fragments)	90,600 / m <sup>3</sup>	3,576 / m <sup>3</sup>	10,600 / m <sup>3</sup>	2,750 / m <sup>3</sup>
Animal bone (Density by weight)	56,310 g / m <sup>3</sup>	196 g / m <sup>3</sup>	491 g / m <sup>3</sup>	489 g / m <sup>3</sup>
Ochre (Total no. of fragments)	428	58	18	-
Ochre (Total weight)	37 g	6 g	9 g	-
Other artefact types	-	Grooved pebble	-	limestone bowl

counted for in part by the extremely good preservation of fine fragments such as microflakes and small chips. Nevertheless, the gross amount of chert artefacts and knapping refuse present far outstrips the quantities recovered from the other two sites according to the density of lithics by weight as well as the numbers of fragments (Table 1).

Two radiocarbon determinations were obtained for Wādī Ḥisbān 2 from different pre-treatments of a sample of burnt animal bone. The organic protein component of the bone yielded a determination of  $9,490 \pm 220$  bp<sup>4</sup> (ANU-8469a). Stratigraphic and typological considerations, however, lead us to believe that a true age range for the site should be in the order of 16-15,000 bp and that the bone collagen was contaminated with later material. Another analysis of the sample (ANU-8469b) was then done on the inorganic bone apatite fraction which gave a somewhat older result of  $11,560 \pm 250$  bp, still unfortunately indicating diagenesis of the bone apatite fraction.

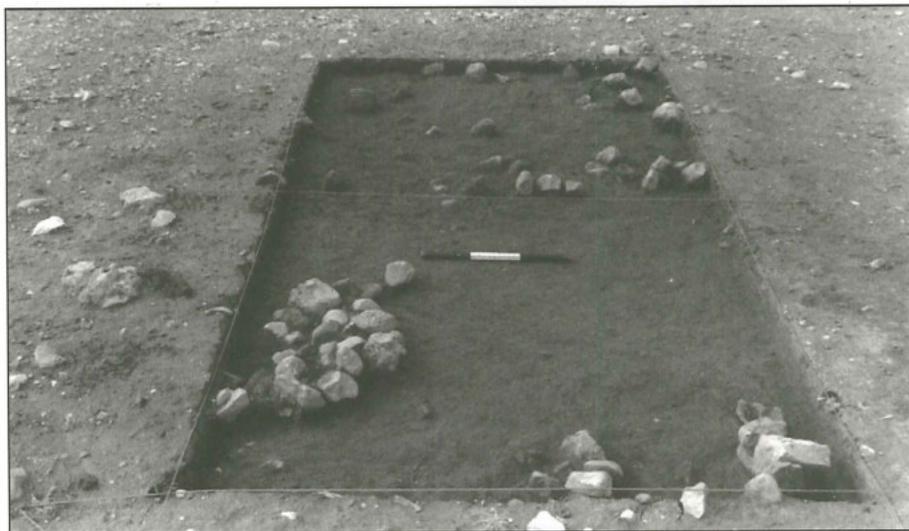
#### *Fauna*

High quantities are even more pronounced for animal bone than for lithics. In Wādī Ḥisbān 2 faunal fragments occur at a density by weight 100 - 300 times higher than those of Wādī Ḥisbān 5 and Wādī

Ḥisbān 6. Bone is notable for being present almost exclusively in the form of small, burnt fragments (Table 1 and Fig. 8:7). The comminuted nature of the burnt bone is probably due to post-depositional mechanical degradation. The absence of unburned bone is noticeable and raises the question as to whether unburned bone has been selectively attacked and degraded in the sediments post-depositionally. The few diagnostic faunal pieces comprise several fractured and burnt *Gazella* (gazelle) and *Potamon potamon* (freshwater crab) phalanges. Marine molluscs were absent.

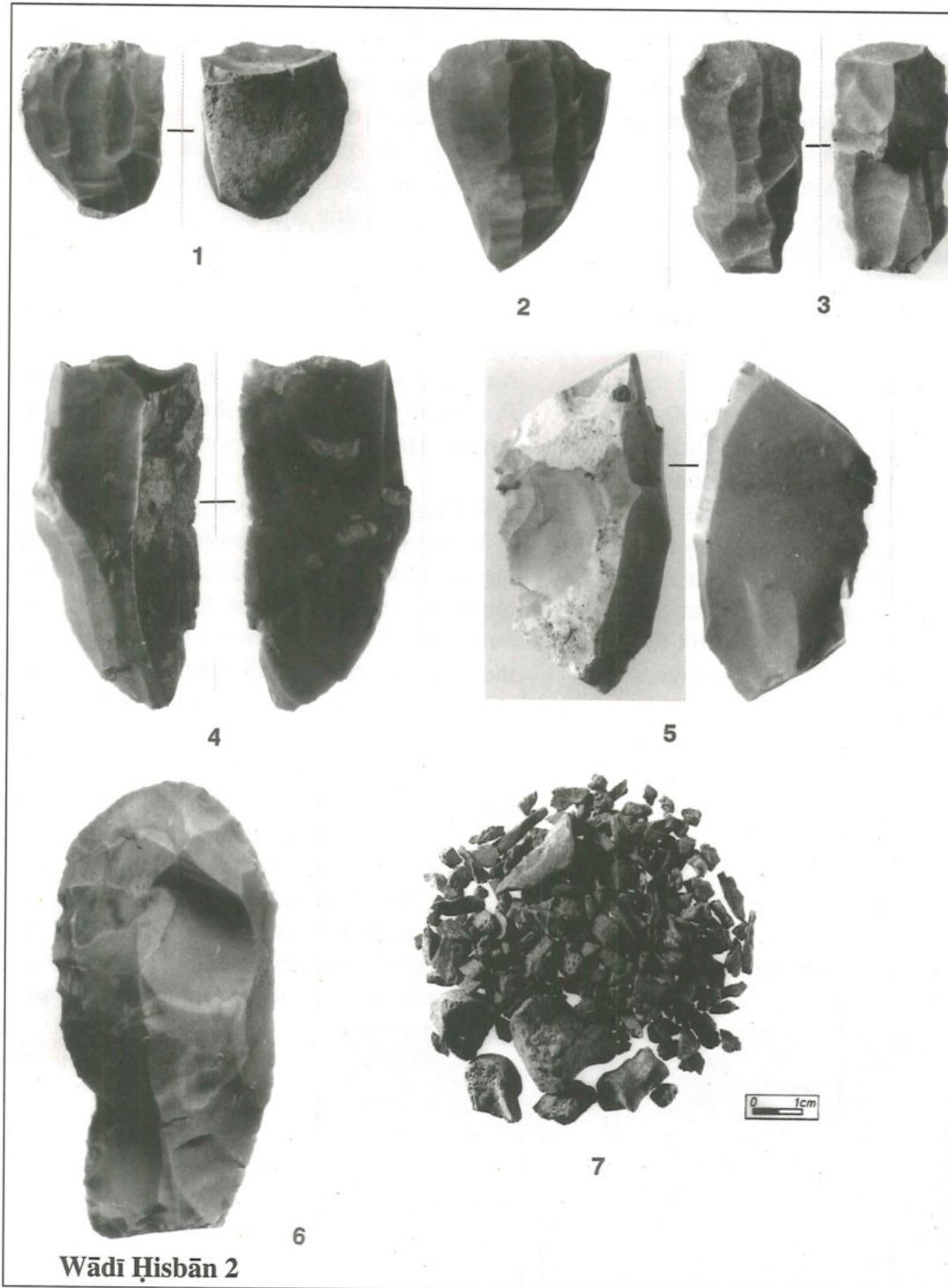
#### *The Flaked Stone Assemblage*

Core reduction was effected by utilising the unlimited local raw material source immediately at hand, in the form of the large numbers of alluvial chert cobbles lying in the channel of Wādī Ḥisbān. The bladelet cores in the excavated sample reflect this situation in that most are single platform types (11 out of 18, Fig. 8:1-2), with only two out of eighteen opposed platform cores (Fig. 8:3) occurring. Blade detachment on cores was usually effected on one side only, leaving the other side cortical (Fig. 8:1). A striking platform was simply produced by removing a large transverse cortical flake. The small number of core rejuvenation ele-



7. Excavations at Wādī Ḥisbān 6. Clustered stones of a hearth (F. 1) are located in the near left hand corner of the Pit, another (F. 2) in the right foreground, and a scattered example (F. 3) in the background.

4. All radiocarbon dates reported here are expressed as uncalibrated determinations Before Present (bp).



8. Wādī Ḥisbān 2: (1-2) Single platform bladelet cores. (3) Opposed platform bladelet core. (4) Multiple burin (on straight truncation and on natural surface). (5) Burin on natural surface. (6) Endscraper. (7) Burnt and smashed animal bone fragments.

**Wādī Ḥisbān 2**

ments (0.2%, Table 2) such as core tablets and ridge-straightening blades reflect the lack of necessity for core rejuvenation.

This is a familiar mode of bladelet core reduction in the Levant where raw materials are bountiful. On the other hand, the most common retouched artefact type here is a

tiny geometric microlith - a triangle (Figs. 9:1 and 10:5) - which in both its diminutive size and the painstaking care taken in its production presents a remarkable contrast to the expendable types of cores and the profligate use of raw material. Triangles were produced by the employment of a specific

version of the microburin technique and the process is reconstructable due to the large numbers and full range of debitage products preserved in this assemblage. Blades produced from blade cores were initially selected for microburin production, sometimes with the first step being the production of concave-truncated bladelets (Fig.10:1). The extreme tips of these were then broken off by microburin technique, leaving in some cases long bladed microburins, and the resultant tiny trihedral piece.

Here one would be tempted to consider the microburin the effective implement, with the tiny trihedral piece representing the discarded waster, were it not for the fact that the great majority of triangular trihedral pieces have been subsequently retouched, an impressive feat of craftsmanship given that the average length of the triangles is just 8.7 mm (N = 100, SD =1.8 ). Occasionally the retouch of the trihedral piece was not added quite symmetrically and the result is a tiny lunate, or in rare cases, a trapeze (Figs. 9:1 and 10:6).

The small size of the triangles should

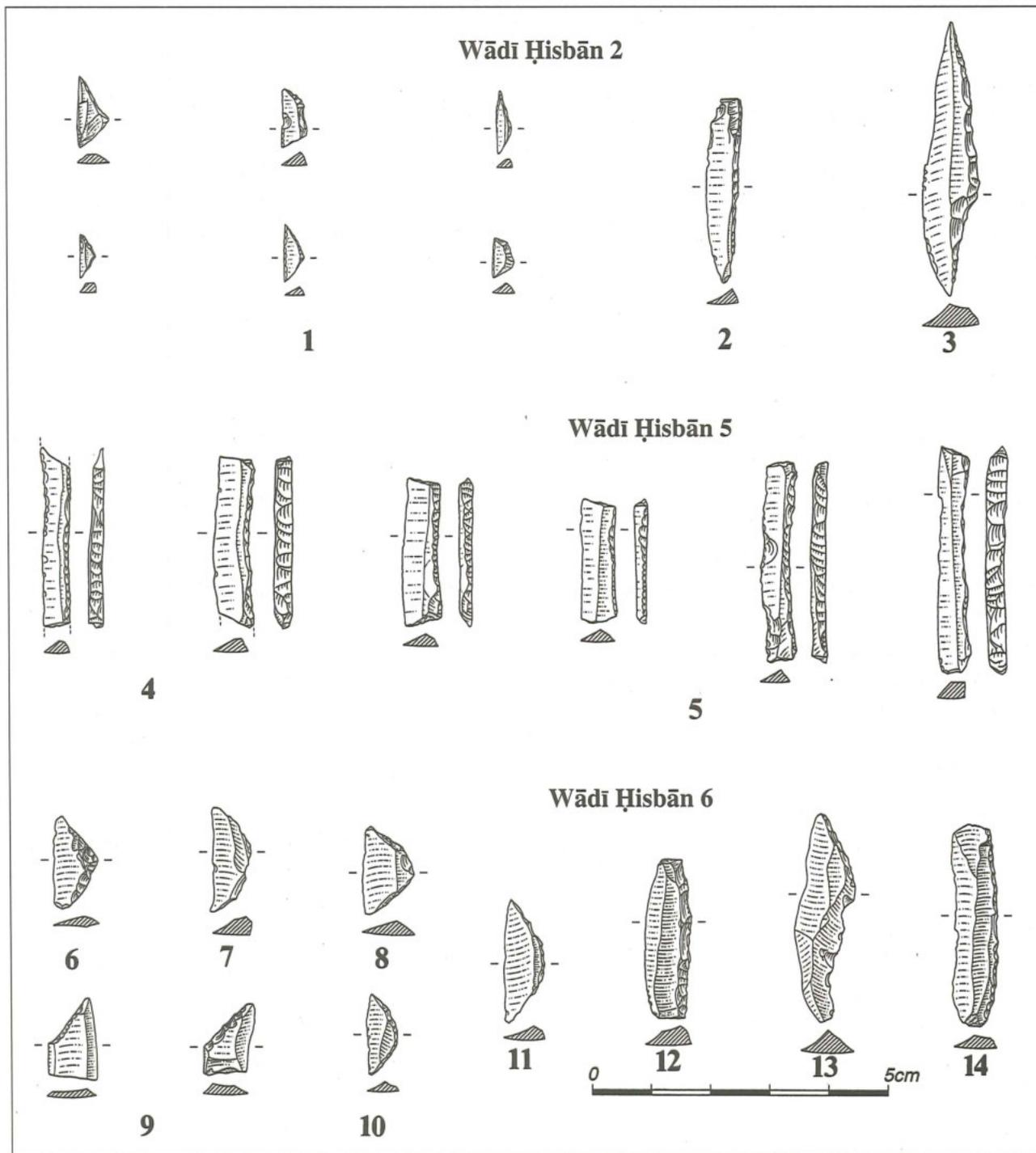
render them easily lost or liable to removal through wind and water deflation which may explain the great preponderance of microburins. The restricted microburin index for the site (Henry 1974) is a colossal 74%, compared with 5 - 9% for the overlying site Wādī Ḥisbān 5 (Table 3). Wādī Ḥisbān 6 also has a very high restricted microburin index of 59.5 %, but in this case the sample size is very small.

During the microburin procedure blades were commonly snapped distally (Table 3), perhaps because the feathered distal terminations of the blades were easier to break than the thicker proximal ends. Microburins are also sometimes double (Fig.10:2), a practice unnecessary in the light of inexhaustible surplus local chert, but more efficient in terms of the production of triangles in that a double microburin once produced could be utilised to create two triangles compared to the one from a single microburin.

While the concave-truncated bladelets may be explained as part of the reduction sequence for production of the tiny triangles, a small proportion of backed blade-

**Table 2.** Wādī Ḥisbān flaked stone assemblages.

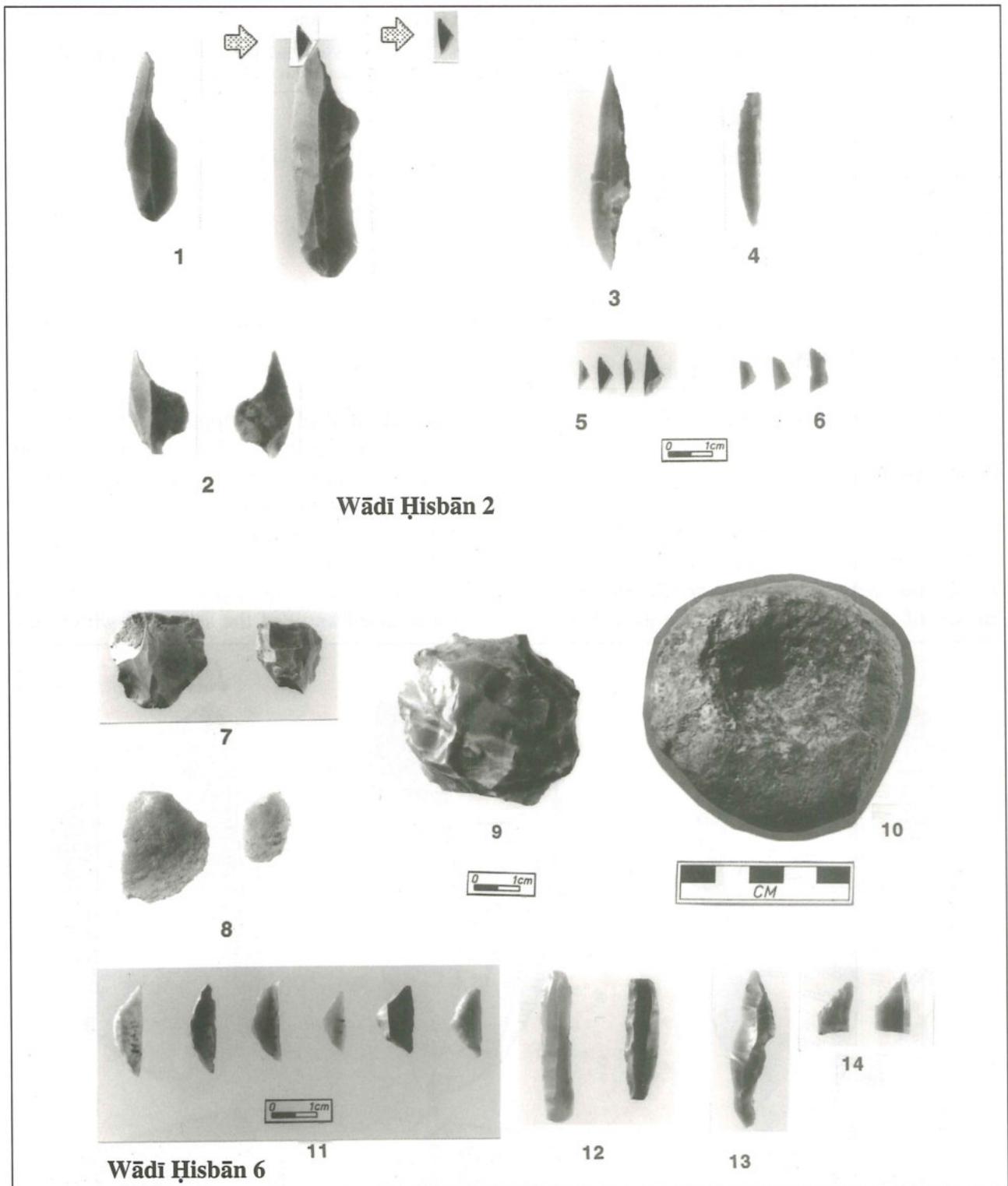
Artefact type	Wādī Ḥisbān 2		Wādī Ḥisbān 5 spot 1 (Loc.1.9-1.13)		Wādī Ḥisbān 5 spot 2 (Loc. 1.7-3.1)		Wādī Ḥisbān 6 (Loc. 3.1-5.4)	
	N	%	N	%	N	%	N	%
Chunks	55	0.4	51	1.3	19	0.8	72	2.5
Chips	4,006	32.8	2,393	58.3	956	39.0	1,613	55.9
Sub-total	4,061	33.2	2,444	59.6	975	39.8	1,685	58.4
Flakes	5,570	45.6	700	17.0	771	31.4	878	30.4
Blades	1,273	10.4	708	17.2	521	21.3	271	9.3
Core trim.	22	0.2	3	0.1	7	0.3	5	0.2
Burin spalls	60	0.6	3	0.1	6	0.3	1	0.1
Microburins	847	6.9	12	0.3	15	0.5	16	0.6
Trihedral pieces	29	0.2	-	-	-	-	-	-
Cores	18	0.1	6	0.2	1	0.1	9	0.3
Sub-total	7,819	64.0	1,432	34.9	1,321	53.9	1,180	40.9
Scrapers	9	<0.1	7	0.2	1	< 0.1	1	< 0.1
Burins	9	<0.1	1	< 0.1	-	-	-	-
Multiple tools	-	-	1	< 0.1	-	-	-	-
Blades	6	<0.1	1	< 0.1	-	-	-	-
Microoliths	60	0.8	204	5.0	127	5.2	7	0.2
Geometric microliths	226	1.8	11	0.3	26	1.1	8	0.3
Notches & denticulates	20	0.1	-	-	-	-	2	0.1
Other	4	<0.1	-	-	-	-	-	-
Sub-total	334	2.7	225	5.5	154	6.3	18	0.6
Total	12,214	100.0	4,101	100.0	2,450	100.0	2,883	100.0



9. Wādī Ḥisbān 2: (1) Tiny triangles, trapezes and lunates. (2) Broken backed bladelet. (3) Microgravette. Wādī Ḥisbān 5: (4) Broken backed bladelets, Spot 1, Loc. 1.13. (5) Trapezes, Spot 1, Loc. 1.11-12. Wādī Ḥisbān 6: (6) Inverse triangle, Loc. 4.1. (7,10,11) Abrupt lunates (8) Trapeze, Loc. 4.1. (9) Broken obliquely-truncated bladelets, Loc. 4.1. (12, 14) Straight bi-truncated backed bladelets. (13) Obliquely-truncated bladelet, Loc. 1.1.

lets were also made which cannot be. Most notable is a complete microgravette (Figs. 9:3 and 10:3), accompanied by several broken pointed and backed bladelets (Figs. 9:2

and 10:4). There were only a handful of larger retouched artefacts; ten in a sample numbering 12,214, which consisted of a few well-made, symmetrical endscrapers and a



10. Wādī Ḥisbān 2: (1) Reconstructed reduction sequence for triangles. (2) Microburin on truncated blade. (3) Microgravette. (4) Backed blade. (5) Triangles. (6) Trapezes.  
 Wādī Ḥisbān 6: (7) Multiple platform flake cores, Loc. 4.1A, Loc. 4.1B. (8) Quartzite flakes, Loc. 5.3A. (9) Rounded scraper, Loc. 5.3A. (10) Limestone bowl, Loc. 5.3A ( at separate scale). (11) Abrupt lunates, (Left to right) Loc. 2.1, Loc.1.1, Loc. 4.3, Loc. 1.1; Trapeze, Loc. 4.1; Inverse triangle, Loc. 4.1. (12) Straight bi-truncated backed bladelets, (Left to right) Loc.3.1. (13) Obliquely-truncated bladelet, Loc.1.1B. (14) Broken obliquely-truncated bladelets, Loc. 4.1B.

**Table 3.** Characteristics of microburin technique for Wādī Ḥisbān Epipalaeolithic sites.

Microburin type	Wadi Ḥisbān 2		Wādī Ḥisbān 5, spot 1 (Loc. 1.9-1.13)		Wādī Ḥisbān 5 spot 2 (Loc. 1.7-3.1)		Wādī Ḥisbān 6 (Loc. 3.1-5.4)	
	N	%	N	%	N	%	N	%
Microburin, distal on blade	406	46.4	4	33.3	-	-	7	28.0
Microburin, proximal on blade	236	26.9	7	58.4	15	100.0	18	72.0
Microburin, orientation indeterminate	64	7.3	-	-	-	-	-	-
Double microburin (scars same side)	88	10.0	-	-	-	-	-	-
Double microburin (scars diagonal)	46	5.3	-	-	-	-	-	-
Microburin, other	7	0.8	1	8.3	-	-	-	-
Trihedral pieces	29	3.3	-	-	-	-	-	-
Total	876	100.0	12	100.0	15	100.0	25	100.0
Restricted microburin index = rIMbt		74.1 %		5.3 %		8.9%		59.5 %

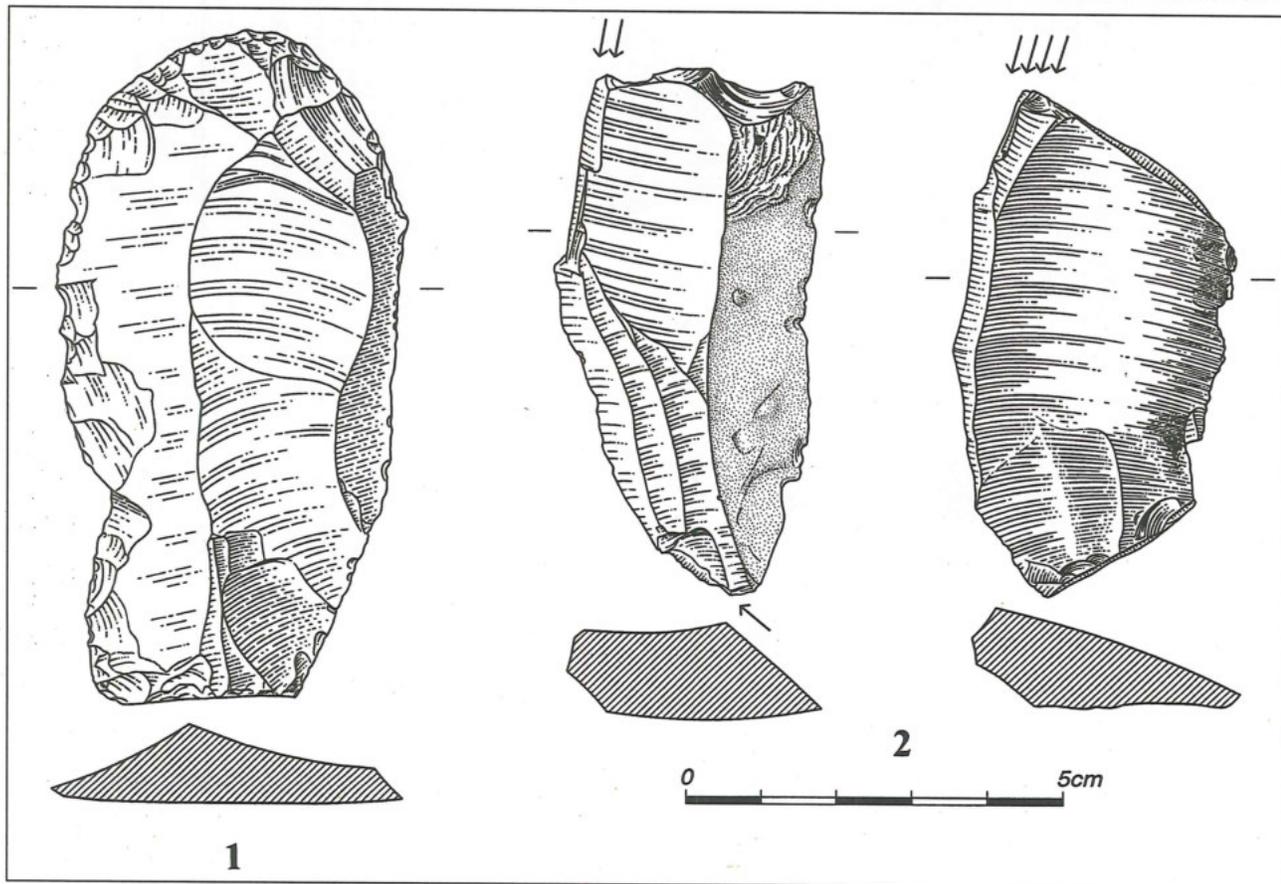
few burins (Figs. 8: 4-6 and 11:1-2).

### Wādī Ḥisbān 5

#### Site Characteristics and Stratigraphy

Wādī Ḥisbān 5 overlies Wādī Ḥisbān 2, intercalated between that lower site and the surface of the terrace. It is visible as a thin,

distinct band of outcropping archaeological material in the bank of the wadi extending over a distance of 45 m, about half a metre from the top of the terrace. Two excavation pits were positioned twenty metres apart in order to intercept this rich horizon (see Fig. 2). The easterly one (Spot 1) was positioned on a raised knoll of the sediment which af-



11. Wādī Ḥisbān 2: (1) Endscraper. (2) Multiple burin (on straight truncation and on natural surface).

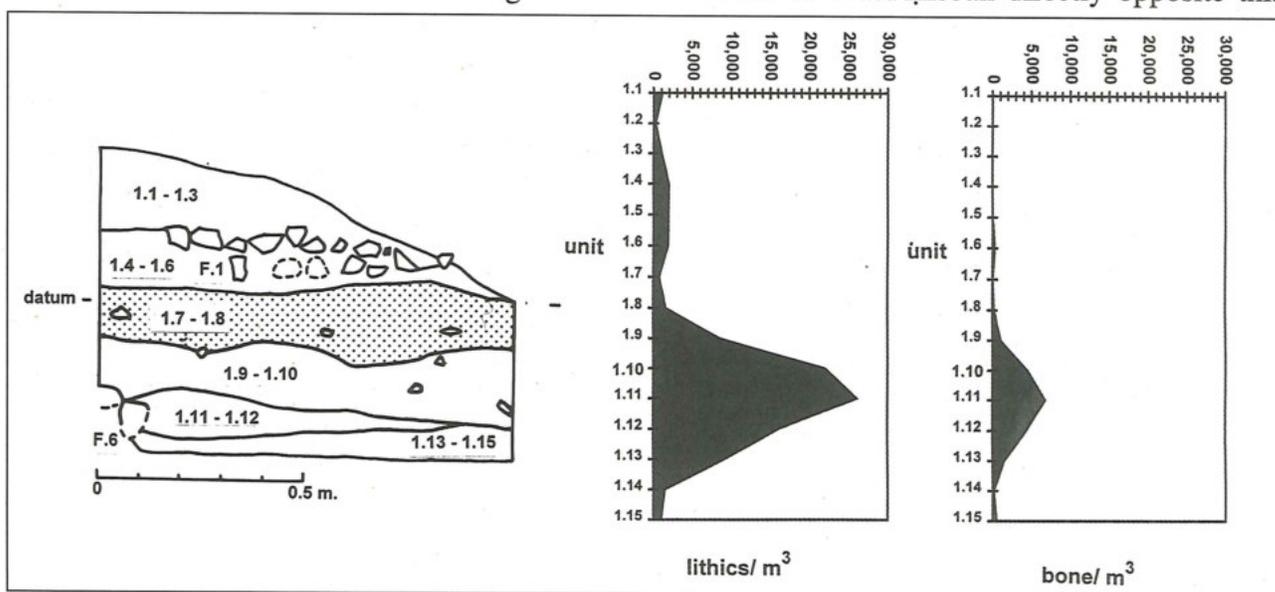
forded the opportunity to excavate down through the deposit (see Fig. 5), and this was effected as a 1 square-metre pit. The westerly sondage (Spot 2) was a rectangular cutting excavated into the cliff face.

Both pits encountered the culturally rich band about a half metre below the terrace surface. In Spot 1 this comprised a dark yellowish-brown (10YR 4/6) silty clay loam deposit, Locus 1.7-8 (Figs. 5 and 12), including grey-stained sediment with numerous flecks of charcoal and burnt bone. The burnt inclusions bestowed a darker hue on this deposit than on those above and below (yellowish-brown 10YR 5/8), although the latter two consisted of a similar silty clay loam. In Spot 1 constructed features (in the form of hearths) were absent from the dense artefact band, however several rebuilt versions of a stone hearth (F. 1) were found both above it at a depth of 0.25 m, and another (F.6) below it at the bottom of the pit at a depth of 0.75 m (Fig. 12). Chert artefacts and burnt animal bone fragments reach a sharp peak of abundance in the dark-yellowish-brown stratum (Fig.12) and in the underlying sediments (Loci 1.8-12). Reduced quantities of the same types of artefacts and burned bone fragments occur both above and below the dense band throughout

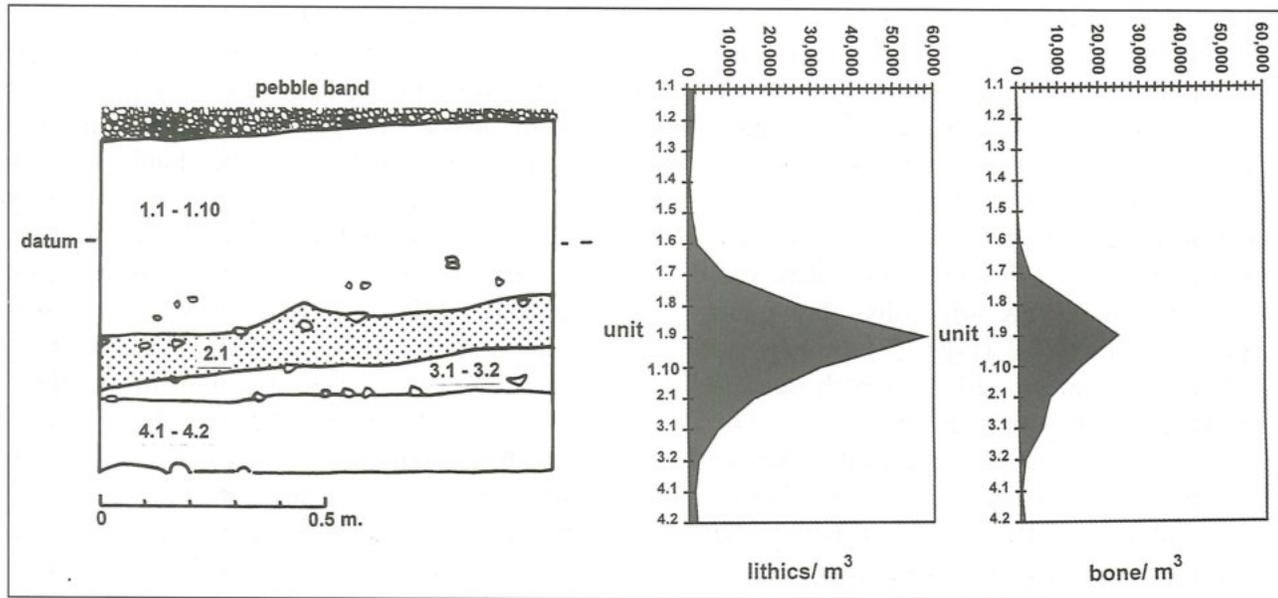
the excavated deposits.

Spot 2 was placed twenty metres to the west of Spot 1, designed to intercept the same dense artefact band which outcrops continuously along the wadi bank between them. Spot 2 like Spot 1 yielded a sharply defined band of lithic artefacts, burnt bone fragments and charcoal flecks encountered at 0.45 - 0.5 m below the wadi terrace surface (Fig. 13). The cultural stratum is stratified near the base of a half-metre thick fine-grained deposit (Loc. 1.1-10), comprising a dark yellowish-brown (10YR 4/6) silty clay loam. A few centimetres below the culturally rich band is a change to a coarser-grained deposit (Loc 2.1) containing numerous rounded pebbles. The silty layer (locus 1) is also capped on the surface of the terrace by a pebble band which evidently represents the course of a former wadi channel overlying the site. No structural features such as those discovered in Spot 1 were encountered in the excavation of Spot 2.

It is uncertain how far the artefact scatter registered in the excavations of spots 1 and 2 extended in the north-south direction. However it is suggestive that lithics and stone hearths can be found at a similar altitude below the surface along the south bank of Wādi Ḥisbān directly opposite this



12. Southern section of Wādi Ḥisbān 5, Spot 1 with flaked stone and faunal densities from the excavation.



13. Northern section of Wādi Ḥisbān 5, Spot 2 with flaked stone and faunal densities from the excavation.

site across the wadi, a distance of more than 100 m away, and it remains possible that these occurrences relate temporally to those investigated at site Wādi Ḥisbān 5.

A sample of burnt bone from Spot 1, Locus 1.11, was submitted for radiocarbon dating, yielding a determination of  $9,200 \pm 350$  bp (ANU-9404) on the inorganic apatite fraction. Although this date is over two thousand years later than the bone apatite date ( $11,560 \pm 250$  bp, ANU-8469b) from the underlying Wādi Ḥisbān 2 site, it is still unreasonably too recent for an Epipalaeolithic site of this type and indicates later contamination of the bone. Further samples of charred plant material await testing.

### Fauna

The composition of the bone assemblage is similar to the situation in Wādi Ḥisbān 2, where surviving bone occurs mainly as small and broken burnt fragments. Mean bone fragment density varies from 3,576 fragments per cubic metre in Spot 1 to 10,600 fragments per cubic metre in Spot 2 (see Table 1). These concentrations are much lower than for Wādi Ḥisbān 2, although peak densities in the rich cultural band of Wādi Ḥisbān 5 are higher at 6,720

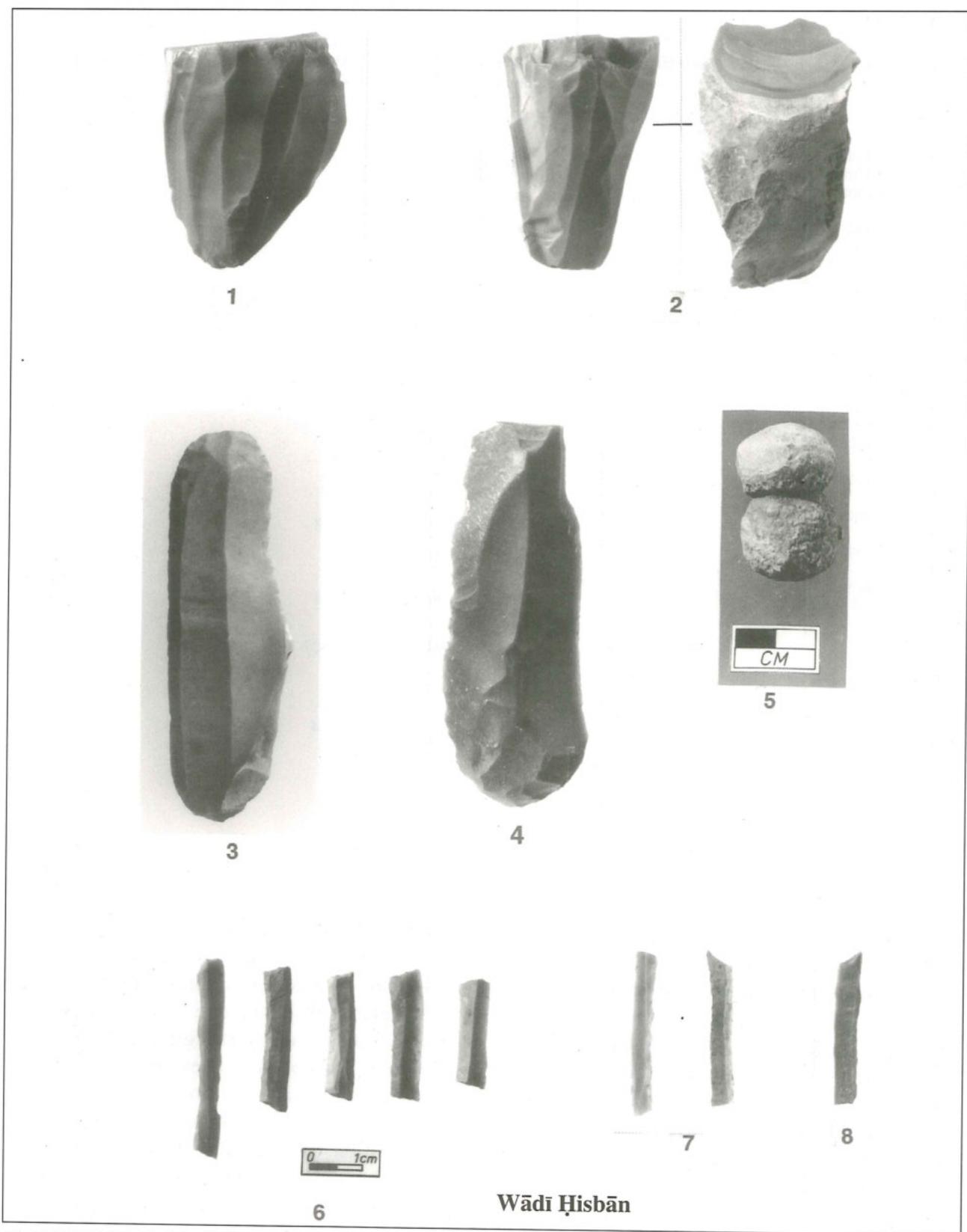
per cubic metre for Spot 1 and 24, 267 per cubic metre for Spot 2 (Figs. 12-13). The faunal remains from all layers of this site were too fragmentary to identify any taxa.

### The Flaked stone Assemblage

For the purposes of this analysis two samples were taken from five successive excavation units in the dense artefact bands in Spots 1 and 2 and are presented here separately (Tables 2-4). For Spot 1 this includes the five units 'Locus 1.9 - 1.13' and for Spot 2 the six units 'Locus 1.7 to 3.1'.

In terms of the initial stages of core reduction, Wādi Ḥisbān 5 is similar to Wādi Ḥisbān 2. Bladelet cores are made from the same alluvial pebbles obtained from the nearby wadi, with a simple, single platform produced by flaking one end of the pebble (Fig. 14:1-2), and once again, considerable cortex is often left on the core (Fig. 14:2). The larger tools, few in number (Table 2), are also similar, and consist mainly of scrapers, including well-made endscrapers on blades (Fig. 14:3) and a burin/ scraper (Fig. 14:4).

The microlithic component of Wādi Ḥisbān 5 signals a major departure from the underlying site Wādi Ḥisbān 2 and its as-



14. Wādī Ḥisbān 5: (1 - 2) Bladelet cores, Spot 1, Loc.1.12. (3) Double endscraper, Spot 1, Loc. 1.12.(4) Burin / endscraper, Spot 1, Loc. 1.10. (5) Grooved pebble, spot 1, Loc. 1.12. (6) Trapezes. Spot 1, Loci 1.11 and 1.12. (7 and 8) Broken backed blade, Loc. 1.13.

**Table 4.** Wādī Ḥisbān microlithic types.

Artefact type	Wadi Ḥisbān 2		Wādī Ḥisbān 5 spot 1 (Loc. 1.9-1.13)		Wādī Ḥisbān 5 spot 2 (Loc. 1.7-3.1)		Wādī Ḥisbān 6 (Loc. 3.1-5.4)	
	N	%	N	%	N	%	N	%
<i>Microliths</i>								
Retouched bladelet	-	-	2	0.9	1	-	1	6.6
Curved retouched bladelet	-	-	-	-	-	-	1	6.6
Straight-truncated retouched bladelet	-	-	-	-	-	-	-	-
Obliquely-truncated retouched bladelet	-	-	8	3.7	-	-	1	6.6
Alternately retouched bladelet	-	-	1	0.5	-	-	-	-
Bladelet with alternating retouch	-	-	-	-	1	-	-	-
Broken retouched bladelet	-	-	1	0.5	-	-	-	-
Straight-truncated bladelet	1	0.3	-	-	-	-	-	-
Obliquely-truncated bladelet	1	0.3	3	1.4	14	9.2	-	-
Convex truncated bladelet	1	0.3	-	-	-	-	-	-
Concave-truncated bladelet	9	3.1	-	-	-	-	-	-
Backed bladelet	5	1.8	8	3.7	-	-	2	13.3
Curved backed bladelet	1	0.3	-	-	-	-	1	6.6
Pointed backed bladelet	12	4.2	-	-	2	-	-	-
Microgravette	1	0.3	-	-	-	-	-	-
Straight-truncated backed bladelet	-	-	36	16.7	4	-	-	-
Obliquely-truncated backed bladelet	-	-	58	27.0	63	41.0	-	-
Convex truncated backed bladelet	-	-	1	0.5	-	-	1	6.6
Concave-truncated backed bladelet	-	-	-	-	-	-	-	-
Broken backed bladelet	29	10.1	86	40.0	41	27.0	-	-
Other	-	-	-	-	1	-	-	-
Sub-total	60	21.0	204	94.9	127	83.0	7	46.7
<i>Geometric microliths</i>								
Triangle	-	-	-	-	1	0.7	1	6.6
Trapeze	-	-	11	5.1	24	15.6	-	-
Parallelogram	-	-	-	-	1	0.7	-	-
Lunate	-	-	-	-	-	-	7	46.7
'Tiny triangle'	151	52.8	-	-	-	-	-	-
'Tiny trapeze'	5	1.8	-	-	-	-	-	-
'Tiny lunate'	22	7.6	-	-	-	-	-	-
Broken geometrics	48	16.8	-	-	-	-	-	-
Sub-total	226	79.0	11	5.1	26	17.0	8	53.3
Total	286	100.0	215	100.0	153	100.0	15	100.0

semblage of tiny triangles produced *via* the microburin technique. Whereas the restricted microburin index for Wādī Ḥisbān 2 is 74% (Table 3), microburins in Wādī Ḥisbān 5 are few and seemingly incidental, with a restricted microburin index (rIMbt) of only 5.3% for Spot 1 and rIMbt = 8.9% in Spot 2. The type of 'tiny triangle' characteristic of Wādī Ḥisbān 2 is completely lacking here. There was a single triangle from Wādī Ḥisbān 5 (Spot 2, Locus 1.10), but at 10.8 mm long (even though it has one end snapped off) and 6.3 mm wide it is larger than the Wādī Ḥisbān 2 type and was

not made by the microburin technique. Instead, the microlithic component of Wādī Ḥisbān 5 features a long, gracile backed bladelet with either one or both ends truncated, most usually straight or obliquely. In a small number of cases the bladelets are truncated but lack backing.

The retouch attributes of backing and truncation (usually straight or oblique) are thus variously combined to give, in a technical sense, a very similar series of products, but in a strict typological sense a great variety of microlith and geometric microlith types such as 'Obliquely-truncated backed

bladelet', 'Straight-truncated backed bladelet', or in the cases where both ends are truncated - a long, gracile 'trapeze' (Table 4). The trapezes (Figs. 9:5 and 14:6) are much fewer in number than the singly truncated pieces. However, the caveat must be added that only eleven of these are entirely complete. The others were judged to have sufficient characteristics to be identified as various types of complete backed and truncated bladelets rather than the less informative class of 'broken backed bladelets'. These specimens usually lack only a short terminal fragment. The justification for this method is that very short terminal truncated fragments, which one would expect to occur if these items had been broken trapezes, are not present in the assemblage. Nevertheless, as Barton and Neeley (1996:142) point out, this is a difficult issue in Epipalaeolithic typology.

It is also worth observing that a considerable number of backed blade segments are snapped obliquely (Fig. 14:7-8), giving the impression that the direction of the snap has been controlled to produce an oblique truncation at one or both ends. It is difficult to be sure whether this was an intentional outcome as opposed to a product of accidental breakage, but this breakage type was rare or absent at the Wādī al-Ḥammeh Epipalaeolithic sites (Edwards *et al.* 1996) which also featured long, gracile backed blade products frequently broken (probably through treadage) with a straight snap.

With their major shape and retouch attributes recurring in different combinations, the Wādī Ḥisbān 5 microlith products give the distinct impression of being integrated in a reduction sequence which begins with the snapping and truncation of backed bladelets, mostly at one end but less often at both ends, to ultimately produce a long, gracile trapeze, or what has sometimes been called on account of its length and gracility a 'Proto-trapeze' (Bar-Yosef 1970: 218; Fellner 1995a: 131). If so, one would expect the tra-

pezes to be shorter on average than the single truncated backed bladelets, and this is indeed so, with the trapezes averaging 26.2 mm in length (N = 36, SD = 6.6) compared with complete non-geometric microliths averaging 29 mm (N = 11, SD = 4.9). But one must caution that while these data are consistent with the model of trapezes being a reduction product of single truncated bladelets, they do not conclusively prove the case, because it should be expected that the doubly truncated trapezes should in any case be shorter on average than the singly truncated specimens even if they were not reduced indirectly from them, but fashioned *de novo* from primary bladelets.

In addition to the flaked stone, a small incised pebble with a grooved waist was found in Spot 1, Locus 1 (Fig. 14:5). This is an interesting and apparently unique piece from the Late Epipalaeolithic, adding to the rare corpus of pre-Natufian incised rock art.

## Wādī Ḥisbān 6

### *Site Characteristics and Stratigraphy*

Wādī Ḥisbān 6 is the uppermost site in the sequence, located about 100 metres further west of Wādī Ḥisbān 5 (see Fig. 4). Flaked stone artefacts including backed lunates, backed and straight truncated bladelets, small multiple platform cores, and numerous burnt and multi-coloured pieces of chert debitage were found scattered over a circular area of about 600-800 square metres. The artefact scatter was limited to a raised circular remnant of sediment, a situation which may account for the restriction of Natufian lithics to this part of the terrace. It should be noted that while Wādī Ḥisbān 6 (at -150.1 m) is a metre lower in absolute altitude than the earliest site Wādī Ḥisbān 2 (at -149.1 m), this is accounted for by the riftward tilt of the terrace in this area (most clearly evident in Fig. 3). The presence of eroded pottery sherds and occasional metal items such as soft drink can ring-pulls em-

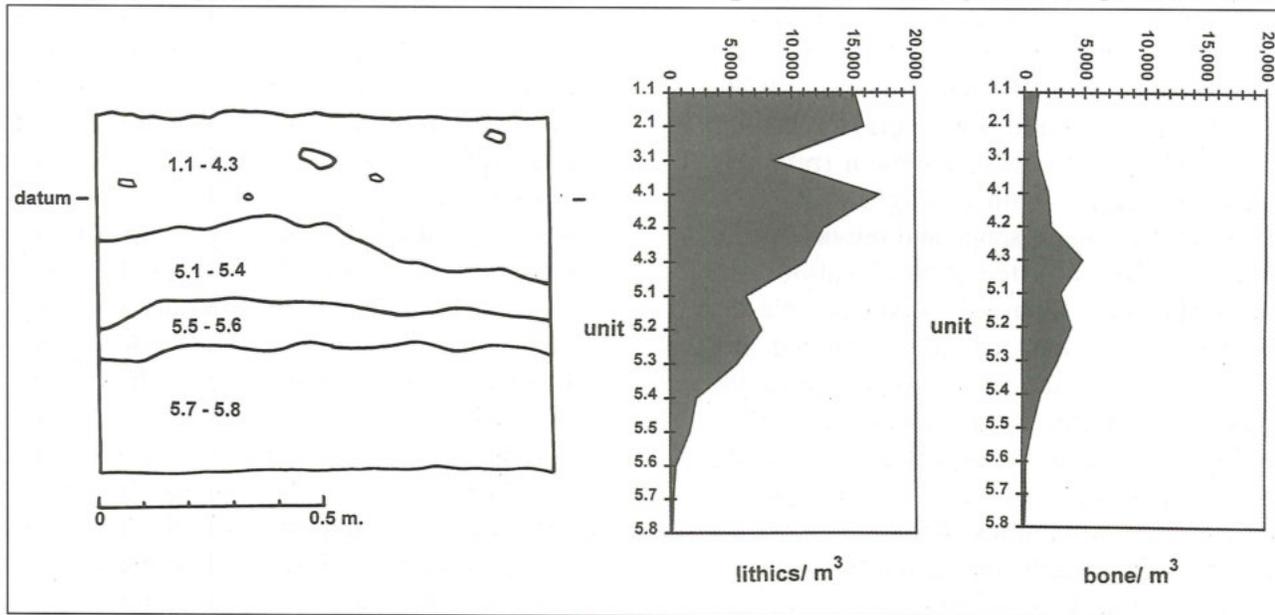
bedded in topsoil together with eroding Natufian lithics indicates that the terrace top has remained stable since the Natufian period, at which time sediment aggradation in the wadi must have ceased.

An excavation pit measuring 2 x 1 m was placed over an eroding patch of burnt pebbles. Upon excavation of the deposits to ten centimetres depth (Fig. 7), three distinct features of this type were found resting on Locus 3.1, a compacted Very Pale Brown silty clay, (10YR 7/4). The first one (F.1) consisted of a mass of rounded and angular limestone fragments and alluvial pebbles, many of which were reddened or blackened by burning. Next to this, some 0.3 metres away, lay a concentration of similar material (F.2), albeit arranged in a semi-circular pattern. A third loose scatter of burnt pebbles (F.3) was distributed in the western half of the pit.

Underneath the stone arrangement F.2 lay a dark patch of burnt sediment, at a depth of 0.2 m (Loc. 4.3a). Some indeterminate animal bone fragments were retrieved from this area. Ten centimetres away to the west a small, roughly-hewn limestone bowl (see Fig. 10:10) lay upside down, embedded in the lower unit Locus 5.3a. The eastern half of the pit (designated 'a') was excavated to a

depth of 0.83 m (Fig.15). Although stone arrangements were restricted to the upper quarter metre of the pit, burnt stone fragments continued to occur down to the bottom. Lithics of Natufian type, animal bone fragments, gastropods, fragments of red ochre and burnt sediments also continued to the base of the pit, though artefacts occurred in reduced numbers compared to the top quarter metre. Artefact densities were highest coincident with the stone clusters in the top quarter metre but burnt animal bone fragments reached their highest densities in the quarter metre below this (Fig. 15).

A radiocarbon determination was run on the collagen fraction of burnt bone from Locus 4.3, yielding a determination of 5,740 ± 220 bp (ANU-9406), once again far too recent like the bone dates from the earlier two sites. In this case we have begun running our batch of samples in other materials. A determination run on the terrestrial gastropod *Xeropicta vestalis*, also from Locus 4.3, yielded a date of 12,950 ± 140 bp (ANU - 9407). This date is early, even for an Early Natufian site, however determinations of a similar antiquity have been found from widely-spaced Natufian sites, for example 12,950 bp for the basal layer at Mugharet el-Wad



15. Southern section of Wādī Ḥiṣbān 6 with flaked stone and faunal densities from the excavation.

(Weinstein-Evron 1991), 12,800 - 12,100 bp for the Wādī Judayid (J2) site (Henry 1995: 321) and 12,900 - 12,100 bp for Bayḍa (Byrd 1989b: 26).

### *Fauna*

Wādī Ḥisbān 6 continued the pattern of the earlier two sites in yielding hundreds of small, smashed fragments of burned bone (Table 1). Virtually no bone elements were retrieved from this assemblage except for a single phalanx from a small mammal. Otherwise, the terrestrial gastropods *Xeropicta vestalis* and *Sphincterochila zonata* were common, as they usually are in these terrace sediments, and some freshwater gastropods *Melanopsis praemorsa* were present. A single phalanx of the Freshwater crab *Potamon potamon* was found. The novel addition in this sequence was the smattering of *Dentalium* sp. fragments that occurred generally throughout the site's deposits. Both ribbed and unribbed types occurred but all were very short fragments and it was not possible to source them from either the Mediterranean or Red Seas.<sup>5</sup>

### *The Flaked Stone Assemblage*

Wādī Ḥisbān 6 has a typically Natufian lithic industry, quite different in character than those of the earlier sites. A wide range of coloured cherts were selected for use. Double lustre (both matt and highly lustrous) on some artefacts attest to the use of heat treatment on the raw material. Short flakes were produced from globular, multiple platform cores (Fig. 10:7), although there were a few flakes of quartzite (Fig. 10:8), an unusual material in the east Jordan Valley Epipalaeolithic. Compared to the total numbers of flaked stone pieces there is a very small number of retouched lithics, (eighteen in all) which occurred throughout the deposits down to locus 5.3, but none occurred below this. Except for a single scraper (Fig.10:9) all

retouched tools are microlithic. Half of them are non-geometric microliths, including truncated and backed bladelets (Figs. 9:12,14 and 10:12) typical of Natufian sickle elements. Three oblique truncations on broad bladelets were found: one on a complete bladelet (Figs. 9:13 and 10:13) and two on broken sections (Figs. 9:9 and 10:14). The geometric microliths comprise five abruptly backed lunates (Figs. 9:7,10 and 10:11), and a single example each of a triangle and a trapeze (Figs. 9:6,8 and 10:11). The geometrics are distributed evenly from the topmost unit down to Locus 5.3.

## **Chronology, Comparisons and Further Prospects**

### *Chronology*

The three Epipalaeolithic sites of Wādī Ḥisbān 2, Wādī Ḥisbān 5 and Wādī Ḥisbān 6 provide an excellent opportunity to chronicle the development of the Middle to Late Epipalaeolithic in the eastern Jordan valley region, north-east of the Dead Sea. Each of the sites is rich in artefacts, uncontaminated by intrusive artefacts, separated one from the other by intervening deposits and superimposed in a straight forward manner. These considerations obviously commend the acquisition of a radiocarbon dating series but as described above these efforts have so far not been very successful. Accordingly, a conclusive chronological discussion is premature here, though several preliminary observations and comparisons are pertinent.

Wādī Ḥisbān 2 is a new addition to the so-called 'Triangle phase' of the Epipalaeolithic (Fellner 1995a) known from a small number of sites including Nahal Oren, where triangles occur from Layers IX through V though peaking in number in Level VII (Noy *et al.* 1973: 81-84); Ein Gev IV (Bar-Yosef 1970: 126-130) which shares with Wādī Ḥisbān 2 the microgravette form, backed

5. The *Dentalium* specimens were kindly examined by Dr David Reese of the Field Museum of Natural History, Chicago.

bladelets, concave truncations, small triangles and extensive use of the microburin technique; Nahal Hadera V (Saxon *et al.* 1978: 262); and Wādī Jilat 6, Upper Phase (Byrd 1989a), which Wādī Ḥisbān 2 strongly resembles in its production of diminutive triangles via the microburin technique, and even in its sole microgravette, though Wādī Ḥisbān 2 entirely lacks the larger scalene triangles of Jilat 6. Wādī Jilat 6, Upper Phase, is the only well-dated site of the 'Triangle Phase' at 16,000 - 15,500 bp (Garrard and Byrd 1992).

Diminutive triangles made by microburin technique also occur in 'Nizzanan' (Mushabian) sites in the Negev, for example at Azariq IX, Hamifgash IV and Shunera III (Goring-Morris 1987: 147-200), but they consistently recur there with other forms such as scalene bladelets and arched-backed bladelets that are entirely lacking from Wādī Ḥisbān 2. So, although the erection of a short-lived 'Triangle Phase' (after Fellner 1995a) may prove to be warranted, triangles do co-occur with a variety of other microlithic forms in several sites across the Levant and the pressing need is clearly to radiocarbon date more of the sites that contain them before we can be sure.

Although the 'Triangle Phase' is dominated typologically by its diminutive geometric microliths, it is considered to be earlier and apparently unrelated to the later Geometric Kebaran sites which are clustered mostly in the Sinai and Negev, and which feature larger geometric microliths in the form of short, thick trapezes and rectangles. The dates of 9,490 and 11,560 bp for Wādī Ḥisbān 2 seem unlikely to be reliable granted the site's strong similarity to Wādī Jilat 6, Upper Phase, and also given the date of 12,950 bp from the uppermost Natufian site Wādī Ḥisbān 6. Similarly, the earliest attempt at dating Wādī Jilat 6 yielded two anomalously late dates of ca. 11,500 bp from the underlying Jilat 6 middle phase (Phase B), one of which at least was also

run on burnt bone (Garrard and Byrd 1992).

The date from Wādī Ḥisbān 6 comes from halfway up the sequence in Locus 4.3 (Fig. 15). We hope to run further paired datings on the terrestrial gastropod *Xeropicta vestalis* and the freshwater gastropod *Melanopsis praemorsa* to evaluate the date already obtained, and indeed to gauge the temporal extent of Wādī Ḥisbān 6 which may be extensive. The few lunates from Wādī Ḥisbān 6 are abruptly retouched, which would suggest a Late Natufian age, and they all derive from deposits above the radiocarbon date, but microburins continue in every unit from the top of the excavations to the one below Locus 4.3. Wādī Ḥisbān 6 has an extremely small percentage of retouched lithics compared to the two earlier Epipalaeolithic sites, and in this regard it is similar to the recently excavated Natufian site of Wādī Khawwan 1 from Ṭabaqāt Faḥl (Edwards *et al.* 1998).

The middle site in the sequence, Wādī Ḥisbān 5, may herald the appearance of an early facies of the Geometric Kebaran industry following the Triangle phase of Wādī Ḥisbān 2. It is characterised by a sharp decrease in microburins (only incidentally produced) and numbers of elongate trapezes or 'prototrapezes' (the latter seems an anachronistic term since it defines an artefact type solely in relation to future developments).

The abandonment of the microburin technique in Wādī Ḥisbān 5 is comprehensible in terms of its microlithic component. As Goring-Morris (1996: 132) notes the microburin technique is a useful way of controlling oblique snaps, and so was useful in the delicate process of producing the 'tiny triangles'. Since the trapezes of Wādī Ḥisbān 5 can easily be manufactured by simply trimming the primary blades' terminations, then the microburin technique is unnecessary.

If Wādī Ḥisbān 2 equates in time with Wādī Jilat 6, Upper Phase, then Wādī Ḥisbān 5 could be expected to date in the interval 15,500 -14,000 bp. In the earliest east Jor-

dan Valley Epipalaeolithic site of Wādī al-Ḥammeh 26, dated 19,500 bp (Edwards *et al.* 1996), the elongate geometrics are absent, but one appears in Wādī al-Ḥammeh 31 dated before 16,800 bp. The subsequent site Wādī al-Ḥammeh 50, dated 15,300-14,500 bp, takes a different turn and does not include any backed geometrics or non-geometric microliths at all. Only a secure radiocarbon series from the Wādī Ḥisbān sites will tell whether the differences between them and the Wādī al-Ḥammeh sequence are due to temporal or geographic differences.

#### *Patterns and Production of Levantine Epipalaeolithic Microliths*

The technological and typological diversity of the Wādī Ḥisbān lithics makes for instructive evidence regarding recent debates over the rationale behind the production of Levantine microliths. Neeley and Barton (1994) have argued that the development of geometric microliths arose as a means of solving raw material shortages and were produced from the further reduction of non-geometric microliths. Ultimately, they deny the existence of successive Levantine cultural entities characterised by differing sets of formally patterned geometric microliths. These arguments appear to be grounded in their strongly held doctrine that microlithic types were not ethnic markers but the inadvertent outcomes of reduction strategies. In doing this they specifically argue that microlithic types (including geometric ones) were not intended to be made in their final forms in one operation, nor that any pre-determined, discrete types actually exist. Barton and Neeley's paper drew several strong responses from the regional specialists (Fellner 1995b; Kaufman 1995; Goring-Morris 1996; Phillips 1996; Henry 1996), who in various measures highlighted problems with it. As Fellner (1995b:383) points out, it is unnecessary to deny the existence of the well demonstrated Levantine Epipalaeolithic cultures because one does not

believe them to be unambiguous or straightforward ethnic markers of specific human social groups.

We disbelieve this interpretation ourselves. However, in this case, the Wādī Ḥisbān sites conclusively demonstrate that the production of geometric microliths, whether long and thin or extremely small, is not associated with economy of raw materials nor that geometrics are necessarily derived from the resharping of non-geometric ones. In the first place, Wādī Ḥisbān forms an abundant chert source and this fact is reflected in the profligacy of the use of chert. Cores are minimally worked, rarely if ever rejuvenated and the microliths lie embedded in piles of unretouched but suitable flake and blade blanks. As to the other argument about the derivation of geometrics from non-geometrics, the 'tiny triangles' of Wādī Ḥisbān 2 are produced *de novo* by the microburin technique and have clearly been produced by a separate reduction pathway than the one followed to make the non-geometric backed bladelets.

This is not to deny that in some instances microlithic types grade together in form as Goring-Morris (1996: 131) points out, for example in the case of trapezes and rectangles. For the extremely diminutive triangles of Wādī Ḥisbān 2, the retouch on the tiny trihedral blank was not always added quite symmetrically and in such cases the result is a tiny lunate or in some cases a tiny trapeze. Subtle transitions between microlithic types also occur in Wādī Ḥisbān 5. Its elongate trapezes fit nicely into a scenario of further reduction from non-geometric microliths, though it seems that the case is difficult to isolate from an alternative one where both the non-geometrics and geometrics were simultaneously desired endpoints of the reduction process. But these instances are quite unrelated to the reality that many quite different microlithic and geometric microlithic types occur in different time periods and

cannot be reduced to a single reduction process. Barton and Neeley deny this, a belief which is exemplified in their Figure 6 on their 1994 paper which shows numerous types of geometrics such as triangles, lunates and trapezes produced as outcomes of a single reduction pathway. (Taken at face value the diagram demands that all types of geometrics underwent a stage of existence as La Mouillah points, a quite unfeasible scenario since La Mouillah points were quite restricted in time and space within the Levantine Epipalaeolithic). The clear message from Wādī Ḥisbān is that a uni-dimensional explanation in terms of reduction strategies cannot explain the variability or form in the microliths of Wādī Ḥisbān 2 and Wādī Ḥisbān 5.

### Further Prospects

Finally, we return to the research aims outlined in the Introduction. Certainly the novelty of the Wādī Ḥisbān sequence lived up to expectations: many of the other aims will ultimately depend on the success of a second round of radiocarbon determinations.

Animal species representation amongst the charred and smashed bone fragments was poor, though at least the condition of the faunal remains raises the interesting question about whether the bone assemblage reflects butchering and cooking methods or preservational factors. The latter is suspected, though it is hoped that the analysis of sediment thin sections will shed light on whether unburned bone had been selectively attacked chemically and removed from the deposits.

In terms of types, Wādī Ḥisbān 2 and 5 fit well within the range anticipated from the pre-Natufian Epipalaeolithic, in that they consist of relatively small sites densely packed with lithics and animal bone fragments, and contain few architectural embellishments beyond stone hearths. Wādī Ḥisbān 6 however presents a striking contrast with the larger architecturally and ar-

tefactually complex Early Natufian sites like the nearby Jericho (Tall as-Sultān) across the Jordan (Kenyon 1981), and Wādī al-Ḥammeh 27 to the north. Once again it is like Wādī Khawwan 1 in this regard (Edwards *et al.* 1998) and also in the eclectic nature of its artefact types and imported marine molluscs.

The presence of a Natufian site in the top levels of the terrace also bears on the question of the disappearance of Lake Lisān in the terminal Pleistocene. Incision by Wādī Ḥisbān after the deposition of Wādī Ḥisbān 6 may have been a response to a new lowered base level, as was the case in Wādī al-Ḥammeh (Macumber and Head 1991). It is therefore of great relevance to this event to date the top of the Wādī Ḥisbān 6 sediments.

The sites were not rewarding in terms of charred plant remains, though these may ultimately prove invaluable samples for AMS dating, as will samples of *Melanopsis* and *Xeropicta* molluscs. More radiocarbon dates need to be gained before many of the issues raised above can be usefully revisited, and this search will form our next research aim.

Phillip C. Edwards  
Department of Archaeology  
La Trobe University  
Bundoora, 3083  
Victoria,  
Australia.

M. John Head  
National Laboratory of Loess  
and Quaternary Geology  
Chinese Academy of Sciences  
22-2 Xi Ying Rd  
Xian 710054  
Shaanxi  
Republic of China

Phillip G. Macumber  
Ministry of Water Resources  
PO Box 213, Code 112  
Ruwi  
Sultanate of Oman

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# ARCHAEOLOGICAL EXCAVATIONS AT THE LATE NEOLITHIC SITE OF ASH-SHALAF: A PRELIMINARY REPORT ON THE 1998 SEASON

by

Hans-Dieter Bienert and Dieter Vieweger

with contributions by Katrin Bastert, Lothar Herling and John Meadows

## Introduction

The Pottery Neolithic period in Jordan (5,500-4,500 BC) is still not very well-known and often lacked attention by archaeologists whose focus was on the large and well-preserved settlements of the previous period, the Pre-Pottery Neolithic B (PPNB, 7,600-6,000 BC). Research on those sites produced in the past decade a new and fascinating insight into the beginning of human settlement.

The Pottery Neolithic period, in contrast to the PPNB, did not leave - as it seems - many remains. At least, the number of sites in Jordan dating to that period is small. Rollefson described the Pottery Neolithic period as "in a sense the 'Dark Age'" of the region's prehistory (Rollefson 1993: 103). Therefore, it is hoped that present and future archaeological research will be able to uncover more information about that period.

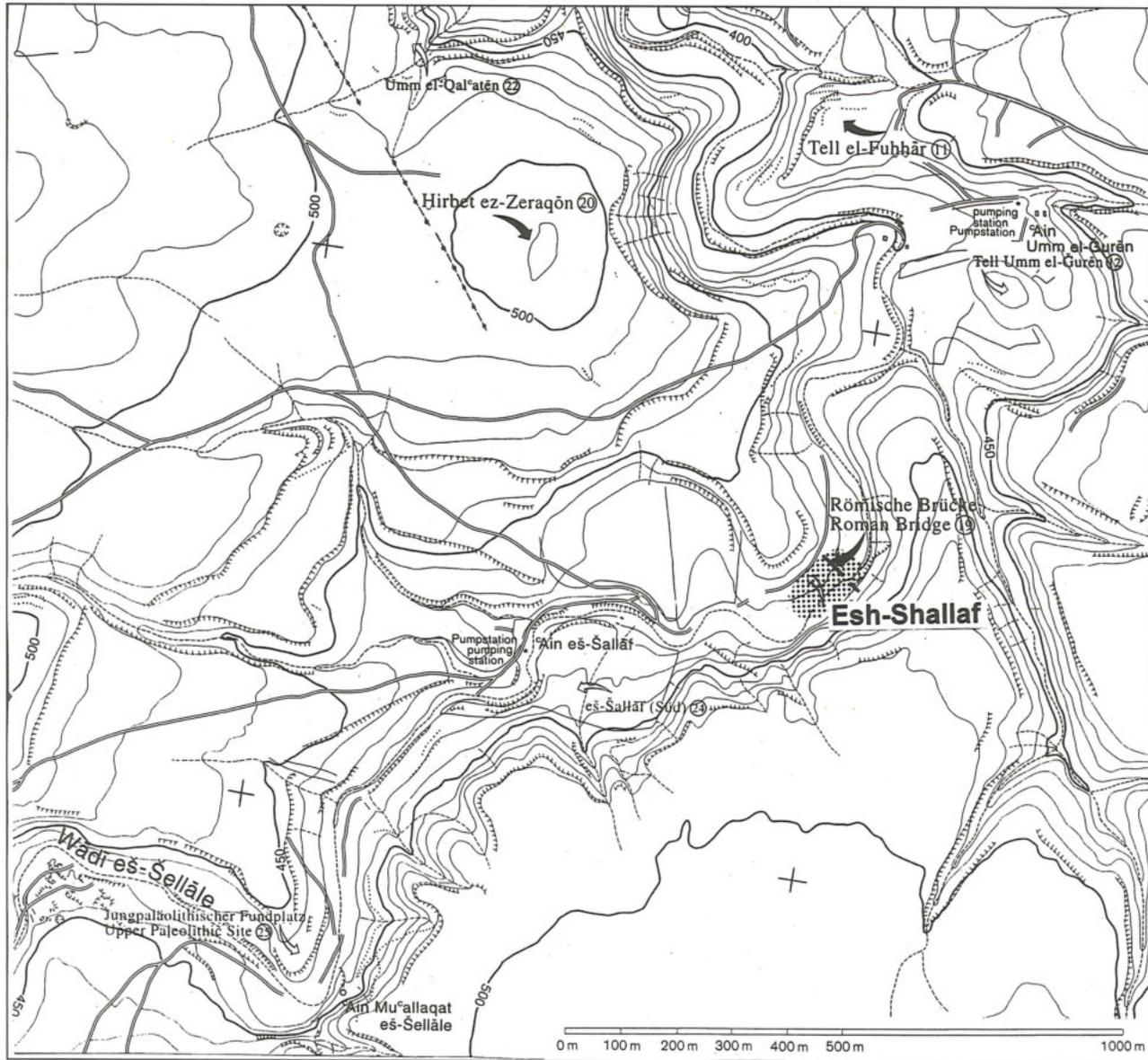
## Site Location and History of ash-Shalaf

While the settlements of the preceding Pre-Pottery Neolithic B/C period (PPNB/C, 7,600-5,500 b.c.) covered areas of up to 15 ha (Rollefson 1997: 241), the sites of the following Pottery Neolithic were much smaller and far less developed. None of the outstanding architectural features of the PPNB are repeated in the Pottery Neolithic period. On the contrary, it seems that at some sites only semi-permanent dwellings existed. Roughly made circular or oval-shaped foundations have been excavated and support such considerations (Garfinkel 1993; Kafafi 1993).

The site of ash-Shalaf is located 10 km northeast of Irbid. It is situated on a terrace approximately 90 m wide on the lower

western slopes of Wādī ash-Shallālah at an altitude of about 420 m asl. (Figs. 1 and 2). The terrace follows the contour of the wadi for ca. 350 m from northeast to southwest (Fig. 3). At the eastern end, a cliff approximately 5 m high separates the terrace and the wadi bed. Towards the north, the terrace gradually becomes part of the hillside, while towards the west, the terrace is bordered by a steep hillside which leads to a higher plateau. At the southern end the terrace descends gently towards the wadi bed. The terrace is currently used for agriculture. The closest natural water source is 'Ayn ash-Shalaf, about 350 m west-southwest of the site (see Fig. 1). A second spring, 'Ayn Umm al-Qurayn, is situated 500 m towards the northeast. Both springs are used today by local farmers for irrigation purposes.

Ash-Shalaf was discovered by Siegfried Mittmann (Tübingen University, Germany) while excavating at nearby Khirbat az-Zayrāqūn (1984-1994) and surveying the region adjacent to the Early Bronze Age city. From the pottery he collected from the surface of the wadi terrace in Wādī ash-Shallālah, it seemed that the site was a small village or hamlet dating to the Late Neolithic period - the so-called Yarmoukian (5,500-4,500 BC). The material collected by the excavation team directed by Mittmann has been studied by Jens Kamlah (Kiel University, Germany) and will be published as part of the regional survey conducted by Kamlah. Of 118 pottery sherds, Kamlah identified 96 as belonging to the Pottery Neolithic period. A few others date to the Early Bronze Age and the Roman-Byzantine period. The Roman-Byzantine sherds may be related to the nearby so-called "Roman bridge" (see Figs. 2 and 3), which is situated



1. Topographical map of Wādi ash-Shallālah area (courtesy of S. Mittmann, Tübingen University).

in the northern part of the terrace and cuts it in a northwest-southeast direction. The Roman bridge cuts the site according to Kamlah's investigation into two parts. He suggests an extension for the Neolithic occupation of 35 x 80 m (Kamlah, pers. comm.).

The research by Mittmann and Kamlah initiated the idea and interest for further investigations of the place.<sup>1</sup> In October 1998 a

three-week season of excavations was conducted by the German Protestant Institute of Archaeology in Amman (DEI). The excavations were jointly directed by Hans-Dieter Bienert and Dieter Vieweger. The excavation consisted of volunteers from Germany and local workmen. Team members included Ute Koprivc (Remscheid, Germany), Michael Schefzik (München, Germany), Jörg Hentzschel (Radevormwald, Germany),

1. We appreciate the help and advice of both colleagues, Prof. Dr Siegfried Mittmann (Tübingen University, Germany) and Dr Jens Kamlah (Kiel University, Germany). We are also very grateful

to Dr Kamlah for allowing us to study parts of his unpublished Ph.D. dissertation dealing with ash-Shalaf. Dr Kamlah will participate in the final publication of the site.

# ESH-SHALLAF

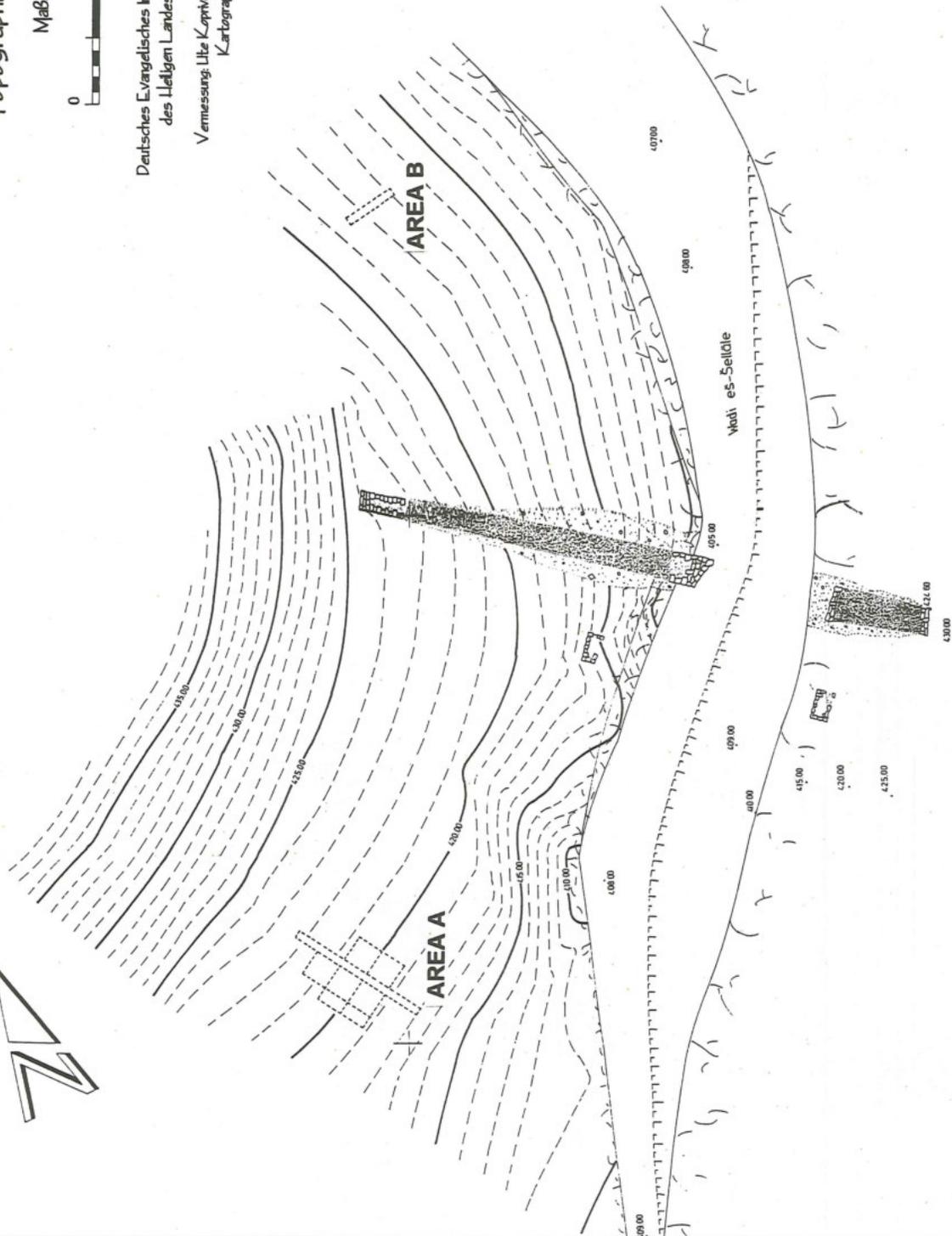
## Topographische Grundkarte

Maßstab 1:500



Deutsches Evangelisches Institut für Altertumswissenschaft  
des Heiligen Landes - DEJ (Amman/Jordanien)

Vermessung: Ulla Koprivc, Katja Ruzdol, Michael Scheffk  
Kartographie: Ulla Koprivc



### LEGENDE

- 5m Höhenlinie
- - - 1m Höhenlinie
- Höhenpunkt
- ⚡ Fels
- ▨ Sandbank
- ▨ erodiertes Gestein
- ▨ abgesteckte Areale
- ▨ römisches Bauwerk

Alle Höhenangaben beziehen sich auf NN

2. Contour map of ash-Shalaf with excavation areas A and B.



3. View from east into Wādi ash-Shallālah. Excavation area A situated on the lowermost terrace. (centre left).

John Meadows (Northcote, Australia), Katja Riedel (Bremerhaven, Germany), Gerhard Reimann (Offenbach, Germany), and Oliver Korn (Krefeld, Germany).

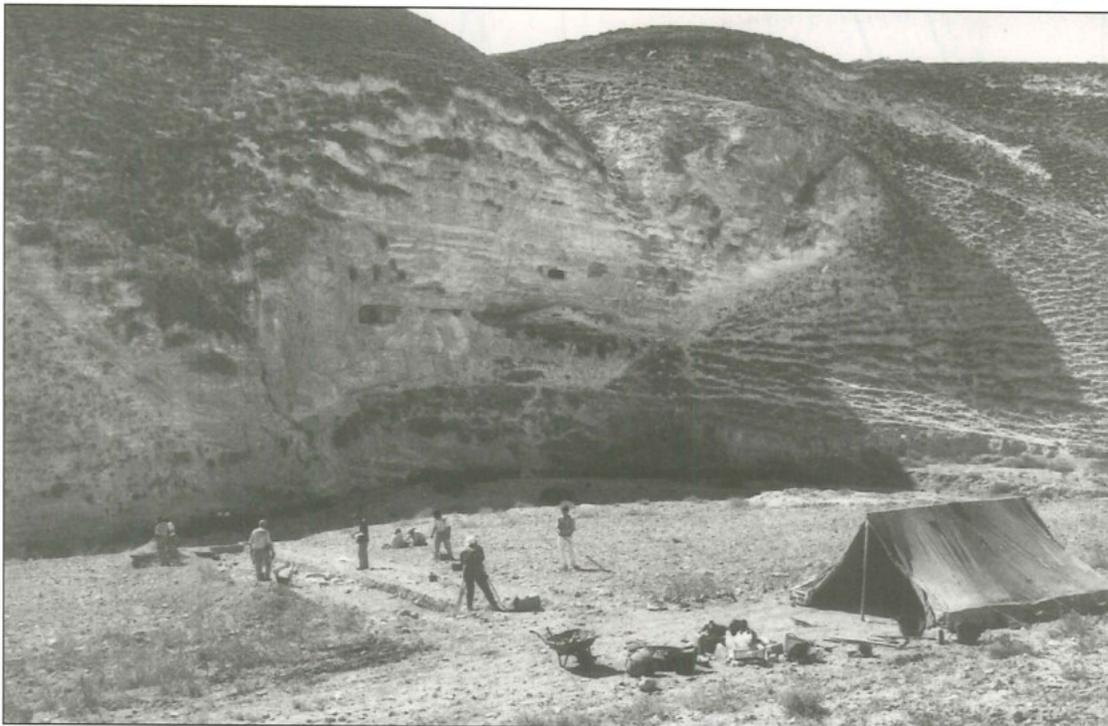
### Excavation Strategy and Results

After an initial inspection of the area with Siegfried Mittmann, who advised the team during the first days of the field campaign, the location for a long trench was defined. Approximately 85 m southwest of the Roman bridge a test trench (T1) of 27 m in length and 1.5 m in width was opened to in-

vestigate the nature of possible architectural remains (Figs. 2, 4 and 5). Another test trench (T2) of 10 by 1.5 m was dug ca. 60m



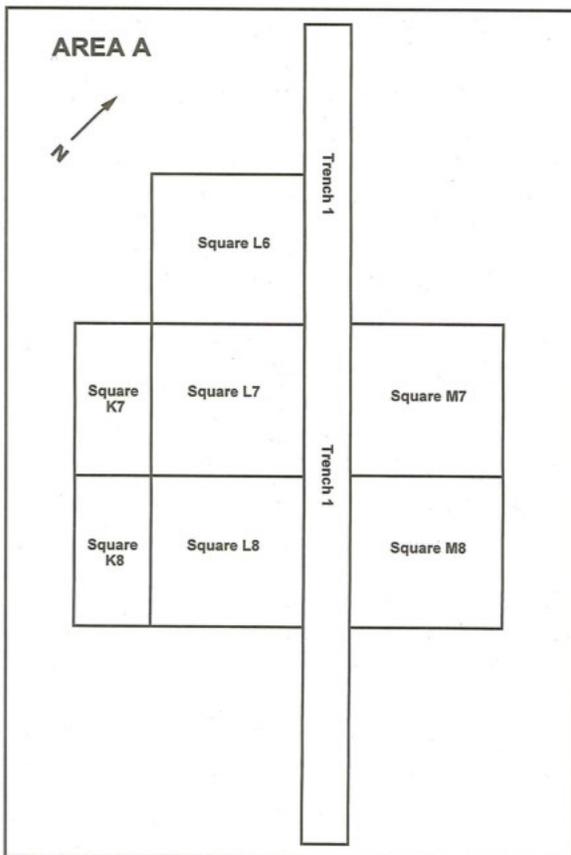
4. Excavation area A with architectural remains at the end of the 1998 season (view from east).



5. View from northwest towards trench 1 in area A.

north of the Roman Bridge (Fig. 2). While this second trench (T2) revealed only fragments of a small wall with no indication of its date, the larger one (T1) exhibited more architectural remains and Yarmoukian pottery. Consequently, it was decided to open up five squares of 5 x 5 m and two squares of 5 x 2.50 m, all adjacent to trench T1 (Figs. 2, 4 and 6).

Remains of walls were detected in trench 1 at several spots, and were mostly found immediately below the surface (Figs. 4, 7:A-C and 8-10). The excavated walls were rather fragmentary and in most cases only the lower-most course had survived. Some of the walls indicate a semicircular or oval foundation (Fig. 9), while others show rectangular foundations (Fig. 10). The same manner of wall construction was more or less found in the adjacent squares (Figs. 7:A-B, 8 and 11). However, the poor state of



6. Schematic plan of trench and square locations in area A. Note that the deep sounding as shown in Fig. 8 B is not indicated in this sketch.

preservation also caused by modern agricultural activities on the site did not allow the identification of single buildings or building units. Instead, "structures" and structural elements were only partially preserved, and they are presented in Fig. 8.

The construction technique of the walls appeared to be very simple: stones of different size were placed on the surface without any archaeological indication of a foundation ditch or any other kind of fundamental support. In some instances walls were destroyed or partly dismantled by modern ploughing. This fact also made it very difficult to develop a proper stratigraphy for the architectural remains. Therefore, until the excavation results have been fully studied and further investigations - at least in some areas - taken place, no final ground plan of buildings can be presented.

Some small lumps of clay with reed impressions which were found in several squares, suggest that the upper walls of the foundations were built of wood, reeds or tent-like material. In one case (S 1), remains of what would have been either a platform made for a possible wooden pillar or a table-like structure was found (Figs. 8 and 10). No proper floors were detected, and therefore it seems that either no floors were constructed or they simply consisted of stamped earth. Doorways could not be found either. However, no complete dwelling has yet been identified, and it is possible that some, if not all, of the oval structures were open on one side and that the upper part of the dwelling consisted in most cases of reed/wood or some similar material.

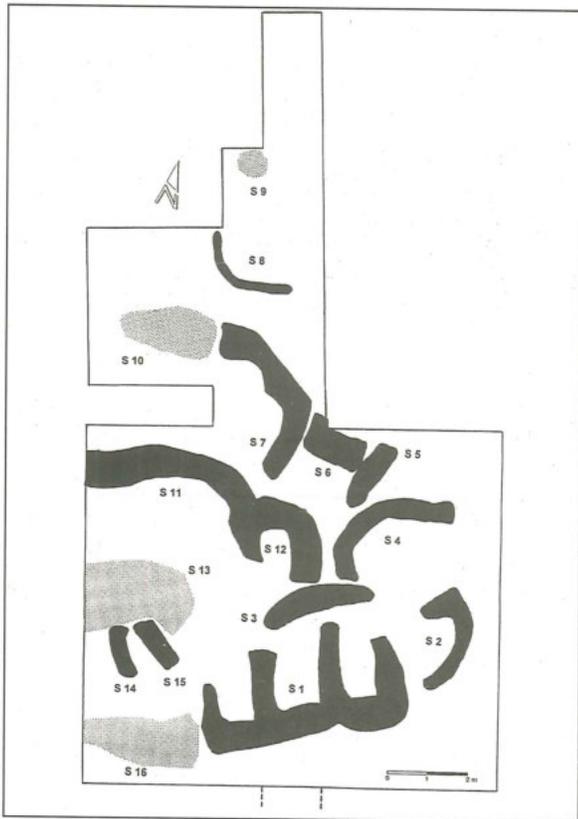
Beside walls, a few other architectural elements could be detected. In squares L6 (Fig. 8: S 10), L7 (Fig. 8: S 13) and L8 (Fig. 8: S 13 and S 16) remains of possible platforms consisting of clusters of small stones appeared. Their function, as well as their relationship to the near-by walls is not yet obvious. Banning drew our attention to what he thinks are similar features at Ṭabaqat al-



7A: Top plan of the eastern part of trench 1 and of squares K7, K8, L7, L8, M7 and M8 (from left to right and top to bottom).



7B: Top plan of the western part of trench 1 and of square L6 and the deep sounding.  
7C: Top plan of the eastern most part of trench 1.



8. Schematic plan of structures in area A (eastern end of trench 1 is not shown).



9. Remains of a roundish structure (S 7), excavated in trench 1.



10. Remains of a rectangular structure (S 1), excavated in trench 1.



11. Part of an oval shaped structure (S 2), bearing fragments of a possible *ṭābūn* (centre).

Būma. There, a paved surface was found in phase 3 (Banning, pers. comm.; see also Blackham 1997: 357, Fig. 9).

In the northern part of the excavation area a deep sounding was conducted to investigate the stratigraphy of the settlement and to search for possible earlier occupation levels. There, still in the Late Neolithic occupation layer, a silo (S 9) was excavated. Its bottom and side walls were made of stone slabs (Fig. 12).

As mentioned earlier, the poor state of preservation as well as the simple way of construction and modern interference made it very difficult and at times impossible to develop a vertical and/or horizontal stratigraphy. Further archaeological research will be necessary to investigate the inter-relationship of the different structures. At this stage, no dwelling or building plan can be proposed.



12. Remains of a possible storage pit with a paved bottom (S 9).

For the time being, the character of the site could be described as follows: ash-Shalaf was a small settlement of herders and - maybe - farmers. Due to the architectural context it seems that it was not occupied all year round, but rather only on a seasonal basis. The dwellings were very simple with stone foundations outlining the dwelling, the upper part of which was constructed of reeds/wood. The entrances were most likely wide and covered only with cloth, so that the dwellings had the character of a tent or simple hut.

**The Pottery** (Katrin Bastert, Hans-Dieter Bienert and Dieter Vieweger)

Most of the excavated pottery clearly resembles that of the so-called Yarmoukian period, with sherds of both, a fine ware and coarse ware. A number of sherds bear the characteristic "herring-bone" incisions. A total of 1,612 sherds were found in excavation area A (Table 1, Figs. 13 and 14). 1,567 sherds could be identified as Neolithic, and were specifically Yarmoukian. Only 45 sherds date to the Roman-Byzantine period and are most likely related to the near-by Roman bridge. All sherds have been covered by a layer of sinter that was in some cases thick. Therefore, the sherds had to be treated with hydrochloric acid before any proper analysis of the objects was undertaken. The Neolithic pottery from ash-Shalaf resembles assemblages from other contemporary sites such as 'Ayn Ghazāl (Rollefson and Simmons 1985; Kafafi 1990; Kafafi *et al.* 1990: 16, Fig. 2; Rollefson *et al.* 1993: 110-111, 117, Figs. 9-10; Kafafi 1995),

'Ayn Rāḥūb (Kafafi 1989), Abū Thawwāb (Kafafi 1985; Kafafi 1988; Obeidat 1995), Munhatta and Sha'ar ha-Golan (Garfinkel 1993).

A first study of the pottery assemblage from ash-Shalaf, undertaken by Katrin Bastert, distinguishes a handmade fine ware and a handmade coarse ware. Sherds of both wares can bear decoration. However, while decoration can be found on 59% of the fine ware sherds, it is found only on 7% of the coarse ware sherds (Table 2). The type of decoration varies according to the following elements: colour spots, different "herring-bone" incisions, painted stripes and red polish (Table 3).

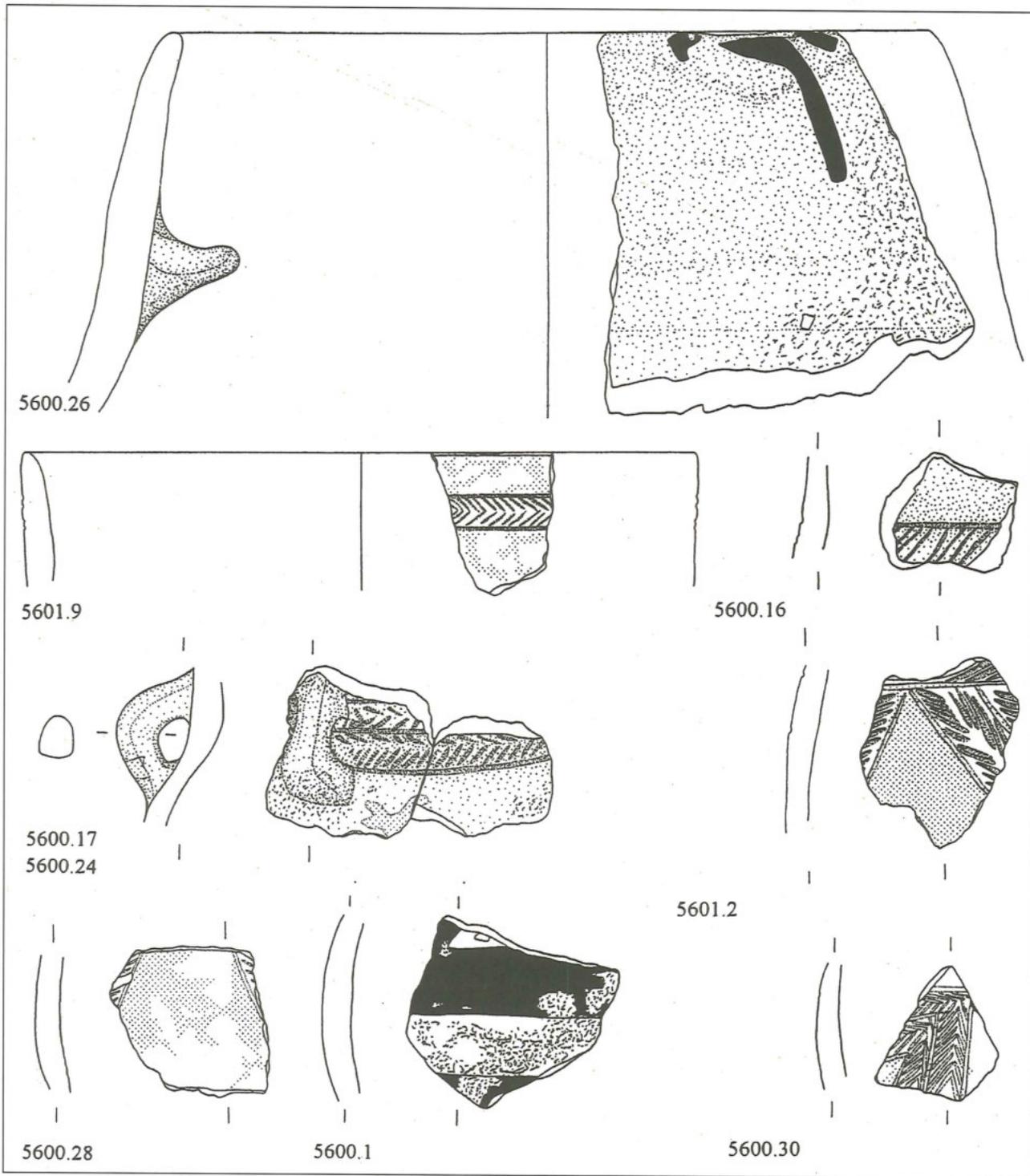
**Table 2.** Distribution of undecorated and decorated sherds according to coarse and fine ware.

	coarse ware		fine ware		Σ
undecorated	1018	93%	194	41%	1212 (77%)
decorated	79	7%	276	59%	355 (23%)
Σ	1097	100%	470	100%	1567(100%)

The coarse ware bears a high percentage of organic and inorganic temper material. The consistency of the clay is porous and coarse-grained. The thickness of the sherd walls varies between 1.2 and 2.0 cm. Despite their thickness, the sherds appear rather light and soft. The organic temper material consists of straw, the impressions of which are sometimes visible on the surface of the sherds. As inorganic temper material, fragments of limestone, quartz, basalt, cinders and sherds were used. Particles of the temper are visible on the surface of sherds.

**Table 1.** Distribution of pottery sherds in the excavated squares of area A.

surface	TR 1 (area A)	TR 1 (area B)	K7	K8	L6	L7	L8	M7	M8	Σ	period
261	244	7	107	31	122	273	114	167	241	1567	Neolithic
3	13	22	0	0	0	1	1	1	4	45	Roman- Byzantine
264	257	29	107	31	122	274	115	168	245	1612	

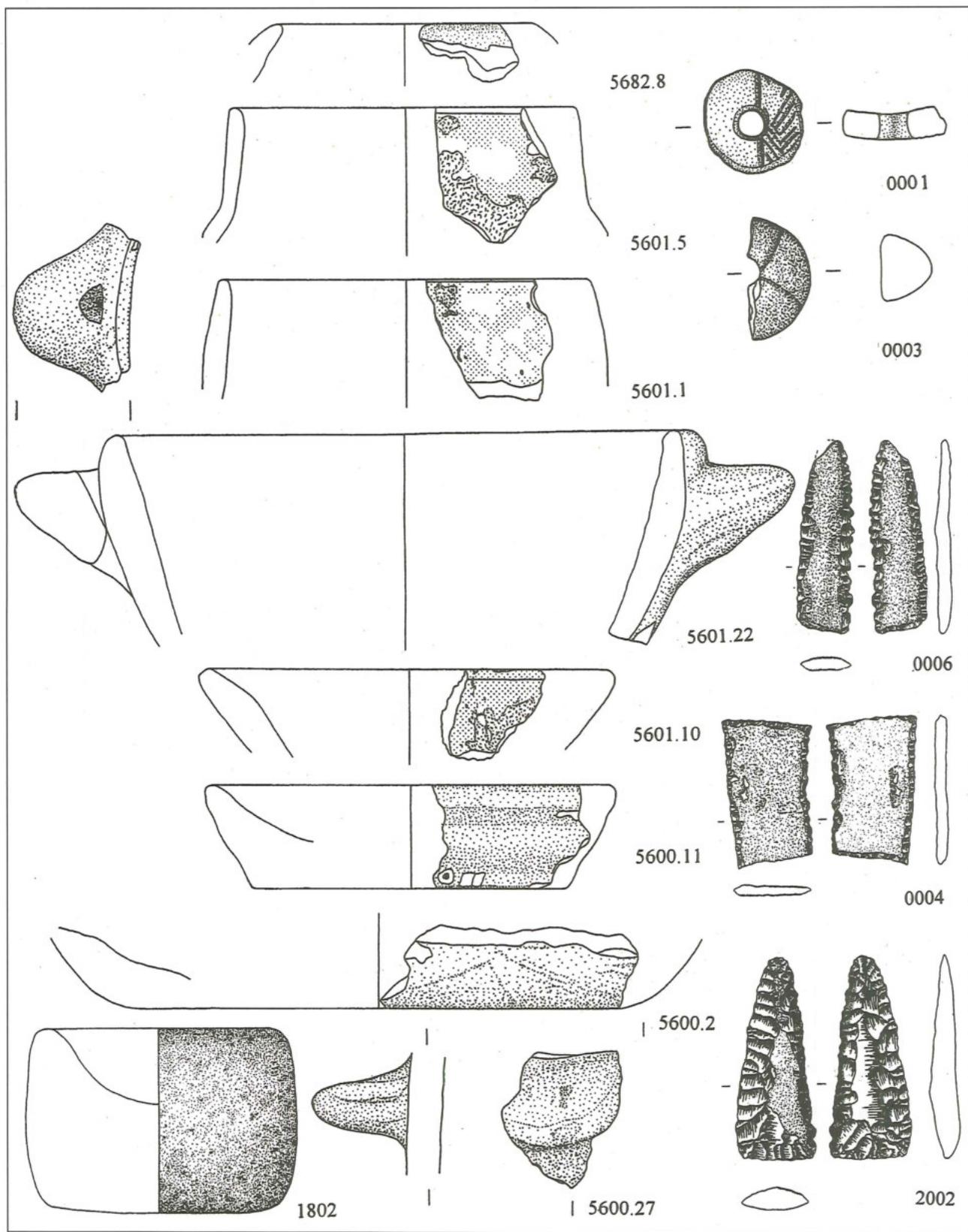


13. Excavated pottery: examples of fine ware (5601.9, 5600.16, 5600.17, 5601.2, 5600.28, 5600.1, 5600.30) and coarse ware (5600.26). The fine ware shows incised herring-bone pattern and dusky red painted lines (5600.1), scale: 1:2.

Often, sherds show a carefully made slip of orange, reddish or yellow colour on the inner and outer surface.

The sherd walls of the fine ware are thinner than those of the coarse ware, varying

between 0.4 and 0.8 cm. As with the coarse ware, the temper material consists of organic material as well as limestone, quartz, basalt, cinders and sherds. The sherds are carefully made from the inside as well as the outside.



14. Pottery sherds of fine ware (5682.8, 5601.5, 5601.1, 5601.22, 5601.10, 5600.11) and coarse ware (5600.2, 5600.27), scale 1:2; spindle whorls (0001, 0003), scale 1:2; selected lithic artifacts (0006, 0004, 2002), scale 1:2; basalt mortar (1802), scale 1:3.

**Table 3.** Total number of Neolithic sherds, separated by ware and decoration.

	body-sherds		rims		bases		handles		Σ		%	
	coarse ware	fine ware										
undecorated	852	147	72	35	54	11	40	1	1018	194	65%	12%
colour spots	52	84	7	2	9	1	0	8	68	95	4%	6%
polished	0	64	4	33	2	7	0	1	6	105	0,5%	7%
incised	2	53	0	9	0	0	2	3	4	65	0,3%	4%
painted	1	7	0	3	0	0	0	1	1	11	0,2%	1%
Σ	907	355	83	82	65	19	42	14	1097	470	70%	30%

59 % of the sherds bear colour spots and incisions (Table 2). The undecorated sherds are covered by a reddish or brownish slip.

As expected, the percentage of decoration within the fine ware is much higher. Four kinds of decoration could be distinguished: colour spots, a carefully made red polished slip, incisions and painted stripes (Table 4). 10 % of the sherds bear colour spots, while 7 % show the red polished slip (Tables 2-3, 5-6; Fig. 15: lower row). Incised patterns (Figs. 13 and 15: first and second from left in the upper row; Figs. 16 and 17: upper row) can be found on only 4 % and painted stripes on 2 % of the whole pottery assemblage (Tables 3-4). The herring-bone motif is by far the most common type of incision; it varies from simple forms to more complex ones, sometimes in double rows (Figs. 13, 16 and 17). The herring-bone incisions can only be found on the outer face of sherds. One sherd bears beside a herring bone incision on the outer face, painted stripes on its outer as well as on its inner face (Fig. 15: upper left sherd).

From a total of 1,567 late Neolithic sherds, 305 pieces have been singled out as being of diagnostic character (Table 5). Among those, 165 pieces are rims. They are almost equally distributed in both wares.

Bowls, deep bowls, jars, hole-mouth-jars

**Table 4.** Distribution of diagnostic sherds according to their decoration.

	bodysherds	rims	bases	handles	Σ	%
undecorated	999	107	65	41	1212	77%
colour spots	136	9	10	8	163	10%
polished	64	37	9	1	111	7%
incised	55	9	0	5	69	4%
painted	8	3	0	1	12	2%
Σ	1262	165	84	56	1567	100%



15. Pottery sherds with dusky red painted lines (upper row) and sherds with a red creamy slip (lower row).



16. Pottery sherds with different herring-bone patterns.

**Table 5.** Distribution of both wares according to bodysherds and diagnostic sherds.

	coarse ware	fine ware	Σ
body sherds	907	355	1262
diagnostic sherds	190	115	305
Σ	1097	470	1567



17. Pottery sherds with different types of handles: loop handles (upper row), lug handles and knob handles).

and plates are the vessel forms which could be identified within the pottery assemblage. 46 % of these are bowls and deep bowls. They are mostly undecorated. 14% of the rim sherds belong to jars. Hole-mouth-jars account for 29% of the rim sherds and in most cases they do not show any decoration. Plates are rare and only a few sherds have been identified until now.

A total of 84 sherds belong to bases (Tables 3-4 and 6); they belong mostly to the coarse ware. 56 handles (big and small loop handles, lug handles and knob handles) or handle fragments were within the pottery assemblage (Table 6). As for the bases, they belong in most cases to the coarse ware. One piece, which is a hole-mouth-jar, is quite extraordinary as it has a lug handle on the inside of the vessel (Fig. 13: 5600.26).

**Other Finds**

Two spindle whorls made of clay (Fig. 14: 0003) and of a fragment of a sherd with an incised herring bone pattern (Fig. 14: 0001) are among the very few small finds

from ash-Shalaf. A fully preserved basalt mortar (Figs. 14: 1802 and 18) was also found. Only a very small quantity of animal bones was found and remains to be analysed. Fifteen soil samples were taken during the excavation, mainly from loci 17, 19, 22 and 23 in the deep sounding trench 1. They are being analysed by John Meadows (La Trobe University, Melbourne, Australia) and some results are presented below.

No human burials or bones were found in the excavated areas so far. There was also no indication at all where burials might have been situated. Due to the nature of the site - probably a semipermanent settlement - it is likely that there was no specific burial ground and that burial might have taken place at other spots.

**Observations on the Lithic Industry of ash-Shalaf (Lothar Herling)**

The lithic material collected during the excavation is currently under study by Lothar Herling. Therefore, only a brief comment can be made at present on the nature of the artifacts or the tool kit. However, among the abundant lithic material three are described



18. Basalt mortar, found in square M8.

**Table 6.** Total number and percentage of diagnostic sherds.

	bodysherds		rims		bases		handles		Σ	%
coarse ware	907	58%	83	5%	65	4%	42	3%	1097	70%
fine ware	355	23%	82	5%	19	1%	14	1%	470	30%
Σ	1262	80%	165	11%	84	5%	56	4%	1567	100%

below.

The first of the glossed pieces (Fig. 14: 0006) consists of thin tabular flint with a slight terminal break. It is quite thin and longitudinal in form and the basal end is nearly right-angled. The cortex on one surface appears both coarser and lighter in colour than on the other. The artefact shows a peripheral bifacial retouch. On the lateral left the created tool edge is nearly straight. The denticulation on the lateral right functional edge makes it difficult to identify the weak sickle gloss located primarily on the ridges.

Another glossed element (Fig. 14: 0004) was prepared from even thinner tabular flint. During the selection process of the otherwise very flat and parallel raw material, it was taken into account that the lateral left ventral surface contained a natural depression. In two places it broke through the flint. Nevertheless, it was possible to place the backed retouch adjacently without damaging the artefact. The working edge on the lateral right shows gloss from usage (cutting wood, leather, reeds, meat, or other organic material). It is very weak on one surface and can only be found on a few of the ridges. On this artefact, the cutting edge is irregularly denticulated. The edge retouch was arranged in a peripheral fashion and it was executed bifacially. The basal end carries only a ventral retouch.

In contrast to the other two artefacts, the third glossed piece (Fig. 14: 2002) is noticeably thicker. It was not made from tabular flint but prepared from a flake. The center of the dorsal surface is still covered with cortex. The element shows rather coarse marginal retouch arranged in a peripheral pattern. The retouch is very regular on the lateral left side. The gloss on the edge can be identified more clearly due to the greater thickness of this artefact. The gloss is more pronounced on this artefact than on the other two elements.

The gloss, which is more or less intensely present, clearly identifies the three artefacts

as sickle blades, coming from different tools. Blade no. 0004 was most likely incorporated in the center of the sickle body. The three blades already permit a first insight into the flint industry of ash-Shalaf. The lithic material will be presented in its entirety within the final publication of the excavation.

Catalogue of the above described lithic artifacts:

- 1) Field No. 0006, Area A, Locus L 6, under Pl. 1; Colour: 10 YR 4/1 (cortex 5 YR 7/6), Weight: 7,7 g, Length: 6,8 cm, Width: 1,9 cm, Thickness: 0,5 cm (Fig. 15: 0006)
- 2) Field No. 0004, Area A, Locus L 7, Colour: 10 YR 6/2 (cortex 7,5 YR 6-7/6), Weight: 9,2 g, Length: 5,3 cm, Width: 3,1 cm, Thickness: 0,4 cm (Fig. 15: 0004).
- 3) Field No. 2002, Area A, Locus L 1, Trench 1; Colour: 10 YR 6/3 (cortex white), Weight: 18,9 g, Length: 7,1 cm, Width: 2,8 cm, Thickness: 1,0 cm (Fig. 15:2002).

### **Palaeobotany (John Meadows)**

Fifteen soil samples were taken by the excavators from four contexts in Area A, Trench 1 (the 'deep sounding'). The four contexts, L 17, L 19, L 22 and L 23, were sampled because they appeared to be deposits which had accumulated during the occupation of the site, and not after its abandonment. The sampling strategy was therefore to sample every securely stratified occupation deposit. The samples were processed by flotation, using the 'wash-over' method. Table 7 shows the results of the sorting of samples.

Stratigraphically, L 19 is below (earlier than) L 17, and L 22 and L 23 are contemporary with or earlier than L 19. The quantity of grass roots, which is not recorded, was much greater in L 17 than in any of the lower levels (and apparently greater in the L 19 samples than in those

from L 22 and L 23). The excavators described L 17 and L 19 as ashy occupation levels (secondary contexts), and L 22 and L23 as possible fireplaces (primary contexts).

With these results and stratigraphic relationships in mind, the following observations were made:

1. *The uncarbonised seeds are probably all modern.*

Note that (a) the incidence of uncarbonised seeds decreases with depth below the modern surface; (b) there are more types of uncarbonised seeds in L 17 than below L 17 (the 'cf. pea' in L 19 was introduced during the recovery process); (c) the

**Table 7.** The results of this stage of sorting are as follows:

Sample	Level	Volume (litres)	Carbonised plant remains	Uncarbonised	Snails
7700	17	1.7	1 barley grain 1 cf. <i>Astragalus</i> 1 ? grass seed + fragments	2 Boraginaceae	22
7701	17	5.0	5 cf. <i>Astragalus</i> + fragments	36 Boraginaceae	36
7702	17	6.5	1 grain, indet. 1 unknown seed + fragments	33 Boraginaceae 2 <i>Fumaria</i> sp.	62
7704	19	2.0	1 cf. lentil 3 cereal grains dozens of small legumes (1 or 2 cf. <i>Astragalus</i> )	1 Boraginaceae	10
7705	22	0.6	1 glume base 2 cf. grains + fragments	-	-
7706	23	0.1	3 glume bases 1 cf. lentil 1 cf. grain 2 grass seeds 8 cf. <i>Astragalus</i> + fragments	-	-
7707	17	2.5	1 cf. lentil 2 cf. grains + fragments of cf. <i>Astragalus</i>	11 Boraginaceae	11
7708	17	2.8	1 ? emmer grain + fragments	9 Boraginaceae	15
7709	17	2.8	fragments of several small legumes and grass seeds	18 Boraginaceae	15
7710	19	7.0	several dozen cf. <i>Astragalus</i> fragments	11 Boraginaceae	15
7711	19	6.3	1 cf. lentil 1- 2 grass seeds several dozen cf. <i>Astragalus</i> fragments	20 Boraginaceae	16
7712	19	1.2	1 cf. <i>Astragalus</i> fragments of 5-6 others	3 Boraginaceae 1 cf. pea	3

cont. Table 7.

Sample	Level	Volume (litres)	Carbonised plant remains	Uncarbonised	Snails
7713	19	11.5	3 glumes 1 glume base 2-3 grains 1 pulse 1 speck of wood estimated 50+ cf. <i>Astragalus</i> + fragments	21 Boraginaceae	34
7714	22	3.0	1 glume base 4-5 grains + fragments	1 Boraginaceae	16
7715	17	6.5	1 cf. lentil 2-3 grains 1 cf. <i>Astragalus</i> + fragments	55 Boraginaceae 2 <i>Fumaria</i> sp.1 Caryophyllaceae	37

Summarising these results by context:

Context	Samples	Volume (litres)	Carbonised plant remains	Uncarbonised	Snails
L17	7	27.8	7 grains, 1 grass seed, 2 lentils, 7 cf. <i>Astragalus</i> + fragments	164 Boraginaceae 4 <i>Fumaria</i> sp. 1 Caryophyllaceae	198
L19	5	28.0	6 grains, 5 glumes, 1-2 grass seeds, 3 lentils, 3 cf. <i>Astragalus</i> + scores of small legumes + fragments	37 Boraginaceae 1 cf. pea	78
L22	2	3.6	6-7 grains, 4 glumes + fragments	1 Boraginaceae	16
L23	1	0.1	1 grain, 6 glumes, 2 grass seeds, 1 lentil, 8 cf. <i>Astragalus</i> + fragments	-	-

most common type of uncarbonised seed is a species of Boraginaceae, whose seeds have siliceous coats - several were broken open to confirm that only the seed coat remains, the organic part having already decayed. There is nothing to suggest that these seeds were ever carbonised.

Therefore, the seeds are part of the modern seed bank, which have not germinated and are in the process of breaking down. Modern seeds without siliceous coats clearly break down more quickly, and are not often found much below the modern surface. Charred seeds of Boraginaceae are some-

times found on Jordanian sites, but never as the most common taxon.<sup>2</sup>

2. *The snails are probably a mixture of modern and ancient.*

Although snail incidence decreases with depth below the modern surface, it does not decline as rapidly as the incidence of uncarbonised seeds. Only a small proportion of the snail shells were glossy, bullet-shaped shells typical of burrowing species, and these were practically all in L 17 samples. Most shells were weathered rounded types, which are still extremely common on the ground around the site. Since even these are

2. Note that the ash-Shalaf assemblage is similar in many ways to that from el-Kowm in central Syria (van Zeist 1986), which was also dominated by Boraginaceae seeds. The author, together with Gordon Hillman of the Institute of Archaeology,

University College London, concluded that the Boraginaceae were mostly modern. Again, the samples came from relatively close to the modern surface of the site.

nearly three times as common in L 17 as in L 19, it may be that a proportion of them reached the archaeological strata as a result of recent bioturbation.

3. *The incidence of crop remains is very low.*

The number of grains, glumes and lentils per litre of sediment is about the same in L17, L 19 and L 22 (0.25, 0.5 and 2.5 items/litre, respectively), and rather higher in L 23 (50 items/litre). The density of crop remains in L 22 is comparable to that from a poor secondary context at sites in the Jordan Valley, whilst that in L 23 is comparable to a poor primary context (see Meadows 1998 for examples).

4. *The incidence of small legumes in L19 is several times that found in L 17.*

Estimating the actual number of seeds recovered from the many fragments of *Astragalus* and perhaps other small-seeded legumes will be a laborious process. It is clear, however, that there are 5-10 times as many in the L19 samples as in the L17 samples.

5. *There are no glumes in L 17.*

Each of the other 3 contexts produced at least some glumes - evidence for the later stages of crop processing of emmer (or einkorn). The low incidence of all plant remains in L 17 may be due to the absence of crop processing (generally the source of most archaeobotanical material, even if indirectly). Alternatively (see below), the absence of glumes could indicate generally unfavourable preservation conditions in L17, which should also be reflected in a low count of other plant remains.

The ash-Shalaf assemblage is relatively poor. This is probably due to several factors operating at different stages in the site formation process, such as:

- \* the range of plant material reaching the site, the form in which it arrived, how and where it was processed, stored and consumed
- \* the thermal conditions under which the

surviving material was carbonised (preservation in recognisable form only takes place in a relatively narrow temperature band, when the oxygen supply is limited)

- \* post-depositional conditions: charred plant remains are chemically inert, but physically very fragile, and therefore vulnerable to mechanical damage.

As suggested earlier, most archaeobotanical remains in open sites reflect local crop-processing; in most circumstances, the amount of wastage during storage and consumption would have been much smaller than the volume of residual material from crop processing. One possible explanation of the low incidence of plant remains at ash-Shalaf, therefore, is that it was not a permanent agricultural village. Results from other lines of evidence may support or refute this idea.

Furthermore, the use of ruminant dung as fuel is probably the major source of carbonised plant remains at arid or semi-arid sites with domestic animals. Typically, crop processing residues are fed to animals, which incompletely digest their fodder, and pass identifiable plant remains which are then preserved by charring. The availability of dung for fuel obviously depends on what animals were herded and how they were managed. The absence of wood charcoal, however, tends to imply that dung would have been used had it been available.

The most likely explanation of the low incidence of charred plant remains at ash-Shalaf is damage occurring during and after carbonisation. The remains that were recovered, however badly preserved, are those which survive the widest range of thermal conditions (Boardman and Jones 1990). Less dense plant parts, such as straw and rachis internodes (which are found in abundance at Jordan Valley sites with good preservation), did not survive at all at ash-Shalaf. The more durable parts (grains and glumes) are badly damaged. This tends to suggest that fires were fairly open and well-

ventilated. Plant remains from around *tābūn* ovens, where dung was used as fuel, tend to be much better preserved.

The topography of ash-Shalaf is probably also a factor. It is a relatively high-energy environment, which is reflected in the fragmentation of the bones and the poor preservation of architecture. Plant remains, which are more fragile than either bones or walls, probably suffered even more damage. A combination of slope processes, oxidising thermal conditions and perhaps seasonal occupation may therefore account for the relative poverty of the ash-Shalaf plant assemblage. Bearing in mind the small sample size, some tentative conclusions may be drawn from what was recovered.

Cereal grains (glume wheat and hulled barley) occur in every sampled context. Lentils were also found in every sampled context except L 22. No other crops were found. The combination of crop staples, emmer, hulled barley and lentil, is ubiquitous at Neolithic sites, and ash-Shalaf is no exception. Given the small sample size, no conclusion about the absence of other crop species is meaningful.

Small-seeded legumes outnumber all the other types combined. The better-preserved of these apparently belong to the genus *Astragalus*, which is usually treated as an indicator of steppe vegetation. Given the dominance of *Astragalus* at ash-Shalaf, the absence of wood, the absence of evidence for crop-processing and the absence of burnt animal dung, the most likely explanation for its presence is that it was a shrub gathered for fuel.

This does not mean that the surrounding vegetation was a continuous sward of *Astragalus*. As van Zeist (1986) points out in his report on el-Kowm, the very small and delicate seeds of *Artemisia herba-alba*,

probably the dominant steppe species, are quite unlikely to be recovered in identifiable form.

Finally, the absence of wood is likely to be more significant than the absence of minor crop species. Given that seeds were preserved, it tends to suggest a real shortage of timber, which implies that the environment may have been much as it is today. Even with today's rainfall, some wood from wadi vegetation is expected to be found.

### Acknowledgements

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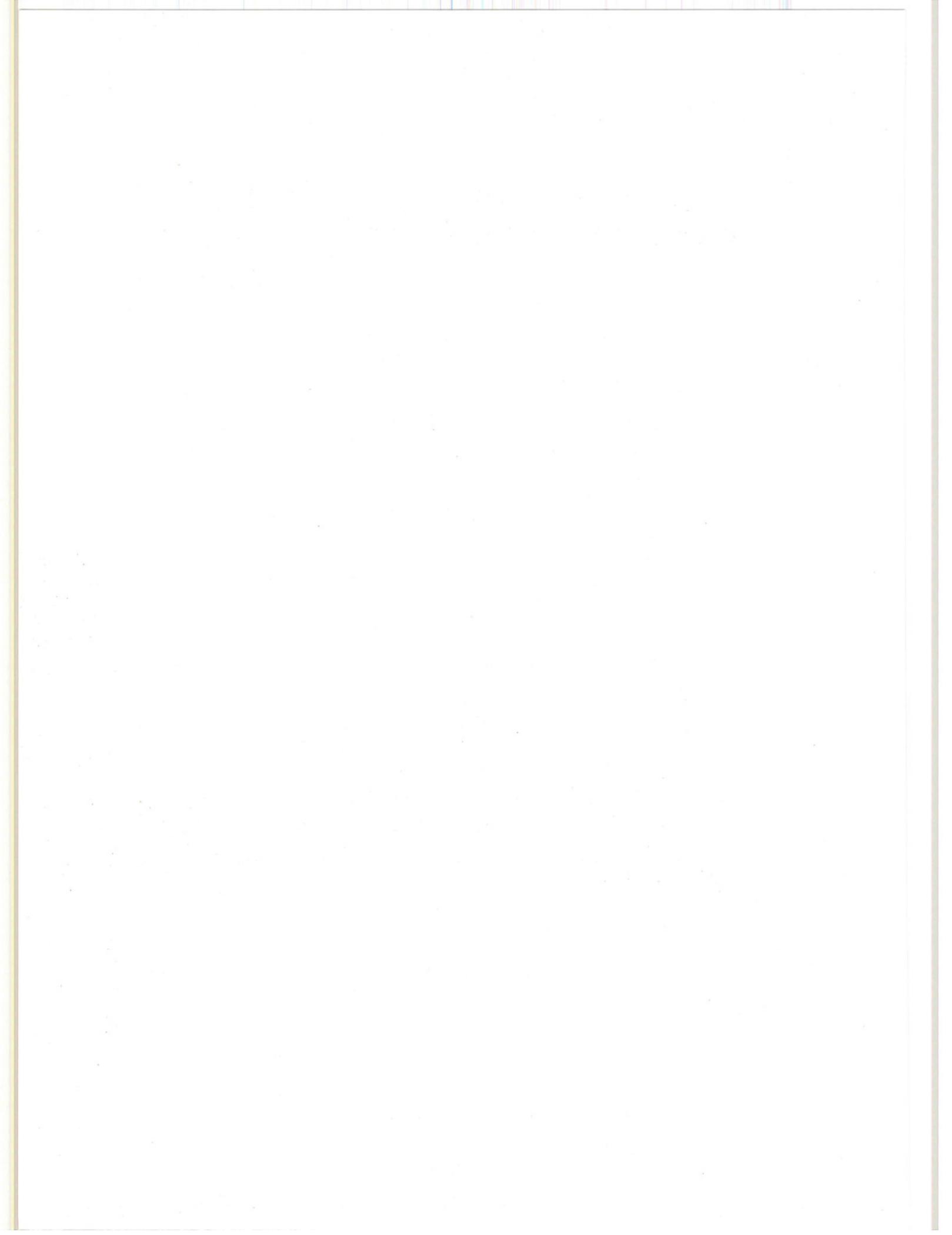
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Hans-Dieter Bienert  
 German Protestant Institute of  
 Archaeology in Amman  
 P.O.Box 183  
 Amman 11118  
 Jordan

Dieter Vieweger  
 Kirchliche Hochschule Wuppertal  
 Dietrich - Bonhoefferweg 20  
 42285 Wuppertal  
 Germany

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# QĀ' ABŪ ṬULAYḤA WEST: AN INTERIM REPORT OF THE 1998 SEASON

by  
Sumio Fujii

## Introduction

The second season at Qā' Abū ṬulayḤa West - a tabular scraper mega-factory that was located in the northwestern area of the al-Jafr basin, southern Jordan (Fig. 1) - was carried out from 25 August through 10 October in 1998. The main purpose of this season was to excavate Structure 03 - another workshop of tabular scrapers. A supplementary survey of other loci was also conducted in order to explore the total picture of this site.

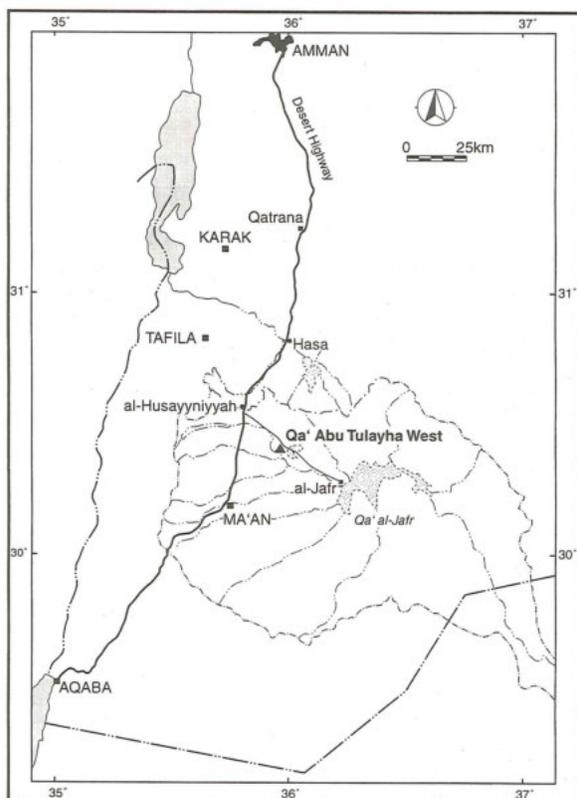
This season's investigation revealed some interesting aspects of this site. First, it was found that the site included at least two phases of tabular scraper production repre-

sented by Structure 03 and Structure 01 respectively, thus possibly opening the way to the seriation of this enigmatic but informative stone implement. Second, the occurrence of refitted tabular scrapers and the equipment related to them (i.e., hammerstones, punch blades, anvils) made it possible to reconstruct, though still incompletely, the *chaîne opératoire* of the tabular scraper production. Third, the site turned out to include workshops not only of tabular scrapers but also of Canaanian blades - the two off-site chipped stone industries for the Early Bronze Age urban societies roughly north of Arad and west of the Jordan valley. Fourth, there occurred the possibility that the site included a cemetery or sanctuary area separated from the workshop area.

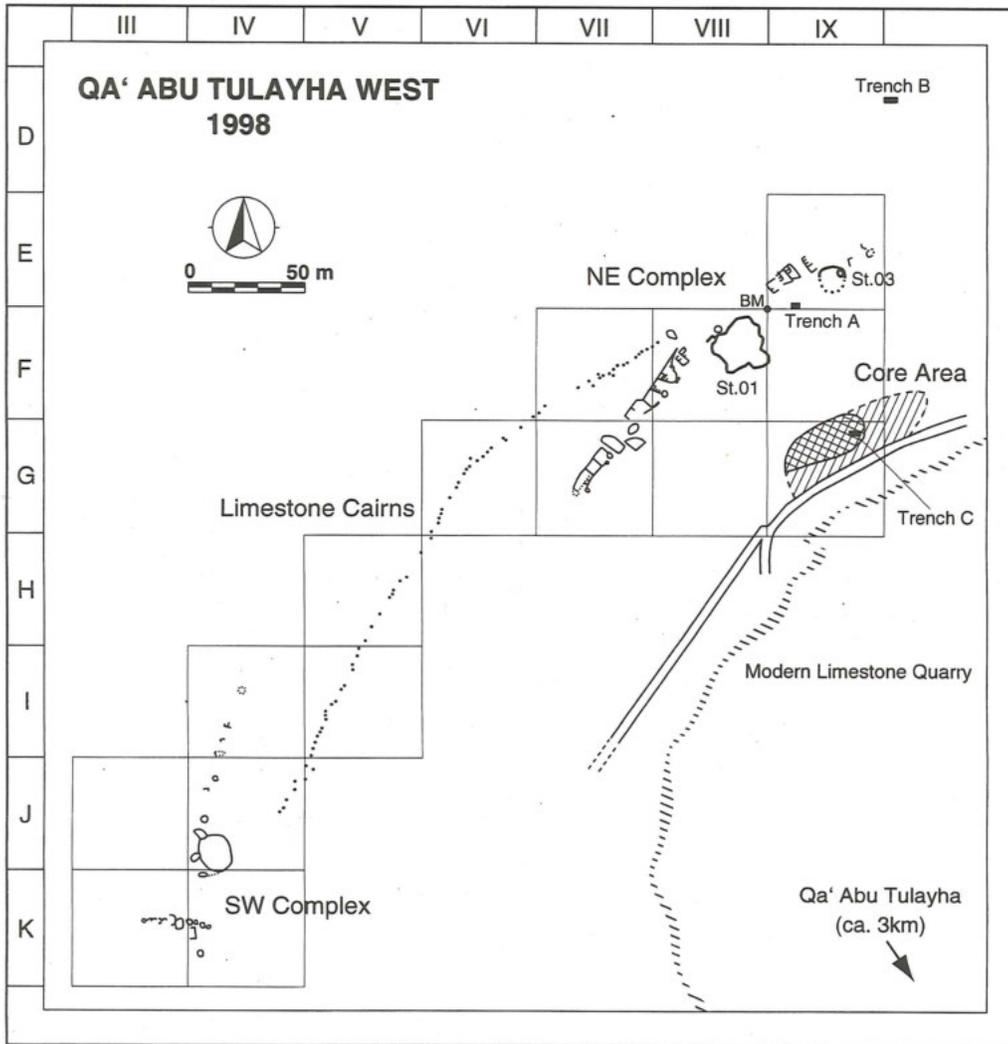
The following is a brief summary of this season's investigation. In addition, some discussions will be made at the end, focusing on the dating and the intra-site structure of Qā' Abū ṬulayḤa West.

## EXCAVATION OF STRUCTURE 03

Structure 03 is included in the major Square E-IX (Fig. 2), which represents the northeastern end of the Northeastern Structural Complex (hereafter NE Complex). It is situated about 30 m northeast of Structure 01 - another workshop of tabular scrapers that was excavated in the last season. The original floor level of Structure 03, as that of Structure 01, corresponded to the upper surface of Layer 3 (reddish-brown, aeolian sand layer), thus indicating the rough synchronism of both structures (for the stratigraphy, see Fujii 1998: 128).



1. Drainage of the al-Jafr basin (based on JICA 1990) and the location of Qā' Abū ṬulayḤa West.



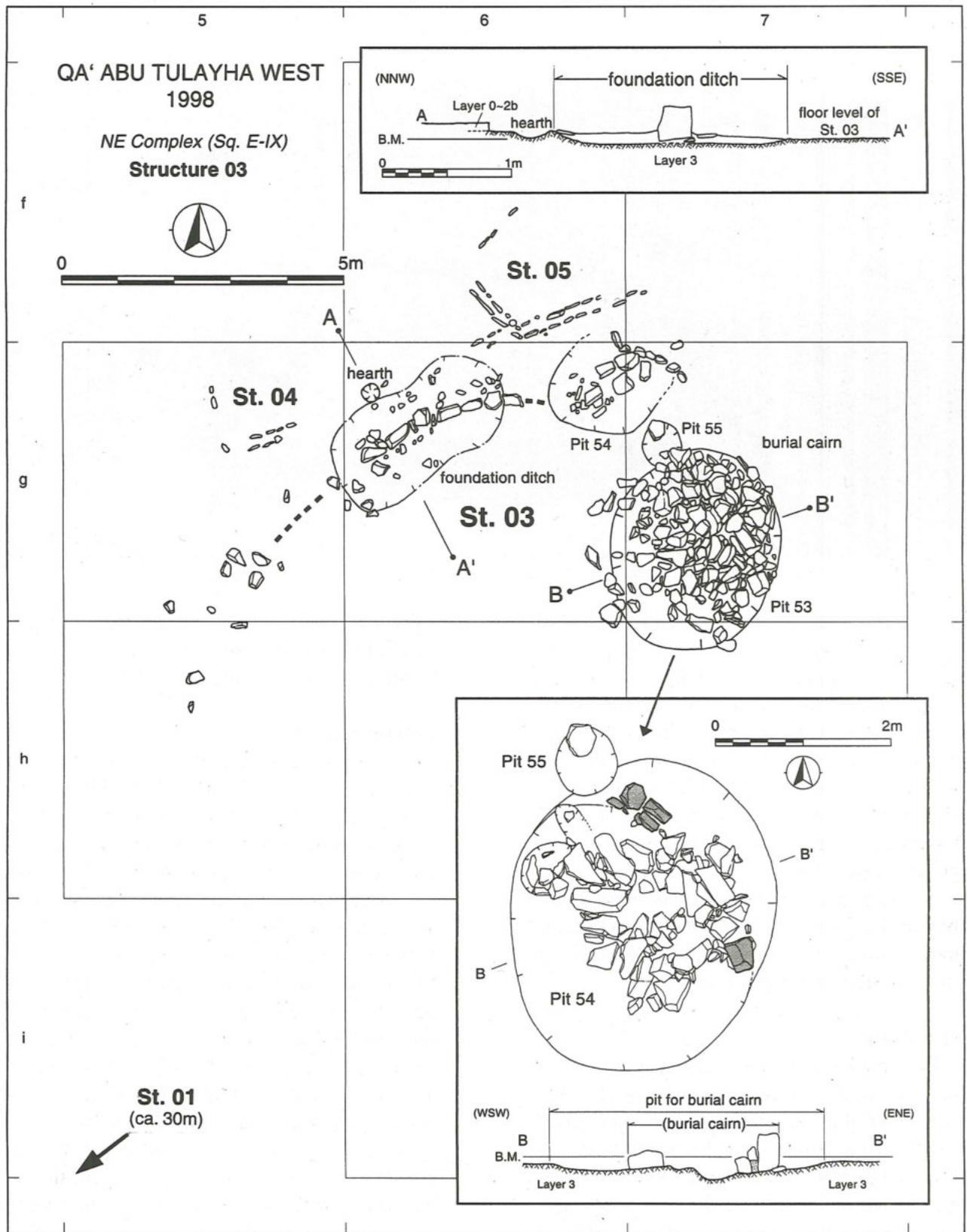
2. Site range of Qā' Abū Ṭulayḥa West.

### The Wall

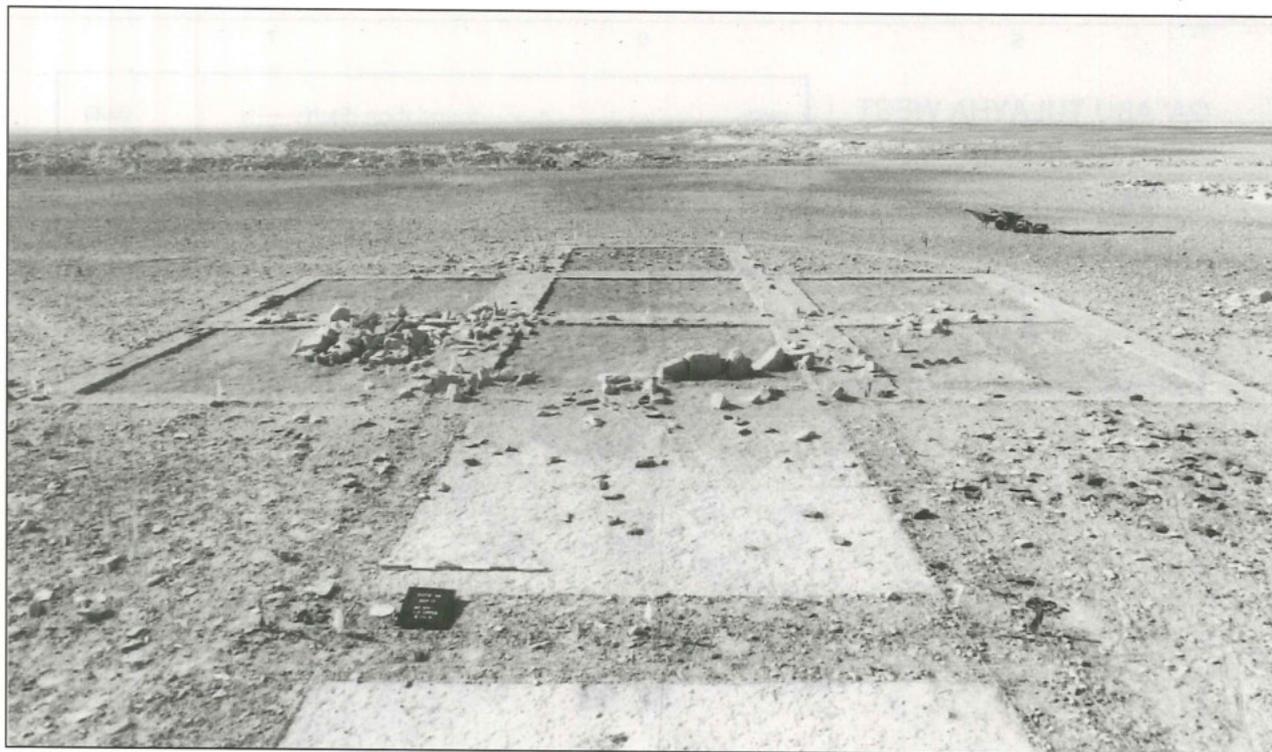
A line of upright limestone boulders was found in the northwestern quarter of minor Square g-6 (Figs. 3 and 4) (for the grid system, see Fujii 1998: 127). It was about 3 m long and slightly in-curved southwards. The section A-A' crossing this wall revealed that: 1) these limestone boulders, as those in Structure 01, stood upright on a foundation ditch; 2) limestone rubble was often driven under the bottom of these boulders in order to support them upright; 3) the foundation ditch, semi-rectangular in general plan, was about 3 m long, 1.5 m wide and 10 cm deep with a roughly flat bottom; 4) it was filled out with compact soil including limestone rubble and small abraded flint pebbles; 5) it was partly paved by either limestone or flint slabs.

In the southwest of this upright stone wall, some sporadic limestone cobbles were found *in situ* (Sq. g-5 and h-5). Though heavily damaged by a later disturbance, they seemed to represent an extension of the central, upright stone wall. However, the construction method of this wall was much different from that of the central wall; specifically, the construction material was not based on a foundation ditch but put directly on the then ground surface in a horizontal position.

Also heavily damaged was the eastern extension of the central wall (Sq. g-6 and g-7). The original wall of Structure 03 was completely erased by a later pit (Pit 54), in which a number of limestone cobbles and boulders were thrown. Possibly, these stones



3. Structure 03 and the surrounding structures.



4. Structure 03 (from the north) and modern limestone quarry (rear).

originated in the wall of Structure 03. Further to the southeast, the wall was erased again by a larger pit (Pit 53), on which a stone concentration was built. This stone concentration was about 2.5 m in diameter and consisted of more than one hundred limestone cobbles and boulders and some flint nodules. As mentioned below in detail, it seemed to be a burial cairn with a hollow space in its center.

No substantial wall was recognized further in the south. Thus, Structure 03 measured about 10 m wide and 5 m deep, being semi-circular in general plan.

### The Floor

No special treatment was recognized on the floor of Structure 03 except for the possibility of the cleaning of sand and small abraded flint pebbles on the ground surface (Fujii 1998: 130-131). Neither postholes nor inner partitions were found. Only one hearth was unearthed just north of the foundation ditch. This small hearth, about 30 cm in diameter and 10 cm in depth, yielded loose,

ashy soil. However, neither artifacts nor faunal/floral evidence was retrieved despite the 2 mm mesh dry sieving of the fill.

### Burial Cairn

As mentioned above, the southeastern wall of Structure 03 was ended with a large, oval, shallow pit (Pit 53), on which a stone concentration was built. Evidently, this pit cut the original wall of Structure 03. It follows that the pit and the stone concentration are dated to be later than Structure 03. It is, however, noteworthy that the lower part of this stone concentration included some boulders that seemed to represent an extension of the central wall (see Fig. 3, below right). If so, the above dating becomes questionable. This complicated situation puzzled us, but my present interpretation is as follows:

1) the original wall of Structure 03 was constructed in the first place; 2) then, the pit was dug partly destroying the original wall; 3) next, the stone concentration was built on this pit; 4) after that, the wall was partly reconstructed sharing the wall line with the

lower part of the stone concentration. Given this, one may suppose that the inhabitants of Structure 03 constructed the stone concentration during their residence and continued to live thereafter.

The next question is the function of this stone concentration. In this regard, one should note that it included a hollow, but partly paved, central floor about 1 m in diameter (Fig. 5). This floor was surrounded by a number of long boulders arranged roughly in a circle. Interestingly, some of them, especially those in the northern and western part, were inclined toward the center, probably suggesting that they originally stood in an upright position. This means that the stone concentration had a small, hollow space in its lower part.

These observations remind us of burial cairns in the Early Bronze Age sites of the Negev and the Sinai (Haiman 1992; 1993). Their size, morphology, structure, and relative position to a mother structure – all fit well with the stone concentration at Structure 03. It is therefore likely that our example is of the same character (i.e., burial cairn). Incidentally, neither burial bones nor burial gifts were recovered despite the 2mm-mesh dry sieving of the fill. However, the case is often true for the burial cairns, especially those in cairn fields, in the Negev and the Sinai. Another example occurs at al-Adeimeh in the lower Jordan valley (Stekelis 1935; Gilead 1968; Webley 1969).



5. Burial cairn in Structure 03 (from the west).

Accordingly, the absence of human bones and burial gifts does not necessarily impede the identification as a burial cairn; rather, it might reinforce the interpretation.

We are now ready to reconsider the function of the similar stone concentrations that were found but left intact during the excavation of Structure 01 in the last season (Fujii 1998: 128-130). Their size, morphology, and relative position to the mother structure lead us to the same conclusion; they are probably burial cairns. The same may be true for Pit 54 of Structure 03 where several limestone boulders, though heavily disturbed, seemed to form a central hollow space.

### Summary of Structure 03

Although the heavy damage by a later disturbance makes it difficult to reconstruct the total plan of Structure 03, the following two views can be made. One view is that this is a small, semi-circular, single-unit structure with an upright stone wall in the center and its short extension in both directions. If one follows this interpretation, one may suppose that Structure 03 corresponds to one unit of the neighboring workshop, Structure 01, which is a large, amorphous, multi-unit structure (Fujii 1998: Fig. 8). One may further assume that Structure 03 is comparable with the westernmost unit of Structure 01, because: 1) both consist of an upright stone wall in the center and its simplified extension in both directions; 2) the ends of the wall are often accompanied by a burial cairn.

Another view is that Structure 03 represents a disturbed picture of a larger, multi-unit structure like Structure 01. This view is based on the assumption that the neighboring inhabitants – especially, those of Structure 01 – diverted the construction material of Structure 03 to their own construction. In this regard, one may note that the southern and western walls of Structure 03 were most heavily damaged, because Structure 01 is situated to the southwest of Struc-

ture 03. Also suggestive is the surface observation which was carried out in advance of the excavation. It confirmed that a number of loose stones (i.e., stones out of the original context) were scattered around Structure 03 roughly drawing a circle (about 15 m in diameter).

Nothing conclusive can be said at the present stage, but the latter view seems to be more plausible. The poor character of the eastern wall of Structure 01 (Fujii 1998: Fig. 8) might reflect the easy diversion of the construction material from the neighboring, discarded structure - Structure 03.

### Surrounding Structures

Two rectangular structures, Structure 04 and 05, were found just north of Structure 03 and partly excavated. It might be that both structures had originally constituted one long, multi-roomed, rectangular structure. A good example occurs in the southwest of Structure 01 (see Fig. 2). Stratigraphically, these two structures belonged to Layer 2b or 2a, thus indicating a later date than Structure 03.

Both structures were too disturbed to deserve an individual description. However, their construction method is worthy of a brief comment. The wall consisted of usually two-rowed, upright flint slabs put in a narrow foundation ditch. The same method was seen at Structure 02, which was excavated in the last season and tentatively dated to the Late Neolithic (Fujii 1998: 134-136). These examples, coupled with the Pre-Pottery Neolithic varieties in the al-Azraq basin (e.g., Waechter and Seton-Williams 1938: 3-4; Garrard *et al.* 1994: 75-85), suggest the deep-rooted conservatism in the arid peripheries. In this sense, it is roughly round, multi-unit structures with one-rowed stone wall (e.g., Structure 01 and 03) that are rather heterogeneous to the local tradition of the *inland* Levant (Fujii *et al.* 1987: 37). One may assume the close interaction between the al-Jafr, the Negev and the Sinai.

This assumption may be supported by another line of evidence (e.g., the similarity in burial custom and lithic production).

### Findings at Structure 03

In contrast to Structure 01, the findings at Structure 03 was very poor in quantity and variety. It consisted exclusively of chipped stone artifacts, although some heavy-duty tools and a groundstone artifact are included as a minor component. Neither pottery shards nor faunal/floral evidence were recovered.

### The Chipped Stone Artifacts

A total of 146 chipped stone artifacts were found within the context of Structure 03 (Table 1 and Figs. 6 and 7). As was in the excavation of Structure 01, the surface findings were the most numerous; the number of findings decreased as the excavation approached the original floor level. Thus, more than half of the findings were not *in situ*. However, the homogeneity both in raw material (light to dark brown, fine-textured, Eocene flint) and in techno-typology (tabular scrapers and the debitage related to them) allowed us to handle all the samples as a set.

*Cores:* Except for one miscellaneous sample and one core fragment, this category consisted only of flake cores. Technologically, some 75 % of these flake cores was of the single platform type, and the remaining 25% was of the 90° opposed type. Typologically, they consisted mostly of small, non-cortical cores. They were probably the source of smaller flakes (Fig. 6: 2, 3). In contrast, tabular scraper cores were quite rare (Fig. 6: 1), being inconsistent with the frequency of tabular scrapers in tool classes. This discrepancy, as mentioned in the last report (Fujii 1998: 131), indicates that Structure 03 (and Structure 01) were the second stage indoor atelier for finishing tabular scrapers. In contrast to the final process, the core preparation and blank detachment processes were probably executed in the

**Table 1.** Inventory of chipped stone artifacts at Structure 03 (excluding heavy duty tools - anvils and hammerstones).

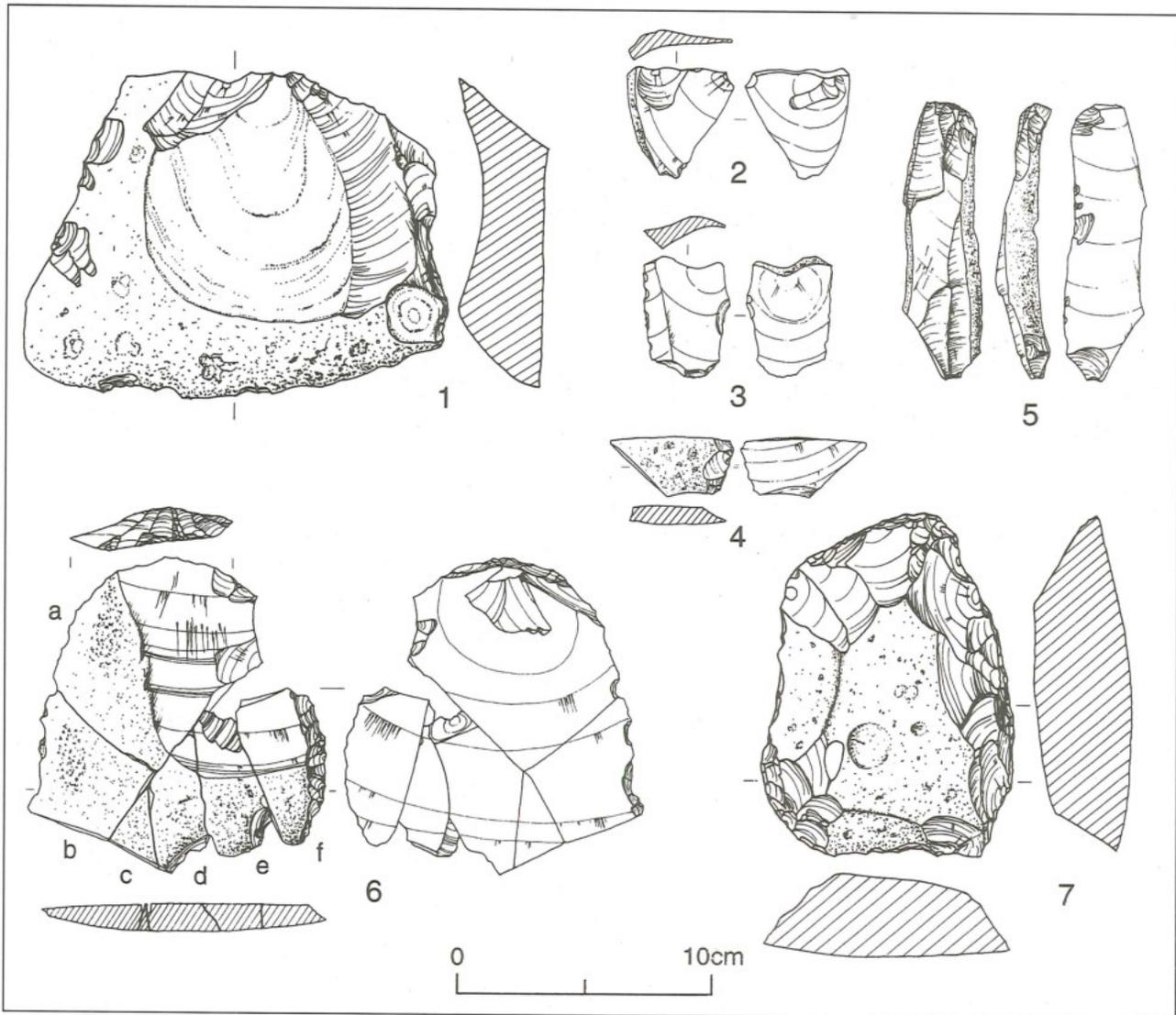
Category	Class	Sub-class	N	N	% <sup>1)</sup>	%	% <sup>2)</sup>
Cores	flake cores		8		72.7		5.5
		single platform		6		75.0	
		90 degree opposed		2		25.0	
	tabular scraper core		1		9.1		0.7
	varia		1		9.1		0.7
	core fragment		1		9.1		0.7
(sub-total)			11		100.0		7.5
Debitage	unmodified flakes		55		75.3		37.7
		non-cortical flakes*		32		58.2	
		sub-cortical flakes		5		9.1	
		cortical flakes		18		32.7	
	thermal flakes		2		2.7		1.4
	TSTE		14		19.2		9.6
	unmodified blade		1		1.4		0.7
	cortical blades			1		100.0	
	chip/chunk		1		1.4		0.7
	(sub-total)			73		100.0	
Tools	tabular scrapers		30		48.4		20.5
		fan		2		6.7	
		round		6		20.0	
		semi-circular		4		13.3	
		oval		2		6.7	
		rectangular		2		6.7	
		varia		14		46.7	
	massive scrapers		3		4.8		2.1
	notches/denticulates		2		3.2		1.4
	retouched/used flakes		14		22.6		9.6
	punch blades/flakes		11		17.7		7.5
	varia		2		3.2		1.4
	(sub-total)			62		100.0	
grand total			146		—		100.0

%<sup>1)</sup> : percentage in the category.

%<sup>2)</sup> : percentage in the collection.

\* Flakes are subdivided into the three types depending on the extent of cortical surface:

non-cortical (less than 10 % cortexed), cortical (more than 50 % cortexed), and sub-cortical (between the two).



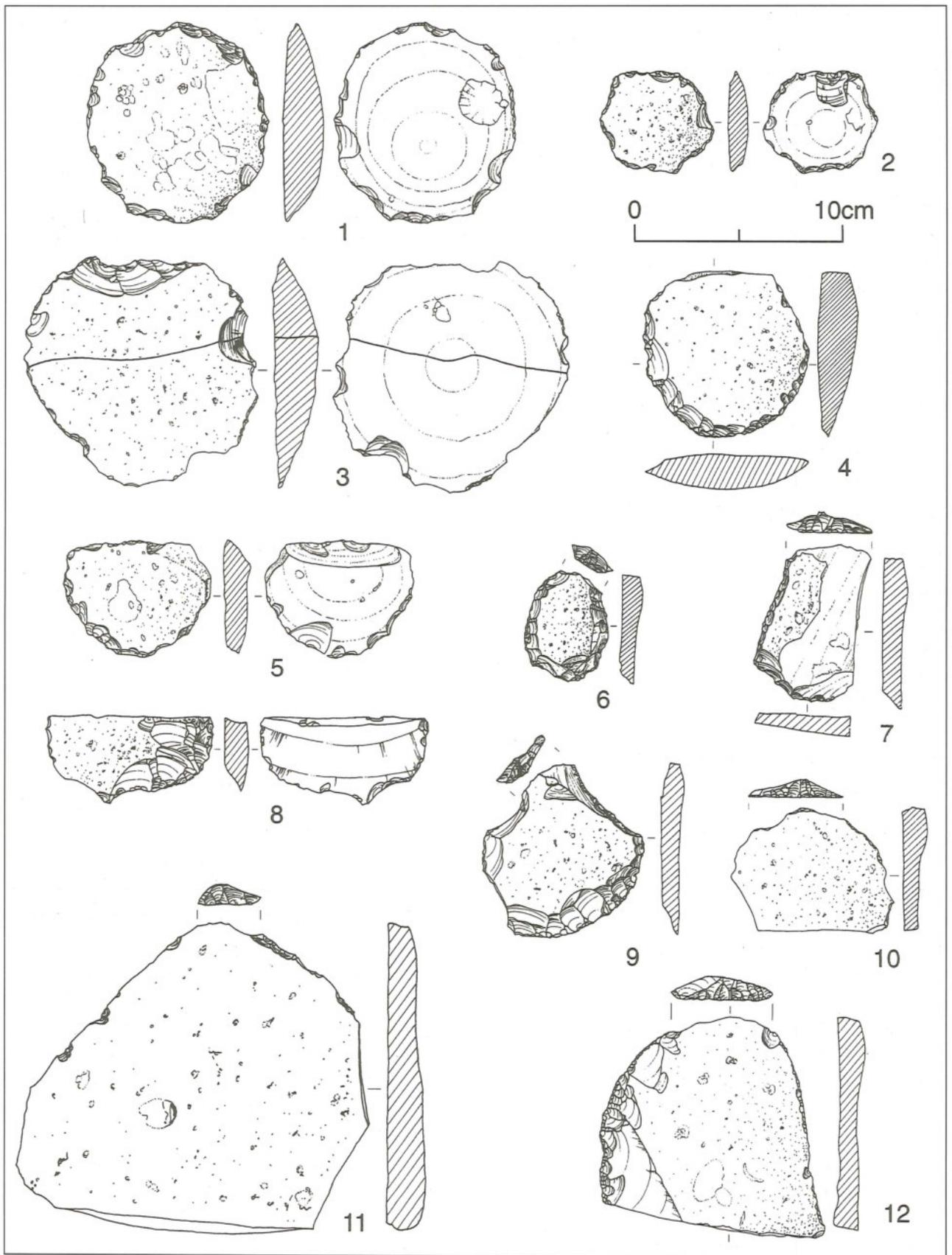
6. Chipped stone artifacts at Structure 03: 1. Core; 2-3. Unmodified (winged) flakes; 4. Retouched/used flake on TSTE; 5. Punch blade; 6. Refitted tabular scraper; 7. Massive scraper.

core area south of the two structures.

*Debitage*: The inventory table illustrates that the chipped stone industry of Structure 03 is an extremely flake-oriented one; the ratio of flakes to blades is about 57: 1. The former included robust, cortical, either artificially - or thermally - detached flakes as a major component. Not only their frequency but also their morphology (i.e. the robustness and the cortical surface) indicated that they were mostly the tool blanks for tabular scrapers. Also frequent was small, cortical, often geometric debitage - *TSTE* : *Tabular Scraper Trimming Elements* (Fig. 6: 6-b, c, d; Fujii 1998 : 131-132) . Owing to the find

of a refitted example (Fig. 6: 6), it is now clarified that the *TSTE* originated in the blank splitting process of tabular scrapers.

In addition, smaller, non-cortical flakes occurred in a large number. Their frequency may be a reflection that smaller, non-cortical flake cores were most predominant in the core classes. Interestingly, the striking platform of these smaller flakes often showed a winding profile. Evidently, the flint knappers did not use a ridge left on a flaking surface as a guiding line of percussion wave; instead, they struck the middle point between two ridges left by a former flaking. One may assume that this technique was ap-



7. Chipped stone artifacts at Structure 03: tabular scrapers.

plied in order to obtain wider and thinner flakes without a central ridge like Levallois flakes (e.g., Henry 1998). Interestingly, a similar technique is often recognized in tabular scrapers (e.g., Fig. 6: 6), thus linking both genres of lithic production. Further, this technique reminded us of Canaanean blades, which are often, though not always, characterized by trapezoidal section (e.g., Rosen 1997: 46-49). These three industries—winged flakes, tabular scrapers, and Canaanean blades—are possibly related with one another in their fundamental technology.

In contrast to flakes, blades are a small minority of debitage classes. However, their occurrence, though infrequently, gives rise to a question about what their corresponding cores were. A plausible explanation will be given below in the description of tool classes.

*Tools:* Tabular scrapers were highly predominant, being about 56% in tool classes. Typologically, they are divided into several types: fan-shaped, round (Fig. 7: 1-3), semi-circular (Fig. 7: 4, 5, 8), oval (Fig. 7: 6), and rectangular type (Fig. 7: 7). The classification here is principally based on Rosen (1997: 71-79). Among them, round or semi-circular type is the most frequent, and often made on thermal flakes. In contrast, the fan-shaped one (i.e., classic fanscrapers) is much less frequent, possibly suggesting a post-Chalcolithic date of this industry. The other types are also small in number except for *varia*—a catch-all class including miscellaneous types (Fig. 7: 9-12). Their frequency may be a reflection that punch technique, which applied to the blank splitting process of tabular scrapers, often resulted in the production of amorphous secondary blanks.

Overall, the tabular scrapers at Structure 03 are characterized as follows: 1) they are often smaller and less finely-retouched than those at Structure 01; 2) they often use thermal flakes, suggesting that some heat treatment of raw material was conducted in the

core area (however, no direct evidence has yet been obtained); 3) edge-trimming is often recognized, corresponding to the frequency of cortical, geometric debitage - *TSTE*; 4) platform facetting is often seen at a bulbar end, but the orientation is always obverse (i.e., from a cortical, dorsal surface to a bulbar one). In this sense, the facetting does not necessarily represent a platform preparation; rather, it was possibly a retouch for making a reversed endscraper (the similar classification occurred in Gophna and Friedmann 1993: 158). It may serve as evidence of this view that such fine facetting is rarely found on the platforms of tabular scraper cores.

Incidentally, some tabular scrapers and *TSTE* were refitted (Fig. 6: 6). This example illustrates that a robust flake was split into several fragments, some of which were retouched into tabular scrapers and the others left unmodified as geometric debitage (i.e., *TSTE*). This unique sample, coupled with the occurrence of punch blades, hammerstones, and anvils, clearly indicates that the punch technique was applied to the blank splitting process of tabular scrapers. This refitting, though still isolated, will make a breakthrough to tracing the *chaîne opératoire* of the tabular scraper production (Fujii 1999b).

In addition, retouched/used flakes either on robust flakes or on *TSTE* (Fig. 6: 4) occurred in a high frequency, numbering about 30 % of tool classes. The latter examples, coupled with the occurrence of the refitted tabular scrapers, provide a reliable clue to the technological reassessment of the similar flakes which have often been called 'tabular scraper fragments' (e.g., Oren and Gilead 1981: Fig. 12, no. 3; Beit-Arieh 1986: Fig. 21, no. 19; Gopher 1988/89: Fig. 2, no. 5; Greenhut 1989: Fig. 11-15, Fig. 22, no. 6, 7; Rosen 1988: Pl. 53, no. 3, 5, 6; 1993: Fig. 1, no. 10; Henry 1995: Fig. 15.5, no. a). Also, their wide distribution probably suggests that the punch technique was used in a wide

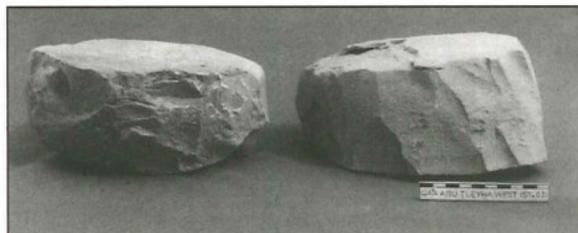
range both in period and area.

The other classes, which included massive scrapers (Fig. 6: 7), notches/denticulates, and a retouched/used blade, were all minor components, being less than 6 % of tool classes. Both the robust morphology and the cortical surfaces characterized these tools, linking them to the tabular scraper - the main product at this workshop.

Of special note was the frequent occurrence of punch blades/flakes (Fig. 6: 5). They showed heavy scaling/splintering and/or pseudo burin facets at both ends, suggesting their use as punch blades. This inference is supported by another line of evidence. First, the refitted example revealed the application of punch technique to the blank splitting process of tabular scrapers. Second, not only anvils but also hammerstones occurred within Structure 03. Third, edge trimming was often recognized in tabular scrapers. Fourth, the collection includes a large number of small, cortical, often geometric debitage (i.e., *TSTE*) that was produced in the blank-splitting process. All these argue for the above identification. It is, however, to be noted that no blade cores occurred at Structure 03. This discrepancy between blanks and their mother cores suggests that these robust blades originated in another kind of chipped stone industry; specifically, they were probably brought from other places. This question is taken up again below in the description of Structure 1001 - a Canaanite blades workshop.

### Other Findings

A total of five limestone anvils were found either in or out of the original context (Figs. 8 and 9). They were homogeneous in raw material (coarse-textured limestone) and morphology (low and roughly cylindrical body with an oval working surface). Their size and weight was also standardized. They averaged 18.8 cm in width, 14.2 cm in depth, 9.2 cm in height, and 4.9 kg in weight; further, each attribute had a rela-



8. Anvils found at Structure 03.

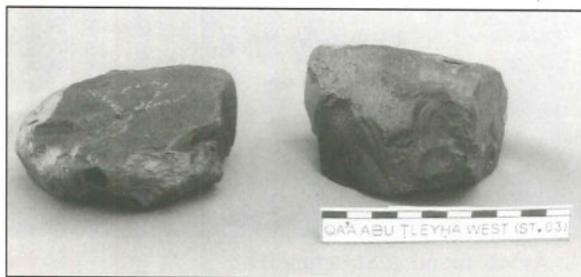


9. An anvil left in the wall of Structure 03 (or the burial cairn).

tively small standard deviation. Moreover, they share the same technology; the side wall is modified by alternative retouch, whereas the upper and lower surface often remain intact (The same is also true for the samples that were found in Structure 01 during the last season). The specific function of these anvils is almost evident. The occurrence of refitted tabular scrapers and the equipment related to them (i.e., hammerstones and punch blades), coupled with the frequency of *TSTE*, clearly indicate that these anvils were used mainly for the blank splitting (and maybe retouching process) of tabular scrapers.

Besides, two flint hammerstones were found (Fig. 10). Both are made on small, cortical, flint nodules and show heavy scaling/splintering either on corners or around peripheries. It is obvious that they were used as hammerstones. Further, their size fitted a palm, serving as another line of evidence of the above identification.

The groundstone in a strict sense consisted of only one limestone artifact. It had a roughly round, flat base and a convex sec-



10. Hammerstones found at Structure 03.

tional view. The size and morphology fell within the handstone of Wright's classification (Wright 1992: 141). However, both the absence of linear and/or curvilinear wear on the working surface and the presence of a shallow concavity at the center suggested its use as a kind of hammerstone.

## INVESTIGATIONS AT OTHER LOCI

### Reexamination of Structure 01

An intensive reexamination of the walls of Structure 01, which had been excavated in the last season, was carried out in order to collect further information on the construc-

tion method. As a result, it was found that the previous view (Fujii 1998: 128-130) must be partly corrected; the foundation ditch which appeared in the E-W section of Structure 01 was, in fact, restricted to the range of the upright stone wall, and the other walls were built either on a plain ground or on a pebble pavement without a foundation ditch. Therefore, it was concluded that Structure 01 and 03 shared the same construction method.

### Test Trenches

In order to explore the geological and sedimentological background of Qā' Abū Ṭlayḥa West, three test trenches (Trench A to Trench C) were opened in the NE Complex (see Fig. 2). Describing in due order from north to south, Trench B (6 m EW by 1 m NS) was set in the flint *hammada* north of Structure 03 (Fig. 11). Trench A (4 m EW by 1 m NS) was opened in the limestone *hammada* on which a number of structures stood. The third one, Trench C (5 m

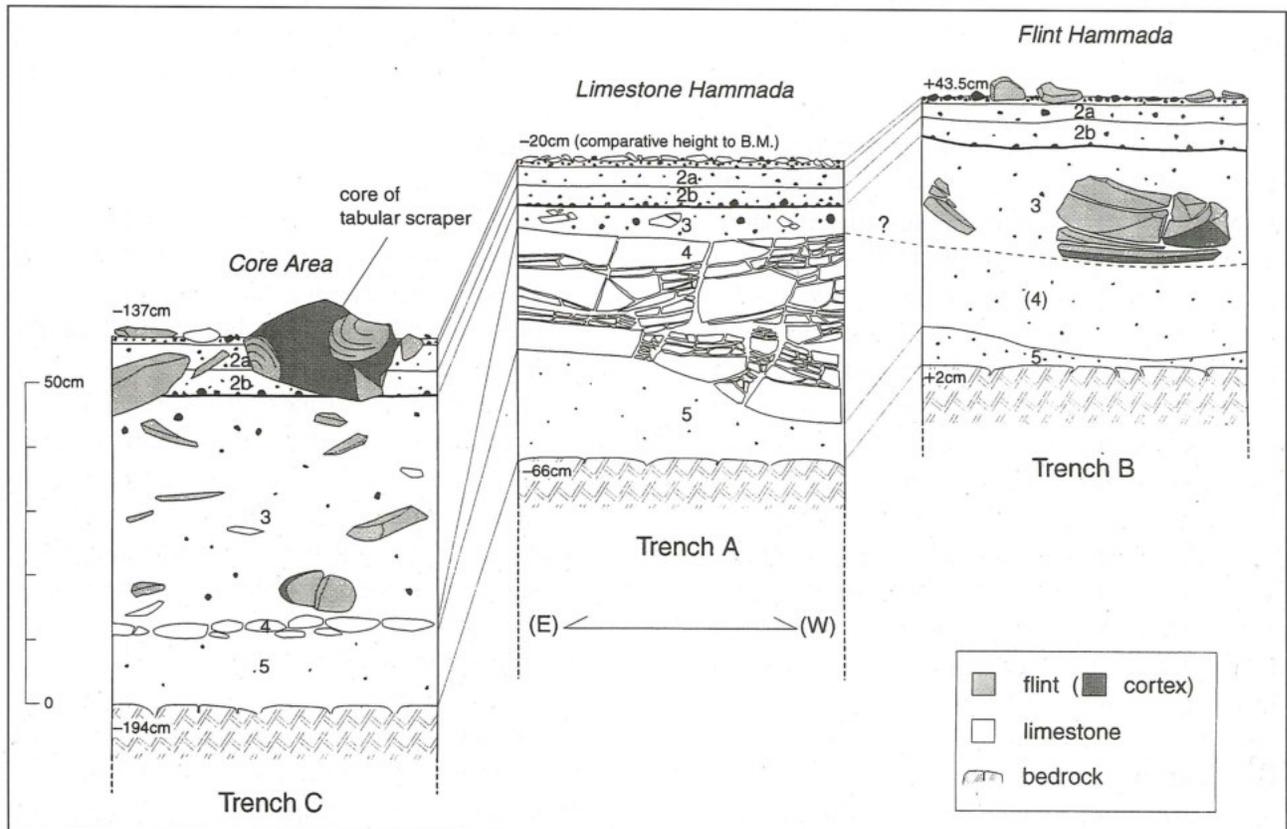


11. Test Trench B (from the SE): Layer 1 through Layer 5 in due order from left to right (the right end is the limestone bedrock).

EW by 1 m NS), was opened in the core area about 70 m south of Structure 03. The following is a brief summary of the observations of these trenches (Fig. 12).

- 1) The limestone bedrock layer exists about 50 cm below the ground surface of each trench.
- 2) The stratigraphy of each trench is roughly the same in that it consists of five layers from the buff to light brown, sandy or silty surface layer (Layer 1) to the reddish-brown, compact, soil layer (Layer 5).
- 3) The most prominent difference between the three trenches is the contents of Layer 4. No limestone cobbles are included in Trench B on which the flint *hammada* develops. In contrast, Trench A includes a thick, compact layer of angular limestone nodules, reflecting the development of the limestone *hammada* on the ground surface. Trench C is moderate in character between the two, corresponding to

- the distribution of both flint nodules and limestone pebbles.
- 4) The three trenches shared the reddish, rather loose, eolian sand layer (Layer 3), but the thickness and the inclusion are quite different depending on the spot. Trenches B and C include angular flint nodules, whereas Trench A does not. This may also affect the present landscape around each trench.
- 5) The thickness and the inclusion of the upper layers (Layer 2b through Layer 1) are almost the same in the three trenches except that some flint nodules and cores protrude up to these layers in Trench C.
- 6) Except for Layer 4 in Trenches A and C, all layers of the three trenches include small, heavily abraded flint pebble and gravel. However, their density is slightly different depending on the layer and the vertical position in each layer; they are often concentrated on the surface level of



12. Sections of Test Trenches.

each layer.

The points to be discussed here are the following two: the geological context of the core area and the land choice for the construction at this site.

As for the core area (Trench C), one should note that no substantial flint layer is recognized below the upper surface of Layer 3 - the living surface where the flint knappers executed the core preparation and blank detachment for the tabular scraper production. This phenomenon implies that the raw material for these processes were not mined here but transported from other spots (probably from the flint outcrops in the lower hill; Fujii 1998: 125-126). An alternative interpretation is that the raw material was thoroughly mined around this trench, thus resulting in the disappearance of the original flint layer. The scattered distribution of angular flint nodules and flakes in Layer 3, coupled with their inclined position, may argue for this view. However, further discussion must be restrained due to the limited excavation.

As for the second point (i.e., the land choice for the construction), one should note that Layer 3 is the thinnest in Trench A, whereas Layer 4 is the thickest there. Both phenomena suggest that the flint knappers at Qā' Abū Ṭulayḥa West avoided the sandy, loose ground and, instead, chose the solid ground with a thick limestone foundation for their construction space. Possibly, this land choice benefited the procurement of angular limestone boulders which were often used in the central wall of each structure. One may further assume that a pit, which had originally been dug for the procurement of limestone boulders, was reused as a foundation ditch to hold the unearthed boulders in an upright position.

### The Cairns

As was briefly mentioned in the last report (Fujii 1998: 125), a line of limestone cairns were found extending between the NE



13. Cairns (towards the NE Complex).

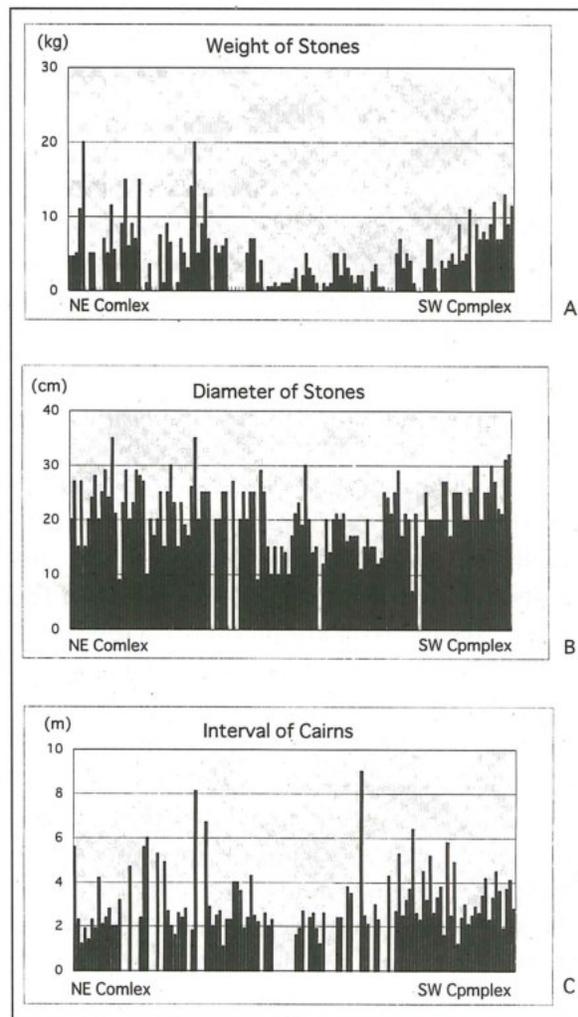
Complex and the SW one (Figs. 2 and 13). The basic data of these cairns were collected in this season. They are summarized as follows:

- 1) The line of cairns consists of a total of 95 individual cairns.
- 2) It extends about 300 m long between the two complexes, but stops about 4.5 m before the nearest structure of the NE Complex and about 27 m before that of the SW one.
- 3) A total of 123 limestone cobbles and/or boulders are used for these cairns, ranging from 1 to 7 pieces per cairn with the average of 1.3 piece per cairn.
- 4) The weight and the maximum length of these limestone cobble/boulders average 5.4 kg and 21.2 cm respectively.
- 5) The interval of these cairns varies from 1.1 m to 8m with the average of 3.1 m.

Interestingly, there is a negative correlation, though roughly, between the distance from the nearer complex on one hand and the size and weight of the construction material of each cairn on the other hand (Fig.

14: A, B).

Specifically, the more a cairn leaves from a complex, the less the size and weight of the construction material become. This probably suggests that the construction material of each cairn was transported from both complexes. In contrast but related to this, there is a positive correlation between the distance from the nearer complex and the interval of each cairn (Fig. 14: C). The more a cairn leaves from a complex, the more the interval of each cairn becomes. This also indicates that the construction material of each cairn depended on both complexes. Probably, the increase of carrying distance was supplemented not only by the reduction of



14. Correlation between the weight/size/interval of each cairn and the distance from the structural complexes.

the volume of carried stones but also by the enlargement of the interval of each cairn.

All these observations may suggest that the cairns were built by reusing the construction material of both complexes. This probably means that they are dated to be later than both complexes, although no evidence has been found to determine the time lag. Incidentally, the function of these cairns is still obscure. One possible explanation will be given below in the description of the SW Complex.

### Some Observations of the SW Complex

A preliminary surface survey was carried out in the SW Complex. As briefly referred to in the last report (Fujii 1998: 125), this complex was quite different from the NE one in the contents of the structures; it consisted mainly of small, round features, which were often arranged in a line. Also noticeable was the poor occurrence of artifacts. Tabular scrapers – a landmark of the lithic production at Qā' Abū Ṭulayḥa West – were rarely found there. To date, the surface collection comprises a small number of flakes and Canaanian blades.

It is therefore possible that the SW Complex represents a cemetery for the neighboring settlement (i.e., the NE Complex). A good example occurs in the Early Bronze Age cairn fields in the Negev (Haiman 1992), although no elongated freestanding walls - a characteristic of the cairn fields in the Negev - have been identified at Qā' Abū Ṭulayḥa West. However, a line of limestone cairns mentioned above might represent its deformation in the al-Jafr basin. Given these, one may assume that Qā' Abū Ṭulayḥa West includes not only flint workshops but also their cemetery or sanctuary area within the site range.

### Surface Collection at Structure 1001

A small (about 2 m by 3 m), oval structure, which had been left unnoticed behind

the dump of a modern limestone quarry, was found on a small terrace below the hill. It was situated some 150 m south of Structure 01. Though only surface-surveyed, the collection at this structure is worth of a special comment.

Surprisingly, the collection consisted exclusively of Canaanean blades and the debitage related to them (Fig. 15); few tabular scrapers were included. The examination, though still preliminary, showed that the Canaanean blades in our collection were quite different from those in the Early Bronze Age sites beyond the Jordan valley. First, the cores were made of local, cortical, tabular flints, thus being of a tabular, not prismatic, morphology (Fig. 15: 1, 2). Second and relevant to the first, the blades detached from these cores were generally robust and often retained the original cortex on their dorsal surfaces. Interestingly, blades with left lateral cortex (Fig. 15: 3, 4) are roughly as many as those with right lateral cortex (Fig. 15: 7, 8). In contrast to their frequencies, two-ridged (i.e. trapezoidal in section), non-cortical blades - Canaanean blades in a strict sense - are much less frequent (Fig. 15: 5, 6). These observations, coupled with the examination of cores related to these blades, suggested the following reduction strategy:

- 1) the procurement of tabular flint from the surrounding outcrops;
- 2) the rough shaping of the raw material, leaving the original cortex on the two flat surfaces intact;
- 3) the preparation of a striking platform by a knapping and grinding technique;
- 4) the preparation of a flaking surface by the detachment of primary elements (i.e., robust blades with either left or right lateral cortex) from both lateral edges of a long flaking surface;
- 5) the detachment of strictly-sensed Canaanean blades (i.e. non-cortical, two-ridged, long blades) from the moderately protruded flaking surface;
- 6) the rejuvenation of the flaking surface

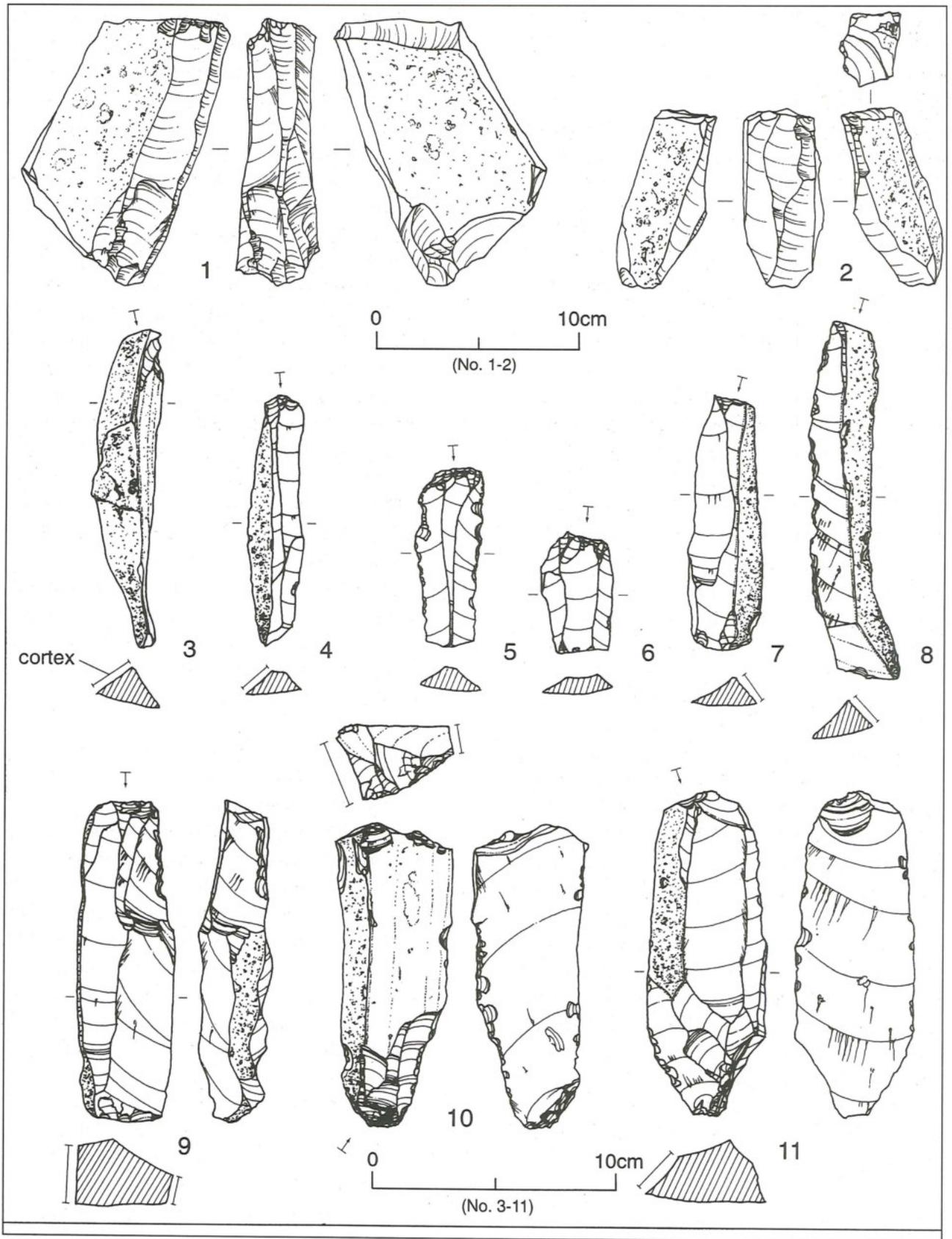
(i.e., the recovery of the moderate protrusion on the surface) by the detachment, again, of robust blades with either right or left lateral cortex;

- 7) or another rejuvenation for removing hinge-fractured surfaces (Fig. 15: 9);
- 8) the resumption of the detachment of Canaanean blades in a strict sense from the flaking surface that recovered the moderate protrusion and/or the flatness without hinge-fractures;
- 9) the processes from 6) through 8) are repeated up to the exhaustion of the tabular core (Fig. 15: 2).

This *chaîne opératoire* may account for the phenomenon that robust, cortical blades was a major component in the collection. It is also understood in this context that robust blades with left lateral cortex (and a left-inclined platform) balance roughly with those of the opposite character. On the other hand, strictly-sensed Canaanean blades - main products of this *chaîne opératoire* - were probably transported to other places for some use or trading, thus resulting in their infrequency.

This unique *chaîne opératoire* induces us to give these blades a new designation - the Jafr blades, for example. More importantly, they provide a clue to the chronological reassessment of the seemingly Upper Palaeolithic, robust and cortical blade industries which have been often found in the al-Jafr basin (Huckriede and Wiesemann 1968: 82-85; Quintero and Wilke 1998: 118-120). An attribute analysis now in progress will hopefully provide further clue to this critical issue (Fujii 1999c).

Incidentally, some of the robust blades showed pseudo-burin facets or heavy scaling/splintering on both ends (Fig. 15: 10, 11), suggesting their use as punch blades. In this respect, one should remember the occurrence of similar examples at Structure 03 - a tabular scraper workshop. The occurrence of (al-Jafr type of) Canaanean blades at both structures implies the rough syn-



15. Surface collection at Structure 1001- a Canaanite blade workshop.

chronism and the close contact between the two industries.

### Discussions

Owing to the two seasons' investigations, a general picture of Qā' Abū Ṭulayḥa West has gradually become clear. The following is a tentative overview of this site, focusing on the dating and the intra-site structure.

#### *The Dating of Qā' Abū Ṭulayḥa West*

The rich occurrence of tabular scrapers made it possible to date Structure 01, the main target of the 1997 season, to the cultural horizon from the Chalcolithic to the Early Bronze Age (Fujii 1998: 137). The same is true for Structure 03; the tabular scraper-oriented lithic industry at this structure enables us to place it to the same range. Further, the concomitant occurrence of (the al-Jafr type of) Canaanian blades as punch blades provides a breakthrough to narrowing down the dating. Structure 03 (and probably Structure 01) can be dated to the Early Bronze Age. The concomitance of burial cairn(s) in both structures may serve as another line of evidence of this dating, although burial cairns are not necessarily restricted to the Early Bronze Age (e.g. Haiman 1992). Structure 1001, a workshop for (the al-Jafr type of) Canaanian blades, is also dated to the Early Bronze Age. The same may be true for SW Complex, because a few (al-Jafr type of) Canaanian blades were found there. Thus overall, Qā' Abū Ṭulayḥa West can be dated to the Early Bronze Age, although the multi-roomed, rectangular structures, which are situated along the workshops of tabular scrapers, seem to be of a later date.

Then, the next question is what stage of the Early Bronze Age Qā' Abū Ṭulayḥa West belongs to. If one follows the general consensus that tabular scrapers disappear with the end of EB III (Rosen 1989: 203; 1997: 75), one may conclude that the site belongs to some stage between EB I through

EB III. However, more precise assignment is still difficult because of the total absence of more sensitive indicators such as pottery shards. The author's present impression, which is based on the overall comparison with the Early Bronze Age sites in the Negev and Sinai (Beit-Arieh 1981, 1986; but see also Sebbane *et al.* 1993), is that the placement to EB II-III seems to be the most plausible. Support for this assignment may also be found in the demographics of the southern Levant (Broshi and Gophna 1984; Joffe 1993), and especially of southwestern Jordan (Steele 1990). It seems that the rise of urban society in the southern Levant during EB II-III provided a market for the mass-production of tabular scrapers and (the al-Jafr type of) Canaanian blades. This might have revitalized the arid peripheries such as the Negev, Sinai, and the al-Jafr as specialized suppliers of flint products.

However, this is a tentative assessment; further investigation and comparative studies are needed for the final conclusion. C14 dating now in progress will provide another line of clue to this issue.

#### *The Intra-Site Structure*

A wide variety of activities have so far been confirmed at Qā' Abū Ṭulayḥa West. First, the raw material for tabular scrapers was mined and/or collected in the flint outcrops below the gentle hill. Second, the core preparation and the blank detachment took place in the core areas just between the flint outcrops and the structural area. Then, robust, cortical flake blanks were brought into the second stage indoor ateliers (e.g., Structure 01 and 03), and retouched into final products.

Furthermore, the flint outcrops were also used for the production of the (al-Jafr type of) Canaanian blades as well as that of tabular scrapers. As mentioned earlier, the primary elements produced in the former industry (i.e. robust, lateral cortical blades) were often reused as punch blades in both

lithic industries. This means that they were often transported from the former workshop to the latter one, because such blades were quite heterogeneous to the lithic industry of the latter. It is, however, unlikely that these two industries were run by the same group, firstly because both are quite different in techno-typology, secondly because the structures related to both industries are different in typology and location within the site. It seems that both groups separately coexisted within the site, probably sharing the same flint outcrop. In this regard, one may suppose the difference in seasonality between the two groups.

Besides these flint industries, Qā' Abū Ṭulayḥa West showed another aspect; the SW Complex probably represents a cemetery or sanctuary area for the neighboring settlement (i.e. the NE Complex). It is, however, still unknown which of the two flint industries was concerned with this non-domestic area. The occurrence of (al-Jafr type of) Canaanian blades in a small feature of the SW Complex might suggest that the (al-Jafr type of) Canaanian blade knappers were concerned with this cemetery or sanctuary area, but a line of cairn linked it to the NE Complex – the tabular scraper workshop area. Further discussion must await the next season's work.

### Concluding Remarks

The excavation at Qā' Abū Ṭulayḥa West had originally aimed at a comparative study of the prehistoric adaptations in the arid peripheries of the southern Levant. Thus the main subject had been the study of the nomadic adaptations proper to the steppic environments. In fact, the site turned out to be

a mega-factory not only of tabular scrapers but also of (the al-Jafr type of) Canaanian blades – the two off-site chipped stone industries for the Early Bronze Age urban society roughly north of Arad and west of the Jordan valley. Thus, the site indicated a close contact with the western and/or northern regions under the Mediterranean climatic regime. However, this may not be worthy of surprise, because the pastoral nomadism necessarily depends on the urban and farming societies. On the other hand, the close cultural interchange among arid peripheries – more precisely, the interrelation between the al-Jafr and the Negev and Sinai – also began to be traced in terms of burial custom and lithic industry.

The al-Jafr basin, despite the barren appearance, seems to provide a reliable clue to understanding the dynamism of the prehistoric inland Levant. The third season's excavation will hopefully further unveil the hidden dimensions of this basin so far poorly investigated.

### Acknowledgements

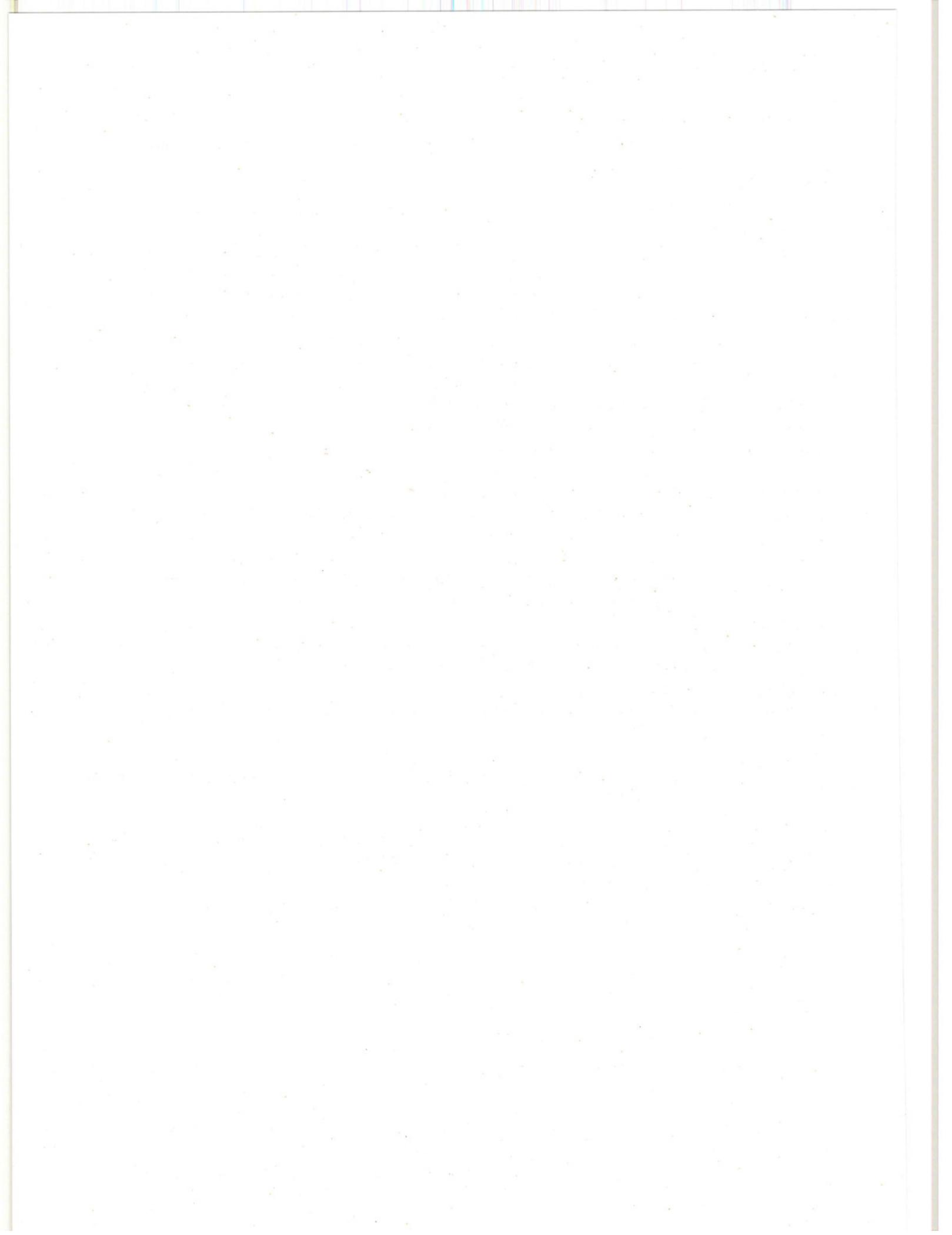
I would like to express my gratitude to the Department of Antiquities of Jordan for their kind cooperation and to the Nissan Science Foundation for the financial support. My thanks also go to Mr Emsaytif Suleiman, representative of the Department and to the members of the staff (Chizu Kanenaga, Nazeh Fino, and Yoichi Hayasaka).

Sumio Fujii  
 Faculty of Letters  
 University of Kanazawa  
 Kakuma-machi, Kanazawa  
 920-1192, Japan

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# AL-MARĀJIM, IMPLANTATION RURALE DU III<sup>ème</sup> MILLENAIRE EN JORDANIE DU NORD

Par

Christophe Nicolle, Tara Steimer et Jean - Baptiste Humbert

## Abstract

Since 1982, french archaeologists have been surveying the region north of Wādī az-Zarqā', between 'Ajlūn and the more arid zone of Khirbat as-Samrā', in the aim of establishing an archaeological inventory of sites which are most often in danger of destruction by modern agriculture. The surveys are coupled with excavations of the most important sites, sometimes in collaboration with others teams (like in the case of the spanish excavations of the Jabal al-Muṭawwaq). Al-Marājim is one of those sites. Located 50 kilometers north of Amman, it is a settlement composed of several occupations : tumuli of the beginning of the Early Bronze Age I, dolmen, standing stone, and an Early Bronze Age IV village of about one hectare, regrouping more than one hundred rectangular houses. The site is in a steppic region, most often devoted to pastoralism, but in some places, rich red soil allowed some agriculture. The different elements of al-Marājim described in this article are important for a general understanding of the nature of the economy of the Early Bronze populations.

## Historique des recherches

L'étude de al-Marājim s'intègre dans une

tradition de recherches françaises dans le nord de la Jordanie. Du massif 'Ajlūn jusqu'à Khirbat as-Samrā', en bordure de la steppe, plusieurs prospections ont déjà été menées, notamment celles de J. Sapin dans le massif du 'Ajlūn à l'âge du Bronze<sup>1</sup>, et celle de J. Besançon et F. Hours sur le haut bassin du Wādī az-Zarqā' à l'époque paléolithique.<sup>2</sup> Ces prospections viennent compléter les fouilles effectuées par l'Institut Français d'Archéologie du Proche-Orient (IFAPO) ou par l'École Biblique et Archéologique Française (EBAF), notamment à Jérash, à Khirbat as-Samrā' et à Mafraq.<sup>3</sup>

Dès 1982, des prospections dans la région entre le Wādī ad-Dulayl et le Wādī az-Zarqā' avaient montré l'importance et le nombre élevé des vestiges d'installations rurales, principalement de l'âge du Bronze.<sup>4</sup> En 1994, une prospection systématique des nombreux sites ainsi repérés depuis dix ans, fut entreprise avec, en première mission, le relevé de l'agglomération rurale de al-Marājim.<sup>5</sup> En juillet 1997, une seconde mission a permis de compléter le relevé du site et d'effectuer l'étude des installations des alentours.<sup>6</sup> Nous présentons ici les résultats de ces deux campagnes.

Al-Marājim se trouve à 50 km au nord d'Amman, au centre du triangle Jarash/al-

1. Sapin J. (1985) pp. 217-227. Prospections Géométriques de l'Ajlun 1981-82, Exemple de recherche intégrante, SHAJ II Amman: Department of Antiquities.
2. Besançon J., Hours F. (1985) pp. 59-66. Prehistory and Geomorphology in Northern Jordan : a Preliminary Outline, SHAJ II Amman: Department of Antiquities.
3. Voir dans *Contribution Française à l'archéologie jordanienne*, Institut Français d'Archéologie du Proche-Orient, Centre d'Amman, (1989).
4. Ces prospections furent entreprises dans le cadre de la mission archéologique de Khirbat Samra

(EBAF), par J. Sapin et J.-B. Humbert. Pour un premier rapport, voir Humbert J.- B. (1993) Vestiges proto-historiques du bassin inférieur du Wadi Dleil, LA 43: 455-461.

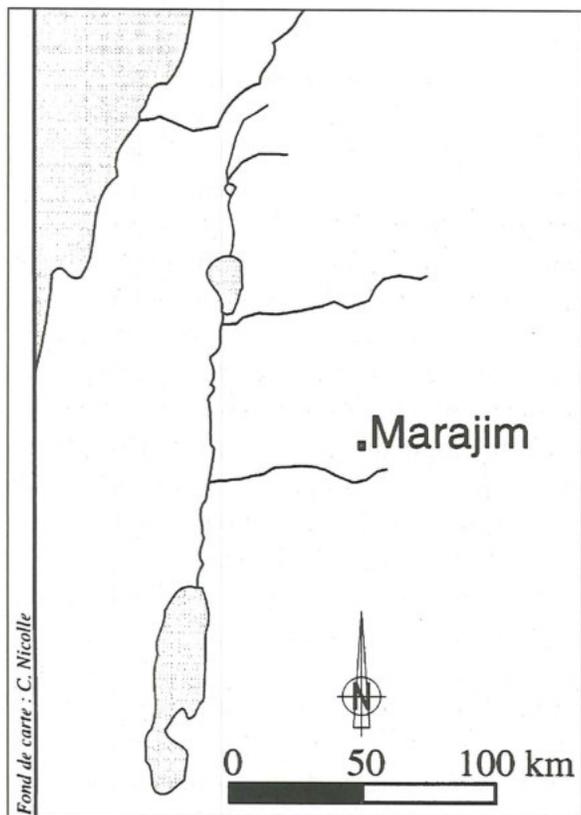
5. Une campagne de relevés a été effectuée en juillet-août 1994 sous la direction de J.-B. Humbert (EBAF) aidé de C. Nicolle (IFAPO) et de A. J. Ravensberg (Univ. de Copenhague).
6. Cette mission fut réalisée par C. Nicolle (IFAPO) et T. Steimer (Doctorant de l'Univ. de Paris I) avec l'aide de la Mission Archéologique Espagnole du Jebel Mutawwaq dirigée par J. Fernandez-Tresguerres (Univ. d'Oviedo, Espagne).

Mafrac/az-Zarqā' (Figs. 1 et 2). Le site s'impose comme un assemblage de plusieurs installations (habitats, tumuli, dolmens et pierre dressée) qui s'échelonnent dans le temps, de

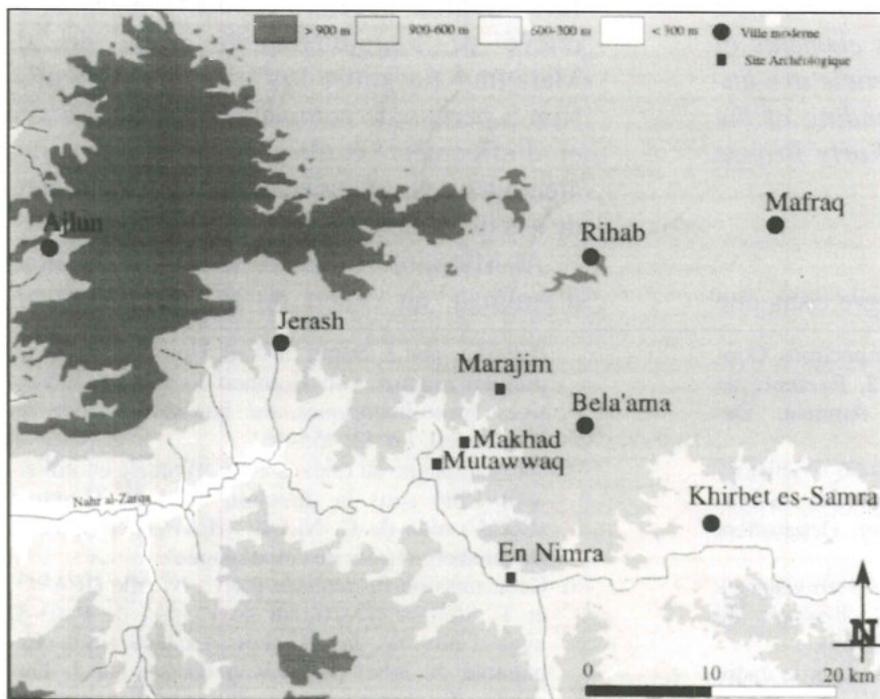
la fin du Chalcolithique au Bronze ancien IV. Il a été fortement détérioré par de récentes mises en culture et l'élargissement de la route Bal'ama-al Karm. Une centaine d'habitations ont pu être relevées et étudiées, une bonne partie d'entre elles ayant disparu depuis 1994.

### Présentation de la zone de al-Marājim

Le secteur de al-Marājim appartient à la zone de steppe herbeuse semi-aride qui s'étend entre les isohyètes annuelles de 300 et 200 mm, plus propice à l'élevage qu'à l'agriculture, malgré la présence de sols rouges fertiles dans les vallons en berceau des hauts bassins-versants, sur les replats de versants et dans le fond de vallées. Cette zone steppique se situe à mi-parcours ouest-est entre les sommets du massif de l'Ajlūn qui relèvent du domaine méditerranéen et le plateau de la steppe aride et pauvre qui commence avec le secteur de Khirbat as-Samrā'. On passe donc, sur une courte distance, d'un milieu favorable à une sédentarité stable, à un autre, moins hospitalier, où ne peuvent vivre, en dehors de phases climatiques exceptionnelles, que des groupes semi-



1. le Levant sud.



2. la région du Nahr az-Zarqā'.

nomades avec leurs troupeaux.

Al-Marājim est localisé à 4 km au sud-ouest du village de Khirbat al-'Ayn et à moins de 1,5 km de la source 'Ayn Daber, dans la partie septentrionale du bassin du Nahr az-Zarqā' à quelque 600 m d'altitude en contrebas d'un vaste cirque naturel formé par les hautes collines ad Dhakhireh et al-'Anziyeh (Fig. 3). Les eaux de ruissellement de ce cirque sont drainées vers le az-Zarqā' par l'intermédiaire du Wādī al-Marājim puis celui d'el-'Ayn-Daber-Khureisan. Le site s'étire sur la rive droite du Wādī al-Marājim.

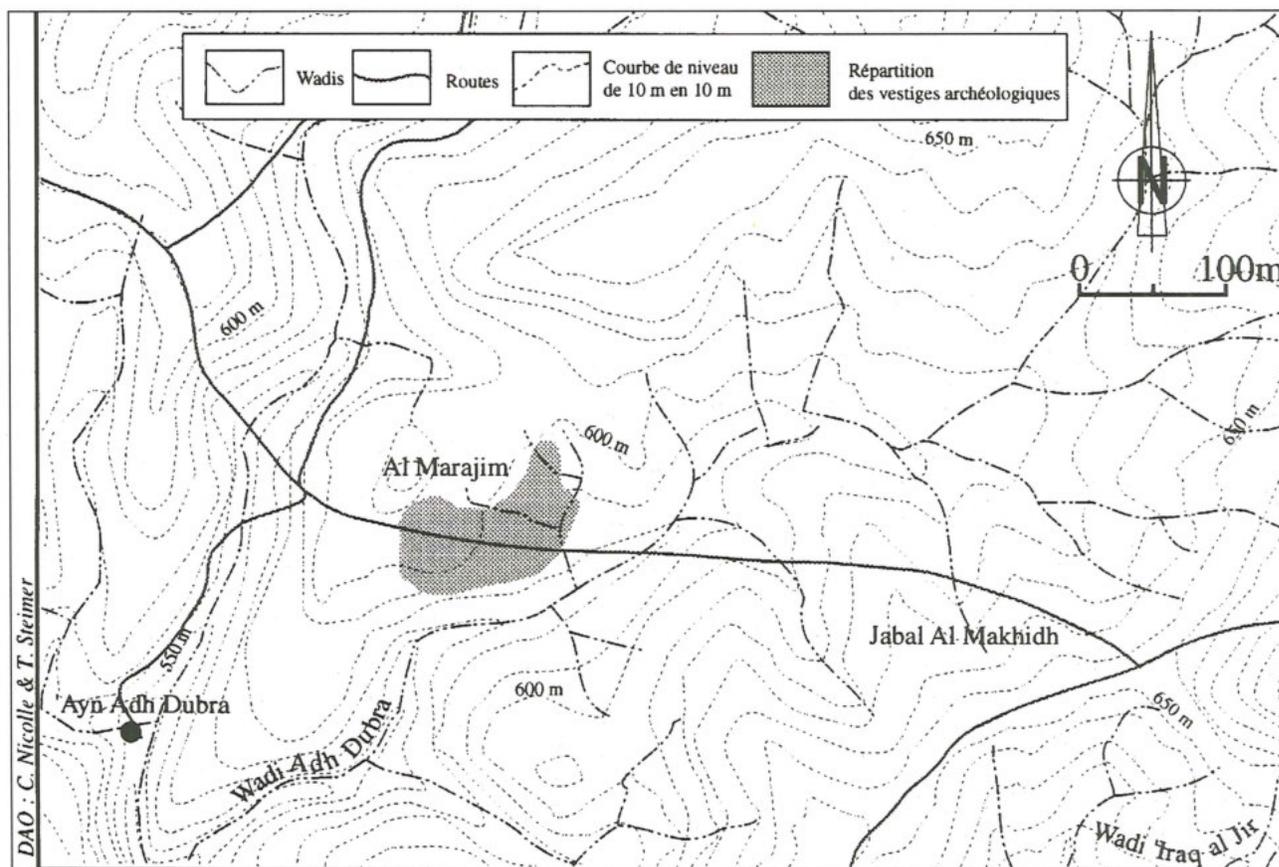
Les processus d'érosion ont entaillé un banc calcaire qui affleure à mi-pente et modelé un relief de petites croupes parallèles entre elles et perpendiculaires au wadi globalement orienté nord-ouest/sud-est. Les constructions de al-Marājim ont été implantées de préférence sur les croupes, à l'endroit même où l'affleurement calcaire qui fournissait le matériau. Quant aux vallons et

replats ayant retenu des sols fertiles, ils restaient disponibles pour les pratiques agricoles.

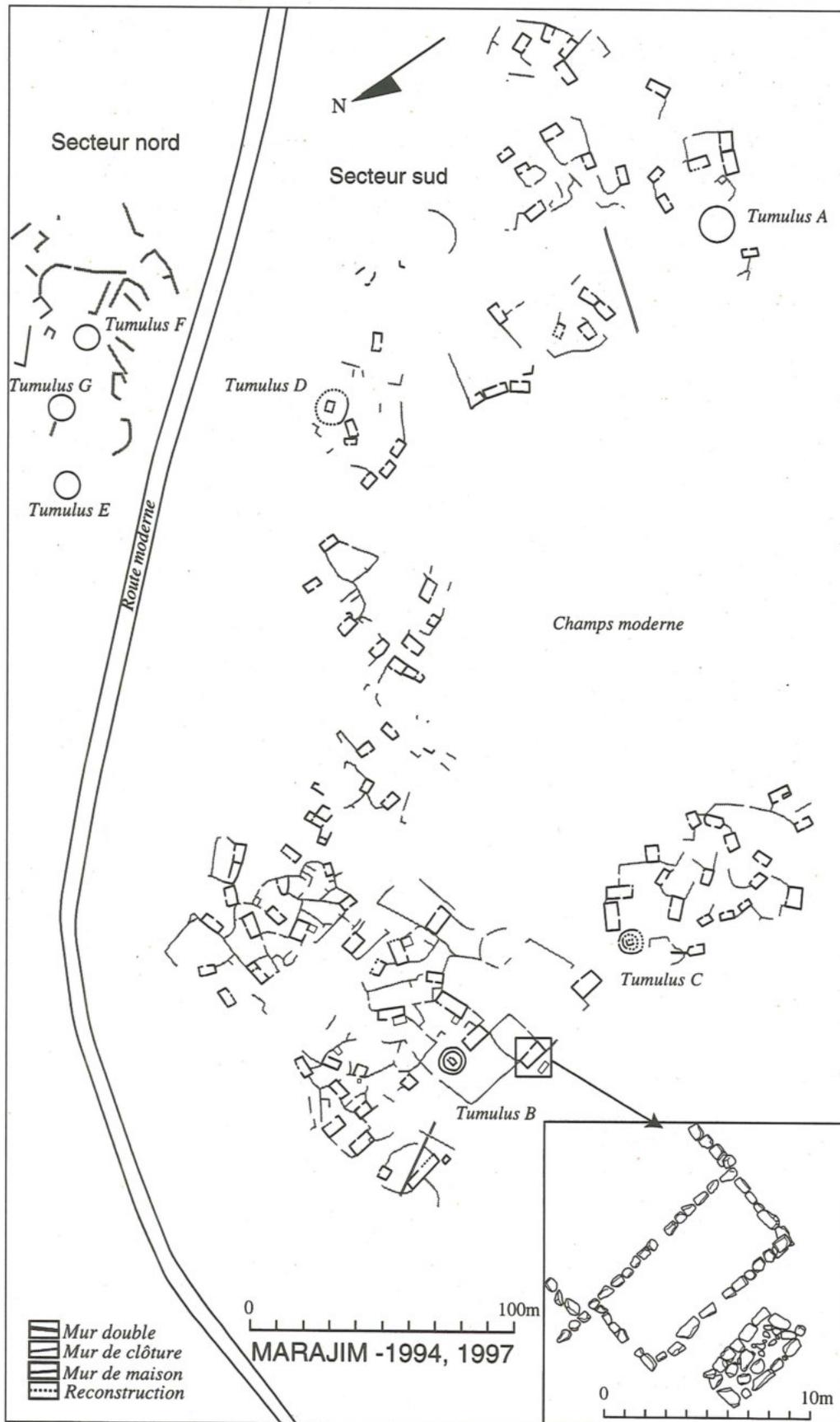
### Description générale du site

La route moderne coupe le site d'est en ouest. Les installations les mieux conservées sont au sud de la route. Au nord, se trouvaient les trois quarts des vestiges. Un important épierrement moderne n'a laissé que quelques tronçons de grands murs de clôture ou de bâtiments qui ne permettent pas de reconstituer un plan cohérent (Fig. 4). Seul, le secteur à proximité de la route a été relevé.

Dans la partie sud, sur une superficie de 1,1 ha, plus d'une centaine de maisons avec cour ont pu être relevées. Leur durée d'occupation est difficile à évaluer; tout au plus peut-on distinguer deux phases principales dans l'occupation du site, grâce à la découverte de plusieurs tronçons de murs épais et à double parement, recoupés par cet ha-



3. la région de al-Marājim.



4. Relevé de al-Marājim.

bitat. Le relevé semble indiquer une forme d'organisation du bâti en îlots, mais ce n'est probablement que l'effet de l'aménagement moderne de petits champs. En réalité, l'organisation générale du secteur était assez dense et homogène comme en témoignent les parties les mieux conservées. Dans un carré théorique de 100 sur 100 m, nous avons dénombré vingt cinq maisons. Une telle densité, appliquée à tout le secteur sud (soit huit carrés de la même dimension), permet de restituer un chiffre de deux cents maisons pour l'ensemble du secteur.

Dans le secteur sud, quatre tumuli paraissent avoir été construits dans des cours de maisons. En réalité ils n'étaient pas liés à l'habitat. Jointes aux longs murs épais et aux vestiges du secteur nord, moins bien conservés mais comptant quatre autres tumuli aisément reconnaissables, ils témoignent d'une autre forme d'occupation. Celle-ci se caractérise, premièrement par des murs de clôture épais, atteignant souvent 40 m de long, et deuxièmement par des parties de bâtiments d'un module nettement plus grand que celui de l'habitat au sud de la route. L'ensemble nord couvrait une superficie bien plus importante que l'ensemble sud. Avec ses grands bâtiments rectangulaires et les vastes enclos, il devait être consacré à l'élevage.

#### *L'organisation de l'habitat du secteur sud*

Le modèle standard de l'habitat est un édifice de plan barlong, mono cellulaire. Les dimensions des édifices accusent en moyenne 7 m sur 3 m avec de préférence une orientation au nord-sud (46,8 % des cas) et est-ouest (25,31 % des cas). Les portes ont une largeur qui varie de 0,70 à 0,80 m. Elles ouvrent généralement vers l'est (33,8 % des cas), ainsi que vers le nord-est, le nord et le sud (respectivement 13 % des cas). Dans la région, le vent dominant souffle du sud-ouest, une orientation qui peut expliquer les ouvertures plutôt dans la direction opposée. Les maisons sont associées à des cours dont

les dimensions et les formes varient selon la densité de l'habitat. Il y a de grandes cours rectangulaires de plus de 20 m de côté. L'habitation associée est aussi de grandes dimensions. Le plus souvent, les cours sont petites, déformées au gré des constructions voisines et des ajouts successifs. Les maisons ont alors une superficie plus réduite et elles partagent parfois une cour.

Les bâtiments, rarement mitoyens, n'ont pas d'annexes. Les seuls éléments architecturaux, associés sont des plates-formes rectangulaires, construites en façade des maisons ou isolées en arrière. Les plates-formes ont des parements constitués de dalles de chant qui devaient émerger d'une quarantaine de centimètres par rapport au niveau des sols extérieurs. Le remplissage est composé de petites dalles ou de petites pierres. Dans les habitats, aucune division ou aménagement intérieur n'a été constaté, excepté un petit compartiment en pierres construit dans l'angle intérieur de deux maisons et des murs de refend qui, dans trois maisons, délimitaient une petite pièce.

Souvent, la densité des constructions obligeait les habitants de al-Marājim à traverser plusieurs cours pour accéder à leurs habitations. Dans la partie septentrionale de la zone étudiée, deux murs de cours parallèles délimitent un espace de circulation sur lequel deux cours ouvraient en évitant les vis à vis. Cependant, dans la plupart des cas, du fait de l'imbrication du parcellaire, les cours étaient des passages indispensables à travers les différentes unités d'habitation, mêlant étroitement espace privé et espace communautaire.

#### *Les matériaux et leur mise en œuvre*

Le matériau de construction, disponible en abondance sur le site, provient d'un affleurement calcaire qui se délite naturellement en bancs horizontaux de 0,40-0,50 m d'épaisseur. Bien qu'aucune carrière n'ait été identifiée, plusieurs endroits, sur et aux alentours du site, offraient toutes les pos-

sibilités pour une extraction et une mise en œuvre aisées des blocs sur lesquels on ne distingue aucune trace de taille. Les blocs se classent en trois modules: le plus petit se compose de blocs arrondis de dimensions inférieures à 0,45 m, des petites dalles de 0,45-0,50 m sur 0,80 m constituent le module moyen alors que le module supérieur regroupe des grandes dalles de 0,45 m sur 1,20 m. La fonction architecturale détermine le choix d'un module. La base des murs des maisons est formée par une assise de dalles moyennes posées de chant. Les blocs effondrés, que l'on trouve encore aux pieds des murs, suggèrent l'existence d'une seconde assise de blocs du même module. Cela représenterait des bases de mur d'une épaisseur de 0,45-0,50 m pour une hauteur de 0,80-1 m. Un appareil plus massif de grandes dalles fut utilisé pour les murs des cours. Ici, l'accent est mis sur les accès des cours, signalés par des montants mégalithiques qui atteignent souvent 1,20 m de haut. Une telle particularité permet de différencier aisément un mur de clôture d'un mur de maison, dont les montants de porte sont moins élevés. La superstructure des murs devait être constituée de pisé, éventuellement armé des petits blocs que l'on trouve en grand nombre sur le site. Quant au mode de couverture des maisons, aucune trace de pilier n'a été repérée. La largeur moyenne à couvrir était de 3,40 m avec une exception à 5 m, mais aucune trace de poteau ou de pilier n'a été trouvée. Sans que l'on puisse le prouver (du fait de l'absence de fouilles), les murs de cour paraissent avoir aussi la fonction de murs de terrasse, permettant un aménagement des pentes en gradins.

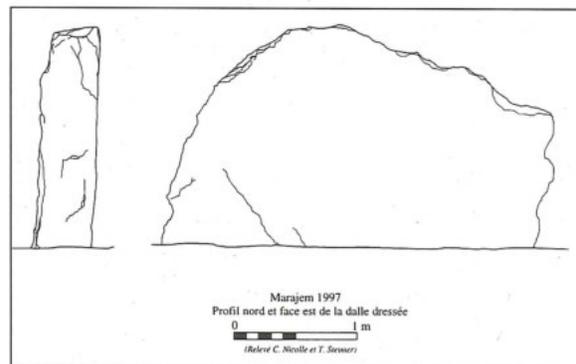
### *Les tumuli*

Parmi les sept tumuli reconnus, trois d'entre eux ont été largement détruits. Le plus grand des tumuli conservés a un diamètre de 14 m pour une hauteur de conservation de 3 m (tumulus A). Il contenait

une ciste centrale, entourée d'au moins quatre petites cistes. Le diamètre des cinq autres tumuli oscille entre 9 et 14 m. Le tumulus B fut construit avec un double parement. Il recouvrait une chambre à ciste composée de petites dalles de chant, orientée est/ouest. Les parements bien réguliers du tumulus sont constitués de blocs de taille moyenne. Leur état de conservation permet de restituer une élévation à deux gradins avec un bourrage de petits blocs. La hauteur de ce tumuli devait atteindre 3 m. En plusieurs endroits du secteur sud, des éléments de murs à double parement ont été découverts. Ils évoquent les chaînes funéraires, une forme d'inhumation bien connue dans les zones désertiques et semi-désertiques du Levant sud et de la péninsule arabique. La datation des tumuli, tous pillés, n'est pas sûre. Il est établi qu'ils furent construits avant les habitations du secteur sud, car à plusieurs reprises les murs à double parement ont été coupés ou recouverts par l'établissement de l'agglomération. Des photos aériennes, prises antérieurement à l'élargissement de la route, permettent de voir qu'il y avait au moins trois autres tumuli, disparus depuis.

### *La pierre dressée*

À 150 mètres au nord-ouest de la zone relevée, une pierre dressée subsiste au milieu de quelques éléments épars de murs, surplombant le secteur sud (Fig. 5). Il s'agit d'une dalle mégalithique de 3 m de longueur pour une hauteur apparente de 1,80 m et une

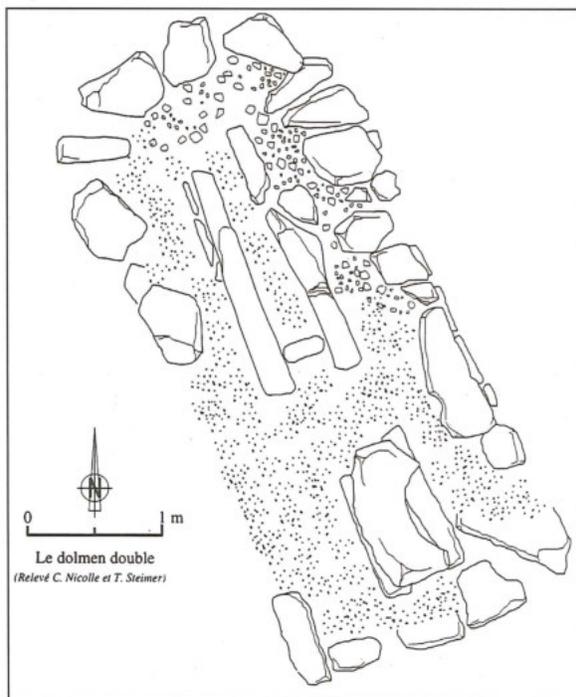


5. Profil nord et face est de la dalle dressée.

épaisseur de 0,45 m. Elle est fichée de chant dans la terre selon une orientation nord-est/sud-ouest. Des pierres, de 0,40 sur 0,50 m, formaient, contre sa face sud-est, un petit autel en arc de cercle d'un diamètre de 1,90 m. Elle se rattache à la tradition des pierres levées du Proche-Orient, déjà attestée dans plusieurs régions de l'Arabie, de Jordanie et du Levant sud.<sup>7</sup>

### *Le dolmen double*

À seulement 1,5 km au sud-ouest de l'agglomération de al-Marājim, trois monuments funéraires sont encore visibles sur une croupe. Le monument le mieux conservé a été relevé (Fig. 6). Il s'agit d'un dolmen double, d'orientation nord-est/sud-ouest. Il est entouré d'une plate-forme rectangulaire de 4 sur 10 m, délimitée par un parement de blocs calcaire conservé sur 0,60 m de haut. Il ne



6. le dolmen double.

7. Voir notamment Körber C. 1994 *Monolithic Pillars in Jordan and the 1992 Excavations at Dhr'a*, pp. 65-74. in S. Kerner (ed). *The Near East in Antiquity. Archaeological work of National and international institutions in Jordan*, Volume IV, German Protestant Institute for Archaeology of the Holy Land, Amman; Avner U. 1984, *Ancient Cult*

subsiste que quelques petites pierres du remplissage de la plateforme dont il est impossible de restituer la hauteur initiale. Le dolmen nord abrite une chambre de 3,50 m de long pour une largeur de 0,55 m et 0,77 m de haut. À un mètre, le dolmen sud, qui possède encore sa dalle de couverture, forme une seconde chambre de 2 m sur 0,50 m. Les deux dolmens sont fermés sur le côté sud-ouest. L'ensemble ayant été construit dans la pente nord-sud, le petit dolmen se trouve en contrebas du plus grand.

### **La datation du site**

La datation des différentes installations que nous venons de décrire est problématique. Nous pouvons d'ores et déjà avancer plusieurs hypothèses. Bien que les sols aient été emportés par les eaux de ruissellement, un ramassage de surface a permis de récolter des tessons (le plus souvent de petites dimensions et émoussés) et du matériel lithique, dans les endroits les mieux préservés du secteur sud. Parmi les tessons, deux anses «oreilles» et trois décors appartiennent à la période du Bronze ancien IV, alors que deux anses ruban, probablement du Bronze ancien II, témoignent d'une occupation de longue durée. Nous ne disposons d'aucun élément de datation pour la pierre dressée. Cependant sa proximité la rattache à l'agglomération sud. De plus, elle correspond à une tradition bien attestée au Levant à la période du Bronze ancien.

Quant aux tumuli, nous avons établi qu'ils appartenaient, avec les murs à double parement, à une chaîne funéraire, antérieure à l'agglomération du secteur sud. En nous fondant sur la superposition et sur la datation des constructions funéraires alentour déjà connues<sup>8</sup>, nous proposons de dater les

Sites in the Negev and Sinai Deserts, *Tel-Aviv* 11 (2): 115-131.

8. Pour une présentation de la nécropole de dolmens du Jebel Mutawwaq voisin : Fernandez-Tresguerres J., Junceda Quintana F. 1991, *Jebel Mutawwaq (Jordanias), campanas 1989-1991*, *Estudios Biblicos* 49: 523-542.

structures funéraires de la transition du Chalcolithique au début du Bronze ancien I. Cela correspond d'ailleurs à une des deux grandes périodes d'utilisation d'une telle forme d'inhumation.<sup>9</sup>

### Conclusion

L'affleurement du banc calcaire peut expliquer le choix du site pour les tumuli. Il doit se comprendre pour les deux agglomérations suivantes par la présence du Wādī adh-Dubra et la source pérenne de 'Ayn Debbeh proche (Fig. 3). Pour l'agglomération du Bronze ancien IV, des recherches ultérieures permettront de voir s'il est possible de faire des comparaisons avec le site syrien de Moumassakhin, similaire par son implantation, son architecture et sa datation.<sup>10</sup> Qu'il s'agisse de l'agglomération

du Bronze ancien IV ou du celle du Bronze ancien II il est probable que ces implantations sont le fait de populations semi-nomades pratiquant une économie à dominante pastorale. Des campagnes ultérieures permettront de compléter le relevé du site et d'en confirmer la datation.

C. Nicolle  
IFAPO  
Damas-Syrie

T. Steimer  
CFEY  
Sana'a-Yemen

J.-B. Humbert  
EBAF  
Jerusalem

9. Par exemple dans: Zohar M. 1992 Megalithic Cemeteries in the Levant, Pp. 43-63 in O. Bar-Yosef and A. Khazanov (eds.), *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspectives*. Prehistory Press, Madison.

10. Bounni A. and Al-Maqdissi M. (1990). Al-Mou-massakhin, site du IIIème millénaire au

nord-est de Damas. *Von Uruk nach Tuttul. Eine Festschrift für Eva Strommenger. Studien und Aufsätze von Kollegen und Freunden.*, pp. 33-36. Herausgegeben von Barthel Hrouda, Stephan Kroll und Peter Z. Spanos. Profil Verlag, München Wien.

# MĀDABĀ PLAINS PROJECT: EXCAVATIONS AT TALL AL-'UMAYRĪ, 1998

by

Larry G. Herr, Douglas R. Clark

Lawrence T. Geraty and Øystein S. LaBianca

## Introduction

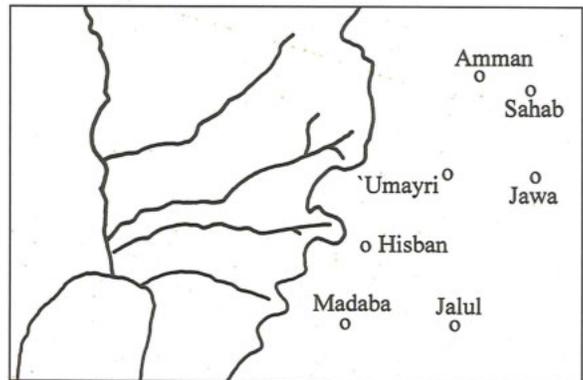
A seventh season of excavation by the Mādabā Plains Project occurred between June 21 and August 5, 1998. It was sponsored by Andrews University in consortium with Canadian University College, La Sierra University, and Walla Walla College. Full reports have already been published for the first three seasons (see *ADAJ* 1997: 145).

This season, a team of about 87 persons took part in the interdisciplinary project at Tall al-'Umayri, located about 10 km south of Amman's Seventh Circle on the Queen Alia Airport Highway at the turnoff for Amman National Park (Fig. 1).<sup>1</sup>

During this season, Fields A and B - which were first opened in the first season (1984) - had their squares deepened into Iron I and Late Bronze Age remains; Field H - first excavated in 1994 was expanded to the south, uncovering late Iron II, Persian, Hellenistic, and Byzantine remains; more surfaces around the dolmen were found in Field K to the west and north; and a new field, Field L, was opened on the southern lip of the site.

## Field A: The Upper Western Slope (John I. Lawlor)

Previous excavation in Field A on the



1. Map of the Mādabā Plains region.

western rim of the site has produced a significant administrative complex of buildings from the end of the Iron Age and the Persian period (Geraty *et al.* 1987: 189; Geraty *et al.* 1989: 146-149; Herr *et al.* 1991: 156-159; Herr *et al.* 1994: 148-151; Herr *et al.* 1996: 64-65). Small hints of Iron I and early Iron II material were found at isolated locations, especially in the northern parts of Field A. This season one new square was opened to the west of the central portion of Field A and three squares from earlier seasons were deepened; these straddled the rim of the site to the west of the administrative complex in order to catch the outer fortification wall and the buildings immediately inside that wall, which we have dated to the early Iron I pe-

1. The authors of this report are especially indebted to Dr Ghazi Bisheh, then Director-General of the Department of Antiquities; Ahmed esh-Shami and Zuheir az-Zoubi, Department of Antiquities representatives; and other members of the Department of Antiquities who facilitated our project at several junctures.

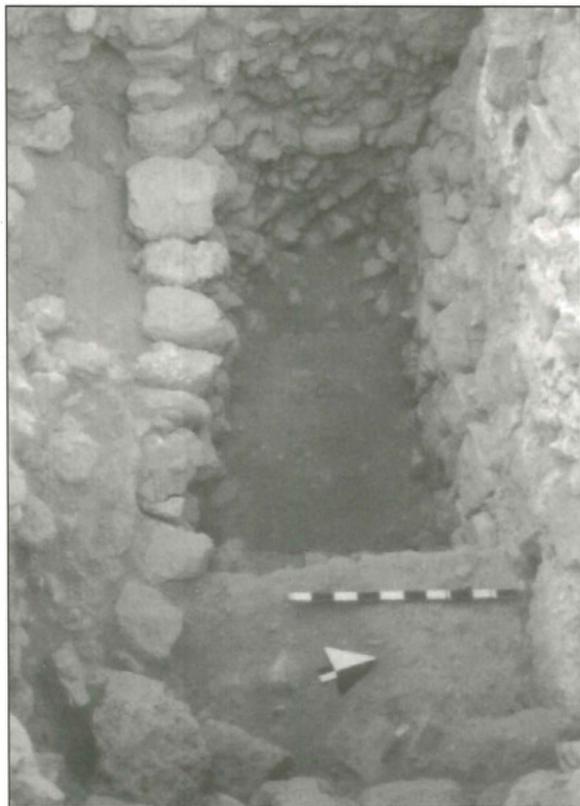
The land owner of Tall al-'Umayri, Dr Raouf Abu-Jaber, was again generous in facilitating and encouraging our research. The officers and staff of the American Schools of Oriental Research and its local affiliate, the American Center of Oriental Research in Amman directed by Dr Pierre Bikai and assisted by Dr Patricia Bikai, provided invaluable

assistance. The staff was housed in al-Muqabelein at the Amman Training College, an UNWRA junior college for Palestinians. We give special thanks to its Principal, Dr Fakhri Toumleleh for making our stay a genuine pleasure. The scientific goals and procedures of the project were approved by the Committee on Archaeological Policy of the American Schools of Oriental Research.

Thanks are also due to each member of our staff, which was divided into two sections: field excavation and camp logistics. In charge of planning and overall execution of the project were the authors, co-directors of the project. Other core staff members appear as authors of sections of this report.

riod. Because these excavations were outside the Ammonite administrative center excavated in previous seasons, we will list only the phases encountered this season with tentative suggestions as to how the phasing connects with that mentioned in earlier reports.

*Phase 14 (Middle Bronze IIC? Or Early Iron I).* Beneath the outer fortification wall of the subsequent phase was a lower “skirting” which extended a few centimeters from under the later wall in three squares where the wall turns from a north-south orientation to east-west (Fig. 2). Although the earth layers running against it contained early Iron I pottery, we have not yet reached its founding level and there is some stratigraphic reason to suggest that it may be a continuation of the Middle Bronze Age wall uncovered in Field B. Alternatively, it could be from an early Iron I phase earlier than any we have



2. Tall al-'Umayri, Field A (Phases 14 and 13): The lower phase of the perimeter wall extends beneath the upper phase; the skirting is visible above the right end of the meter stick.

so far found in Fields A and B. A parallel wall only 1.5 m south of the easternmost portion of the wall is as yet unexplained (Fig. 2), but the earth layers running against it were also early Iron I and its founding level has also not yet been attained.

*Phase 13 (Early Iron I).* The major early Iron I fortification wall was built on top of the Phase 14 wall line (or “skirt”) but inset 0.15-0.20 m (Fig. 2). A surface sealed against the south face of this wall in the southwestern extent of our excavations and covered the Phase 14 walls. At the same location the wall stands at least 3.30 m high (nine courses) and shows evidence of having been plastered (Fig. 3). Fragments of the plaster also lay upon the surface. Where the wall turns to the east, the masonry style changes from small boulders to large boulders set in two rows (Fig. 4). This phase of the wall now stretches from the northern ex-



3. Tall al-'Umayri, Field A (Phase 13): Elevation of the early Iron I perimeter wall; note the plaster remnants in cracks.



4. Tall al-'Umayri, Field A (Phase 13): Early Iron I perimeter wall from above.

tent of Field B (the northwest corner of the site) into Field A where it curves east and was cut by the late Iron II Ammonite administrative complex (Fig. 5). We may have picked it up again in Field H where it was heading south and then may have turned east again. If the plan has been reconstructed correctly, then we have traced it for approximately 85 m.

Remains of the buildings inside the wall were uncovered in the northern two squares. These were probably parts of Building A, partially uncovered in Field B during the 1989 to 1994 seasons (Herr *et al.* 1996: 68). The floors discovered this season are at the same level as those of Building A and contained fragments of collared pithoi. More excavation is needed to show coherent house plans. Above these remains was a brick destruction layer identical to that found in Field B.

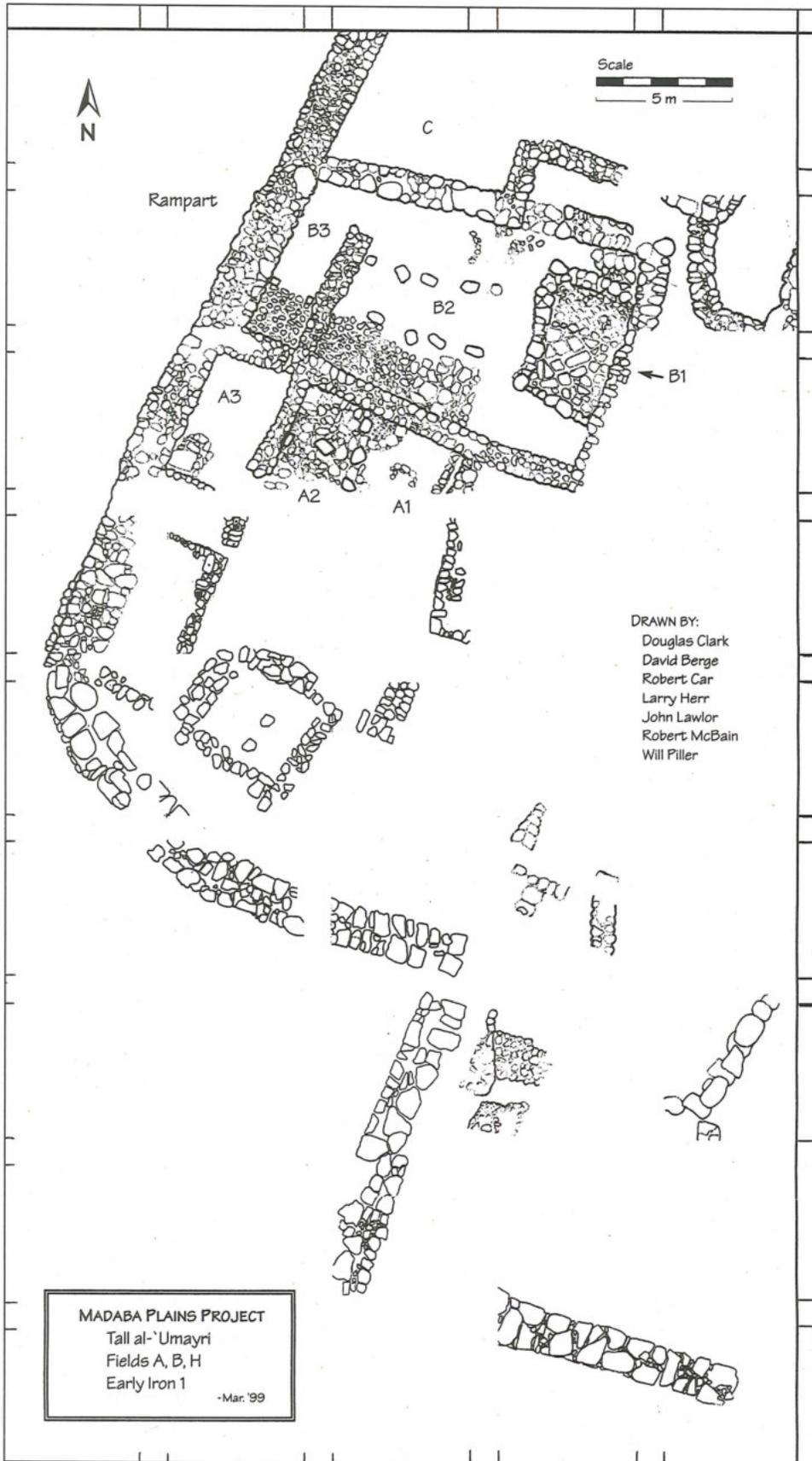
*Phase 12 (Early Iron I).* Inside the curve of the wall was a square room with two stone pillars somewhat off center (Fig. 6). The northern wall was clearly founded within the Phase 13 destruction debris. A surface joined all these architectural features but no objects or pottery were found on the surface. We have not as yet answered the question about why the pillars were off center and why no door is apparent except for a possible 0.75 m opening halfway up the wall in the northeast corner and about 0.60 m above the surface. Approximately 0.85 m of loose ashy soil filled the room, apparently deposited after the room had gone out of use because it covered the collapsed southern pillar. The ash did not contain any artifacts and was deposited in such a way as to suggest rapid deposition, perhaps when the burned destruction of Phase 12 was leveled for the next settlement. If so, it may have been deposited at the beginning of Phase 11. Half of a large scarab (Object No. 6510) came from the ash.

Northwest of this room were two wall fragments from a room that most likely abut-

ted the interior of the fortification wall. It may have been used with another east-west wall fragment immediately west of the two-pillared room. A small wall fragment may have framed a door that opened to another room. No surfaces have yet been found inside these rooms, but the floor levels of Building A in Field B have not yet been reached. In the destruction debris to the east of the rooms a bronze cymbal (Object No. 6615) was found which probably formed a pair with a slightly differently shaped object from the 1996 season (Object No. 6199) (Fig. 7). More wall fragments were found about seven meters east of these rooms, but no coherent plan or surfaces have yet been found.

*Phase 11 (Iron I).* The fortification wall from Phase 13 continued in use as did the pillared room which may now have been used to deposit the ash layers of the Phase 12 destruction. Two wall fragments which formed a door jamb found during the 1987 season (Geraty, *et al.* 1989: 146) may have been part of this phase as was a plastered surface covering the Phases 13 and 12 destruction layers in the northern part of the field. Other fragmentarily exposed remains in the southern portion of the field may come from this period; they include wall lines and a cobbled floor.

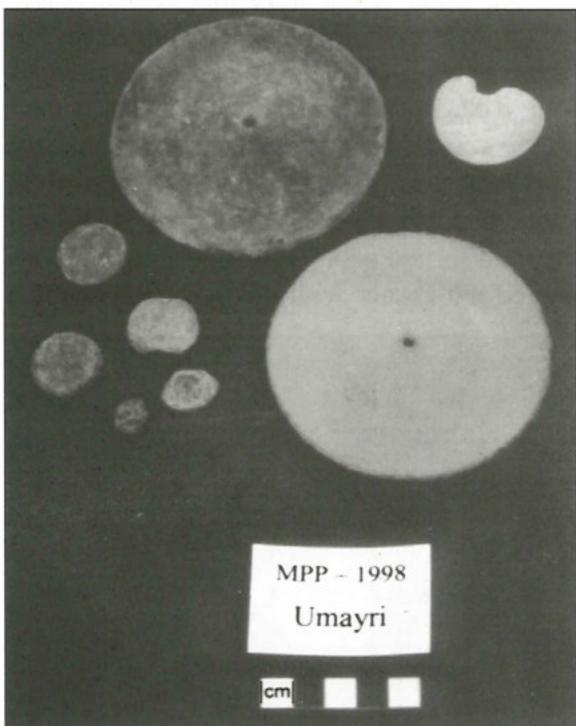
*Phase 10 (Iron I).* Two north-south walls that define Phase 10 were built upon the plaster surface of phase 11. The eastern wall may have served as a terrace wall to support a store room to the west; our western wall was the eastern wall of this room which, in the 1996 season, produced 18 collared pithoi embedded into the destruction of Phase 11 or 12 and in various states of preservation. Flotation samples from the pithoi yielded grape, chickpea, barley, wild legume, and other unidentified seeds. Small fragments of walls found in previous seasons to the southeast were probably part of this phase. The



5. Tall al-'Umayri, Fields A (Phase 13), B (Phase 11), and H (Phase 9): Plan of the early Iron I perimeter wall as we reconstruct its plan at the western edge of the site.



6. Tall al-'Umayri, Field A (Phase 12): Early Iron I pillared room and surface.



7. Tall al-'Umayri, Field A (Phase 12): Pair of cymbals from destruction (with other miscellaneous objects); the upper cymbal was found in 1996.

earlier fortification wall continued in use. All Phase 10 remains were covered by an ash layer separating Iron I layers from those of Iron II.

*Phase 9 (Early Iron II).* This phase is represented by a layer of debris that overlay the Phase 10 destruction ash and contained early Iron II pottery.

*Phase 8B (Iron II).* Two earth layers overlying that of Phase 9 contained Iron II pottery.

*Phase 7B (Late Iron II/Early Persian).* Debris layers outside, covering, and inside the Iron I fortification wall suggest that the wall was no longer in use. Other earth layers with Late Iron II/Early Persian pottery also covered most of the other features. A rubbly line of stones may have been added to the northern wall of the pillared room. From a layer sealing against this stone line came an Athenian tetradrachma (Object No. 6530).

*Phase 4 (Hellenistic?).* One black terra sigillata sherd came from an earth deposit above the Phase 7B loci. Elsewhere, a pit may belong to this phase. The Hellenistic phase in Field H has also revealed pits.

*Phase 3 (Roman).* The latest pottery in the topsoil of three squares contained Roman sherds.

*Phase 2 (Byzantine-Late Islamic).* Five earth layers contained pottery from the Byzantine to Late Islamic periods.

*Phase 1 (Modern).* Modern activity, such as sift deposits from previous seasons of our excavation, was detected in two squares.

### **Field B: Northwest Domestic Quarter** (Douglas R. Clark)

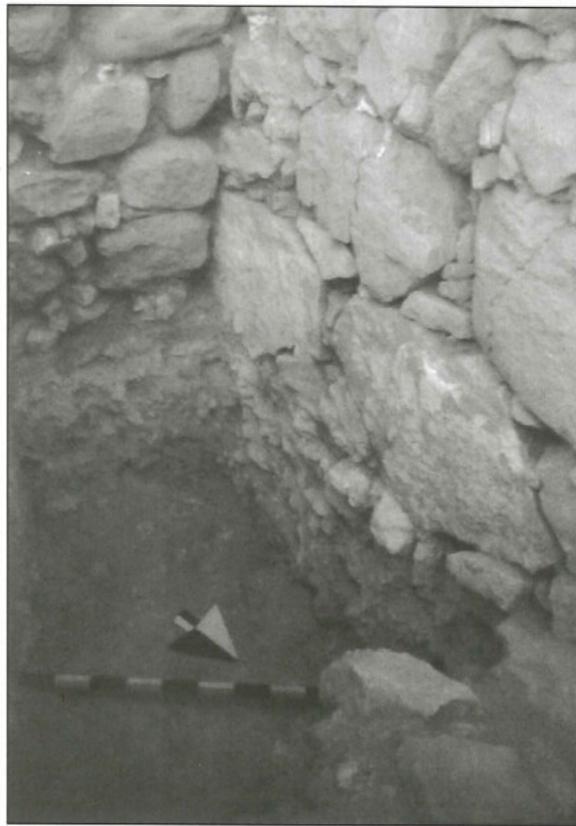
Previous seasons in Field B have produced the fortification system for the site during the Middle Bronze Age and early Iron I, as well as houses from the latter period, house fragments from Iron II/Persian and other minor later remains (Geraty *et al.* 1987: 189-192; Geraty *et al.* 1989: 151-154; Herr *et al.* 1991: 159-162; Herr *et al.* 1994: 151-155; Herr *et al.* 1996: 65-69). Work during this season took place at the northern extent of the field and focused on answering questions raised by work in 1996. What pe-

riods could be found preceding the early Iron I houses? Why was so much Middle Bronze Age pottery coming up near the northwest corner of the site? What kind of building lay north of the Iron I structures and did it date to early Iron I, as well? What was the stratigraphic connection between Fields A and B? These questions were approached by excavating deeper in the eastern part of the field to reach the bottom of a large pit just east of the early Iron I house uncovered completely in the previous season. Excavations were also deepened north of the early Iron I house in order to understand the emerging architecture. As well, the northernmost remains of the late Iron II/Persian administrative complex which stretches into Field A was excavated.

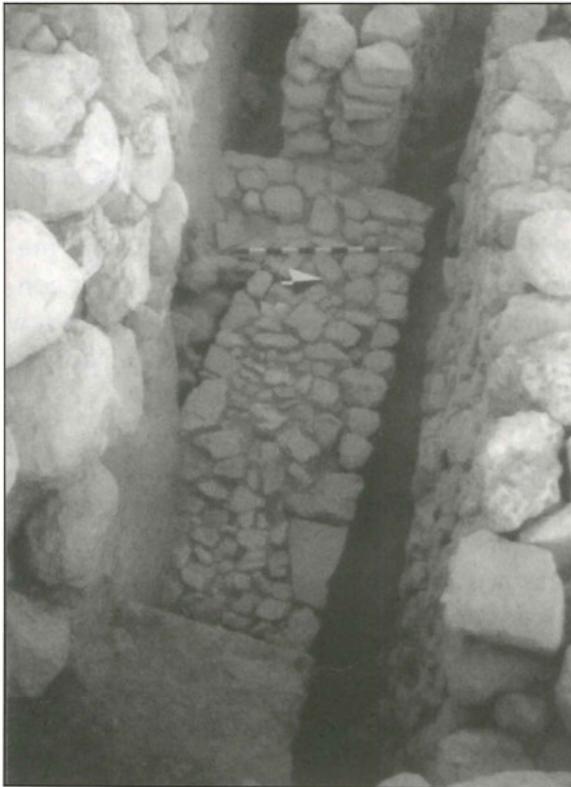
*Phase 14 (Middle Bronze Age IIC).* For the first time, work during this season produced coherent MB IIC architectural features at the top of the site (fragmentary remains had been found on the north slope in 1987 [Herr *et al.* 1989: 154-155]). It was expected to find an early Iron I house north of Building B, but this season's work showed that the MB IIC rampart rose originally to a high point at the northwest corner of the site. Founded within the rampart was a major wall which dates to this period, but was discovered to be in precise alignment with the later Phase 11 perimeter wall. Whether this was part of a MB IIC perimeter wall or part of a tower at the northwest corner of the site is not as yet clear. Farther to the south, the wall was reused as part of an early Iron I rebuild after an earthquake caused the collapse of the rampart and wall around 1200 BC (Herr *et al.* 1996: 66). It had been long noted the different masonry style on the surface of the tall (small boulders and large cobbles—definitely not Cyclopean) in this portion of the wall, but could not document its date. It was assumed to be early Iron I, like the rest of the wall. But the debris layers inside the wall clearly dated it to MB

IIC. Just where the MB wall stops and the early Iron I addition starts has not yet been clearly determined. It was also not clear as to whether this wall was part of a perimeter wall that encircled the site on top of the rampart or was part of a tower at the northwest corner of the site. Because no corner has been found which would represent the southern wall of a tower, it would appear most likely that the wall was a perimeter wall which was destroyed to the south. The wall was founded on top of the chalky rampart (Fig. 8).

Two other walls were discovered inside the perimeter wall and were founded on top of the rampart (Fig. 9). One of the walls was founded with several courses of neatly laid cobbles and had a superstructure of bricks. This wall was oriented east-west and turned south beneath Phase 11 Building B. Where the wall turned south, a stone extension connected the corner with the perimeter wall to



8. Tall al-'Umayri, Field B (Phase 14): Perimeter or tower wall founded on top of the rampart.

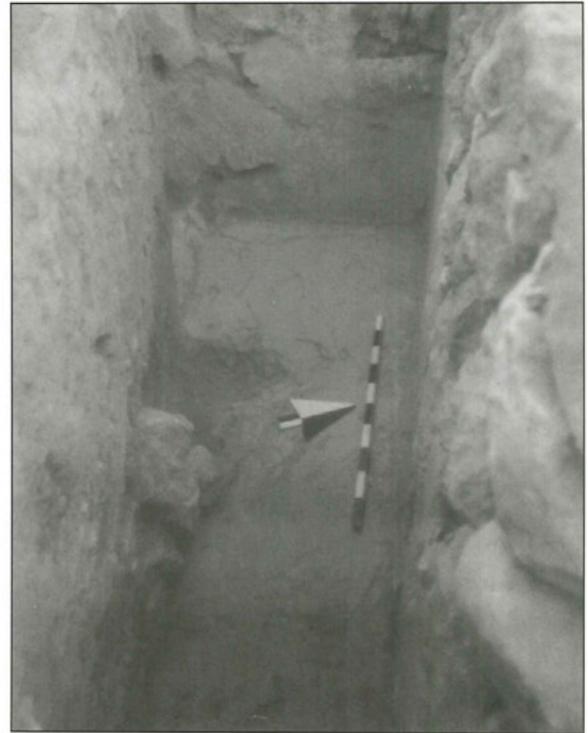


9. Tall al-'Umayri, Field B (Phase 14): Two wall fragments; the cornering wall in the middle had a superstructure of bricks; the stone wall going out of the picture at the top center was added slightly later.

the west. On the south side of this extension was part of a finely plastered pool (Fig. 10) with an east-west width of about two meters. Because it extended beneath Phase 11 Building B, its north-south dimension could not be determined.

Farther inside the site, about 18 meters east of the crest of the rampart, was the bottom course of a MB IIC structure made of large boulders (Fig. 11), the closest masonry style to Cyclopean at the site so far. Because the wall seems to corner to the west, the semi-plastered surface (plaster patches and/or a thin layer of chalk on top) found on its east side was probably an exterior surface. No objects were found there.

*Phase 13 (Late Bronze Age II).* After a hiatus during the early part of the Late Bronze Age, the site was again occupied at some point during LB II. Two rooms from a single building on an east-west axis were



10. Tall al-'Umayri, Field B (Phase 14): North end of a plastered pool; it goes beneath a balk to the left.



11. Tall al-'Umayri, Field B (Phase 14): Wall with large stones beneath stone rubble of Phase 13.

found immediately north of the Phase 14 walls near the northwest corner of the site (Fig. 12). A doorway led from the western room to the north where it has not been excavated yet. The western room contained a very hard, but irregular beaten-earth surface; this floor was very easy to trace in the room but could not be followed through the door into the eastern room where no corresponding surface was found. Perhaps this room was used much less intensively. But no objects were found in either room to sug-



12. Tall al-'Umayri, Field B (Phase 13): Building with two rooms and brick-like stones.

gest functions. A probe beneath the surface in the western room revealed another destruction layer and showed that the walls of the building keep descending and an earlier floor phase may still be found. The south wall of the building has so far been exposed to a height of approximately three meters. The brick-like masonry style of the stones in all the walls is unique at the site.

Southeast of this building were the remains of another LB building immediately above the MB IIC structure. Another beaten-earth surface was found here running up to a wall constructed of large boulders. This wall runs west beneath Building B of Phase 11 and was cut by the large Phase 12 garbage pit to the east.

*Phase 12 (Late Bronze Age/Early Iron I).* During the 1996 season a large pit filled with homogeneous debris containing almost 15,000 animal bones was excavated. This season, the bottom of the pit was located (immediately above the Phase 14 building with large stones) and the bones were preliminarily analyzed by Joris Peters of the Institut für Palaeoanatomie in Munich, Germany. His oral preliminary report was that the bones were from similar parts of primarily sheep/goat carcasses and that these parts were the edible portions of the animals. A few pig and cattle bones were also found. This analysis certainly fits our interpretation of the pit as a garbage depository that was in use intensively for a relatively

short period of time. The debris layers in the pit sloped downward to the east, suggesting they had been thrown into the pit from the west. Was this a large garbage pit for people living in an earlier phase of Buildings A and B? We have uncovered evidence for such an earlier phase in these buildings during previous seasons. The pottery from the pit contained many LB sherds, and also had a few that were similar to those found in the destruction of the Phase 11 Buildings.

*Phase 11 (Early Iron I).* Most of Buildings A and B were excavated in previous seasons. One wall was found during this season just southeast of Building A. However, considerably more destruction debris from this phase was removed in the southeastern corner of the field. No surfaces or architectural features were found.

*Phase 7.* A pit into the Phase 11 destruction was excavated in the southeastern corner of Field B. Several other pits were excavated in this area in earlier seasons. The pottery from the pit was the typical late Iron II/early Persian corpus from 'Umayri that dates to the sixth and fifth centuries BC.

#### **Field H: The Southwestern Administrative Complex** (David R. Berge)

This season was the third summer we excavated in Field H (Herr *et al.* 1996: 69-70). Excavation expanded to the south in order to extend our research to the very edge of the site. The southern extent of the Ammonite administrative complex was found. Outside these remains to the south were walls and surfaces from later periods above apparent domestic remains contemporary with the administrative complex.

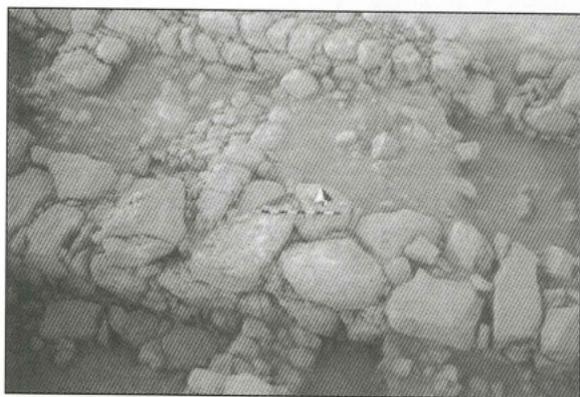
*Phase 9 (Iron I).* A thick north-south wall at the western edge of the site from this phase was uncovered in previous seasons (Figs. 5 and 13). We now suspect it may have been part of the early Iron I perimeter

wall found in Fields A and B. During this season the top courses of an apparently similar wall were found running east-west slightly to the southeast (Figs. 5 and 14). Although no Iron I remains have yet been found in association with it (excavation is not deep enough), it may be part of the same perimeter wall system. But this is by no means certain. The Ammonite administrative center to the north seems to end at this wall, perhaps reusing it.

*Phase 8 (Early Iron II; =Phase 7 in 1996).* Added to the finds from last season, was a possible flagstone pavement at the southeast corner of the field; the stones may also belong to a large wall; the only reason to apply these stones to this phase is because



13. Tall al-'Umayri, Field H (Phase 9): The north-south stretch of the early Iron I perimeter wall, possibly the same wall as that of Phase 13 in Field A.

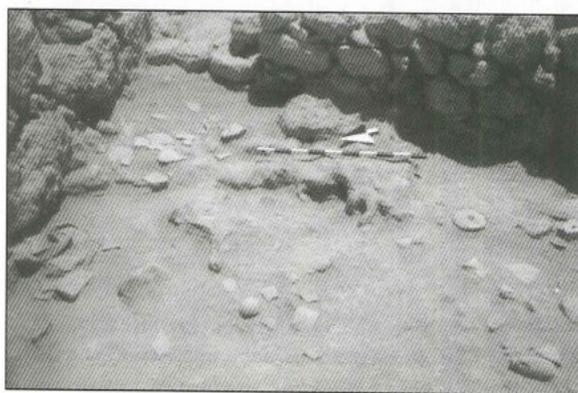


14. Tall al-'Umayri, Field H (Phase 9): The east-west stretch of a possible early Iron I wall (beneath the meter stick); it may be the same perimeter wall as that of Phase 13 in Field A.

they precede the structure of Phase 7.

*Phase 7 (Late Iron II; =Phase 6 in 1996).* The walls from this phase were built upon and into the fill layers that covered Phase 8. The phase includes the large wall we have tentatively suggested may be part of the Phase 9 perimeter wall, now reused (?) as the southern wall of the Ammonite administrative center. Another wall was connected to it by a cobbled surface which was at least 3 x 3.15 m in size, but has not yet been all excavated. Another small patch of cobbled surface which probably belongs to this phase was found to the north. Disruption by later constructions does not allow a coherent plan of the buildings.

*Phase 6 (Late Iron II/Early Persian; =Phase 5 in 1996).* This phase represents a major remodeling of Phase 7. Doors were blocked and new ones were constructed with added walls. However, except for a few of the walls, none of the foundation levels were reached, so our phasing must remain tentative. In the debris immediately above the surface (Fig. 15) of a room in the southwestern part of the field a complete juglet, several half bowls, a grinder, a whetstone, a weight, one ballistic missile, and a horse-and-rider figurine were found. The earth layers which surrounded and covered the walls were the result of the collapsing walls; no destruction debris was observed. The pot-



15. Tall al-'Umayri, Field H (Phase 6): Earth deposits above a surface with finds *in situ*.

tery belonged to the typical late Iron II/early Persian corpus of southern Ammon.

*Phase 5 (Late Iron II/Early Persian; =Phase 4 in 1996).* Although a few walls seem to be new to this phase, most of the Phase 6 walls were reused, but one of the doorways was blocked. A combined flagstone beaten-earth surface was found in the southeastern portion of the field; on the surface was a broken cooking pot. Farther to the northwest was also a cobble surface with plaster on top; a similar floor was found in the room to the west. These plastered floors (on top of a cobbled foundation layer) are to be equated with the similar construction of the plaster floor found in the large room to the north in the 1996 season (Fig. 16). The lack of a doorway into this large room was noted in last season's report; excavation this season likewise did not produce a door. Although this large room was clearly part of the administrative complex, the smaller rooms excavated to the south during this season could have been residential.

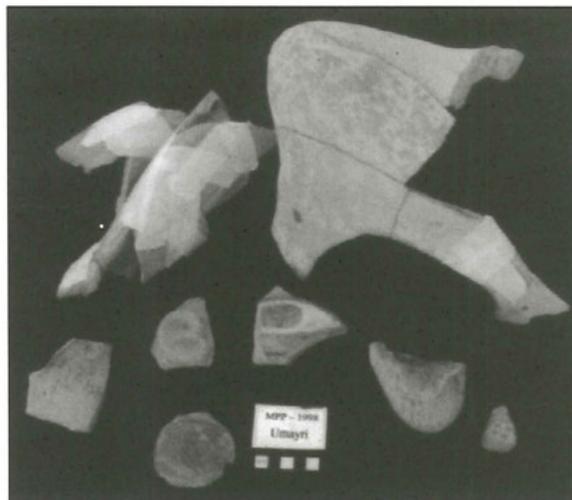
*Phase 4 (Persian; =Phase 3 in 1996).* This phase constituted of a reuse of all the architecture of Phase 5 except for two walls, and should be seen as a minor remodeling. It most likely corresponded to the second plaster floor in the large administrative



16. Tall al-'Umayri, Field H (Phase 5): Large room of the administrative center with plastered floor discovered in 1996.

room to the north excavated in 1996. A second plaster floor, extant only in patches, was also found in the rooms immediately to the south of the large room. Several later pits intruded upon this surface.

In one of the debris layers above the surface were numerous fragments of one or more ceramic statues or anthropomorphic cult stands (Fig. 17). Although some mends were possible, they were not enough to clarify the form of the object(s). The fragmentary nature of the finds match similar pieces from Field H found in earlier seasons. The pieces this time were, however, the most important yet found and included a larger-than-life-size eye dramatically painted; a life-size chin and mouth with painted beard or tattoo; a slightly smaller-than-life-size ear; two possible fragments of a life-size heel; parts of arms or legs smaller than life-size; and a possible shoulder, much smaller than life-size. The ceramic ware was generally the same, except for the eye, which was also painted with a different color scheme than the other pieces. Whether these finds were in secondary deposit or not is unclear at present. That they were not on the surface might suggest secondary deposition, but they were clumped together into a corner of the room indicating that they were intentionally placed there. The finds from



17. Tall al-'Umayri, Field H (Phase 4): Fragments from ceramic statues; the eye is in the center.

this phase were so close to the surface of the site, that it is possible that other pieces could have been taken away with the erosion of topsoil.

*Phase 3 (Hellenistic).* No new developments were found from this phase during this season.

*Phase 2 (Byzantine/Early Islamic).* The western edge of a building from the Byzantine period was discovered in the eastern half of the field. A Byzantine potsherd was found in the foundation trench of one of the walls. Several possible surfaces were discovered in association with the walls. This season, it was found that a pit excavated in 1996, which cut the surfaces of Phases 5 and 4, seems to have been dug from this phase; it contained a Byzantine coin. Since only a small portion of the building was uncovered, its plan and function are not clear. This is the second evidence of limited Byzantine activity at the site. The other was discovered in 1987 in Field F at the eastern edge of the site. We have suggested it was the remains from a small farm (Geraty *et al.* 1989: 162).

*Phase 1.* Topsoil and sub-topsoil layers ran up to and covered virtually all the architecture in Field H. Objects of material culture, as is normal of such layers at 'Umayri, were profuse; three to four times the number of material culture items are found in topsoil layers than from *in situ* deposits. The objects included seals, beads, a glass bangle, a medallion, an incense altar fragment, spindle whorls, an eye-shaped bone object (found in 1996), a Roman coin, a metal ball, figurine fragments, basalt querns and grinders, slingstones, and a metal bowl fragment.

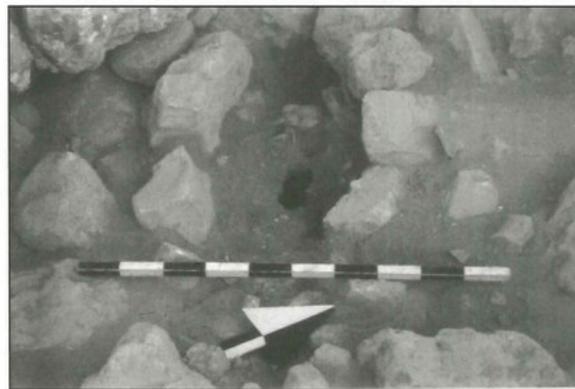
Near the southern edge of the tall was a burial of a single infant (under six months old) in a shallow stone-lined cyst dug against one of the walls (Fig. 18). Along with the burial were a small bronze bell and

black and white beads, items commonly occurring with young female burials in recent burials.

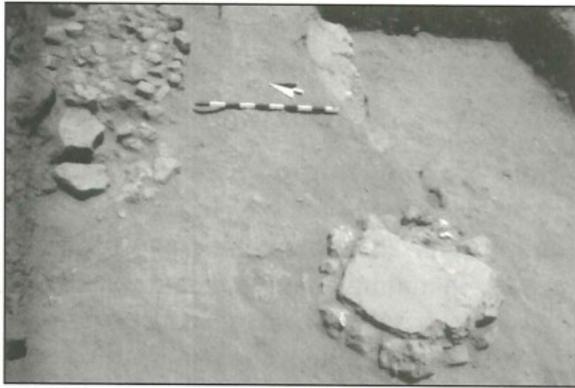
#### **Field K: The Dolmen** (Elzbieta Dubis)

A dolmen was uncovered in the 1994 season with 20 burials and copious objects inside, including complete pottery vessels and jewelry from EB IB (Herr *et al.* 1996: 75-76). In 1996, the excavation also produced multiple exterior plastered and semi-plastered surfaces which dated to the same period. This is the first time in the entire Mediterranean basin that patterns of use have been associated with the outside of a dolmen. Seven surfaces were counted, one on top of the other. This season, three squares were laid out north and west of the dolmen to examine the extent of the surfaces and to see if any other architectural features could be associated with the use patterns around the dolmen.

Generally, the farther one proceeded from the dolmen, the weaker the surfaces became, but by no means their end was reached, neither in the west nor in the north. Embedded in one of the surfaces about five meters west of the dolmen was a patch of cobbles tightly laid, perhaps forming the base of an unknown feature (Fig. 19). Nearby and about a meter farther west was a large flat stone surrounded by cobbles at the same level as one of the surfaces; it looked very much like a small table. Could it have been



18. Tall al-'Umayri, Field H (Phase 1): Infant burial; the cracked skull is at top above the hole.



19. Tall al-'Umayri, Field K: Features in one of the surfaces west of the dolmen.

used to receive votive or funerary gifts? Placed into one of the surfaces about five meters to the north of the dolmen was the lower third of a flat-based jar; no contents were found. About three meters northeast of the dolmen was a small patch of a very well made hard plaster floor (Fig. 20); similar patches had been found between it and the dolmen in 1994. If a surface of this quality originally surrounded the dolmen when it was used, it was not simply the result of people walking in the area, but was carefully laid for a specific (ritual?) function.

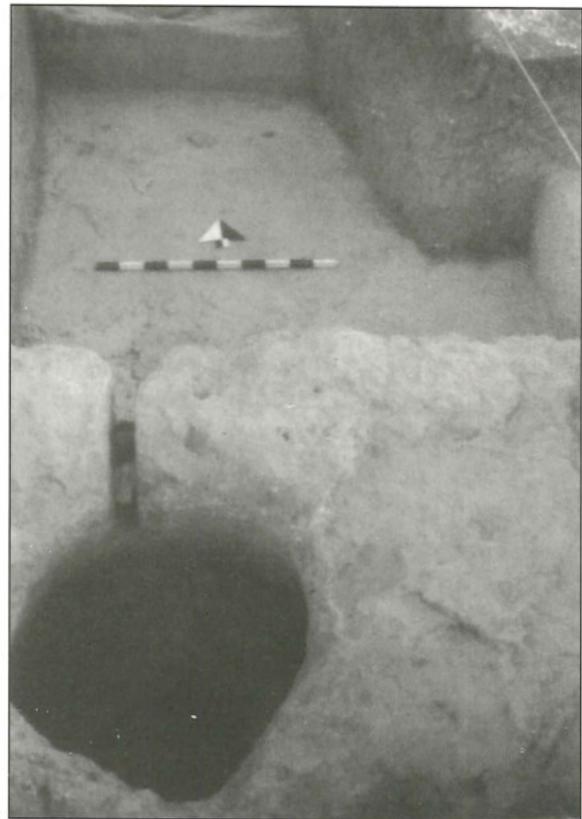
A small team looking for other tombs on the southern hill of al-'Umayri excavated the major part of a winepress (Fig. 21). It could not be clearly dated.

**Field L: The Southern Edge** (David C. Hopkins)

Ever since the beginning of excavations at



20. Tall al-'Umayri, Field K: Patch of well made plaster surface northeast of the dolmen.



21. Tall al-'Umayri, Field K: Winepress found at the southeastern bottom of the site.

al-'Umayri in 1984, we have been wanting to examine a topographic low near the center of the southern edge of the site. On either side of the dip, the wall line of the apparent fortifications of the site are clearly visible with large boulders to the west and a wide line of smaller stones to the east. Ground penetrating radar produced anomalies that seemed to suggest the presence of a case-mate wall to the west of the dip. A vertical line of stones descends the slope of the mound from this area. Some have suggested that this could be associated with an ancient road, although the slope is quite steep at this point (ca. 20 degrees). Because we have not yet found a gate to the site, we decided that we should examine this location for such a possibility. Three squares were opened, but, after the topsoil was removed, work was limited to the northern two squares.

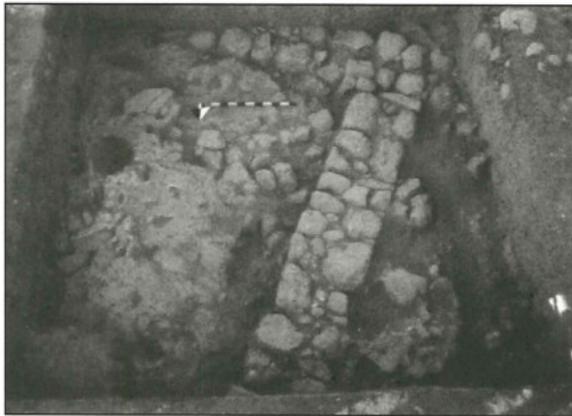
*Phase 6 (Late Iron II/Persian).* A fragmentary building consisted of two walls (Fig.

22). The eastern row of stones of the north-south wall has moved off of its foundation, suggesting that the structure experienced some damage at the end of the phase.

*Phase 5 (Late Iron II/Persian).* This damage to the wall of Phase 6 supplied the reason for the construction of the Phase 5 walls near but not directly on top of the damaged structure. This phase consists of two well-built walls (ca. 0.75-1.0 m thick) and associated plaster floors (Fig. 23). The east-west wall of the building runs more or less parallel to the lip of the tall and into both the south and west balks. It may reappear at a higher level about 4 m to the west in the next square. Perpendicular to it, the north-south wall may be an interior wall since plaster surfaces existed



22. Tall al-'Umayri, Field L (Phase 6): This phase is made up of the two inner walls below the Phase 5 walls upon which the meter stick lies.



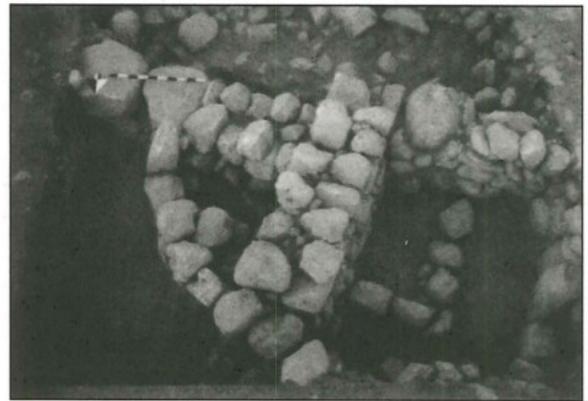
23. Tall al-'Umayri, Field L (Phase 5): Two walls with plaster surfaces and diagonal drain (just emerging beneath the surface near the intersection of the two walls and under the meter stick).

on both sides. Associated with these walls, a narrow drain beneath the plaster splits diagonally the space they enclose.

*Phase 4 (Persian).* Wall lines were discernable beneath the Hellenistic features of Phase 3 (Fig. 24) west of the Phases 6-5 structures. This phase consists of a ca. 2.0 x 2.5 m right-angled corner, but the bottoms of the walls have not yet been reached. The stub of another wall was also visible beneath the later Hellenistic structure. But it possesses a slightly different direction and was not aligned with the east-west running wall of the corner. As mentioned above, this stub may belong to Phase 5, because it aligns with the east-west wall of Phases 6-5 to the east, though it is considerably higher.

*Phase 3 (Hellenistic).* Hellenistic walls west of the Phases 6-5 structures (Fig. 24) consist of the beginnings of a large structure, as yet not completely exposed, made up of a semicircular bin or platform, a small room (1.6 x 1.5 m), and a smaller bin (1.0 x 1.0 m).

*Phase 2 (Post Hellenistic Period).* The southernmost square quickly dispelled any notion that the apparent wall lines on the surface were remnants of an Iron Age gate or fortification system. Two phases of activity accounted for the observed remains. The evidence suggests that the remains were



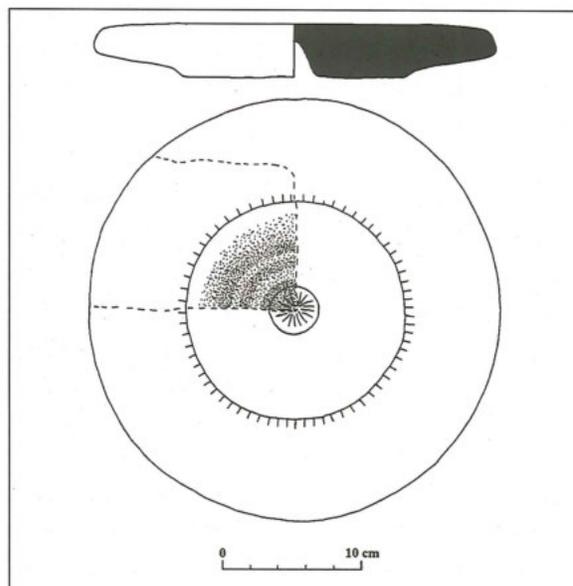
24. Tall al-'Umayri, Field L (Phase 3): Hellenistic structures; The wall upon which the meter stick rests is probably somewhat earlier.

later than the Hellenistic structures to the northwest, but could not be dated well because of a lack of contemporary pottery in an agricultural field setting. The earliest of the two phases consists of a one-two course, predominantly two-row boulder and chink wall which projected some two meters into the square from the east. Possibly a terrace wall, the somewhat random courses of the structure were founded on dirt immediately below topsoil.

*Phase 1 (Post Hellenistic Period).* Abutting the terrace wall of Phase 2 was a curvilinear single row field wall stretched across the square from south to north. The wall apparently created a stable spot for workers to deposit stones removed from the fields on the top of the site.

### An EB III Potter's Turntable

We must publish a very significant find discovered during the 1984 season and, at that time, called a stone platter. However, we have recently noticed certain features which make that identification incorrect and another as most likely (Fig. 25). Its top is completely flat, more like a disk than a platter; it contains a small hollow exactly in the center of the disk, probably on its under side; and it carries circular wear patterns, some of which are highly polished including the small hollow. All this indicates that it functioned as a disk that spun on a support beneath it and which extended up into the hollow to keep it in place. The best suggestion for the function of this stone is an upper turntable, most likely for the manufacture of pottery. Only about a sixth of the turntable is preserved but a complete radius has been preserved and we can thus reconstruct the piece completely. There is no doubt about neither the archaeological date nor the find spot of the piece. It came from the destruction debris above a storeroom of an EB III house in



25. Tall al-'Umayri, Field D: EB III potter's turntable.

Field D (Phase 4 in the 1989 seasonal report, Harrison 1997: 113-174), the same room which produced almost 30 pottery vessels during the 1989 season. Tim Harrison has pointed me to a parallel turntable found at EB III Megiddo (Loud 1939: Pl. 268:1-3).

Larry G. Herr  
Canadian University College  
235 College Ave.  
College Heights, AB THL 2E5  
Canada

Douglas R. Clark  
Walla Walla College  
College Place, WA 99324  
USA

Lawrence T. Geraty  
La Sierra University  
Riverside, CA  
USA

Øystein S. LaBianca  
Andrews University  
Berrien Springs, MI 49104

USA

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# MĀDABĀ PLAINS PROJECT 1997: EXCAVATIONS AND RESTORATION WORK AT TALL ḤISBĀN AND VICINITY

by

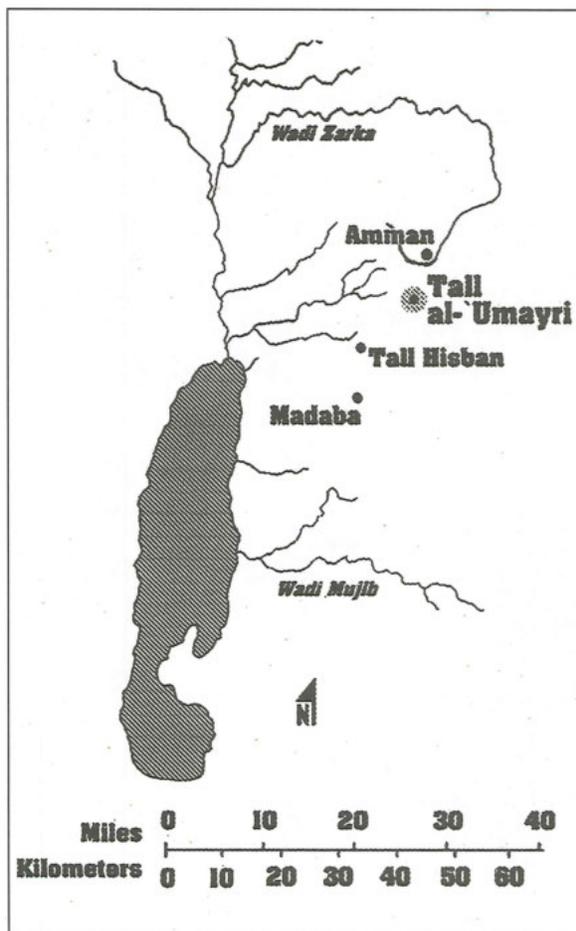
Øystein S. LaBianca and Paul J. Ray Jr.

## Introduction

A short three and a half week season was conducted at Tall Ḥisbān between June 18 and July 11 in the summer of 1997. This was a continuation of the work that had begun during the sixth season of excavation and survey by the Mādabā Plains Project in 1996. At that time, cleaning and restoration work was begun at the tall under the direction of Øystein S. LaBianca and Lawrence T. Geraty (Younker *et al.* 1997: 230). This site (Fig. 1), which had been excavated by Andrews University and other institutions between 1968 and 1976 had greatly de-

teriorated since its last season of excavation some twenty years ago. Preliminary reports (Borass and Horn 1969, 1973 and 1975; Borass and Geraty 1976 and 1978; Horn 1972 and 1974; Geraty 1975 and 1976) as well as some final reports (LaBianca 1990; Mitchel 1992) have since been published. Plans had been made for the restoration of the site in 1976, however, it had never been the recipient of any such work. Its importance, due to its location on two trade routes and its long occupational history make it a good candidate for restoration and the idea of finally starting such a project received strong support from the director of the Department of Antiquities as well as the mayor of the town of Ḥisbān. Although the primary reason for returning to the site was its restoration and development as a tourist site, it was also felt that the earlier excavations had left some unanswered questions that further excavation might possibly address. In addition, much of the tall had never been excavated and further work was seen as desirable.

The 1997 season at Tall Ḥisbān, though short and for the most part designed to deal with specific aspects of the earlier excavations, nevertheless represents a preliminary campaign of a new (phase 2) series of excavations at the tall. The research design, in addition to the basic objectives of the Mādabā Plains Project, which focuses on cycles of intensification and abatement in settlement and land use in the region and employs the food system's concept to operationalize it (Geraty *et al.* 1986: 117-119), seeks to: 1) answer questions remaining from the earlier (phase 1) excavations; 2) pursue further excavations in selected areas; and 3) preserve certain features, both previous



1. Map of the Mādabā Plains region.

and currently excavated, for tourist purposes. In addition, the new regional survey in the vicinity of Tall Ḥisbān, that was begun in 1996 (Younker *et al.* 1997: 229), was continued.

Although Tall Ḥisbān is a well known and relatively frequently visited archaeological site in Jordan, very little has been done to highlight its most important archaeological features for the visitor. As mentioned above, this situation began to change during the summer of 1996.

The effort to clean up the site was continued in 1997, resulting in improved presentation of the Iron I bedrock trench, the Late Iron I reservoir, the Hellenistic tower and fortification wall, the Roman staircase and "temple," the Byzantine church, the Mamluk bath, and the "Ottoman cave village." To bring these features into focus for the visitor, viewing platforms were constructed in selected locations throughout the mound, and paths were constructed leading the visitor from the bottom of the tall to each of the viewing platforms. On each viewing platform, signs were mounted which explained about the ruins brought into clear view by each platform.

A deliberate effort was made to involve village residents in this effort. To this end, the cooperation of the village mayor, was sought and obtained. The local blacksmith was hired to make the signs and a local school teacher, did the painting of the signs. Tours were provided on a daily basis for village visitors to the site and the workmen were empowered through daily instruction about the site's history to teach their family and friends about the history and significance of the village. A local resident, was trained to serve as a guide for tourists visiting the site throughout the year. New road signs were also made (free of charge) and mounted by the Ministry of Public Works along the 'Ammān-Na'ūr-Mādabā road to make the site easier to find.

In 1996 a number of large building stones

were laid upon what was thought to be the foundation of a Roman temple, as depicted on Ebus coins from that time, to the east and below the Middle Islamic Bath complex. In the process of their removal for reconstruction purposes in 1997, part of a mosaic (Fig. 2) was found approximately on the same level as the Byzantine church raising the possibility that the church ran further west than had previously been thought. If this is correct, then the Roman temple could have been located either on a lower level, is elsewhere on the acropolis, or otherwise, it was only an extrapolation from the coin. The relationship between the "temple," church and bath complex must be explored further in future seasons.

### Excavation at Tall Ḥisbān

This season concentrated on two as yet unresolved interpretational problems remaining from the earlier (phase 1) excava-



2. Mosaic fragments on the acropolis.

tions at the site. Both of these involved Iron Age features. In addition, exploratory probes were made in a large cave complex to follow-up the preliminary exploration and mapping done in 1996. Specifically, two soundings (C.3:N; D.7) were made on the western and southern terraces of the tall and four additional probes in (G.22, 24 and 25) and adjacent to (G.23), the cave complex, also located on the southern shelf.

### Field C: The Western Shelf (Phil Drey)

On the western shelf of the tall, excavations were begun again on the north side of Area C, Square C.3. The original excavations conducted there in 1973-74 had revealed a north-south wall (C.3:34), which zig-zagged or off-set as Wall C.3:26 to the west, continuing south into Square C.7 as Wall C.7:44 (Fig. 3). This wall line was founded on a bedrock shelf. Further to the west, there was a large wall (C.3:32), founded in a bedrock crevice. This wall was stepped up for 3.5 m, the extant portion abutting walls C.3:26 and 34 close to the point of off-set. Running parallel to and underneath this wall was a line of large unhewn boulders (Wall C.3:43), 2 courses (or 0.75-1.00 m) high, in part down in the crevice (Fig. 4). While walls C.3:26, 32 and 34 were originally dated to the Iron IIC/Persian period, Wall C.3:34 produced only Iron Age sherds. Wall C.7:44 also produced



3. Offset-inset Wall C.3:34/26A/C.7:44 in Area C (looking S).



4. Walls C.3:32 (right) and 43 (bottom center)(looking E).

Iron Age sherds on bedrock immediately below the first course on both sides of the wall. However, when parts of it were dismantled, Hellenistic sherds were found underneath the second and third (or top extant) courses. In addition, two phases of another wall abutted Wall C.3:26 on the west and extended into Square C.2 as Wall C.2:26. This wall was more poorly-built than the off-set wall, but before the discovery of Wall C.7:44 the following season, it was thought to be part of the same wall and thus given the same numerical designation (C.3:26B and C). This added to the confusion in that this wall dates to the Hellenistic/Early Roman period. Sherds from these periods were also found among fallen rock lying immediately west of Wall C.7:44, possibly from Wall C.3:26B and C. As a result, this overall wall system has been variously dated from Iron Age II to the Roman period in the literature (Thompson 1975 179-80; Mitchel 1992: 57).

In his dissertation on the Iron Age Stratigraphy at Tall Ḥisbān, one of the authors (Ray forthcoming) had tentatively redated this wall system to the Iron IIC/Persian period with later periods of rebuilding in the Hellenistic/Early Roman period. In order to test this hypothesis, a 7 x 2 m trench was laid perpendicular to Wall C.3:34 at the edge of a sub-balk left by the original excavators. Following the removal of 23 years of inter-seasonal debris, a 1 x 2 m trench along the

western (or outer) face of the wall was excavated (Fig. 5). Due to the rocky nature of the sediment no stratigraphy was encountered here. Therefore, pottery pails were changed every 0.30 m in order to gain control of datable pottery. The top 0.30 m yielded sherds from Iron II through the Early Islamic (Umayyad) periods. The remaining 0.60+ m, however, yielded pure Iron IIC/Persian period pottery (Fig. 6) including burnished black ware sherds. A clearly datable seventh century wheel burnished rim sherd (Fig. 6:6) was found almost on bedrock.

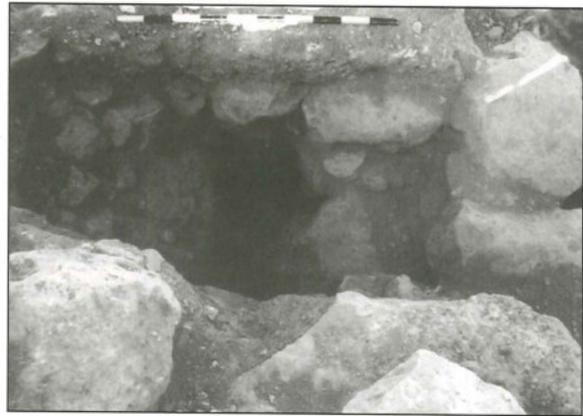
An attempt to find a foundation trench on the east (or inner) side of the wall yielded mostly large stones with a small amount of

soil. This fill was laid between the wall and another, vertical section of bedrock (Fig. 7), accompanied by very few (mostly body) sherds. There was no pottery whatsoever within the last several cm over bedrock. Above this stone fill, flagstones were laid between the wall and the vertical section of bedrock at the level of the greatest extant height of the wall. The flagstones (C.3:28) seem to have been laid in the Late Roman/Early Byzantine period, as dated by the previous excavators, and this would seem to account for the few sherds from this time found immediately beneath them.

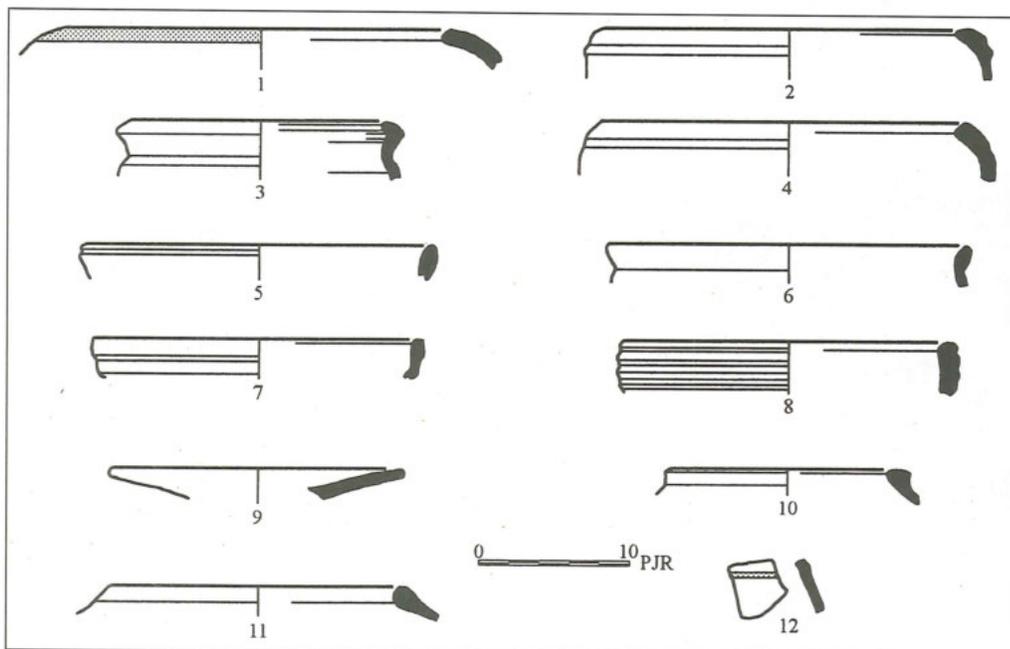
It would appear that Wall C.3:34 was laid directly on bedrock and that the wall system



5. New excavation trench along Wall C.3:34 (looking E).



7. Inner (eastern) side of Wall C.3:34 (looking S).



6. Iron IIC/Persian period sherds dating Wall C.3:34.

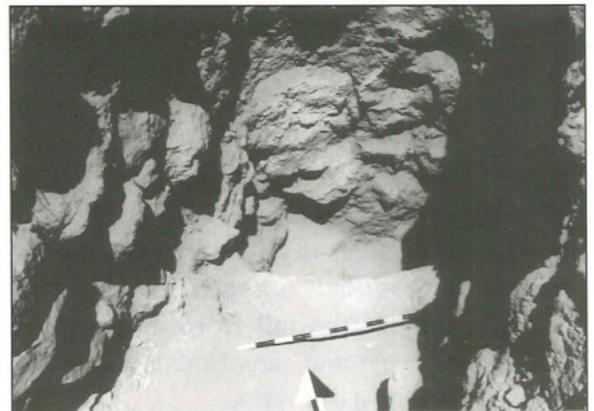
as a whole dates to the Iron IIC/Persian period. It would also seem that the whole system was defensive in nature with Walls C.3:26A, 34 and C.7:44 representing an offset-inset section with Wall C.3:32 functioning as a revetment wall retained lower down by Wall C.3:43. Walls C.3:26A, 34 and C.7:44 were evidently reused during the Hellenistic/Early Roman periods, at which time, new courses were inserted into them.

#### **Field D: The Southern Shelf** (Lael Caesar)

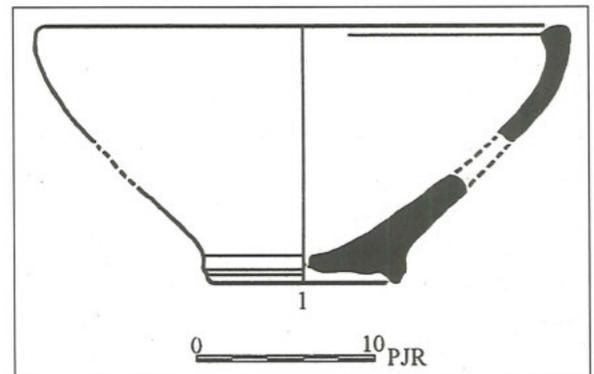
D.7 was a 6 x 2 m trench opened for the purpose of trying to intercept the eastern extension of a bedrock trench which was originally excavated in the 1974 and 76 seasons in Area B, Squares 2 and 3 and Area D, Square 4. It was reencountered again in the 1996 season during cleaning operations. The feature, as originally excavated, averaged between 2-2.5 m in width at the top to about 0.75 m at its bottom, 4 m below. A length of about 13.85 m had been excavated during the original campaigns, most of which had since been backfilled. In order to get an idea of its original extent, and for reconstruction purposes, a ca. 5 x 3 m section at its western end, where it had later been cut by the Iron Age reservoir, was re-exposed. As revealed there, the bedrock trench was originally cut in a SE direction. Thus, the new operations to the east, were concentrated on the southern half of the square at the beginning of the season. The excavations here revealed massive wall collapse along with a fallen arch. As digging continued, a four course wall emerged in the east balk, which appears to date to the Middle Islamic (or Mamluk) period. A closer look at the easternmost extension of the earlier excavated portion of the bedrock trench, as exposed beneath the entrance to a small cave which was cleaned in 1996, led to the conclusion that the feature was arc-shaped and should be encountered further to the north, at which point the northern part of the

square was brought into phase. A fissure in the bedrock soon emerged in the middle of the trench, but was devoid of pottery. This sterile bedrock feature, which was later back-filled, might suggest that those who cut the trench originally, might have made use of natural bedrock anomalies for at least part of the operation. A probe at the northern edge of the sounding however, revealed early Iron Age I ceramics, of the type originally found in the trench. Though the excavators were unable to reach the bottom of the bedrock trench (7 m below the current ground surface) before the end of the season, excavation revealed its southern edge (Fig. 8). The 1.5 m of material that was exposed included vast quantities of Iron Age I sherds, among which were some similar to the so-called "Manasseh bowls" (Fig. 9) of the central hill country of Cis-Jordan.

Among the possible explanations for this feature after the phase 1 excavations is that



8. Early Iron Age I bedrock trench, Area D.7 (looking N).



9. Early Iron Age I sherd from Area D.7.

it was a dry-moat. This was rejected early on due to the lack of exact parallels. The concurrent excavation of a huge 17.5 x 17.5 x 7 m Iron Age reservoir led to the proposal that the bedrock trench was actually a water channel to an earlier prototype. This explanation would seem to be unlikely since the water channels exposed along with the excavated reservoir were only 0.20-0.65 m wide and 0.15-0.55 m deep. In addition, early Iron Age moats are now known to exist at Khirbat 'Ayūn Mūsā and Khirbat al-Mukhayyaṭ in proximity to Tall Ḥisbān as well as south of the Wādī al-Mūjib, at the sites of Khirbat al-Mudayna al-Mraygha (North) and Khirbat Mudaynat 'Alia (South). All of these exist on only the most vulnerable sides of their respective tall, their other sides, as at Ḥisbān, being naturally defensible due to deeply cut wadis. In addition, a large Late Hellenistic or Early Roman period wall (B.1:17=B.2:62) was later built at approximately the same location on the southern portion of the tall, indicating, it would seem, the need of special defensive measures on this part of the site (Ray forthcoming). Although there is a lack of exact parallels, and the trench is narrower and located rather high up on the tall instead of at its base, as at other dry moats in the region, the feature nevertheless appears to have successfully cut off the tall from its approach on the southwest and thus functioned in the same manner as a dry moat.

Although the location of yet another section of this feature does not substantiate or negate the above interpretation of its function, it does however show that the bedrock trench existed further to the east.

### **G Probes: Cave Complex** (Bill Fagal and Bob McDaniel)

Originally located and explored in 1976, a large tri-level cave complex was found on the southern shelf of the tall, immediately southwest of the reservoir, from which one of its openings appeared. It was further ex-

plored and mapped in 1996 and yielded large quantities of Middle Islamic (or Mamluk) pottery.

A trial trench, 2 x 2 m in size (G.22), was laid on the northwest corner of the second (or middle) level, underneath one of the three arches (Fig. 10) which were found at that level. A probe of 2 m x 0.50 m revealed dung and ash layers mixed with roof collapse. It was excavated ca. 0.75 m down to the original cave floor, allowing one to stand upright and move comfortably underneath the arch. The ceramic evidence embedded in the floor indicates that the arches were probably originally made during the Byzantine period, though the extensive fill material above the floor shows that the cave continued to be used during later times. Objects included tesserae, glass fragments, beads and coins. Bones included human, chicken, rodent, turtle and porcupine in addition to the more usual sheep and goat. Seeds included grape, olives, wheat, barley and lentils.

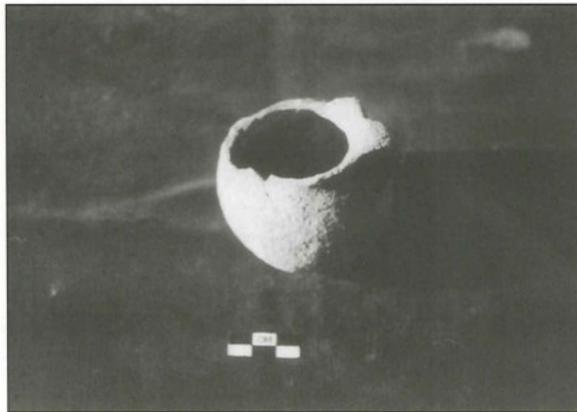
Northeast of the above-mentioned trench, two cisterns or storage silos ca. 1.5 m deep were located and excavated. Both had evidence of plastering. The easternmost one (G.24; Fig. 11) yielded a nearly complete juglet (Fig. 12) with a concave disc-base within the top 0.25 m of the fill material and underneath a shallow "retaining" wall, skirting the upper part of the silo on its south side. Although it appears to be Early Bronze



10. G.22 excavation below the arch in the cave complex.



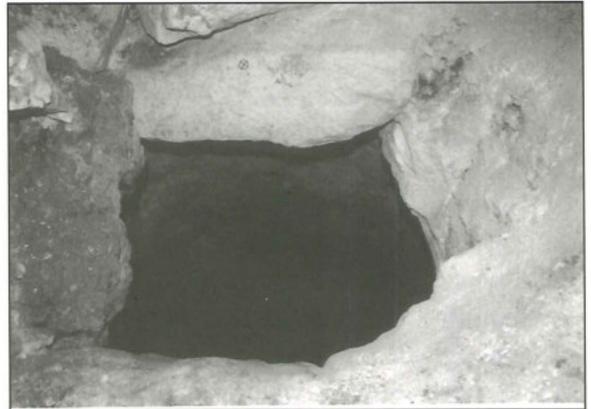
11. G.24 storage silo.



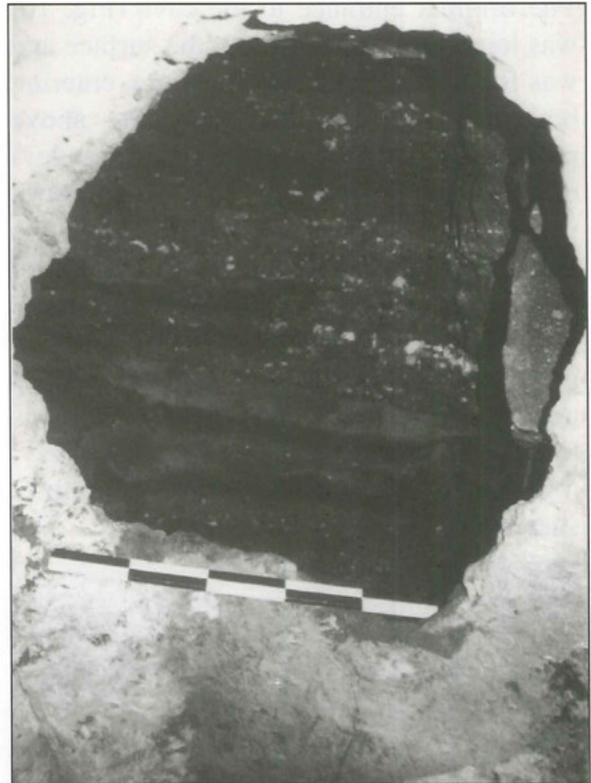
12. Juglet from G.24 silo.

in date, it also resembles similar vessels of the Late Islamic (or Ottoman) period found in the al-Karak Plateau area. The later dating would seem to be more likely at this point since stratigraphically, Middle Islamic (or Mamluk) pottery dominated the fill material found below the vessel. This material consisted of loamy soil and dung along with chicken, rodent, sheep and goat bones. The seed evidence consisted of wheat, barley, and wild grasses. Apart from a nail, objects were practically non-existent.

The second of these features (G.25) vaguely resembled an Early Bronze single-chamber shaft tomb (Fig. 13). The fill material in the "shaft" area was similar to that of the other storage silo, and also contained mostly Middle Islamic (Mamluk) sherds. The "chamber" area, however, which was only partially cleared and consisted of alternating fill and ash layers (Fig. 14) con-



13. G.25 storage silo.

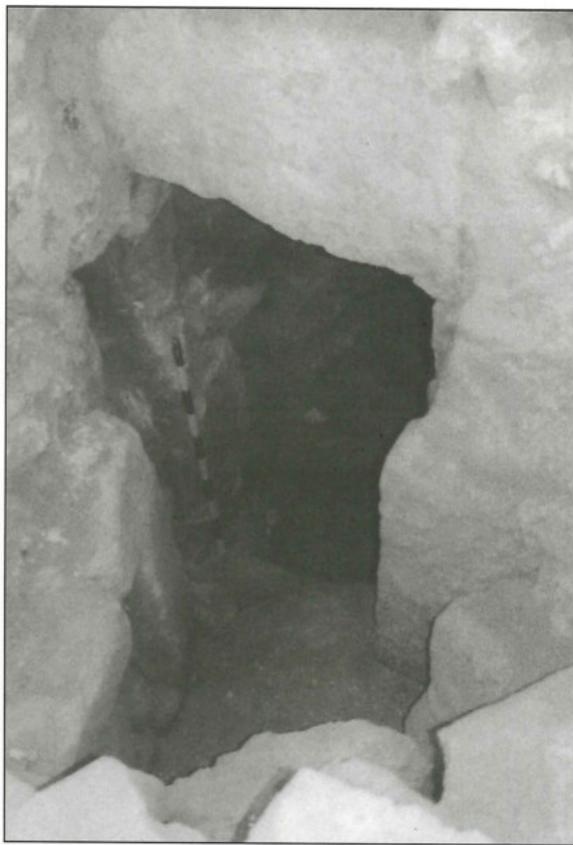


14. Alternating ash and fill layers in "chamber" area of G.25.

tained predominately Iron Age II pottery. In addition, the entrance to the so-called "chamber" did not begin at the bottom of the shaft and project down further below the "floor-level" of the shaft. Instead, it appeared in the center of the vertical wall of the shaft and bottomed out at its floor level. A blocking wall above the structure, proved both, difficult and too dangerous to remove in the attempt to ascertain what was above the fill material, and was left to be tackled at

some future date. Objects were found only in the "shaft" area and included metal pieces, beads, nails, and a coin. Seeds were also found, but only in this part of the structure, although bones were found in both sections.

Several attempts were made at locating the original entrance of the cave. Probe G.23 was successful in this respect, and also in locating 2 walls and arches (Fig. 15), one of which was fallen, within the probe. While these were drawn and measured, they were left unexcavated during this season. The original entrance to the cave (Fig. 16) was located ca. 2.5 m below the surface and was found to be bipartite in nature, entering both the middle level, where the above probes were made, as well as the upper level, the major feature of which was a barrel vault. Byzantine pottery was found on the threshold of the entrance making it apparent that both the entrance and the architecture of the middle level date to this time, though it continued to be used during later periods as well. An almost complete sugar pot was found on a higher level in the entrance way, together with Middle Islamic (Mamluk) sherds and a ram's horn (Fig. 17). The



16. Entrance to cave complex (looking E).

probe contained numerous artifacts including bangles, coins, nails, tesserae, a cosmetic (?)



15. Walls and arches in probe G.23.

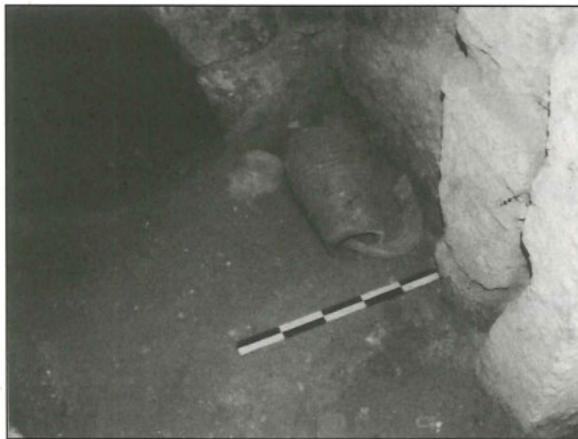
pallette, and glass fragments. Bones and seeds were also numerous.

### The Regional Survey

The purpose of this survey was to re-investigate part of the area of the earlier Heshbon survey, which was conducted between 1973-76 (Ibach 1987), using the current survey methodology developed by the Mādabā Plains Project. In order to do this, one hundred 200 x 200 m squares within a 5km radius of the site were randomly generated with the use of ARC/INFO GIS software by Gary Christopherson of the Advanced Resource Technology Group at the University of Arizona. These were superimposed on a Jordan 1:25,000 series Palestine Grid topographical map which employs 1000 m grid coordinates. Of these, 100 were randomly selected. The first 50 squares had been explored in the 1996 season, while the remaining 50 were examined between July 1 and 30, 1997. Although a number of new sites were found, in addition to the 20 sites located in 1996, these were left to be followed up in 1998. In addition, information was collected on trees in order to try to reconstruct where forests might have been located at various times in the history of the region.

### Deforestation Study

A grant from the National Geographic Society enabled the continuation of the field re-



17. Ceramic and faunal finds in cave entrance.

search begun in 1996 concerned with reconstructing the history of deforestation in the Ḥisbān Project Area. The study built on previous research on the historical environment of the Ḥisbān region by the Hesban Environmental Survey (LaBianca and Lacelle 1986). Methods used included an arboreal survey to ascertain the current and potential state of the forest; an archaeological survey (see above) to deepen understanding of long-term changes in settlement patterns and technologies for managing soil and water resources; geoarchaeological research in selected wadis to determine patterns of erosion and soil loss; and a re-examination of faunal data on hand from earlier excavations at Tall Ḥisbān to search for clues that might help fill out the picture regarding long-term environmental changes. The survey succeeded in establishing a link between episodes of food system intensification and abatement and cycles of environmental degeneration and regeneration in the project area (LaBianca 1998).

### Acknowledgments

The authors are indebted to Dr Ghazi Bisheh, then Director-General of the Department of Antiquities for the support that he provided for this season, including 10 laborers, payed by the department, for the restoration work. Thanks are also due to Taysir 'Atiyyat, our Department of Antiquities representative as well as other members of the Department of Antiquities who assisted us with various aspects of the excavation.

The staff was again housed at the Amman Training College thanks to Dr Fakhri Tumulieh, principal of the UNRWA-sponsored institution. Special appreciation also go to his staff, who extended to us every courtesy in making our stay comfortable. In addition, we would like to thank Yusef al Awawdah, the mayor of the town of Ḥisbān for his support, Mahfooth Abdul Hafiz, the teacher of the Ḥisbān school for his help with sign painting and Abū-Nūr, a local res-

ident for storage of on-site equipment, for catering our second-breakfast needs and for help with various logistical problems.

We would also like to extend our thanks to Dr Patricia Bikai and Dr Pierre Bikai as well as the staff of the American Center of Oriental Research (ACOR) for their support and the use of their facilities while we were in the field.

The excavation took place because of the financial assistance of Andrews University, our principal sponsor, and a grant from the National Geographic Society.

The staff of this season, much smaller than the normal Mādabā Plains Project's group, consisted of 30 archaeologists, students and volunteers and about 20 Jordanian specialists and workers. The director of the excavation was Øystein S. LaBianca, the chief archaeologist was Paul J. Ray Jr., and Gary Christopherson was in charge of the regional survey. Area supervisors included Phil Drey (C.3), Lael Caesar (D.7), Bill Fagal (probes G.22, 24 and 25) and Bob McDaniel (G.23).

The authors would like to thank Jennifer Groves and Phil Drey for their help with scanning and cleaning up the sherd drawings for the pottery plates, which were done on Adobe Photo Shop software.

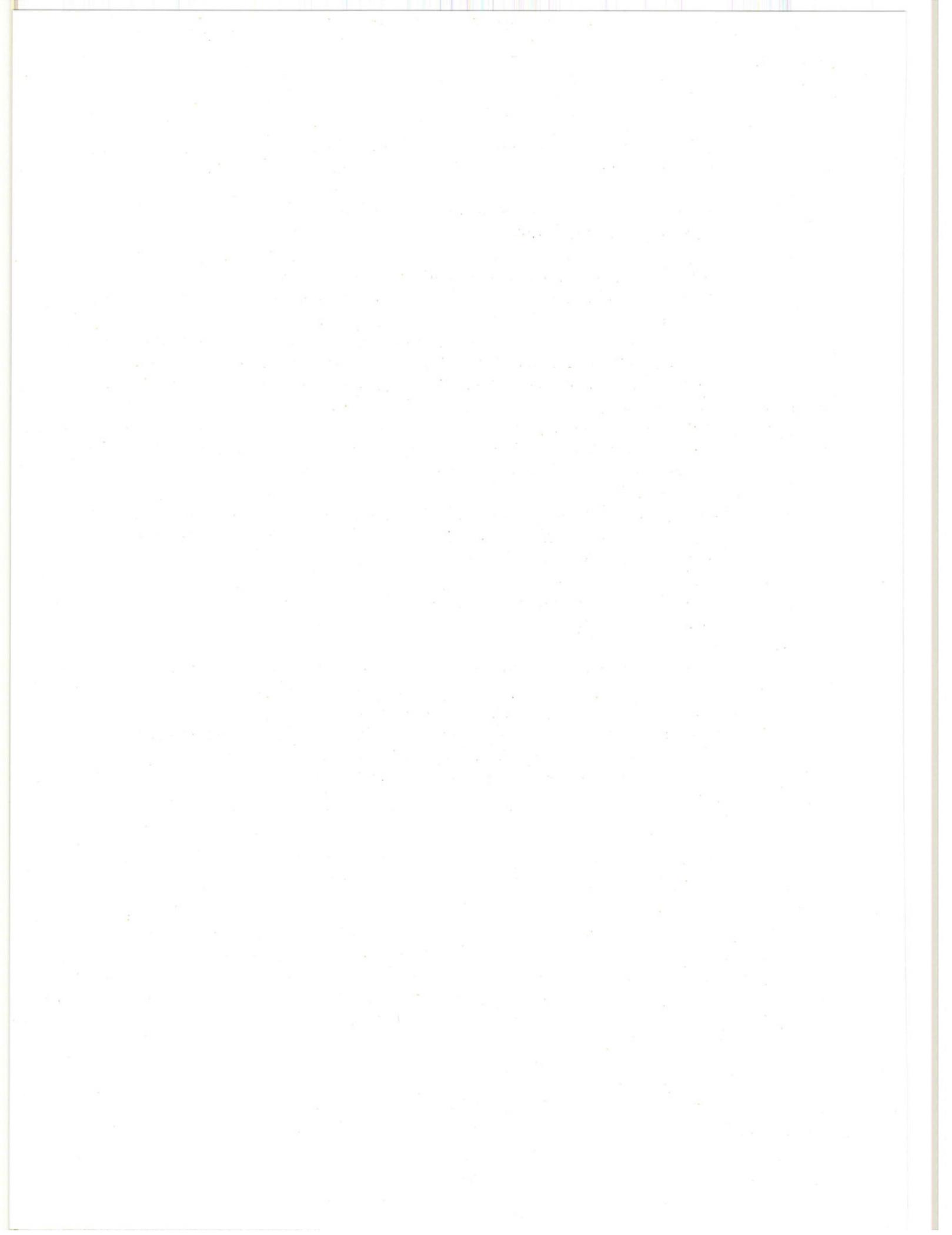
Besides the groups at Tall Ḥisbān and the regional survey, there was another group of about the same size at al-Azraq. This excavation developed out of the environmental survey begun in the 1996 season (Younker *et al.* 1997: 229-30). The group, which had their own camp and facilities, but which shared equipment and two specialists, was directed by Rick Watson and Doug Schnurrenberger of San Jaun College and will be reported on elsewhere.

Ø.S. LaBianca  
 P.J. Ray Jr.  
 Institute of Archaeology  
 and Department of  
 Behavioral Sciences  
 Andrews University  
 Berrien Springs, Michigan  
 USA

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# AL-KARAK RESOURCES PROJECT 1997: EXCAVATIONS AT KHIRBAT AL-MUḌAYBĪ'

by

Gerald L. Mattingly, John I. Lawlor, John D. Wineland, James H. Pace,  
Amy M. Bogaard and Michael P. Charles

## **Introduction** (J. Lawlor)

As a direct follow-up to the Miller-Pinkerton survey of the al-Karak Plateau (1978-1982) (Miller 1991), the al-Karak Resources Project began in 1995, with a selective, intensive surface survey and environmental study of the southern half of the al-Karak Plateau (Mattingly 1996; 1997). One goal of the pilot season was to select one of the 17 surveyed sites for excavation in future seasons. Khirbat al-Muḏaybi', located in the southeastern corner of the al-Karak Plateau—on the southeastern rim of the Fajj al-'Usaykir, was selected both because of its location and potential. This site's location on a trade route passing through Fajj al-'Usaykir between the "King's Highway" and the "Desert Highway," as well as its location in a transitional zone between the al-Karak Plateau and the desert, qualified it as an ideal site for examination of the region's environmental, historical, and cultural heritage. The site's well-preserved perimeter walls and striking architectural fragments, particularly several proto-aeolic capitals (Negueruela 1982), raised several questions, the answers to which could produce an increased understanding of the region's history and the ancient inhabitant's utilization of the region's natural resources. Who were those inhabitants? Would the site yield any significant data related to the origin of the Moabites (Mattingly 1992)?

As an extension of the project's overall agenda to research both the ancient and modern use of the natural resources of the region, the 1997 staff included a team of specialists, which devoted its energies to collecting a wide range of data that will provide a context in which the target site can be bet-

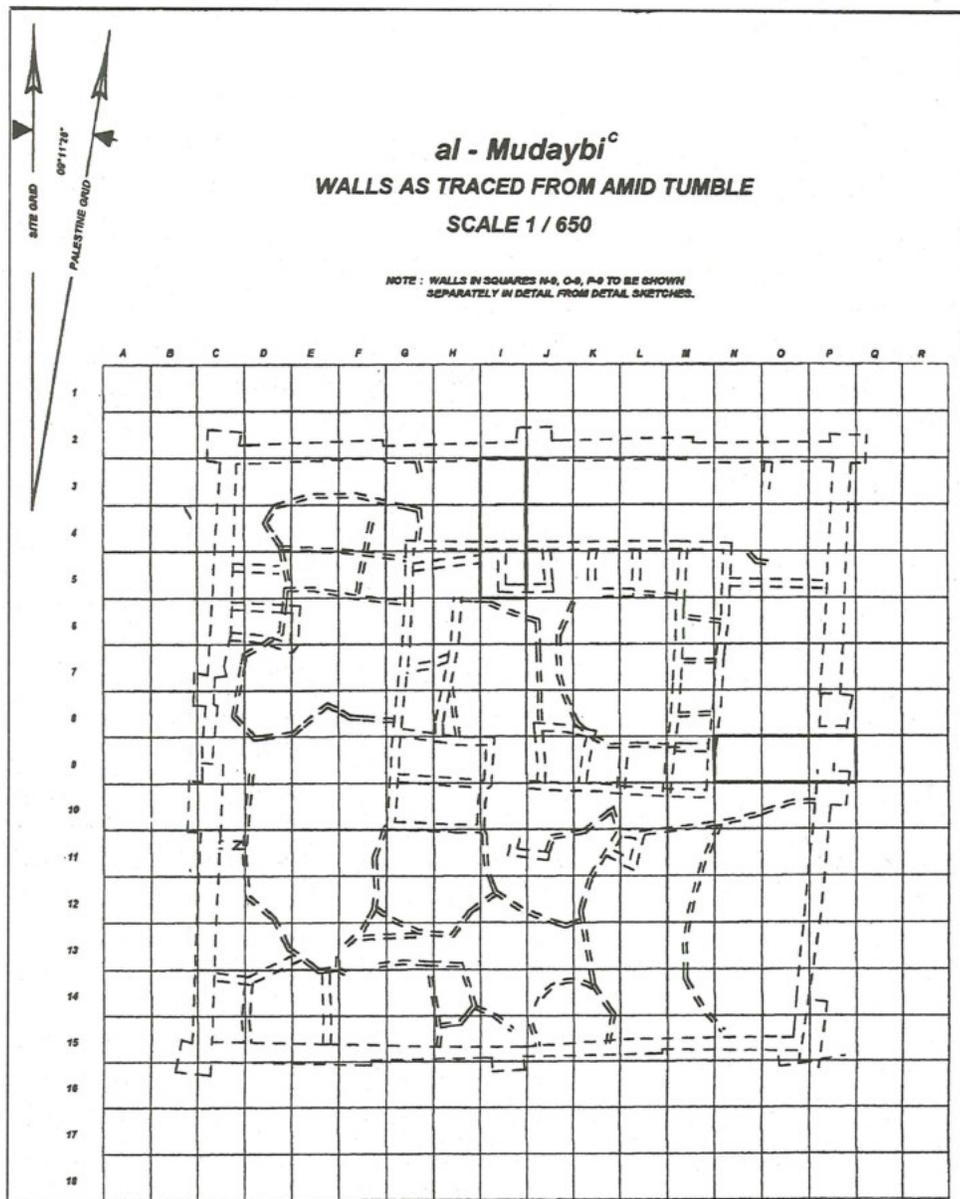
ter understood. Thirty-five individuals, representing 19 educational institutions, made up the 1997 staff. The present report focuses particularly on the 1997 excavation of Khirbat al-Muḏaybi'.

Based on his visits to the site, Glueck represents the perimeter walls as 80 m N-S x 82 m E-W and intersecting at 90° angles. His plan of the site shows four protruding corner towers, gates between paired towers on both east and west walls, and a protruding tower midway along both north and south walls (Glueck 1934). Among the priorities of the 1997 season was the plotting of the major walls at al-Muḏaybi'. The use of computerized technology demonstrated the exterior walls to be 83.5 m N-S x 88.75 m E-W (Fig. 1). Glueck dated the perimeter walls to the "Early Iron Age" and concluded that the interior acropolis walls were Nabataean in origin (Glueck 1934; 1939). Ceramic material retrieved from al-Muḏaybi' by Miller included Early and Late Bronze, Iron II, Hellenistic, Nabataean, Early and Late Roman, Early and Late Byzantine and Ayyubid/ Mamluk sherds (Miller 1991).

Another primary objective of the 1997 season was to clarify, stratigraphically, the founding dates of both the perimeter and acropolis walls. The ceramic data obtained from the 1997 field campaign indicates a seventh/sixth century BC date for the founding of the exterior wall; hopefully, subsequent excavations will more precisely date this structure.

## **Field A: The Northern Suburb** (J. Lawlor)

Extensive preliminary examination of the terrain of Khirbat al-Muḏaybi' in 1995 and



1. Plan of the Perimeter and Acropolis Walls of Khirbat al-Muḏaybi'.

1996, led to the placement of Field A midway along the north perimeter wall on its south side (i.e. "inside"). Three 5 x 5 m squares not only facilitated the goal of establishing a stratigraphic connection between the external and the acropolis walls but also accommodated excavation south of ("inside") the acropolis wall; both of these were high priorities for the initial season of excavation. Excavation between the site's two wall systems on the north side and inside (south of) the interior wall would potentially provide data about the history and occupation of the site that excavating the

gate complex on the east side (Field B) would not necessarily obtain. Was Khirbat al-Muḏaybi' founded merely as a military outpost to guard a major trade route? What population size was supported at the site? Did the nature of the site change throughout its occupational history? What kinds of correlation might exist between the "official"/ "royal" architecture which, based on preserved architectural fragments, apparently characterized the initial construction, and the nature of the community that initially inhabited the site?

The entire site was put under a 6 x 6 m

grid, with the three squares of Field A situated along the west side of the site's north-south axis – north of the east-west axis (see Fig. 1). The surface contour of the area selected for Field A suggested that a substantive amount of overburden, occupational and abandonment in nature, would be encountered. The 1997 excavation in Field A yielded evidence for five distinct occupational phases. They are reported here in the sequence in which they were historically laid down.

*Field Phase V (Byzantine: AD 325-640)*  
(Fig. 2)

The east-west oriented Wall 2 in Square I-4 represented Field Phase V in Field A.

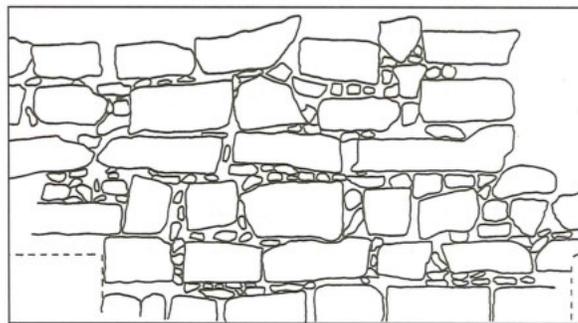


2. Plan of Field Phase V.

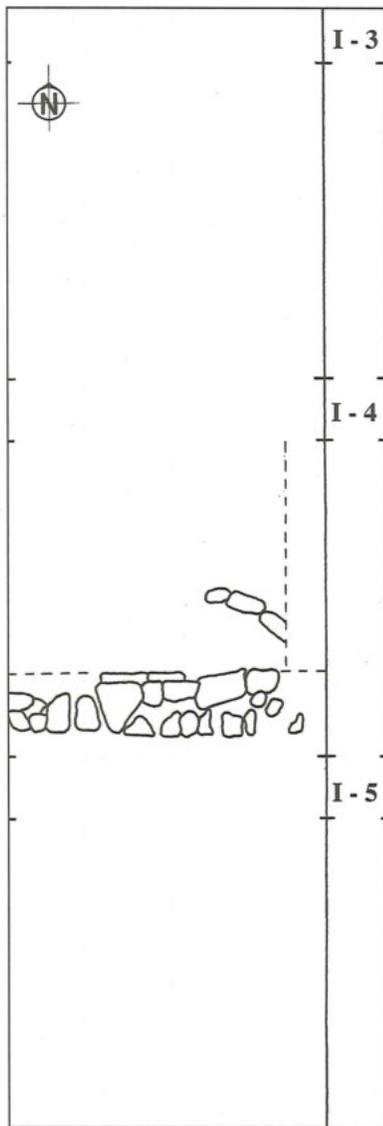
Wall 2 was a segment of the interior acropolis wall on the north side of Khirbat al-Muḍaybi'. Wall 2 was constructed on an 82° orientation, and ranged in width from 0.80 to 1.10 m. While there was some question about a possible Middle Islamic realignment of the upper three courses of Wall 2, the lower three excavated courses were preserved to a length of 5 m. The exposed height of Wall 2 was 2-2.20 m (six courses) (Fig. 3). Evidence that the wall originally stood several courses higher comes from Field Phase II, Earth Layer 5 of Square I-4, which contained extensive wall tumble from Wall 2. Based on the plan of the acropolis wall, Square N-9's Wall 1B (Field B) appeared to be the eastern counterpart of Square I-4's Wall 2 (see Fig. 1). Since the 1997 excavation did not expose the founding courses of Wall 2, the original date and level of construction cannot be determined yet.

*Field Phase IV (Early Islamic/Late Byzantine: AD 640-1100)* (Fig. 4)

Field Phase IV remains were limited to a series of surfaces which sealed against the north face of Wall 2 in Square I-4. These surfaces had their corollaries in Square I-3, immediately to the north of I-4. An ephemeral bin wall sat on the lower surface in the southeast quadrant of Square I-4. It was a one-row, one-course arrangement of three rectangular medium boulders set on edge in a slightly curved alignment. This installation's easternmost extent was not determined because a N-S subsidiary balk was maintained 0.70 m west of the square's east



3. North Elevation of Wall 2 in Square I-4.

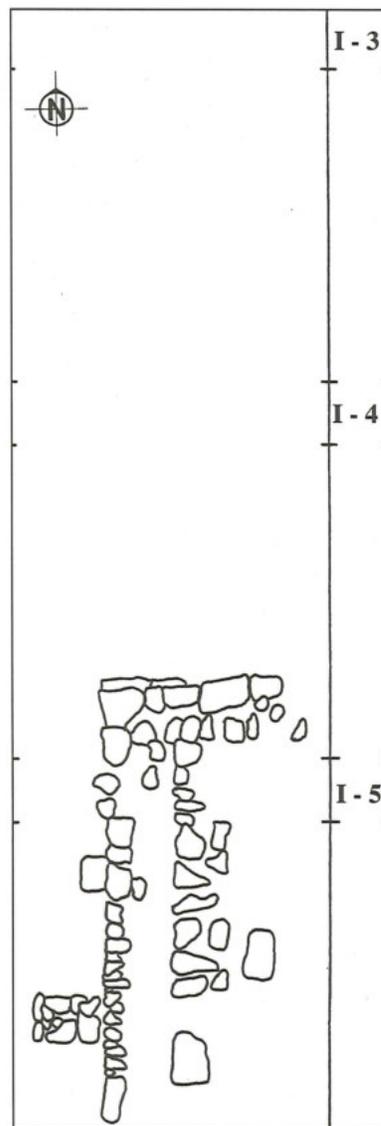


4. Plan of Field Phase IV.

balk. These surfaces covered an area which extended at least 6 m north of Wall 2. The upper surface, Surface 6, signaled the end of the Field Phase IV. A portion of Wall 2 collapsed onto this surface. On the basis of the ceramic remains, it dated to the Early Islamic/Late Byzantine period.

*Field Phase III (Middle Islamic: AD 1100-1500) (Fig. 5)*

Field Phase III was represented by significant coherent architecture in Squares I-4 and I-5. Subsequent to the collapse of the upper courses of Field Phase Wall 2 in I-4, which appears to have marked the end of Field Phase IV, construction of a series of



5. Plan of Field Phase III.

walls took place south of I-4's Wall 2 (i.e. "inside" the acropolis wall). A realignment of the west end of I-4's Wall 2 may have occurred in conjunction with that building activity.

Walls 3 and 4 in Square I-5 were laid side-by-side on a 352° orientation, and the north end of each abutted the south face of I-4's Wall 2; Wall 3 was situated to the east of Wall 4. This arrangement created "room-like" features to the west of Wall 4 as well as to the east of Wall 3 (Fig. 5). The westernmost wall, Wall 4, was exposed to a height ranging from 1-1.30 m (4-5 courses); its counterpart to the east, Wall 3, was exposed to a height ranging from 0.80-1.35 m

(4-5 courses). The foundations of neither wall were reached. Based on the present stratigraphic evidence, it is impossible to determine which wall was constructed first. No associated surfaces were identified for either wall. Although it was not definite, Wall 3 appeared to be joined, at its southern end, by an east-west oriented wall, Wall 5, which extended from the east face of Wall 3 into the eastern balk of the square.

Abutting the west face of Wall 4, 1.90 m south of the intersection of I-4's Wall 2 and I-5's Wall 4 was a well-built 0.60 (N-S) x 0.40 (E-W) m pedestal (Fig. 6). Its five exposed courses stood 1.10 m high. The function of this pedestal was not determined. Also abutting the west face of Wall 4, 4.10m south of its intersection with I-4's Wall 2, was east-west oriented (260°) Wall 8 (Fig. 6). Wall 8 extended 1.10 m west of Wall 4's west face and was 0.75 m (2-3 rows) wide. It was exposed to a height of 0.75 m (3-4 courses). No surfaces associated with this architecture were found.

Close examination of the north face of I-4's Wall 2, as well as its plan, suggested the possibility that it was altered to accommodate the plan of the architecture associated with its south face. The upper three courses of the easternmost 1.40 m of Wall 2 appeared to have been dismantled in order to create access through the wall to the



6. I-4, E-W Wall 2 corners with I-5, N-S Wall 4; Pedestal 7 and Wall 8 abut the west face of I-5, Wall 4; view toward the east.

structure to the south. The alignment of the western face of I-5's Wall 4 with the west end of the upper three courses of I-4's Wall 2 created a "cornering" of the two walls (Fig. 6). Small boulder tumble, found to be a part of I-5's Earth Layer 6, appeared to have created subsequent blockage of this "passageway."

Pedestal 11 abutted I-5's Wall 2, 1.70 m south of the intersection of I-4's Wall 2 and I-5's Wall 3 (Fig. 7). Its 2-3 courses stood to a height of 0.50 m. No surfaces were identified in the area east of I-5 Wall 3 and south of I-4 Wall 2.

Earth Layer 12 was a 0.04-0.10 m thick layer of black ash. It appeared to have at one time sealed against the south face of I-4's Wall 2, but because of the wall's upper courses "slumping" to the north, wind blown debris filled in a void between the wall's face and the ash remains. Sparse ceramic material (2/31) dated this ash to the Middle Islamic era also.

Seismic activity sometime subsequent to AD 640, appears to have caused the collapse of Wall 2 in Square I-4 onto the exposed surface of Earth Layer 6 of Field Phase IV. Amiran catalogues a total of 19 earthquakes for the Early Islamic period, 20 for the Middle Islamic period and 40 for the Late Islamic period (Amiran 1994: 266-277; see also Russell 1985: 46-49). The presence of Early, Middle and Late Islamic ceramic materi-



7. West face of I-5 Wall 3 with the exposed course of Pedestal 11; view toward the west.

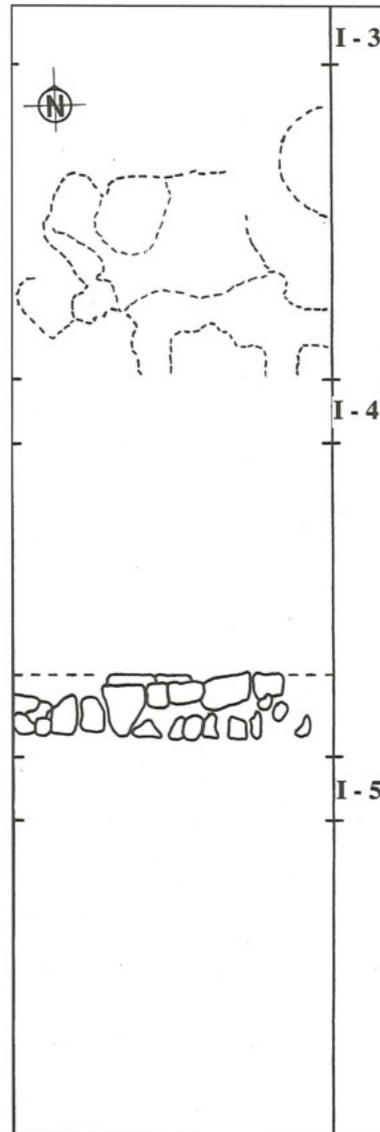
al in the matrix of the wall – collapse – with some Late Islamic deep in the layer – suggests that the Middle or Late Islamic periods are the more likely candidates for the time of the seismic activity responsible for the destruction. More specifically, Amiran’s catalogue shows three Middle Islamic earthquakes which had particularly devastating effects on the al-Karak region: AD 1212, 1293 and 1456/7. One of these Middle Islamic dates seems to correlate best with all the available data, including the Middle Islamic occupation as well as the later Late Islamic activity.

*Field Phase II (Late Islamic: AD 1500-1900) (Fig. 8)*

The Late Islamic period was represented in Field A by a series of debris layers in the respective squares, an ephemeral wall in Square I-4, and by a “plaster dump” in Square I-3. In Square I-3 Earth Locus 17, a 1 (E/W) x 2 (N/S) m, 0.17 m deep area of very pebbly material, mixed with grey ash contained pottery, bones, straw material, eggshell, charred barley, and wheat. The full exposure of this locus was not possible since it entered the square’s east balk, but its contents suggest that it was a camping site.

I-4’s Wall 3 was a three-course wall (1.21 m) which abutted the west end of I-4’s Wall 2 and ran into the square’s west balk. It was essentially a one-row wall, the south face of which was aligned with the south face of Wall 2 to the east. It appeared to re-establish the south face of the Field Phase V wall which had been realigned in Field Phase III.

Square I-4’s Earth Layer 5 was a 0.53-0.73 m deep mixture of large boulder tumble and earth which covered a 4 x 5 m area north of Wall 2. The large boulder material represented displaced components from Wall 2 from the time of its collapse. The ceramic material recovered from this earth layer clearly dated it to the Late Islamic period.



8. Plan of Field Phase II.

A series of seven plaster-like layers, located 5-8 m north of I-4’s Wall 2 appeared to have constituted a Late Islamic “plaster dump” in Square I-3 (Fig. 9). Some of these layers of plaster were separated by a thin lensing of earth – apparently wind blown material that accumulated between the deposition of the plaster layers. Although the size of the plastered area varied, the largest was 3.90 m (N-S) x 4.10 m (E-W). Situated in the southern four meters of Square I-3, it extended into the square’s southern balk. Evidence of the dump was also seen in the north balk of I-4, but no sustained plaster layers were found. The layers were extremely uneven and badly eroded. Not the



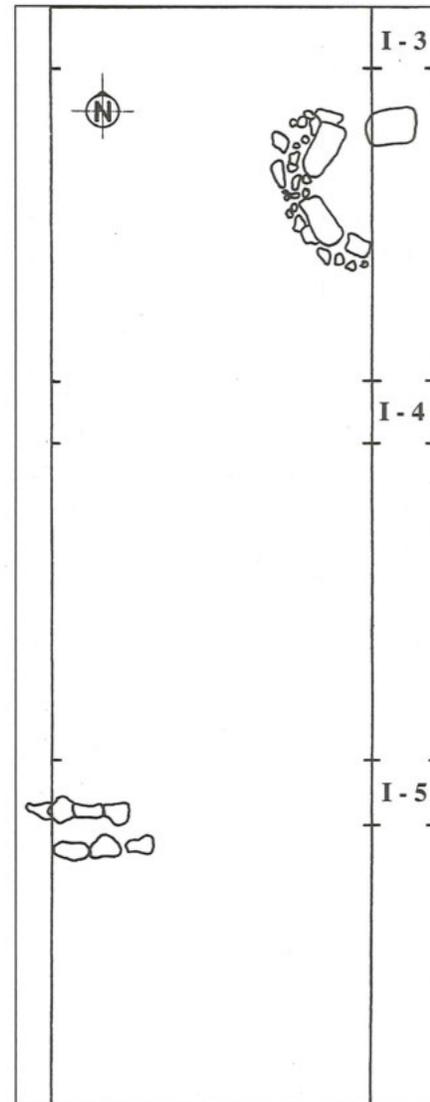
9. Superimposed plaster layers in Square I-3; view toward the east.

remains of a plaster floor, this accretion of plaster appeared to have been a place where either excess plaster was deposited or where plaster was mixed – perhaps for use in the facing of walls. No plaster-faced walls, however, were encountered anywhere in Field A.

*Field Phase I (Modern: AD 1900-present) (Fig. 10)*

Two features in Field A appeared to be the remains of modern bedouin activity on the north side of the site. Installation 4 in Square I-3 was a bin wall created by a semi-circular alignment of four large boulders, two of which were set on edge. The height of two of the boulders ranged between 0.90-1 m. This arrangement was supported at its base on the west side by buttressing of a few small boulders and cobble material. That the installation of this bin wall occurred subsequent to the accumulation of the Late Islamic plaster layers was apparent from the fact that both the boulders of the bin wall and the buttressing at its western base cut through the eastern edge of the plaster material.

In Square I-5, an ephemeral one-course, two-row wall was located in the extreme northwest corner of the square. Wall 2 was 1.65 m long and oriented at 256°. Made of medium sized boulders, it was 0.92 m wide and stood only 0.55 m high. Based on the



10. Plan of Field Phase I.

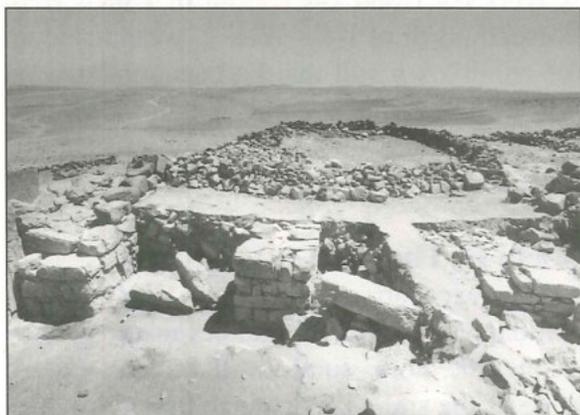
apparent alignment of surface boulders in the area, it appeared that this wall might have been part of a larger plan. Earth Layers I-3:1 and I-4:1, both of which were located north of I-4's Wall 2, were made up of windblown soil that had accumulated on the surface of the site throughout the twentieth century. These created the present exposure surface.

**Field B: The Gate (J. Wineland)**

Pre-excavation study of Khirbat al-Muḏaybi' revealed a gate complex midway along the north-south wall on the eastern side of the site. This gate complex provides a commanding view of the Fajj al-'Usaykir.

Also visible on the surface near this gate was a large proto-Aeolic capital and smaller capital fragments. Surveys by Glueck and Miller-Pinkerton noted these architectural features (Glueck 1934; Miller 1992). Negueruela studied the capitals and fragments and removed some soil so he could better draw and photograph them (Negueruela 1982). The al-Karak Resources Project re-examined this gate complex during its pilot season in 1995 (Mattingly 1996; 1997).

After reviewing the data mentioned above, it was determined that Field B should examine the eastern gate complex. Three 5 x 5 m squares would establish a stratigraphic connection between the inner "acropolis" wall and the eastern gate complex. The excavation team placed three squares along the east-west axis of the 6 x 6 site grid (Fig. 11). These squares roughly bisect the gate opening as it appeared on the surface. This type of placement will allow for further excavation in the gate complex if needed. The excavation season began with several questions in mind. What was the date of the construction of the gate complex? How long was the gate used? What led to its demise? What is the significance of the proto-Aeolic capitals at a seemingly remote site like Khirbat al-Muḏaybi? What was the date of the construction of the "acropolis" wall? What was the relationship, if any, of the inner "acropolis" wall to the outer walls and gate complex?



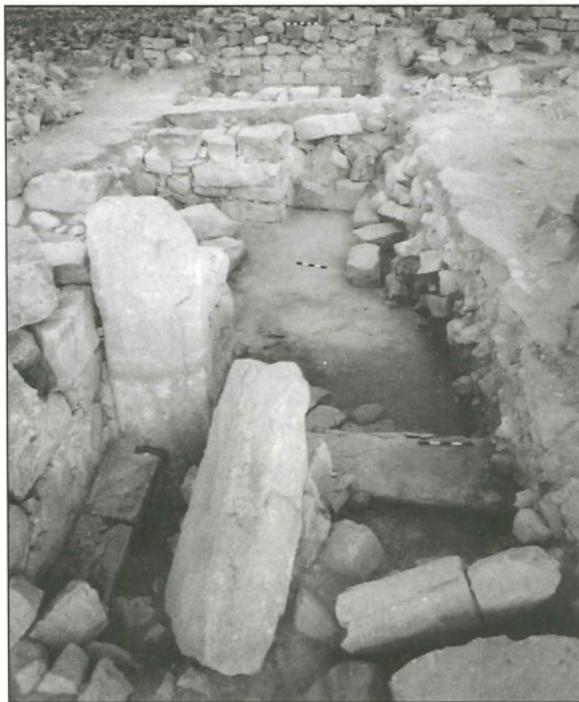
11. N-9, O-9, and P-9; view toward south.

A complete proto-Aeolic capital and proto-Aeolic capital fragments, large cut stones (possible lintels), a massive perimeter wall, a smaller "acropolis" wall, and remnants of modern sheep folds covered the surface of Field B at the beginning of excavation. Clearly these large architectural features would pose some concerns as excavation continued. Some architectural remains visible on the surface were moved during the early stages of excavation in order to facilitate safety and progress of excavation. Negueruela's earlier pitting activity complicated the excavation process. The excavation team worked carefully to determine the limits of his pitting activity in order to maintain stratigraphic control. The 1997 excavation yielded evidence for four distinct occupational phases. They are reported here in the sequence in which they were historically laid down.

#### *Field Phase IV* (Iron II: ca. 920-539 BC)

Field Phase IV can be subdivided into two distinct phases IVA and IVB. Several features relate to the Field Phase IVB in Field B. Architectural features of the gate complex were evident on the surface as well as in each of the three squares (P-9, O-9, N-9). Evidence indicates that this gate complex had a wooden beam superstructure with large limestone lintels spanning piers which supported the proto-Aeolic capital. It is possible that the roof of this gate complex was covered with reed and mud. This gate probably had four or possibly six chambers.

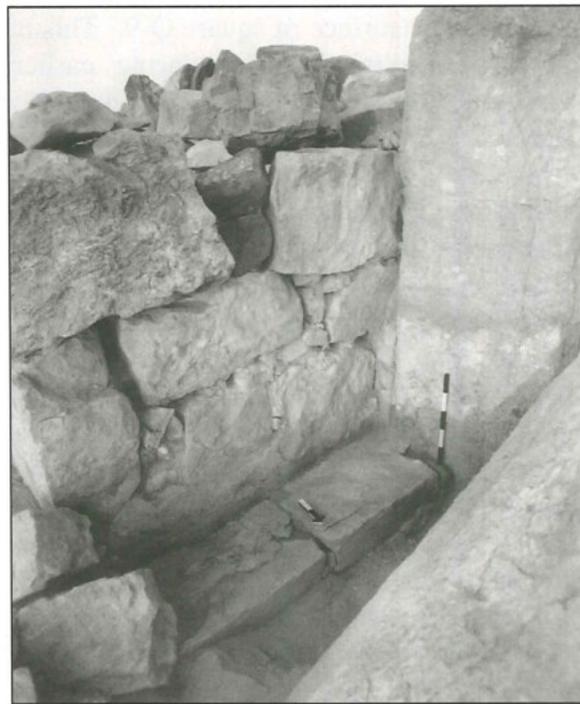
Square P-9 revealed the opening of the gate structure with a massive upright monolith (BP-9:001) still *in situ* adjacent to a large tower on the south side of the gate opening (Fig. 12). This monolithic pillar is composed of fossiliferous limestone and stands 2.88 m high. A similar monolith was found broken (BP-9:013 and BP-9:014) in square P-9 which presumably once stood next to the tower to the north of the gate opening. Excavation revealed that the gate



12. Overview of Eastern gate; view toward west.

had a hard limestone bench (BP-9:015) plastered into the corner formed by the tower and the upright monolith to the east of the gate opening. This bench measured 1.88 m long and 0.48 m wide. The location of this bench to the east (“outside”) the gate opening suggests that the gate complex may extend further to the east and include some type of defensive “entranceway” (Fig. 13). A large charred limestone threshold (BP-9:017) spans the gate opening in P-9. It is 0.88 m wide and it runs 2.5 m long from the upright monolith to the north balk. This threshold extends into the balk towards the north tower. Directly to the west of the threshold a section of several limestones and chert flagstones (BP-9:024) were found in situ. They covered an area of roughly 2 x 1 m. A hard packed earth surface (BP-9:025) extended to the east of the flagstones (Fig. 14).

This hard-packed surface extended into square 0-9 and abutted a pier wall (BO-9:005). This north-south pier wall measures 1.61 to 1.65 m in width and it stands 1.5 m above the beaten earth surface. It is of boulder



13. Plastered bench in P-9, view toward southwest.



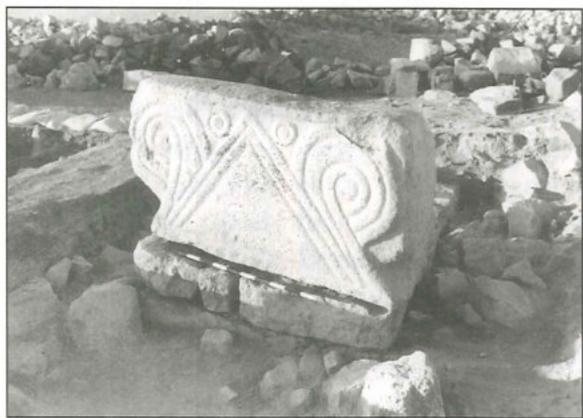
14. Overview of gate area with threshold and flagstones; view looking south.

and chink construction being composed primarily of limestone. The pier wall in O-9 measures 2.9 m in length and continues into the south balk. A similar pier wall (BN-9:010) was uncovered in square N-9 which measures 1.6-1.65 m in length and runs 3.45 m into the south balk. Both of these pier walls are oriented slightly west of north (170°). The similarity in construction and orientation indicates that these pier walls form the chambers of a four or possibly a six chambered gate.

A proto-Aeolic capital (BO-9:001) was

visible on the surface of square O-9. This is the same capital recorded during earlier work at Khirbat al-Muḏaybi' (Glueck 1934; Miller 1992; Negueruela 1982; Mattingly 1996, 1997) and mentioned in one comparative study of similar capitals (Shiloh 1979). This capital is 1.88 m long, 0.78-0.92 m in height, and 0.48-0.51 m thick. Two other proto-Aeolic capital fragments were found in square O-9. This capital and capital fragments were probably the same ones previously recorded by Negueruela (Negueruela 1982), however another intact proto-Aeolic capital (BN-9:009) was unearthed in square N-9. This proto-Aeolic capital was found *in situ* just to the north of the pier wall in square N-9 (Fig. 15). It measures 1.9 m in length, 0.95-1.0 m in height, and 0.48-0.52 m in thickness. The base measurements of this capital (1.65 m) matches the width of the pier wall (1.65 m) (Fig. 16). Its position at the time of discovery suggests that it once stood atop the pier wall. These capitals will be examined in more detail in a forthcoming article by Joel Drinkard.

Intact limestone monoliths and some fragmented pieces of monoliths were found during excavation. The position and design of these monoliths suggests that they served as lintels for the gate complex. A well preserved example was found on the surface of square O-9 (BO-9:002). It measures 3.05 m in length, 0.68-0.77 m in width, and 0.45-0.48 m in height. A second example of sim-



15. Proto-Aeolic capital; view toward southeast.



16. Proto-Aeolic capital *in situ*; view toward east.

ilar design and size extended from square O-9 into the western balk. Two monolithic fragments of similar design (BO-9:016) were found on top of the beaten earth surface in O-9 to the east of the pier wall.

Field Phase IVB was located immediately above the hard-beaten surface used in association with the gate complex. IVB was an extensive layer of burned and charred material. Four carbonized beams were found in square O-9; these beams have been identified as cypress. The carbonized remains of these beams measured 0.20 m in length and 0.15 m in diameter (Fig. 17). They were sampled for possible carbon-dating and dendrochronological studies. These carbonized beams were found in a layer of highly oxidized soil which extended throughout squares O-9 and P-9. A charred ram's horn was found within this layer of oxidized soil (BP-9:020) in square P-9. Also in square P-9, several aggregates of



17. Carbonized timber in O-9; view toward west.

baked earth with reed impressions were found. Samples of this material were taken for further study. They suggest that the earth was baked during the fire which destroyed the wooden beams.

The date of construction of the gate can not be determined at this time since the founding levels of the gate have not yet been excavated. However, the ceramic material found within the gate complex dates to the Iron II period. The design of the gate complex and the style of the proto-Aeolic capitals also strongly suggest an Iron II construction.

*Field Phase III (Period of Abandonment from Iron II to Late Byzantine Period)*

Above this layer of charred material and oxidized soil (Field Phase IVB) was an extensive layer of tumbled hewn and semi-hewn boulders in a matrix of wind-blown soil. There is no discernable pattern to the tumble of boulders. Pottery and other artifacts were extremely rare in this layer. In square O-9, for example 658 guffah-loads of soil yielded only nine sherds (with 1 diagnostic sherd) during the shifting process. These sherds were dated to the Late Byzantine/Early Islamic period. It appears from the size and arrangement of the tumble that this strata consists of tumbled stones deposited during or shortly after the fire in the gate area. The exact method of deposition is unclear. It is likely that the tumble was caused by seismic activity which occurred close to the time of the fire in the gate. The wind-blown soil accumulated subsequent to the rapid tumble. The sparse ceramic material in this tumble indicates that the gate area was abandoned from the Iron II period to the Late Byzantine/Early Islamic period.

*Field Phase II (Early Islamic/Late Byzantine: AD 640-1100)*

Field Phase II remains were limited to a secondary north-south wall (BP-9:004) in square P-9 and a larger north-south wall

(BN-9:001) in square N-9 which has two distinct building phases (1A and 1B). The secondary wall in P-9 blocked the opening of the gate complex. This was a hastily constructed rubble-filled wall composed primarily of limestone boulders with the remainder being basalt. This north-south wall was built on top of the tumble of Field Level IV and it abutted the large upright monolith of the gate structure and continued northward into the balk. Several pieces of a large Late Byzantine pithos were found in association with this wall, however, no foundation trench was evident.

In square N-9 a north-south wall, the so called "acropolis" wall, was examined. It is clear from the construction of the wall that it was built in two distinct phases (Fig. 18). In preparation for the initial construction (BN-9:001B) a foundation trench was cut into the tumble and debris of Field Level III. Wall BN-9:001B was constructed in level rows of almost rectangular blocks (50-75 cm) and was chinked mostly with pebbles and a few cobbles. Three courses of the wall are extant which reaches a height of 1.0-1.1 m. The founding course tends to be wider and less rectangular than the rest of the wall. The width of the wall could not be determined because it was in the west balk of N-9. The fill in the foundation trench of the wall contained only a few small body sherds so the construction can only be ten-



18. Wall in N-9 showing secondary rebuild; view toward west.

tatively dated to the Late Byzantine/Early Islamic period. The surface associated with the wall was difficult to detect and yielded no artifacts. It appears that this surface was outside the "structure" which incorporated wall BN-9:001B. There is no indication of the cause of the destruction/abandonment of this wall. The three remaining courses are intact. The surface associated with the next phase of the wall is level with the top of the three courses of wall BN-9:001B. This suggests that wall BN-9:001B was leveled in preparation for the next phase of the wall BN-9:001A.

The second phase of the wall BN-9:001A is constructed on top of BN-9:001B. This wall is composed of two-thirds limestone and the remainder being mostly basalt with a few pieces of chert. The wall is of irregular construction and it utilizes irregular rather than rectangular blocks. This suggests that the wall was constructed with stones that were most readily available. Large stones are used in the founding courses but since the stones are of irregular size the wall becomes more uneven with each course. The wall extends for three courses with part of an uneven fourth course apparent. No mortar was used in the construction of the wall. A reddish-yellow (5YR6/6) material was found in the upper courses which Negueruela interpreted as clay mortar (Negueruela 1982). John Foss, soil scientist, confirmed in the field that this was soil (loam to silt loam) and not mortar.

A surface associated with the wall BN-9:001A had a few small sherds dating to the Late Byzantine/Early Islamic period. Two pits were found in association with this surface. The fill of pit BN-9:007 during flotation yielded a few lentils and barley grains. While pit BN-9:007 was filled with an ash layer of multiple fires and flotation of the contents yielded shrubby, twiggy wood, some barley grains, wheat, chaff, lentils, and a date stone. This ash was apparently the accumulation of several campfires

which utilized the wall as a windbreak. On top of the ash layers were two stones used to buttress wall BN-9:001A once it began to slump. There is no evidence to indicate when or why the wall collapsed and went out of use.

It appears from the botanical remains, hearths, and basalt grinders found in this phase that limited domestic activity took place during this period. The material remains are consistent with domestic activities of campsites. The positioning of the hearths adjacent to existing walls on the east would have allowed the walls to block the prevailing western winds of the area.

#### *Field Phase I (Modern: AD 1900-present)*

The current usage of the site as an area for sheep folds suggests that the current surface exposure was created by similar activities which utilized the remaining walls as sheep folds. Fragments of basalt grinding stones found in the topsoil suggests some limited domestic activity in the area which would be consistent with pastoral campsites.

Negueruela, who examined the site in 1982, left a pit which was identified in square N-9 and O-9 (Negueruela 1982). The contents of this pit were removed as well as the dump material from his pitting activity found in square N-9.

#### **A Selection of Iron II/Early Persian Pottery from Fields A and B (J. Pace)**

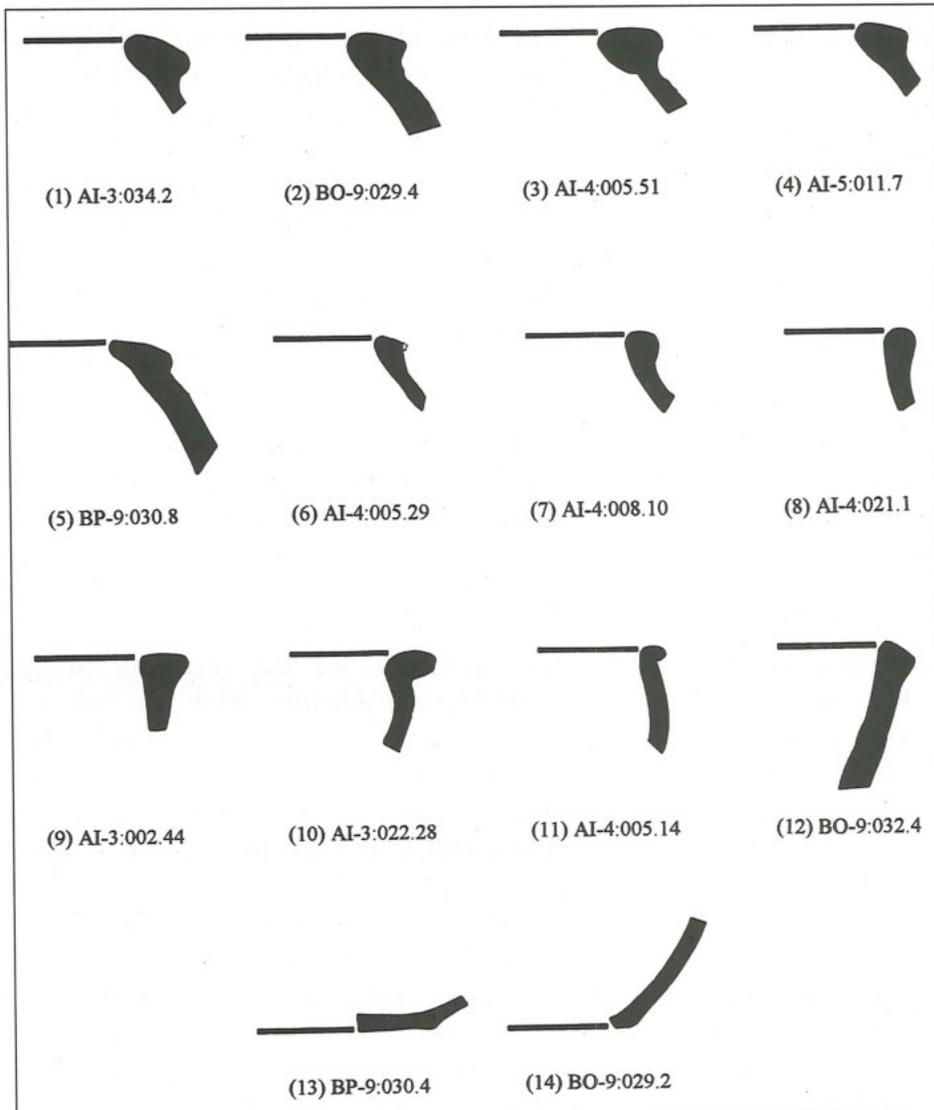
The two fields excavated in 1997 yielded a total of 7533 sherds, 1189 of which were diagnostic pieces. The vast majority of these diagnostic sherds, 1102 out of a total of 6388 sherds, came from Field A, inside the north wall. Only 87 diagnostics from a total of 1145 sherds were found in Field B. This is logical expectation considering that this was the gateway, which as a thoroughfare would necessarily contain less debris. No whole vessels were found, and none could be reconstructed. Information about

al-Mudaybi' provided by the initial season's pottery was therefore limited to establishing preliminary dates for field phases.

The pottery of all three squares of Field A was mixed and represented all periods from Iron II through Late Islamic. Only I-5 indicated any substantial evidence of occupation for any extended length of time, and the pottery was so mixed that nothing certain about dates of habitation can be concluded. The sherds of I-3 and I-4 were embedded in rock tumble and wind-blown loess that covered the surface between the acropolis and the northern wall. Hearths and bins in these two squares indicate sporadic, rather than long-term occupation. The plas-

ter-like layers in I-3 contained Late Islamic pottery. The stone tumble of Wall 2 in I-4 sealed a deposit containing Byzantine and Early Islamic sherds.

Most of the sherds from Field A represented the typical Middle Islamic painted ware found throughout Transjordan and were decorated with geometric designs in monochrome black or bichrome red and black (Brown 1991: 234; 278-79, Nos. 464-75). Several Iron II rims from Field A add to the growing corpus of pottery from that period on the al-Karak plateau. Most of these were thickened inverted rims of kraters or large storage jars (Fig. 19: 1-5). However, there were examples of smaller



19. Late Iron II/Early Persian sherds from al-Mudaybi'.

jars, jugs, and bowls (Fig. 19: 6-14). Of particular note is the bowl with the everted rim and grooved sidewall (Fig. 19: 10) attributed to the Late Iron II-Persian period of Tall al-'Umayrī (Herr 1997:245; 37, Fig. 3.16:15-16).

While the pottery of Field B was much sparser than that of Field A, there was a clearer delineation between the mixed Byzantine through Late Islamic pottery of the upper layer and the distinctly Iron II sherds beneath the debris of the destroyed gate. Most remarkable were the painted body sherds found in O-9, which were decorated with horizontal bands of red, white, and black. This is a pattern which is becoming increasingly familiar in central and southern Transjordan. Albright (1924: 11) first identified it as "Moabite" when he collected numerous pieces of it at al-Karak in 1924. Glueck observed the same design at Khirbat al-Mdaynah (Mdeinet al Mu'rrajeh), Qaṣr Saliyeh, Qaṣr Za'feran I, Khirbat al-Bālū', Khirbat al-Jemeil, and Zobayir al-Qaṣṭal (Glueck 1934: 14-22, Pls. 22-23). Since then, examples have been found on the al-Karak plateau at Mihna (Brown 1991: 260; 275, No. 280), Khirbat al-Bālū' (Brown 1991: 260; 275, No. 281; Worshech 1990: 82, Fig. 25:56-59), ad-Dayr (Brown 1991: 260, 275, Nos. 282-84), ath-Thaniyyah (Brown 1991: 20; 275, No. 285), Rujm al-Hleileh (Brown 1991: 260; 275, Nos. 280-87), Qaṣr Saliyeh (Parker 1986: 189, Nos. 152-54), and Khirbat ath-Thamāyil (Routledge 1995: 138, 10:14). The same decorative pattern has been found to the north of the al-Karak plateau, at Ḥisbān (Lugenbeal and Sauer 1972: Plate IV: 244) and al-'Umayrī (Herr 1989: 323, Fig. 19.6:17-8; 335, Fig. 19.12:25; 337, Fig. 19.13:10; 339, Fig. 19.14:12). Examples of this pattern come from south of the al-Karak plateau at Ṭawilān (Hart 1995:53) and Buseira (Blenkowski 1992: 7). A parallel from Tall as-Sa'idiyya attests to its presence in the Jordan Valley (Pritchard 1985, Fig. 5:1). It seems

clear, therefore, that descriptive terminology linking this style of decoration to a particular ethnic group such as Ammonites, Moabites, or Edomites is misleading and should be abandoned.

Two interesting Iron II bases were found in the gate. One is a thin, flat juglet base from P-9 (Fig. 19:13); the other is a similar small bowl or juglet base found in O-9 (Fig. 19:14). This sort of flat base is unusual and may represent a local tradition.

In short, a preliminary analysis of the pottery recovered from the six squares opened at al-Muḍaybi' indicates that the first season did not make a major contribution to the study of pottery in Transjordan. The Iron II sherds indicate strong similarity with those of the same period which have been uncovered to the north and south of the al-Karak plateau. The fragmentary condition of the sherds and mixed nature of the deposits excavated in the initial season limit what can be said at this time. More definite conclusions must await the discovery of whole forms or larger diagnostics in the sealed strata anticipated in the excavation of the 1999 season.

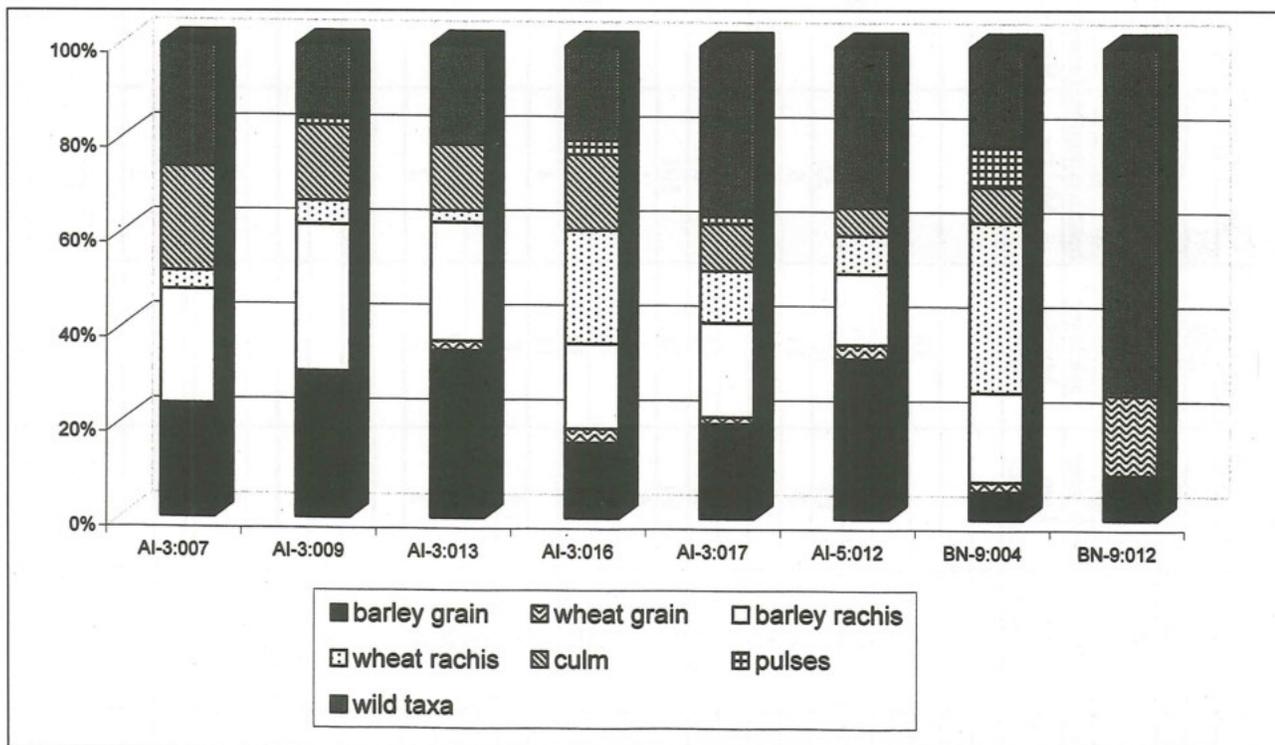
#### **Addendum: Summary of Archaeobotanical Work at al-Muḍaybi'** (Tables 1 and 2) (Amy Bogaard and Michael Charles)

In 1997, 18 soil samples from well-stratified contexts were processed by machine flotation for the recovery of archaeobotanical remains. Flotation was carried out by John Meadows. All of the flots (floating material from each soil sample) were subsequently scanned and the richest eight samples selected for analysis. These eight samples were estimated to contain at least 50 identifiable seed/chaff items. So far the coarse (>1mm) flots of these samples have been sorted (after subsampling in two cases) using a low power (x7-40) stereoscopic incident microscope and the crop material has been fully identified. The fine

Table 1. Composition of the eight rich samples (coarse fractions only).

Sub-sampling of coarse fraction	AI-3-007	AI-3-009	AI-3-013	AI-3-016	AI-3-017	AI-5-012	BN-9-004	BN-9-012
Total items (excluding dung)	350	151	214	330	553	25%		
Soil volume (litres)	48	40	40	40	20	762	595	44
Density of items per litre	7	4	5	33	28	68	32	40
Context type	midden Middle Islamic	midden Middle Islamic	(undefined) Middle Islamic	(undefined) Late Islamic?	ash layer Late Islamic?	ash layer Middle Islamic	hearth/campfire Middle Islamic?	(undefined) Byzantine
Date								
<b>Cereal grain</b>								
Hulled Hordeum sativum, straight	5		3	5		16		
Hulled H. sativum, twisted	1							
Hulled H. sativum indet.	63	21	60	50	102	146	8	2
H. sativum indet.	13	26	15		10	101	32	2
T. durum/aestivum	1		2	6	3	11	5	
Cereal indet grain				1		2	3	2
<b>Cereal chaff</b>								
Hulled Hordeum sativum var. distichum rachis	24	22	19	25	46	56	9	
Hulled H. sativum indet. rachis	53	20	23	23	60	55	101	
Basal Hordeum rachis	9	5	12	12	5	4	4	
Triticum durum rachis	14	2	6	47	50	36	206	
T. aestivum rachis		6		17	10	11	6	
T. durum/aestivum rachis				8		11	4	
Basal Triticum rachis				5	3	8		
Basal cereal rachis				4	4	5		
Culm nodes	67	19	26	42	53	37	44	
Culm bases	9	6	3	11	2	2	2	
<b>Pulses</b>								
Lens culinaris						1	36	5
Vicia ervilia				5			1	
Vicia cf. faba								1
Pisum cf. sativum								1
Large legume indet.		1		1	3	2	9	
<b>Other</b>								
Phoenix dactylifera	1						1	
Vitis vinifera	1						1	
Prosopis cf. farcta						2		
Seeds of other wild taxa	89	23	45	68	202	256	123	31
Wood charcoal (x=present, xx=abundant)	x	x	x	x	x	x	xx	x
Total dung volume (millilitres)			2.5	2	2	18		

**Table 2.** Percentage composition of the eight rich samples (coarse fractions only).



fractions (>300 um) have not yet been sorted, and the identification of seeds of wild taxa has yet to be completed.

All of the plant material identified so far was preserved by charring and is generally in good condition. With the exception of one (relatively poor) Byzantine sample, the samples analyzed date to the Middle-Late Islamic periods and are dominated by the remains of two free-threshing cereal crops – hulled barley (*Hordeum sativum*) and free-threshing wheat (*Triticum durum/aestivum*). In most samples barley is more abundant than wheat.

The barley material consists of grain and rachis and appears to be mainly or entirely the two-rowed form (*Hordeum sativum* var. *distichon*). Free-threshing wheat grains are not identifiable to species but the morphology of the rachis internodes indicates that both macaroni wheat (*Triticum durum*) and bread wheat (*Triticum aestivum*) are present. A high ratio of wheat rachis to grain suggests that this crop has been processed and some grain removed, whereas the barley rachis to grain occur in an approximately equal ratio

(as in two-rowed barley ears) and may be largely unprocessed. In any case, the different proportions of grain and chaff for the two crops suggest that they were processed – and grown – separately. The mixing of the two crops in the samples must, therefore, have taken place after processing.

Pulse seeds, mainly lentil (*Lens culinaris*) and bitter vetch (*Vicia ervilia*), generally occur in small numbers. Other crops identified in the samples include date (*Phoenix dactylifera*) and cultivated grape (*Vitis vinifera*). Charred sheep/goat pellets and dung fragments were also observed in some samples.

Little archaeobotanical work has been carried out at contemporary sites in the region or elsewhere in the Near East (Miller 1991). Thus, the discovery of significant quantities of well-preserved plant remains from al-Mudaybi' are very promising for study of plant use at this time. In both the relative abundance of free-threshing cereal material (particularly hulled barley) and the 'mixed' nature of the samples, the al-Mudaybi' material is similar to that from

the two other Roman-Islamic sites in the al-Karak region where archaeobotanical studies have been carried out – Khirbat Fāris (Hoppe 1998) and al-Lajjun (Crawford 1987). The degree to which this reflects uniformity in arable agriculture through time and space in the al-Karak region remains to be determined. At both of the other sites, dung fuel has been noted as a possible source of at least some of the charred remains though, interestingly, for rather different reasons. If dung is the primary source of archaeobotanical material at any of the sites, the material will reflect animal feeding regimes more directly than overall trends in agricultural production. Further work on the archaeobotanical remains and the present-day al-Muḍaybi‘ area is planned to address this issue.

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G.L. Mattingly  
 J.I. Lawlor  
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 A.M. Bogaard  
 M.P. Charles

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# GRINDING IMPLEMENTS AND MATERIAL FOUND AT TALL DAYR 'ALLA, JORDAN: THEIR PLACE AND ROLE IN ARCHAEOLOGICAL RESEARCH

by

Lucas P. Petit

## Introduction

Until recent days, grinding stones have been one of the essential components of the Levantine household equipment. Their importance has long been archaeologically neglected, in spite of the fact that in almost every site from the Upper-Palaeolithic onwards these stone tools can be found. Several archaeologists have noticed the need for further research concerning this artefact, but only a few have tried to remedy this neglect, most of them in relation to plant-domestication processes and the development of agriculture (Solecki 1969; Kraybill 1977; Hersh 1981; Wright 1992a).

There are numerous reasons for this omission. In the beginning of the century, artefacts were mainly used for sequence dating. Unfortunately, unlike pottery, grinding stones are not time and place-specific, and they are difficult to date typologically (Ben-Tor and Portugali 1987:237-238). The lack of typological change, probably due to long periods of use and a clearly defined functional shape, gave grinding stones a poor place in archaeological studies. Another problem concerning the grinding stones is the limited knowledge of geology and mineralogy among archaeologists: a complete study in grinding stones has to include a good archaeological background as well as an up-to-date regional geological base. A third reason is the confusing list of different and erroneously used nomenclature for this artefact (Hole, Flannery and Neely 1969; Carter 1977:694-695; Kraybill 1977:487-488). Many names and definitions, when given, are multi-variable and/or functionally incorrect. A last reason has to do with the context, where the stones are found. It is rare

to find grinding stones in primary context, *in situ*, and they are therefore, not an easy means for the reconstruction of the society.

Surprisingly, this lack of interest occurs at a time when archaeology has become more of a social science, stressing the significance of human activity. This article intends to present a study of grinding stone artefacts from the Late Bronze and Iron Age contexts found at Tall Dayr 'Alla, in order to demonstrate its significant contribution to archaeological research.

## Methodology

### *a) Research Objectives*

Tall Dayr 'Alla is located on the eastern part of the Jordan Valley, near the entrance of the Wādī az-Zarqa' into the Jordan Valley. From 1960 onwards several excavations have been carried out on the tall, at first directed by H.J. Franken (Franken 1969; 1992) and succeeded by G. van der Kooij, both from the University of Leiden (The Netherlands) and M. Ibrahim, succeeded by Z. Kafafi from Yarmouk University, Irbid in Jordan (Kooij and Ibrahim 1989). One of the main goals is to provide a detailed stratigraphic sequence of the tall, correlating social behaviour of the inhabitants. Such a detailed investigation makes it possible to deal with spatial analysis and the connection with production, diffusion and use of artefacts.

This study does not aim at analysing typological changes within time, or frequencies within a particular period (see however Hovers 1996:171-172), but is rather a case-study, dealing with a large number of grinding stones from one place and of a short period (see however Wright 1992a:43-

44). The clarification of the relationship between the tools - the grinding stones - and the inhabitant - the users - is the main purpose of this report.

*b) Terminology*

Typologies, descriptions and analysis, concerning ground stones are usually technological (Wright 1992a:4). Because this study is dealing with function rather than with form and the phases to provide this form, the term grinding stones is more useful in this report. Grinding stones are defined as: every human-worked stone (=artefact) used for grinding (=an activity performed by using two objects).

Several authors have already noticed the wide range of terminology, sometimes even false (see introduction). This wide range of terms reflects the function-related analyses. Ethnographical as well as experimental and archaeological sources (Wright *et al.* in press:2) have pointed out that most of the stones are multi-functional (in contrast to Kraybill 1977:Table1; Hovers 1996:173), which makes classification rather difficult but not impossible. The attempt to avoid a functional typology (Wright *et al.* in press:2) is an option, but complicates analysis of the social aspect of the settlement or region.

In the case of Tall Dayr 'Alla, four basic categories in the grinding tools assemblage can be distinguished, namely the upper and lower grinding stones, as well as the mortar and pestle (Table 1).

**Typology**

Multi-functionality can also be seen in morphological characteristics: a continuity in shape from one type to the other.

The difference between an upper and lower grinding stone is sometimes hard to see, often because of the fragmentary condition of the artefact. Apart from size, one has to look at the modification of the face opposite the working surface. A rough surface makes it impossible to serve easily as upper stone - because of the uncomfortable grip - well as a lower part where the rough surface prevents slipping away (Hovers 1996:173). The curve of the working surface as well as the section are characteristic elements.

Moreover, the distinction between a basin-like lower grinding stone and a mortar are the wear data. A mortar shows round grooves, while the lower grinding stone has in general parallel grooves. Although the ratio between depth and diameter differs between the two types (Hovers 1996:174), the terminology in relation to the mobile parts is generally based upon function and not on morphological grounds. The same difficulties of distinction may arise with a small upper grinding stone and a big pestle. A multi-functional analysis is possible, but this is only made clear by wear patterns. In addition, experiments of handling give indications of the function.

This study presents a typology based on functional, rather than on morphological or material variables (Table 2). Most of the

**Table 1.** Definitions, concerning the four different grinding stone types. The terms mobile and immobile are limited to the period of use.

<p><i>Upper grinding stone</i> = a mobile implement, characterised by one or more grinding surface(s), with which material can be ground on a lower grinding stone;</p> <p><i>Lower grinding stone</i> = a immobile implement, characterised by a rough lower surface and one or two grinding surface(s), on which material can be ground with an upper grinding stone;</p> <p><i>Pestle</i> = a mobile implement, which can be used with one hand to ground material inside a mortar;</p> <p><i>Mortar</i> = a immobile implement, characterised by a smaller or deeper hollow in which material can be ground (pounding and grinding movements) with a pestle;</p>
--

main types are thus divided on the basis of the used stones, the application and the period of use being of great importance. In all of the examples, an artefact is placed with the most-heavily used surface either facing up towards the observer (type 2 and type 4) or facing directly toward the observer (type 1 and type 3). By the description of each type, a general idea about the morphology, production and function is given, based on the comparison of archaeological features with ethnographical ones. Then, the material of Tall Dayr 'Alla is presented (all the grind-

ing stones from the excavation seasons 1984, 1987, 1994 and 1996), and finally reference material from a few other sites in the Southern Levant.

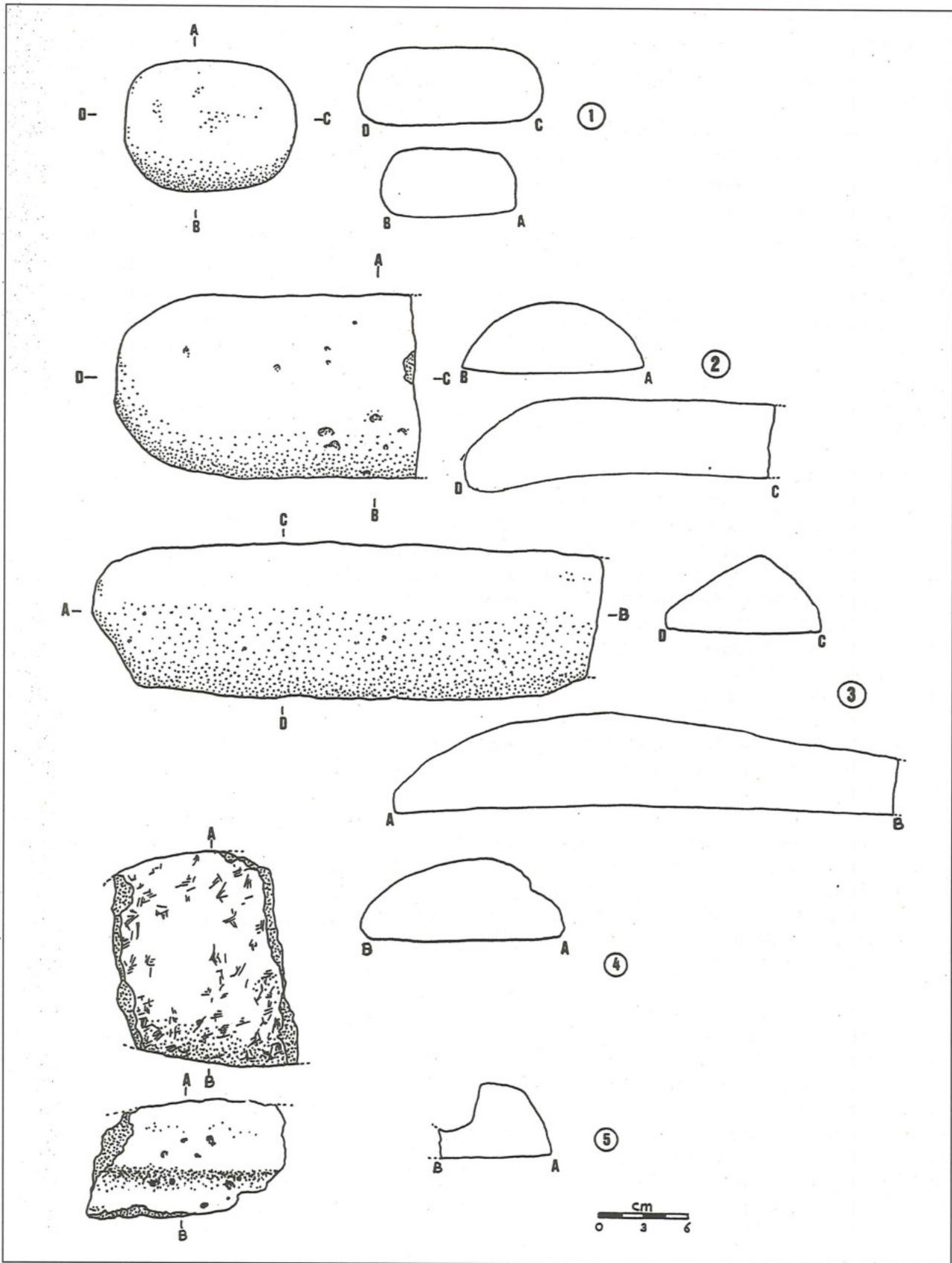
### Type 1: Upper Grinding Stones

#### Type 1a (Fig. 1:1)

This upper grinding stone is small and can be used with only one hand (Morris 1990). These characteristics are not only obtained from their morphology, but also from the wear pattern, which shows the specific

Table 2. Types, numerics and statistics.

Type	N	%
Upper grinding stones		
1a. One-handed upper grinding stone;	22	10.1
1b1. Two handed upper grinding stone with symmetric cross section;	27	12.4
1b2. Two handed upper grinding stone with asymmetric cross section;	57	26.2
1c1. Upper grinding stone as part of an installation- egg-shaped;	3	1.4
1c2. Upper grinding stone as part of an installation- round;	0	0
1d. Irregular upper grinding stone;	0	0
1e. fragments of upper grinding stone;	8	3.7
Lower grinding stones		
2a. Flat lower grinding stone;	12	5.5
2b. Sloping lower grinding stone;	15	6.9
2c. Lower grinding stone as part of an installation- round;	0	0
2d. Irregular lower grinding stone;	0	0
2e. fragment of lower grinding stone;	7	3.2
Pestles		
3a. Pestle: height is longer than width and length;	13	6.0
3b. Pestle: height = length = width;	13	6.0
3c. Pestle: length>width, height = length;	4	1.8
3d. Pestle: length=width, height is smaller than length;	6	2.8
3e. Irregular pestle;	1	0.5
3f. Fragment of pestle;	1	0.5
Mortars		
4a1. Tripod mortar;	12	5.5
4a2. Mortar with four legs	0	0
4b. Mortar with a ring base;	5	2.3
4c. Mortar with a footed base;	1	0.5
4d. Mortar with a flat base;	5	2.3
4e. Mortar with a round base;	0	0
4f. Mortar with a concave base;	0	0
4g. Irregular mortar/basin ;	2	0.9
4h. Bedrock mortar;	0	0
4i. Fragment of mortar;	4	1.8
<b>TOTAL</b>	<b>218</b>	<b>100</b>



1. Upper grinding stones (1=Type 1a; 2= Type 1b1; 3= Type 1b2; 4= Type 1b2; 5= Type 1c1).

movements, made by one hand (see paragraph Function).

In Dayr 'Alla, this type is most often made of local sandstone (77%). The length ranges between 95 and 153 mm, the width between 55 and 94 mm and the thickness between 30 and 63mm. One of the characteristics which is generally well preserved is the width (in the Dayr 'Alla collection no type 1a grinding stones wider than 94 mm were found). The weight varies between 0.39 and 1.48 kg. (c.f. Yadin and Geva 1986:Fig. 38.6; Hovers 1996:Fig. 29.1-2; James and McGovern 1993:Fig. 125:2-5,7).

*Type 1b1* (Fig. 1:2)

This upper grinding stone has a symmetric cross section in contrast with type 1b2. In Dayr 'Alla, the producer had used coarse grained sedimentary rock, as well as vesicular basalt. The stone is too big to use with one hand, and because of its weight and the possibility of using large pressure, the stone gets sharp edges instead of round edges. The weight, the pressure, the size of the working surface and the chosen raw material are all determinants of the productivity (Wright 1992a:72). Beside this productivity, it might say something about the function for grinding coarse hard dehusking grain (like emmercorn).

In Dayr 'Alla, this type is made of local sandstone (70.4%), travertine (3.7%) and basalt (25.9%). The length ranges between 195 and 305 mm, the width varies between 93 and 204 mm and the thickness between 34 and 114 mm. The weight varies between 1.91 and 10.50 kg. (c.f. Yadin and Geva 1986:Fig. 39.9; Chambon 1984: Pl. 77.18; Hovers 1996:Fig. 29:4; James and McGovern 1993:Fig. 126-7).

*Type 1b2* (Fig. 1:3-4)

This upper grinding stone has an asymmetric cross section and sharp edges, caused by grinding with two hands (see functional

analysis). These movements are comparable with type 1b1, but because of this asymmetric shape, the 'miller' can use more pressure on the stone. The steep sides make it easy to press with the palms of the hands, when moving downwards (considering the lower ground stone is sloping down). Because of this pressure, one side will wear off quicker, causing more asymmetry. It is difficult, concerning functional analysis, to draw a sharp line between type 1b1 and type 1b2.

The length of the grinding stones in the Dayr 'Alla collection varies between 168 and 393 mm, the width varies between 100 and 180 mm and the thickness between 38 and 93 mm. Sandstone (mostly coarse grained) is used in 67% of all cases, beside basalt (31%) and flint (2%). It is the most frequent artefact in the ground stone collection of Tall Dayr 'Alla. The fragmentary condition of the specimens makes a weight measurement not possible. (c.f. Yadin and Geva 1986:Fig 38.2, 9-11,12; Chambon 1984: Pl. 77.19; Hovers 1996:Fig 25.6-8 and Fig. 29.3).

*Type 1c1* (Fig. 1:5)

A groove is made in the upper surface of the stone for a wooden stick (Amiran 1956). The 'miller' uses two hands to move this upper grinding stone on top of the lower one. The stone has an asymmetric cross section, comparable with type 1b2.

This type of grinding stone is only known in Dayr 'Alla from fragments and because of that, we know only a little of the outer shape. The thickness ranges between 54 and 63 mm. All of them are made of basalt. The fragmentary condition of the specimens makes a weight measurement not possible.

This type of installation appeared in the Iron Age II, and is probably comparable with objects found in Tall Michal, Tall Zakariyeh, Tall Judeidah, Samaria and Tall Halaf (Amiran 1956:46-49; Oppenheim 1931:Tafel 49b).

## Type 2: Lower Grinding Stones

### *Type 2a* (Fig. 2:1)

A lower grinding stone with the same thickness at both ends, which gives no limitations to the position of the user. Within this type we can distinguish two subtypes, a lower stone with a flat surface and one with a basin-like surface, both characteristics seen from the longitudinal section. The equal height at both ends gives the impression that the stone could be turned around, when one side was too worn off to be useful (e.g. Hovers 1996:176). Although the lower surface was made roughly flat, it is possible that this stone was placed between stones and/or clay (polishing at the bottom of the stones may indicate this), to hold the lower stone steadily and maybe a little inclined. This sloping position, which is natural in type 2b, improves the homogeneity of the powder, because the grinding material will roll slightly downwards during milling. But it is known, from ethnographic evidence (e.g. Reynolds 1969:Pl/ V) as well as from archaeological material that this type is also used in a perfectly horizontal position. The advantage of a flat stone, as already said, is the possibility to reverse the sides, so the stone can be used optimally in grinding before re-pecking is needed.

The more basin-like lower grinding stones of this subtype are difficult to distinguish from mortars. In general, the movements of the upper stone prescribe the type of the immobile part: wearing with rounded grooves makes it a mortar, while wearing with mostly parallel grooves gives it a function as lower grinding stone. Of course, this distinction has to do with the ratio of the depth of the hollow part to the diameter of the opening (e.g. Hovers 1996:176-177), but there is too little comparable information to prove this.

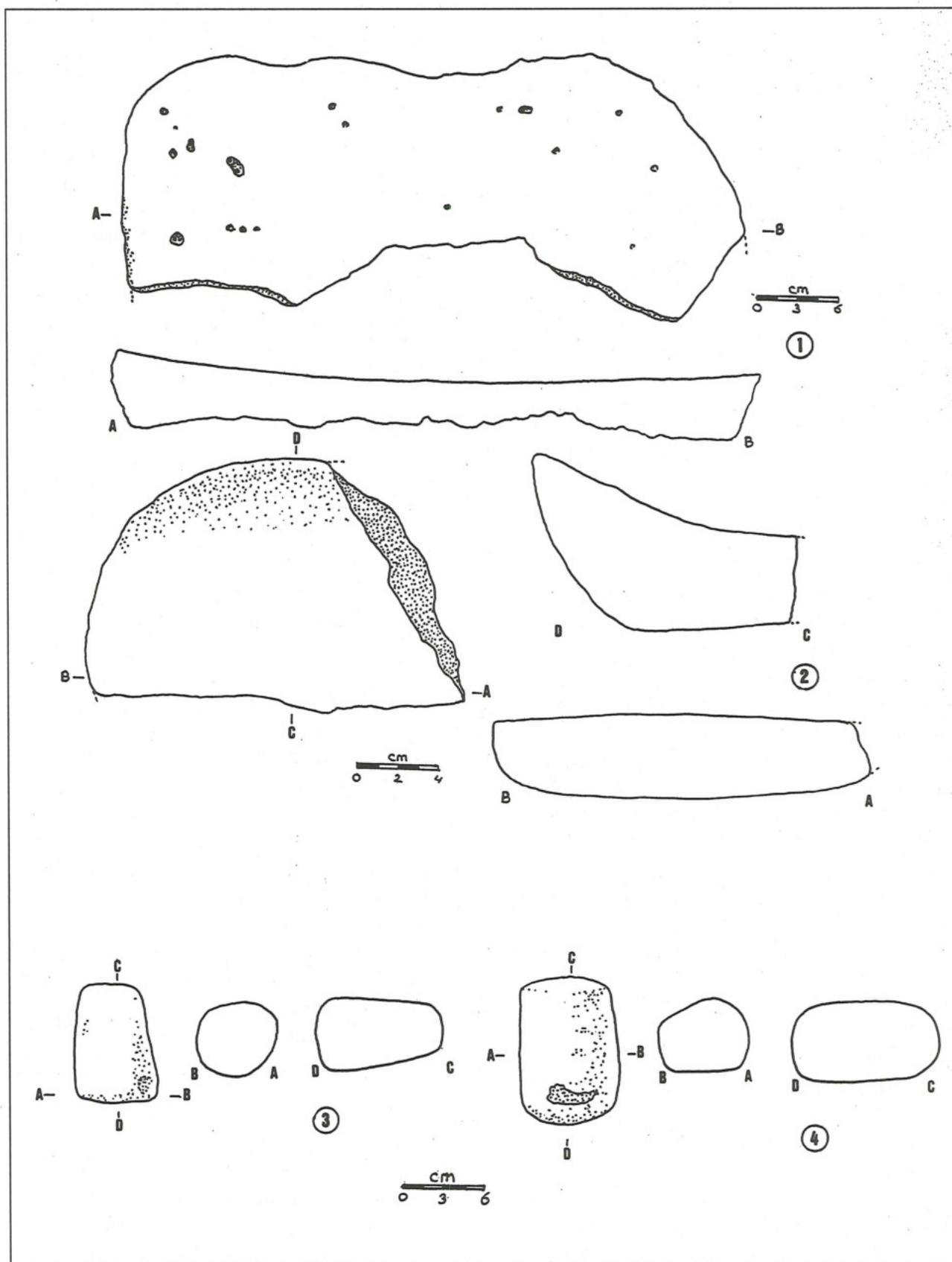
The artefacts found at Tall Dayr 'Alla are made of basalt in most cases (N=10) with two examples of quartzarenite. The basin

shape has been found frequently. Almost all the examples (except for three stones with a flat width) have been used in relation with type 1a and sometimes with type 2b. The length varies between 219 and 459 mm, the width between 150 and 335mm, and the thickness between 72 and 24mm (of the whole objects). The weight which is between 3.0 and 20.0 kg, is in most cases enough to make it stable and held in place by clay or stone beds. (c.f. Herzog, Rapp and Negbi 1989:Fig. 76:7; Hovers 1996: Fig. 26:1,2).

### *Type 2b* (Fig. 2:2)

The morphology of this type indicates the position of the miller towards the stone. The higher side has to be pointed at the miller, as seen from ethnographic sources (Bartlett 1933; Bornstein-Johanssen 1975:287-295) and from archaeological evidence (Darby *et al.* 1977:508-509; Erman 1971). Depending on the choice of the upper stone, the stone will be worn off flat or basin like, although a slight primary shape has already been given by the stone-worker. The difference between the two ways of use, related to the use of a special upper grinding stone, will follow in the paragraph about function. On Egyptian paintings, even flat lower grinding stones, as type 2a, are placed in a sloping direction (Darby *et al.* 1977:508-510). This 2b type has the disadvantage that every time the stone will be used, the same side is away from the miller. The stone has to be re-pecked more often than type 2a, which reduces the time of use.

In the Dayr 'Alla collection this type is made of quartzarenite (60%) and of basalt (40%). The length ranges between 333 and 515mm, the width between 165 and 465mm and the thickness between 28 and 121mm. The weight varies between 12.850 and 9.410 gram of the whole objects. The stone is in most cases hollow in length and flat or round in width-direction, what can indicate a grinding process together with type 1b. Only



2. Lower grinding stones and pestles (1= Type 2a; 2= Type 2b; 3= Type 3a; 4= Type 3a).

four examples have a hollow shape, like most of the 2a examples and could be used together with a one-handed upper stone. (c.f. Pritchard 1985:Fig. 45; McNicoll *et al.* 1992: Pl. 72.4; Franken and Steiner 1990:Fig. 2-24.1; Steiner 1994:Fig. 7-30; Hovers 1996:Fig. 26.3 and Fig. 25.2).

### Type 3: Pestles

#### *Type 3a* (Fig. 2:3-4)

This type has a height greater than the maximum length and the maximum width. The vertical section can be of any shape, triangular as well as rectangular. In most cases there are two use-surfaces (the lower and upper end), but sometimes more. This type is the most popular one, and can be used for pounding and grinding.

Of the Dayr 'Alla collection, 62% of this type is made out of basalt (compact) and the others of local limestone and local sandstone. It is possible that the basalt pestle is produced and distributed together with the related basalt mortar. The height varies between 60 and 122 mm, the width and length between 34 and 74 mm. The weight ranges between 0.10 and 0.80 kg. Traces of manufacture are often covered or worn off by use-marks, but the regular shape may indicate an artificial origin of the tools. Some of these stones are used for pounding, while all are used for rubbing processes, as the wear patterns indicate. (c.f. Yadin and Geva 1986:Fig. 38.7-8; James and McGovern 1993:Fig. 124:1,2,5 and Fig. 126:1,2,3; McNicoll *et al.* 1992: Pl. 73.2; Chambon 1984: Pl. 77.10,13; Franken and Steiner 1990:Fig. 2-23.5, Fig. 2-29.11 and Fig. 2-35.3-4; Herzog, Rapp and Negbi 1989:Fig. 31.7:29-33; Hovers 1996:Fig. 30:1-6,8 and Fig. 24:2,3,4; Finkelstein 1993:Fig. 9:13(1-3,8) and Fig. 9:14 (1)).

#### *Type 3b* (Fig. 3:1)

This type is characterised by a round or squarish shape, with the same measurement

for the width, length as well as the height. Often, this type has been called hammer stone. Also, a function such as stone-work instrument has been suggested by archaeologists and anthropologists (Jeffreys 1966:57-58; Lucas 1962:80; Waelkens *et al.* 1988:5-11) The function depends on the raw material and the wear pattern of this type.

In 62% of all the examples flint is used. The hardness and sharpness of these stones, makes a function as hammer stone possible. Flaking is not a problem, when using the hammer indirectly on the working surface, for example with a chisel. Multifunctionality has to be kept in mind. Some of the flint stones show grinding polish and small grooves, caused by pounding and grinding. The other materials used were limestone and basalt. The diameter varies between 40 and 90 mm. The weight ranges between 0.10 and 1.30 kg. (c.f. McNicoll *et al.* 1992: Pl. 72.7 and 73.5; Chambon 1984: Pl. 77.8-9, Pl. 77.11-12 and Pl. 78.12 (beside the mortar); Herzog, Rapp and Negbi 1989:Fig. 31.7:35-38; Hovers 1996:Fig. 24.5; Finkelstein 1993:Fig. 9:13 (4-6) and Fig. 9:14 (10)).

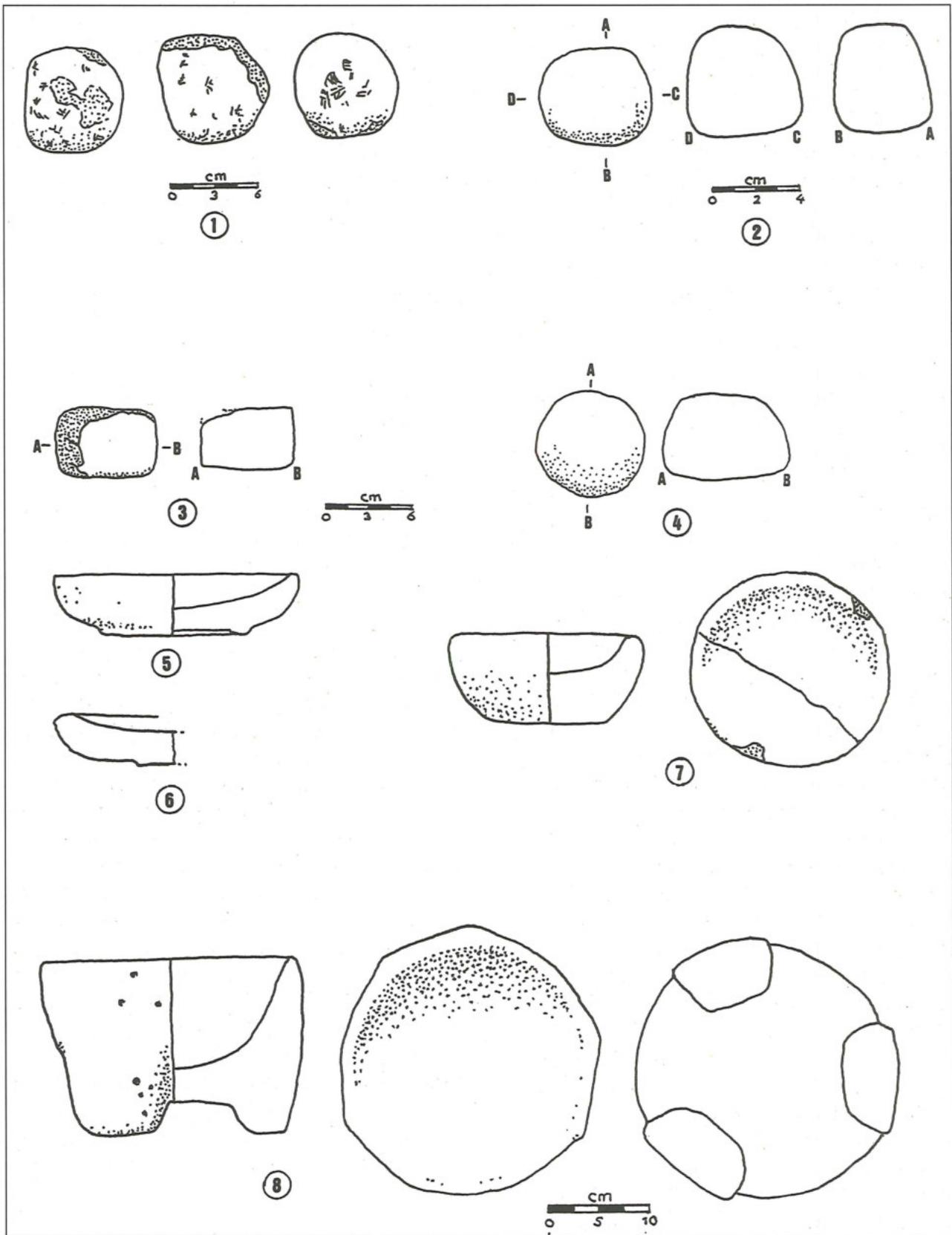
#### *Type 3c* (Fig. 3:2)

This type has the same height as length, but a smaller width. In most cases, the vertical section is triangular, but also rectangular or quadrangular shapes occur.

The length and height range between 40 and 105 mm and the width ranges between 51 and 87 mm. One object is made of basalt, two of sandstone (coarse) and one of limestone. The weight varies between 0.25 and 1.40 kg. (c.f. James and McGovern 1993:Fig. 124:3,4; Hovers 1996:Fig. 30:7,9,10).

#### *Type 3d* (Fig. 3:3)

This type is characterised by a lower height than width and length. Because the grip is not well formed, for example to grind with some force, this type has been called in most publications rubbing stone. The prob-



3. Pestles and Mortars (1= Type 3b; 2= Type 3c; 3= Type 3d; 4= Type 3e; 5= Type 4b; 6= Type 4c; 7= Type 4d; 8= Type 4a1).

lem with distinguishing this type from 3c is the main position of use, especially when more than one surface shows polishing. Therefore one stone can belong to both types.

The height varies between 23 and 58 mm, while the length and width between 40 and 80 mm. The weight ranges between 0.15 and 0.50 kg. In all cases, vesicular or light-vesicular basalt has been used as raw material. Vesicularity in particular, gives the idea of a grinding activity rather than polishing or rubbing. (c.f. Chambon 1984: Pl. 77:6,7,14; Franken and Steiner 1990:Fig. 2-16.3; James and McGovern 1993:Fig. 126:5; Finkelstein 1993:Fig. 9:13 (7)).

#### **Type 4: Mortars**

##### *Type 4a1* (Fig. 3:8)

This type is a bowl with three legs (Buchholz 1963:1-77). The legs are going down straight from the rim but vary in shape and length. In general, the cross section of the legs is triangular with the smallest end pointing at the centre of the 'bowl'.

The sizes differ, but all of the objects are made of compact and light-vesicular basalt. The height ranges between 72 and 175 mm and the diameter between 135 and 480 mm. A mortar of this type has a regular shape and shows only by exception traces of manufacturing. The weight varies between 0.82 and 13.05 kg. (c.f. James and McGovern 1993:Fig. 122.1+3 and Fig. 123.9; Rowe 1940:Fig. XXIII.6,7,8; Pritchard 1985:Fig. 18.5 and Fig. 8.27; Chambon 1984: Pl. 78.5-8; Herzog, Rapp and Negbi 1989:Fig. 31.2:1-7)

##### *Type 4b* (Fig. 3:5)

This mortar has a ring base. In general this type is small and shallow.

The Tall Dayr 'Alla examples have a diameter up to 162 mm and a height between 36 and 99 mm. The only complete example weighted 0.78 kg. The effort to make this shape indicates an experienced stoneworker,

who wanted to make this particular shape. All examples are made of basalt. Not only the inside is smoothed by use, but also the ring base, as a result of moving over hard surfaces. (c.f. James and McGovern 1993:Fig. 121:3-8,11 and Fig. 123:1-2; Rowe 1940:Fig. XXIV.5,10; Pritchard 1985:Fig. 8:26; Herzog, Rapp and Negbi 1989:Fig. 31.3:15).

##### *Type 4c* (Fig. 3:6)

This type is very rare in the Levant. The shape shows close relation with ceramic examples of the Iron Age II (Tufnell 1953: Pl. 79:3,4 and 80:64; Amiran 1969: Pl. 62:8, 64:10 and 67:12; Chambon 1984: Pl. 57:23-24).

The one example is made of basalt and has a diameter of 110 mm and a height of 30mm. This mortar is well made and polished on the inside as well as on the base.

##### *Type 4d* (Fig. 3:7)

A mortar with a flat base. This base makes it difficult to stabilise the mortar when grinding. Therefore this type was probably used for grinding small amounts and soft materials.

Three of the examples are made of compact basalt and have a diameter of 120 mm and a height ranging between 52 and 84mm. The limestone examples are larger (350mm diameter) and higher (115 mm). Limestone is easier to work, but it shows more informal traces of production than the basalt mortars. This could indicate the difference between full-time specialists and part-time local stoneworkers, with less experience and time. The weight varies between 1.15 and 4.95 kg. (c.f. James and McGovern 1993:Fig. 121:10, Fig. 122:2,4 and Fig. 123:8,10,11; Chambon 1984: Pl. 78.13; Herzog, Rapp and Negbi 1989:Fig. 31:3,13-14; Hovers 1996:Fig. 26.5 and Fig. 24.1).

##### *Type 4g*

This type is characterised by an irregular

shape and by being roughly made. In most cases, a river boulder was chosen. It can be assumed that this kind of mortar was only used for a limited period, when a better stone was not available.

Two examples were found at Tall Dayr 'Alla, both made of limestone. Some manufacturing traces are visible, but most of the surface is unworked. The length of these two stones varies between 225 and 95 mm, the width between 188 and 96 mm and the thickness between 65 and 54 mm. This type is often very heavy (more than 5 kg).

### Raw Material

The general characteristics of grinding stones reflect the limited choice of raw material and shape. It seems that both variables were defined in advance. Even if the stone cannot be found in the close surroundings, people try to get that particular kind. This process of selection and modification of raw material in order to achieve a desired product, offers the possibility to understand the relationship of the material and non-material aspects of culture.

At Tall Dayr 'Alla, both local stone and non-local stone are used. This dichotomy is also found ethnographically, for example with the Aborigines (Roth 1904; McCarthy 1941; Kraybill 1977:489). The inhabitants of Tall Dayr 'Alla were able to get coarse and fine grained sandstone, limestone, travertine and flint easily around the tall, especially from the nearby az-Zarqā' Valley (Bender 1968:geological map). Only basalt and andasite are, except for a few very small spots, rare in the direct surroundings (Wright *et al.* in press:11; Bender 1968:104). It is still difficult even with a microscope to identify exactly the place of origin of magmatic rock.

The Tall Dayr 'Alla percentages are: basalt and andasite (45.4%), sandstone (44.0%), limestone and travertine (5.1%), flint (4.1%) and others (1.4%). The popularity of basalt and andasite shows the economic value of this material that is not locally avail-

able. The value is bigger than the expenses, connected with transport and/or trade.

The local stones can be found in the az-Zarqā' Valley, and some of them even in the river, which runs at a distance along the tall (geological survey by the author in 1996). Pebbles are easily chosen and picked up because of their associated forms with the end-product (McCarthy 1941:329-333; Howchin 1934). However some sources (Hersh 1981:358) show that river stones have disadvantages. On one hand the stones show a weathering crust, which makes it rather difficult to work, and on the other hand, samples of sedimentary rock taken from the az-Zarqā' river show traces of the dissolution of the chalk matrix, which makes the stone often too weak to use as a grinding tool. A better material can be obtained from the side-hills of this wadi and this gives the idea of an industrial or individual quarry. Until now, no signs of this industry have been found, and judging from the irregular and somewhat unprofessional manufacturing techniques, an individual quarry on a small scale is to be expected.

### Manufacture

#### a) Introduction

The two sources of the raw material for the Tall Dayr 'Alla stone tools suggest two different production places: one for basalt in the north of Jordan and the other one close to the settlement.

Both working places may show their own techniques, instruments and fashion. Although the raw material differs, it is important to distinguish several variables in the manufacturing process to support the idea of dichotomy. One of the main variables is the formality, the regularity of the result of the process. Training, experience, kind of instruments, workplace, etc. may be reflected in the artefact.

#### b) Manufacturing Processes

Traces of the manufacturing process are

difficult to recognise, and are in most cases removed by finishing work or wear. Another problem in recognizing such traces is to distinguish between traces of wear and traces of manufacture.

Fortunately, one of the stones found on the site was not finished, probably due to premature breaking (Fig. 4). It shows the different phases of the process as well as the traces of the stone-working instruments. Apart from this example, only a few traces are found, especially on spots where it was not essential to smooth the surface or where the function prescribes a rough surface.

The upper grinding stones are in most of the cases well-finished. In Table 3 a few manufacturing phases are distinguished. Pecking is the most general technique and is reflected by small traces, mostly as half-moon shapes, caused by medium-hard knocks with a hammer(stone) and chisel. Figure 5 shows these peckmarks very well. The chisel was placed probably obliquely on the surface in order to limit the danger of

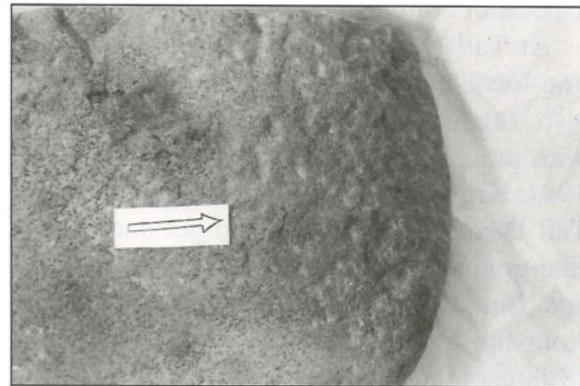
breaking. Although the chisel was probably round shaped, the marks are half-round, because only on one side stone-pieces were chipped off. The stone shows that the upper side was worked first and later the lower side. Finishing work has been done (cf. Fowke 1985:199-200; McBryde 1945; Pond 1930:1-149; Hersh 1981:354-376) probably with a sandstone rough boulder (Hersh 1981:358). This technique does not give a polished or smooth surface.

The lower grinding stones differ from the upper-stone especially in the rough bottom surface. This surface did not undergo phases two and three in the process. The rough surface gives the lower stone the stability it needs during grinding. The upper surface is hand shaped and went through all the production phases.

The pestles are in general made of small natural pebbles (or remains of other stone artefacts), which do not need much change. In relation with the so called natural, not formed, pestles we can assume that only a few pestles were planned and made on or-



4. Unfinished upper grinding stone with production traces.



5. Traces of pecking.

Table 3. Manufacturing phases by upper grinding stones with their supposed techniques, instruments and marks.

phase	techniques	instruments	marks
1)	rough hitting pounding	- hard stone - sharp stone	- big flake-marks - small irregular damage marks
2)	pecking	- chisel/hammer - sharp stone	- small round or half round traces - rough irregular damage marks
3)	rubbing	- sandstone	- formal surface

der. Probably phase 2 was not performed.

The *mortars* are well formed and suggest a trained and experienced worker in most cases, especially with the basalt examples. An extra phase, or technique is the saw, which was not necessarily made of metal, but could also have been made with a rope using quartz sand. Traces of this technique have been found on several Tall Dayr 'Alla stones, especially the tripod mortars. Probably, the stone was first hollowed, and after that the legs (or other bases) were made.

### c) *Place of Manufacture*

The unfinished upper grinding stone (Fig. 4) indicates a working place on the site. It seems quite possible that every household made their own tool from the locally available raw material, when basalt was not available or too expensive.

When there was the possibility of choosing between different raw materials, the stoneworker's place, which produced the grinding stones, was probably situated very close to the basalt source, which in this case is the north of Jordan. The stoneworker did not have to be a specialist in grinding stones only, but could have also been the producer of other stone (basalt) artefacts, like architectural stones, altars, weights and anchors (Bullard 1969; McGovern 1989:269). A surplus of several stones would be needed for the irregular demands of the consumers.

It may be assumed that there were several of these basalt/andesite stoneworker's places, or maybe full-time craftsmen without a stationary place. The number of basalt artefacts found in Late Bronze Age and Iron Age sites show the enormous industry, which cannot be the work of only agricultural based households.

### **Diffusion and Trade-Patterns**

One can divide, at least tentatively, a local group and an imported group of grinding stones at Dayr 'Alla. The local stones are individually made and used while the im-

ported stones are made by full-time stone workers in the north or northeast of Jordan.

Here, we are mainly concerned with the imported objects. The tools are made in the north and transported to the south (e.g. Dalley 1984:170). Considering the period of use for 10 years (Morris 1990:181) of an upper grinding stone and 20 to as much as 1,000 years for a lower one (Wright 1992a:96), the people do not often need new grinding stones. One can imagine an order list to the production centre, when several people of one village or small region needed new grinding stones. Temporarily, the locally collected stone may have been individually worked and used. The differences between local and imported products do not necessarily reflect different classes in this society, although they are expected to have existed.

Chronological information about the occurrence of grinding stones at Dayr 'Alla shows an increase in the use of imported tools around 750 BC (from 30% to 60% of all examples out of one occupation phase). Although this increase is not only based on information acquired *in situ*, a change in import activity is visible. This change is probably due to changes in political, economical and/or social situation at that time.

The northern production centres distributed their products over the country. Taking trade links into account, the farther the basalt tool is found from the source, the more value it gets. Assuming that magmatic rocks were more suitable for grinding than other rocks, settlements closer to the basalt-source (closer to the production centre) would have a higher percentage of magmatic rock than the places farther away (the longer the distance the more the expenses). Although real statistics are missing, the excavation at Tall Rehob (Mazar, pers. comm.), a few kilometres from the basalt-region in north-Israel, shows almost 90% basalt grinding stones.

### **Function**

Functional analysis must extend further

than a general grinding activity, especially at a time, when wear patterns analysis has become a normal procedure in artefact studies (Keeley 1980; Gijn 1990), although today the validity of using micro wear polishes alone for identifying ground materials has been questioned altogether (Newcomer *et al.* 1987:262; Grace 1989). Beside wear patterns, morphology and associated remains (such as chemical residue analysis (Anderson-Gerfaud 1986; Jones 1990; Hillman and Davies 1990:207)) can also be used to complete this analysis.

From the early periods and until the end of the Iron Age, the inhabitants of the Levant used the same basic shapes and the same limited range of raw materials. Even today, ethnographical evidence shows comparable forms in certain areas (Australia: McCarthy 1941; Roth 1904, America: Aschmann 1949; Bartlett 1933; Woodbury 1954, Levant: Dalman 1933; Hillman 1984a). Hovers (1996:183) mentioned correctly that changes in fashion did not affect the shape or the chosen raw material of the grinding stones. But in spite of this morphological conservative character of the stones, there are variations in form in relation to function.

#### *Material and Function*

The selection of material for grinding stones does not only depend on the availability of the stone, but also on the texture and structure of the stone itself. When looking at archaeological (Moorey 1994:23; Yoffee and Clarke 1993:226-239) as well as ethnographic evidence (Weinstein 1973:275; Kraybill 1977:489), it is clear that the inhabitants of a particular region are not bound by the local availability of a stone type, but try very hard to get the best stone even when they have to travel long distances.

There are many products which can be ground (see below) that differ in hardness, toughness and shape. Theoretically, all of these qualities can be related to a special

stone type, with its own texture and structure. The relation between the product and the qualities of the stone reflects the need for an intensive study of the material, as well as of the grinding products found in any historic and prehistoric site.

There are three important qualities of a stone that affect the result of grinding: the bending of the minerals, the vesicularity and the grain size (Hovers 1996:181). When two stones make contact, small parts wear off. The more pressure exerted, the more the stone will transform. Unfortunately, this wearing will contaminate the product and therefore has to be avoided.

In general, the inhabitants of Dayr 'Alla used two stone types: magmatic and sedimentary rock. The first kind is harder (tougher), because the minerals are very small and closely bound. This is in contrast with most of the sedimentary rocks which have larger and less closely bound minerals. When applying the same pressure, the last will contaminate the product more than the magmatic kind. The grain size is important for the toughness of the stone, and for the cutting or grinding qualities. Because of the fine-grained mineral structure, magmatic rocks are less irregular, and therefore less useful for quick grinding. The last quality which affects the grinding result is the vesicularity. This quality is formed in magmatic rocks when the air-supported magma is hardened. The roughness of the magmatic rock makes the edges of these holes as sharp as knives and can be a counterpart for the sharp minerals of most of the sedimentary rocks. The usefulness of a stone type depends on its different characteristics, and indirectly depends on the grinding product.

*Type 1a*, the one handed upper grinding stone is mostly made of fine or compact material. The stone is light and has no real 'cutting facilities', in contrast with high-vesicular or coarse grained samples. Much of the grinding activity has to be done with the pressure applied by the miller. The prod-

uct is probably fine and easy to grind (or maybe this type is used for finishing grinding).

*Types 1b and 1c* have more vesicular and coarse grained samples. The 'cutting' edges, from the natural holes in magmatic rocks and the quartz minerals in sedimentary rocks, together with the weight of the stone, suggest a difficult and tough grinding product. More pressure can be given by the miller in contrast with type 1a. The grinding product cannot be too small in relation to the high-vesicular materials, because the product will 'escape' in the holes.

*Type 2* is in most cases coarse grained or highly vesicular. The same analyses can be given as for types 1b and 1c. The few compact stones as well as fine grained sedimentary rocks can be associated with type 1a.

*Types 3a, 3c and 3d*, are mainly made out of compact or fine grained sandstone or limestone and indicate the need for a tough and regular surface, probably in relation with a mortar. The function is more an alternation between pounding and grinding and is less dependent on the 'cutting' facilities of the texture (Wright 1992a:53). The pressure given by the miller determines the grinding result.

*Type 3b*, is of a different stone, that is mainly made out of flint. The hard and rough characteristics of the stone make hammering possible, but it does not exclude a function as grinding tool together with a mortar.

*Types 4a,b,c, and d* are mainly made of compact basalt. The mortar has to be bowl-shaped and compact to hold the product and does not need to play a more active role in the grinding activity.

The relation between raw-material and function is clear when looking at Table 4. Grain size, vesicularity and binding of the minerals are characteristics, that affect the grinding activity and will be realised by the stone worker, when making a certain grind-

ing tool.

### *Form and Function*

The second relation with function is the form, already mentioned in the first part of this paragraph. The division between a one-handed and a two-handed stone reflects the function and the way it has been used. The movements are reflected by the traces on the stone itself. Type 1a has, in almost all of the stones, a round (in both direction) grinding surface. This has been due to the fact that, when you push the stone downwards at the end, the stone will rise a little because of the movements of the wrist. The same movement will appear when the stone is at the top of the lower grinding stone. This is in contrast to the two-handed stone, where this round movement does not occur. The one-handed stone is probably used for material that is softer or grinds more easily, because the miller cannot apply all his force in the activity. Types 1b and 1c can grind harder and tougher material. The two-handed stone has mostly sharp edges and a flat (or hollow) surface, especially in length. Another difference between these two tools are the movement marks on the grinding stone. The one-handed stone has traces in a variety of directions, sometimes even rounded, while the other types have straight grooves along its width. The movements of the upper stone leave also traces on the lower stone. The lower stone is made or placed with a sloping surface, with the higher side positioned towards the miller. This can also be seen on Egyptian paintings (Darby *et al.* 1977:508-510; Baines and Malek 1980:195) and from ethnographic sources (Bartlett 1933; Bornstein-Johanssen 1975:287-295). The grinding material will roll downwards during grinding, which stimulates an equal flour. When the stone is used with a one-handed upper stone, the lower stone becomes hollow in all directions. The mortar is always used together with another tool, in most cases a pestle, with which the material can be

Table 4. Raw-material and the diffusion over the typology.

	basalt v.	basalt l.v.	basalt c.	sandst. coarse	sandst. fine	limest.	flint	other
<u>upper grinding stones</u>								
type 1a	1	3	1	5	12	-	-	-
type 1b1	7	-	-	14	5	-	-	1
type 1b2	15	3	-	32	6	-	1	-
type 1c1	3	-	-	-	-	-	-	-
type 1e	4	-	-	3	1	-	-	-
<u>lower grinding stones</u>								
type 2a	10	-	-	-	2	-	-	-
type 2b	5	-	1	6	3	-	-	-
type 2e	4	-	-	1	1	-	-	1
<u>pestles</u>								
type 3a	-	2	6	-	1	3	-	1
type 3b	-	1	2	-	-	2	8	-
type 3c	-	1	-	2	-	1	-	-
type 3d	1	1	-	1	1	-	-	2
type 3e	-	-	1	-	-	-	-	-
type 3f	-	1	-	-	-	-	-	-
<u>mortars</u>								
type 4a1	-	5	7	-	-	-	-	-
type 4b	-	3	2	-	-	-	-	-
type 4c	-	1	-	-	-	-	-	-
type 4d	-	-	3	-	-	2	-	-
type 4g	-	-	-	-	-	2	-	-
type 4i	-	2	2	-	-	-	-	-
Total	50	23	25	64	32	10	9	5

pounded or ground (but in most cases it is a combination of these two movements). These activities can be shown by the polishing and damage patterns on top of the pestle. The depth of the mortar gives an idea about the amount of grinding material and the roughness of the movements. A shallow mortar is more suitable for a very small amount of soft material, where only small movements give the best results. If the miller has to enforce the crushing, he needs a deeper or larger grinding basin, like type 4e. If we consider that also grain (like emmercorn and barley, see below) has to be crushed and de-husked before grinding, then this type, or a wooden example is needed, as seen in ethnographic sources (Jeffreys 1966;

Wulff 1966:151f). Several studies indicate that cereal de-husking is best accomplished with a pestle of wood, which avoids crushing the seeds (Foxhall and Forbes 1982:77; Hillman 1984a:129-130). One observation is that the pestle is very vulnerable to damage and wear during use. Except for type 3b, which is rather a hammer, the other pestles have been used for pounding as well as for grinding (often in combination during one 'job'). This multi-functionality has been described also in ethnographical evidence (Bartlett 1933; Wright *et al.* in press:2).

#### *Grinding Products*

Functional analysis has to include the possibility to grind material with the ex-

cavated artefacts, as well as the availability of the grindable materials. Paleobotanic material is always considered for these stones (e.g. Wright 1992a; Hersh 1981), but beside these, also non-vegetable products can be ground.

When looking at archaeological remains, there is a very limited range of possible grinding products, mainly caused by the decay of the products. It is necessary to understand that the range of the material, which is found in Dayr 'Alla, does not reflect the whole range of grindable products, and what is found does not always have to be the consequence of direct human consumption (Hillman 1984a:1-41). This observation has been supported by ethnographical evidence (Kraybill 1977).

### **Paleobotanic Remains Suitable for Grinding Activity**

Most of the botanical samples of Tall Dayr 'Alla have been collected from phase IX-strata, in which several fires preserved the samples as charcoal. A clear archaeological relation between the grinding stones and these plant remains cannot be established yet, but ethnographical as well as textual sources makes it more than possible.

The largest sample, found in Dayr 'Alla, was *triticum aestivum*, a two-row wheat (Neef 1989:30-36). *Triticum aestivum* is highly cultivated, and without bran and chaff, it can be ground into a white, sweet flour. This flour can be obtained by smashing first the wheat-grains in a mortar with a wooden pestle (see above), causing de-husking, after which the seeds can be ground. The mortars, found in Dayr 'Alla are too small and low for de-husking and crushing wheat. Biblical (Num. 11:8) and ethnographical sources (Reynolds 1968:82; van der Kooij 1976:85) show the importance of this pounding/grinding activity.

Another grain found at Tall Dayr 'Alla is emmercorn (*triticum dicoccum*), which has a harder bran than *tr. aestivum*. It has to be

crushed several times before the grain is ready to be ground. After that movement, again the two-handed stones are needed to grind these seeds.

Barley (*hordeum distichum*) is also part of the plant material found in Dayr 'Alla (and in other places in the Jordan Valley, like Pella: McNicoll *et al.* 1992; Tall as-Sa'diyyeh: Pritchard 1985). It does not belong to the 'cereal' family, but can be prepared in the same way. Again the chaff and the bran are difficult to remove from the endosperm. It is almost impossible to make a white flour out of it. A remarkable discovery was a large quantity of broken barley grains, smashed probably in a mortar and directly used as food in Dayr 'Alla.

### **Other Grinding Materials**

Beside these vegetable products, minerals, especially those used for producing pottery temper and for the major substance of glass and faience, could also be ground. The grinding of temper (or even the clay itself) has been widely accepted (Hayden 1987:191; Franken 1969:73 and 76) and is visible by looking at the sherd, by evidence of very sharp angular fragments. Even coarse quartz sand could be crushed inside a mortar with a pestle. This activity has also been recorded in Egypt, for making glass and faience (Lucas 1962:157 and 178), where quartz pebbles or crystals have been ground to make the substance as fine as possible. The basalt remains inside the Dayr 'Alla pottery (Franken 1992:108) can be due to the basalt fragments (which could have been parts of grinding stones), that were abandoned and used for temper. But as Kolb (1988:211) pointed out, these particles may have been accidentally added during the crushing of clay or grinding the temper when the abrading surfaces of the implement were worn off. Shells and chalk could also be ground in a mortar and pestle for the preparation of the temper (Franken 1969:76).

### *Wear Patterns*

This part of archaeological science has been promoted by flint analysis (Keeley 1980; Gijn 1990). The difference between flint and other stone artefacts is the clearness of these traces. Other stone types, like basalt have a vesicular and rough surface, on which very tiny traces are difficult to recognise. But apart from these, the movements make grooves in the working surface, which shows the way of grinding and sometimes evidence for special grinding products (Richards 1989). Comparing these grooves with other evidence, as described above, it is possible to read a functional description of each stone.

Like the pestles, the patterns of type 1a are not regular and parallel. This is a major sign for the way the stone has been used. The movements of the stone were irregular and with less force than type 1b. The one handed upper stone can be compared with the one handed pestle. Real grinding activity would have been alternated by crushing and stamping movements, with their typical wear patterns (damage patterns). These signs are different from the two handed stones, which have a regular groove pattern, due to the great forceful movements of the miller.

All of the stones show polishing and even when they were mostly crushing tools, the stone obtained polish. Contrary to Hersh (1981: 125 and 471), the writer has not seen differences between quick movements and slow regular activity (see also Hayden 1979:189). Polishing is an additional phenomenon, when two stones were rubbed against each other (and probably even when wood or other material is used in connection with a stone).

The wear pattern as pointed out by the mobile parts of the grinding implements, are similar to the immobile parts. Mortars have irregular grooves while lower grinding stones, especially type 2b have regular parallel grooves (type 2a has sometimes irregular pattern, because it has been used as a

basin).

### **Discarding and Re-use**

There are many reasons for discarding grinding stones. Breaking or damaging of the stone, which makes it useless, is probably the most frequent cause, since the stone was used till grinding can no longer be done. Primary contexts of finds of grinding stone are rarely published, which makes a spatial and temporal analysis almost impossible.

At Dayr 'Alla stones were in general reused in architectural construction, especially in stone foundations and pit-lining. Grinding stones enter the archaeological record quite infrequently (Aschmann 1949:685; Horne 1983:18). Beside architectural reuse, the stone parts were also reused as grinding stones, hammers, polishing stones or rubbing stones. These functions have to be defined by wear pattern analysis and comparison.

### **Conclusion**

The role of grinding activity has been pointed out as an important aspect for the inhabitants of Tall Dayr 'Alla and an essential element of any archaeological project.

Tall Dayr 'Alla is located in an agriculturally fertile environment along a main trade route. During the Late Bronze and the Iron Age, external contact seems normal and almost essential. Bearing this in mind, there must have been a distribution pattern of basalt grinding stones in north Jordan. Although many scholars limit trade to luxury goods, it has been cleared that normal household equipment was as important a commodity for daily needs. The inhabitants of Tall Dayr 'Alla were dependent on their usual tools, more than on luxury and treasures. Detailed stratigraphic documentation, as well as chemical and microscopical analyses of the soil surrounding the artefacts are necessary. Beside artefact analyses, also attention has to be paid to waste material of

production. Manufacturing places inside the settlement hold fragments of stone, which may be found during fieldwork.

Grinding activity has been known, but has not been studied systematically. However, Hovers (1996) mentioned that 'it appears to be a rewarding effort' and with the awareness of our lack of knowledge, one is on the right track to remedy the situation.

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Lucas P. Petit  
Königsteiner Str. 46  
D-65929 Frankfurt  
Germany

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# PRELIMINARY REPORT ON THE EXCAVATION AT AL-BĀLŪ' AND A FIRST SOUNDING AT AL-MIŞNA IN 1997

by

Udo Worschech and Friedbert Ninow

This year's excavation took place from July 20 until August 15, 1997. The intention of the excavators was to confirm the results of the season of 1995 and to continue in the formerly discovered strata dating as far back as the EB periods. For this reason, a large area (E) was opened northwest of the Qaşr al-BālŪ' and just north of Area A. The surface of Area E was almost free of the basalt boulders typical of al-BālŪ' and thus offered a good opportunity for excavation (Fig. 1).

## Area E

Area E consisted of several squares which all together measured 15x15 m. A large wall (40) running north to south was excavated. At its southern side two open courtyards were discovered which contained grinding installations and working areas (platforms) as well as pits. Only one beaten earth floor mixed with *hūwwār* was laid over the bedrock which was very irregular. Under the floor of the court east to wall 40 an area of ca. 2x3 m had been burned, as indicated by the charred surface of the bedrock. The burned remains of bones and charred pottery had been covered by a layer of sand until the floor was laid over it, sealing off the remains below. The pottery above and below the floor dates to the Iron IIB period.

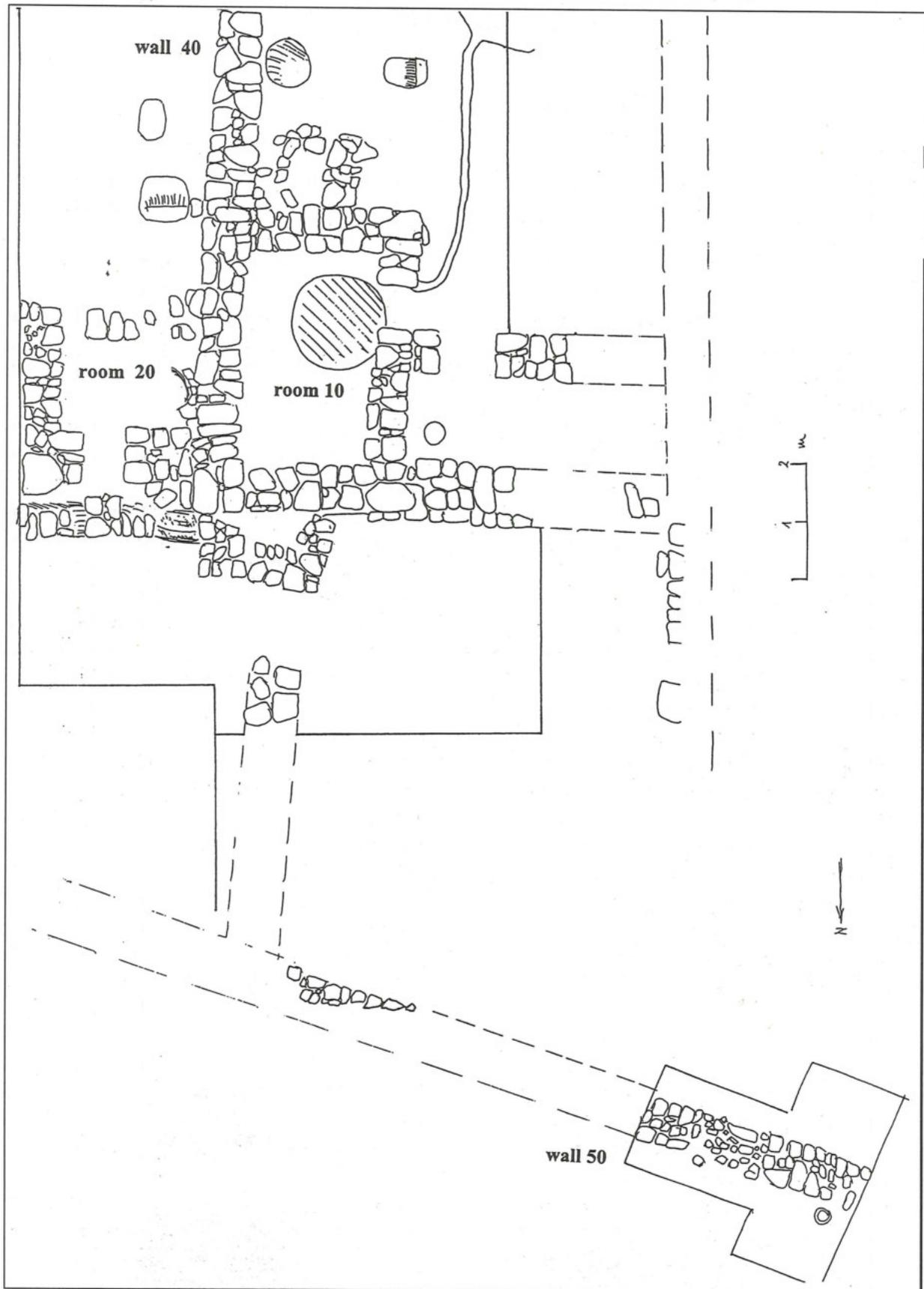
The court area west of wall 40 contained a pit (diam. ca. 1.20 m), several smaller grinding stones, mortars and pestels, and a stone lined shallow pit of rectangular shape (diam. ca. 0.60 m). Immediately at its western side a water channel was unearthed running from the door of room 10 (tentatively so called) southward into a large pit or crevasse which was hewn into the bedrock (Fig. 2). The channel also cuts the bedrock and is

plastered. The plaster is in very good condition. The entire length of the channel is ca. 5 m.

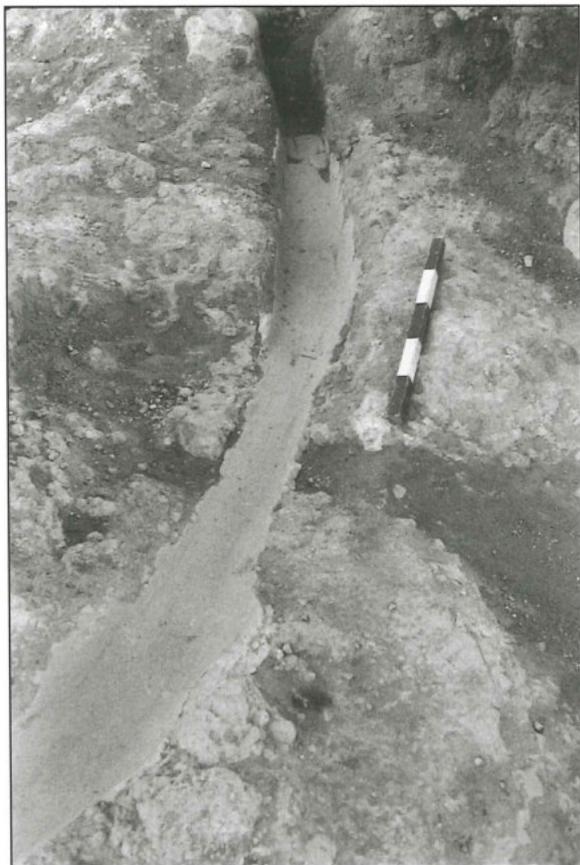
The courtyard areas were separated by wall 40 (no access between the areas). The size of the areas is not known since their outer peripheral walls have not yet been discovered. However, there are wall remains in the western court area.

East and west of wall 40, at its northern end, two rooms (10 and 20) were unearthed. In room 10, with a door at its western side, two floor layers have been discovered containing sherds from the Iron IIB period. When the two floors had been removed and bedrock was reached, a deep (1.70 m) underground pit of ca. 1.20 m in diameter was discovered (Fig. 3). The first floor had been laid over the pit indicating that this large installation had not been in use during the Iron II period. The fill which came out of this installation contained pottery dating to the Iron II periods. However, ca. 0.50 m above the groundfloor of the pit the color of the soil changed from brownish gray to reddish brown and white. The pottery taken from this locus clearly belonged to the Iron I period or to the latest phase of the Late Bronze period. Of special interest are the many body sherds with painting characteristic of the Iron I period (or the very late LB period).

In room 20, which measured only about 2.50 x 2.0 m, the remains of a bath installation was found. Stones set in oval fashion served as support for the later destroyed bath or basin. Thick remains of patches of plaster were still at the stones forming the walls of the tub which measured about 0.60 x 0.90 m. The pottery which was found there belonged to the Iron II period as well. Room



1. Sketch plan of Area E.



2. Plastered water channel running north-south in open courtyard.

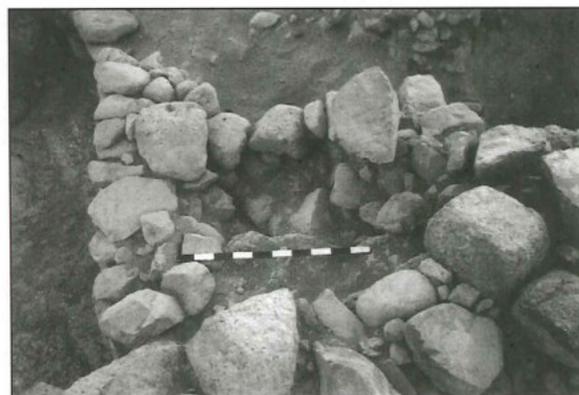


3. Underground pit.

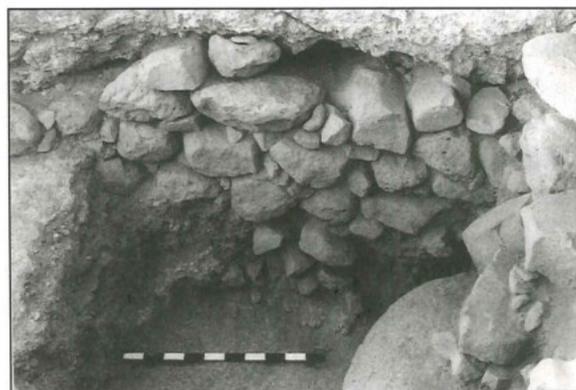
20 had an exit towards the north. However, this door had been blocked by small stones filling the doorway. The reason for this became evident when the area north of room 20 was opened. Here, a wall built immediately adjacent to the outer wall of room 20 strengthened the outer side. Also, a bastion-like installation built a little further to the west, its size being ca. 1.20x1.90 m, served

the same purpose of defense (Fig. 4). Ca. 5 m north of the opened installations and building complexes, an outer wall (50) which probably served the purpose of encircling the whole complex was discovered in two smaller sondage squares. The fill in front of the wall and bastion contained a large amount of pottery dating to the late Iron IIB-CIII / Persian periods, suggesting that the defenses were built during that time.

A wall closing a cave was discovered immediately north of room 10, ca. 1 m below the bedrock "floor" of that room. The wall in front of the cave formed one line with the other wall and the bastion serving the purpose of defense in this area. When the wall was removed, a shallow cave appeared which contained a few sherds of the Iron II period in its upper loci, while below and on the cave's floor only sherds dating to the late EB and prominently to the MB period were discovered (Fig. 5).



4. Bastion and defense wall at northern side of Area E.



5. Walled cave serving as tomb in Area A.

The building complexes dating to the Iron II period with several phases of re-building tell the story of the later historic phases of al-Bālū' with hints at its former history dating back as far as the late EB, MB, and early Iron periods.

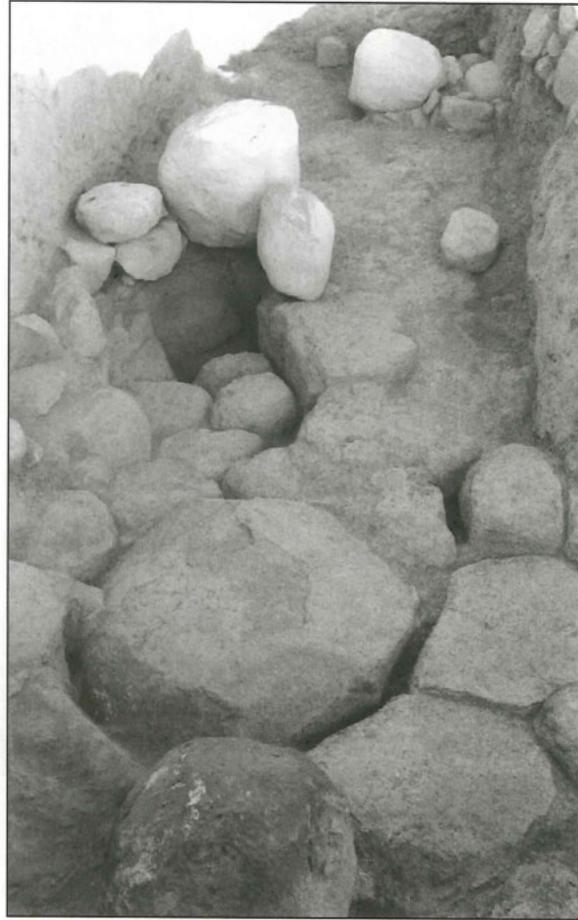
#### Area D

Area D is the area of the casemate wall which has been formerly excavated to the length of ca. 60 m. Close to the Assyrian-type house, a cultic installation had been already discovered in 1995. Two standing stones were carefully set up near the outer wall of the house. A number of wedge stones give these two huge boulders the necessary support. From these two standing stones channels lead downhill into a pit which is about 6-7 m away. The pit contained bones of sheep, goat, and cow, and may indicate that sacrificial rites were performed here. This view is now strengthened by the discovery of another standing stone (ca. 1.70 m) which stands immediately above the deep pit. The excavated area behind the standing stone contained one flat stone which may have served as a table or as an entrance into the sacred precinct (Fig. 6).

#### Sounding at al-Miṣna

In the summer of 1997 a small sounding was carried out at the site of al-Miṣna in order to compare the stratigraphic and ceramic situation with the one at al-Bālū'. Al-Miṣna is the nearest major Iron age site south of al-Bālū' and lends itself to such a comparative investigation. The small ruined hill is situated just 2 km northeast of ar-Rabbah and can be reached through the fields by turning off the main road in ar-Rabbah or the road that connects al-Qaṣr with Ḥmūd (PG: 22.3/76.7). Various wall lines can be detected on top of the hill as well as at the periphery and at the slopes. There is also a probable gateway that faces the east.

The surface is spotted with sherds comprising EB, MB, LB, IR, Roman - Naba-



6. Sacred precinct in Area D.

taean, Byzantine and Islamic. A small sondage square (3x3 m) was opened on top of the hill. There, it appears as if al-Miṣna had a substantial settlement during the second half of the Iron Age. Various phases can be distinguished by various floors one on top of the other. The ceramic forms are closely related to the ones found at al-Bālū' and various architectural remains can be associated with these Iron Age phases. Underneath the Iron Age layer, a mix of MB and LB sherds appeared, but no clear layer could be established as yet. Underneath yet another floor, remains of EB came to light. Besides a variety of EB sherds, a wall was discovered. Bedrock has not yet been reached during this summer's work.

#### Acknowledgements

This season of excavation at al-Bālū' and

al-Miṣna were sponsored by the Ministry of Culture of Sachsen-Anhalt and the Seventh-day Adventist Church. We want to express our thanks and appreciation to the Department of Antiquities in Jordan and specifically to Dr Ghazi Bisheh, then Director-General of the Department of Antiquities who provided the most considerate assistance and encouragement in supporting this project. We would also like to thank Mr Ahmad and Mrs Arwa Massadeh who served as the representatives of the Department of Antiquities facilitating our op-

erations and helping us in many ways.

Udo Worschech  
Theologische Hochschule Friedensau  
An der Ihle 7  
39291 Friedensau  
Germany

Friedbert Ninow  
Theologische Hochschule Friedensau  
An der Ihle 24b  
39291 Friedensau  
Germany



# THE DISCOVERY OF TWO ADDITIONAL POTTERY KILNS AT AZ-ZURRĀBA/WĀDĪ MŪSĀ

by

Khairieh 'Amr and Ahmed al-Momani

## Introduction

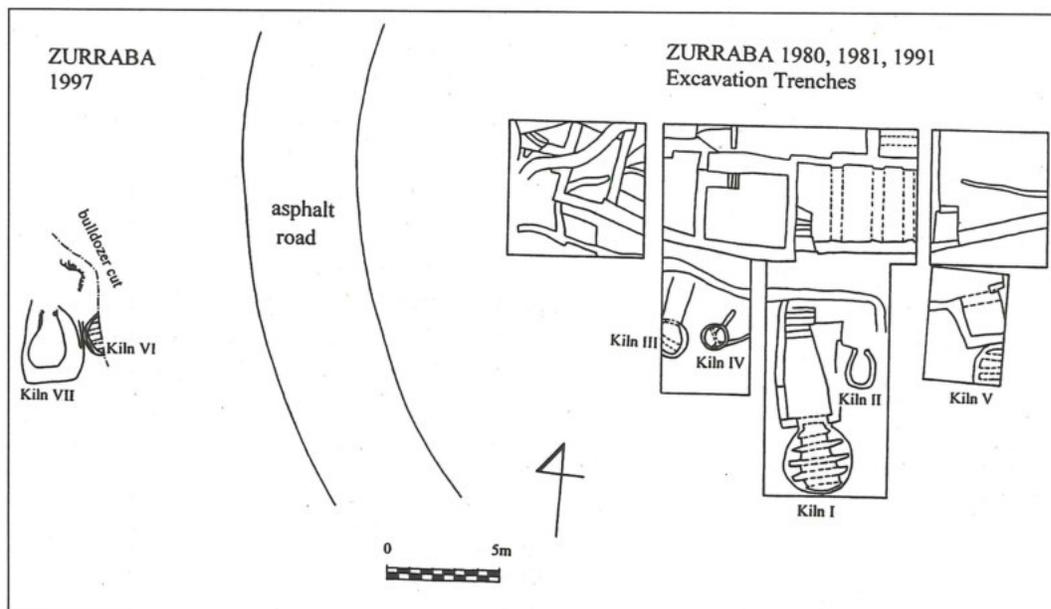
On 6 December 1997, the owner of the plot of land across the street from the excavated portion of the pottery workshops at az-Zurrāba cleared his land in preparation for building. The cleared section revealed the presence of two pottery kilns and a corner of a stone-built structure (Figs. 1 and 2), which were cleared and recorded on 7 December 1997 by Ahmed al-Momani, Khairieh 'Amr, Qais Tweissi (who is also responsible for the conservation and drawing of the finds), Saleh Al-Nawafleh (who helped with the sketch drawing of the kilns) and Jadallah Al-Nawafleh. Elevations for the area were provided by Mahmoud al-Hasanat of the PRPC.

The az-Zurrāba district of Wādī Mūsā is at the northwestern edge of the modern town, close to Petra. Excavations there by the Department of Antiquities over several seasons revealed the presence of a pottery



1. The two kilns in the bulldozer cut at az-Zurrāba after partial clearance. The vertical (50cm) scale stands on the outer floor associated with Kiln VI.

workshop and five pottery kilns dated to the late first/early second, late third/early fourth and mid-sixth centuries AD (Zayadine 1981: 350-351; 1982: 380-393; 1986: 185-187; 'Amr 1991). The discovery of the two kilns in 1997 brought the total of recorded kilns at



2. Location plan of the Kilns VI and VII in relation to the previously excavated part of the az-Zurrāba pottery workshop.

az-Zurrāba up to seven.<sup>1</sup>

### Description of the Kilns

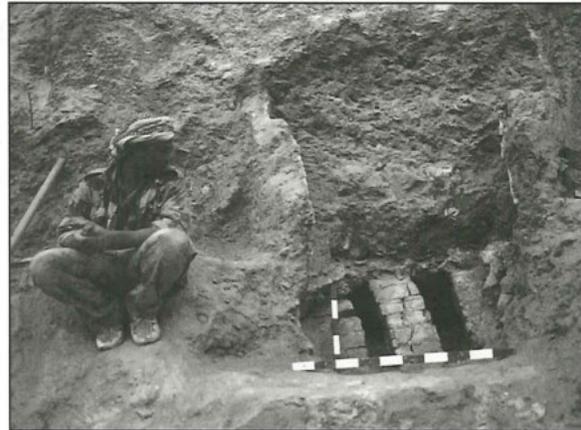
One of the problems of describing kilns is the variety of terms applied to the kiln components. Following the terminology adopted in an earlier paper to describe the az-Zurrāba kilns (Mason and 'Amr 1995), the terms defined by Swan (1984: 29-32) will be used here. Thus the *stoke-hole* is the opening through which the fuel is introduced, the *combustion-chamber* is where the fuel is burnt, in the combustion-chamber are built *supports* for the *raised oven-floor*, above which is the *superstructure* defining the *oven*, in which the pots are stacked for firing.

Both kilns are similar to the previously excavated az-Zurrāba kilns in that they are simple updraught kilns, with the combustion-chamber being directly below the oven. Both kilns are also totally built with brick without any stone elements, and would have originally had domed superstructures. The combustion chambers were dug into the ground, this being a common practice for additional insulation (see for example Adams 1961: 33, 37; 1962: 65, 66; 1986: 31-32; Golvin *et al.* 1982: 42, 43, 47, 88; Coulson and Wilkie 1986: 66; Anderson 1987: 42; Melkawi *et al.* 1994).

Following the nomenclature adopted during the previous seasons at az-Zurrāba, the two new kilns were designated as Kiln VI (the upper kiln) and Kiln VII (the lower kiln).

#### Kiln VI (Fig. 3)

Kiln VI is the smaller of the two, with a diameter of around 1.60m. The maximum preserved height is 1.50m. The floor of the combustion-chamber of Kiln VI is at an elevation of 1048.34m asl, and the combustion-chamber has three transverse arches sup-



3. Kiln VI with the side cut to reveal the combustion-chamber arch supports.

porting the raised oven-floor at around 70cm above the combustion-chamber floor.

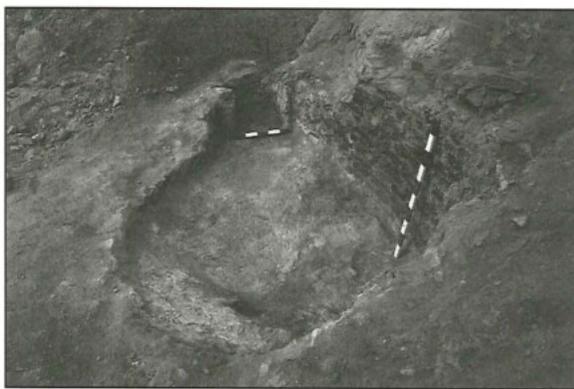
At the same level as raised the oven-floor (1049.03m asl), we detected the outer floor level through which the combustion-chamber was cut. The stoke-hole is still in the section and judging by the orientations of the arch supports, it is most probably at the northern end of the combustion-chamber (similar to the stoke-hole of Kiln VII). The stoke-holes of Kilns I, II, III and IV are all roughly north-facing, while the orientation of the Kiln V arches also suggests a north-facing stoke-hole, see Fig. 2).

#### Kiln VII (Fig. 4)

The larger of the two kilns, only the combustion-chamber of this kiln was preserved to a maximum height of around one metre. The stoke-hole to the north is 0.47m wide. The floor of the combustion-chamber is at an elevation of 1047.66m asl, and its plan is an irregular oval measuring 1.70m east-west by 2.30m north-south (compare to the rectangular combustion chamber of Kiln I measuring 1.15-1.35 x 3.0m, Mason and 'Amr 1995: 629). The supports inside the combustion-chamber had been cleared at a later date

1. Since then, three more kilns were discovered under the dividing modern street during the excavation for the Wādi Mūsā wastewater network in September 1998, bringing the total number of recorded kilns up to ten. These kilns are at approximately 26, 30 and 81m to the north of the

excavated trenches, while the associated structures and archaeological strata extend for a length of around 350m north-south. These findings from az-Zurrāba will be published in the final report of the archaeological supervision of the Wādi Mūsā Water System and Wastewater Project.



4. Kiln VII, view to the north.

(also compare with Kiln I, Zayadine 1982: 380), while the interior lining had melted due to very high temperatures. The stone-built

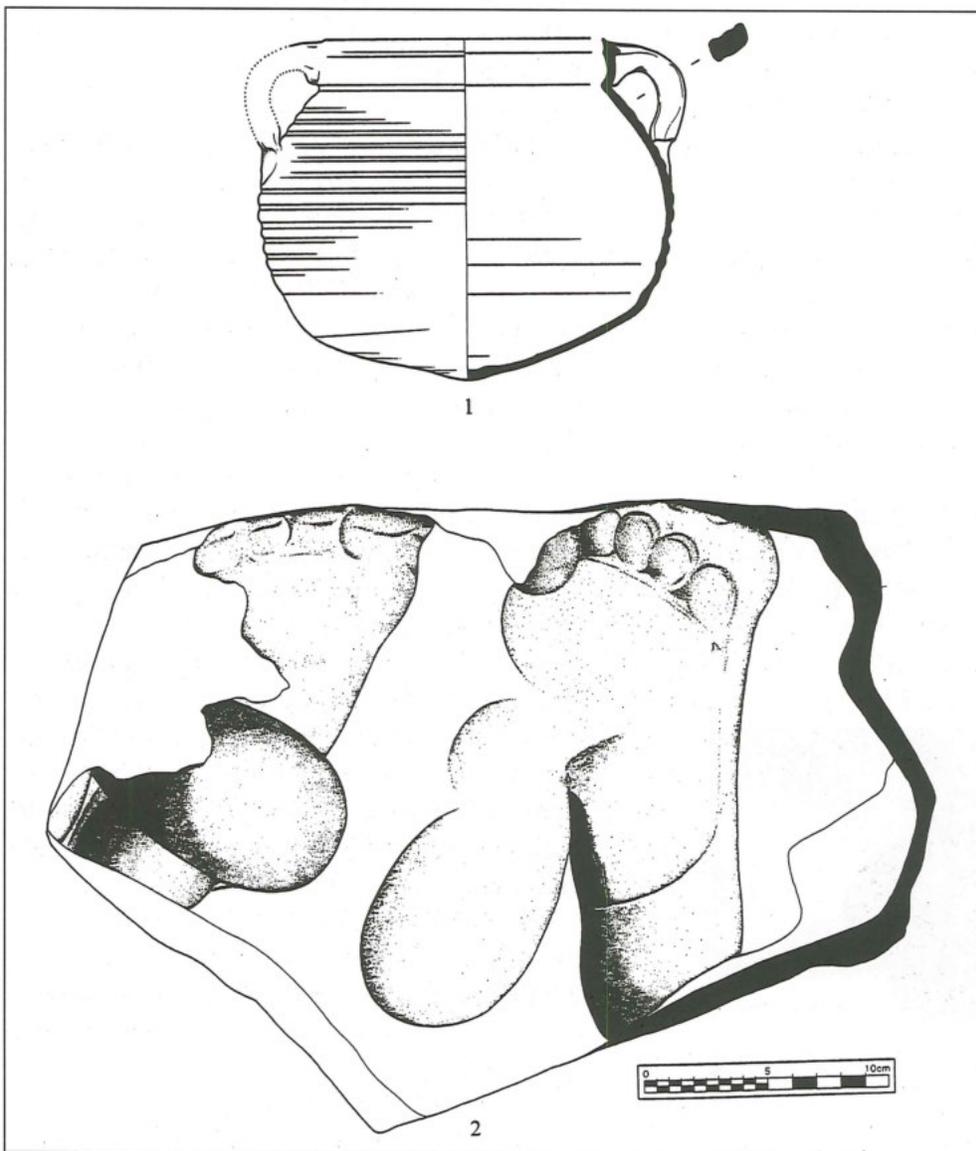
structure to the north is at a distance of around 1.0m and may be part of an entry-way also similar to that in front of Kiln I.

### The Finds

#### *Registered Objects Associated with Kiln VI*

The registered objects from the kilns are deposited at the Petra Museum. They are presented here by the *Registration number/ Petra Museum registration number (location)*.

*Zur 97.KVI.01/ JP5024 (Kiln VI interior)* (Fig. 5:1). Cooking pot. Broken and mend-



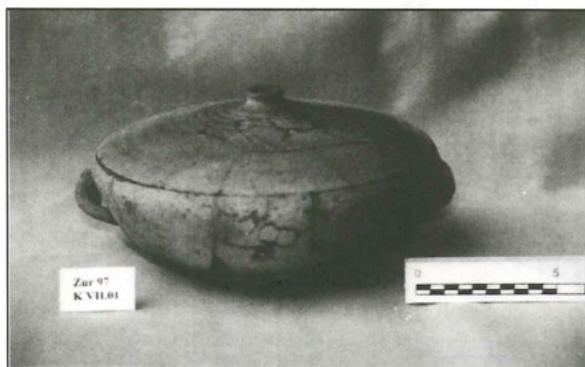
5. Registered finds from Kiln VI (drawing by Qais Tweissi).

ed, one handle and parts of body missing. Ware and interior: 2.5YR 5/6 red; exterior: 5YR 8/2 pinkish white. Many small to medium calcite, numerous sand inclusions. *Parallel examples: Garcia 1965: Pl. LVIII.1 (period Ic: after AD 106-ca. 150); Gerber 1997: fig. 4A (middle to second half of the first century AD).*

*Zur 97.KVI.02/ JP5025 (Kiln VI interior)* (Fig. 5:2). Brick with (six) foot impressions, one complete impression is around 24cm long. Broken and incomplete. Length: 36.2cm; width: 15-25cm; thickness: 10.5cm. Unevenly fired: 2.5YR 5/8 red and 5YR 5/1 grey. Very rough with numerous inclusions.

#### *Registered Objects Associated with Kiln VII*

*Zur 97.KVII.01/ JP5026 (Kiln VII interior)* (Figs. 6 and 7:1). .01a: Casserole; .01b: lid. Small pottery casserole with two handles and rounded base, plus fitted lid with central knob handle. Casserole and lid originally made in one piece then separated with an oblique cut resulting in perfect fit. Broken and mended, complete except for small part of casserole base and lid top; casserole also has small perforation near base. Casserole and lid of equal diameters: 13.1cm. Ware and interior: 5YR 6/6 reddish yellow; exterior: 5YR 6/6 reddish yellow - 5YR 6/4 light reddish brown - 5YR 8/2 pinkish white. Many small to medium calcite, numerous sand inclusions. *Parallel example for casserole: Garcia 1965: Pl. LIX.20 (de-*



6. Casserole and matching lid no. Zur97.KVII.01/ JP5026, from Kiln VII interior.

*scribed as bowl, period Ic: after AD 106-ca. 150).*

*Zur 97.KVII.02/ JP5027 (Kiln VII interior)* (Fig. 7:2). Zoomorphic (ibex) vessel spout, painted. Wheelmade cylinder with applied features. Horns and beard missing. Preserved height: 7.3cm. Ware: 2.5YR 6/8 light red; core: N6/0 grey; remnants of slip: 7.5YR 7/4 pink; paint: 10R 4/1 dark reddish grey. Many small to medium calcite, numerous sand inclusions.

*Zur 97.KVII.03/ JP5028 (Kiln VII interior)* (Fig. 7:3). Small pottery juglet with ribbed globular body. Handle and part of rim and neck missing, small perforation in body. Ware: 2.5YR 5/6 red; exterior: 2.5YR 6/4 light reddish brown with patch of 2.5Y 8/2 white. Few small calcite, many sand inclusions.

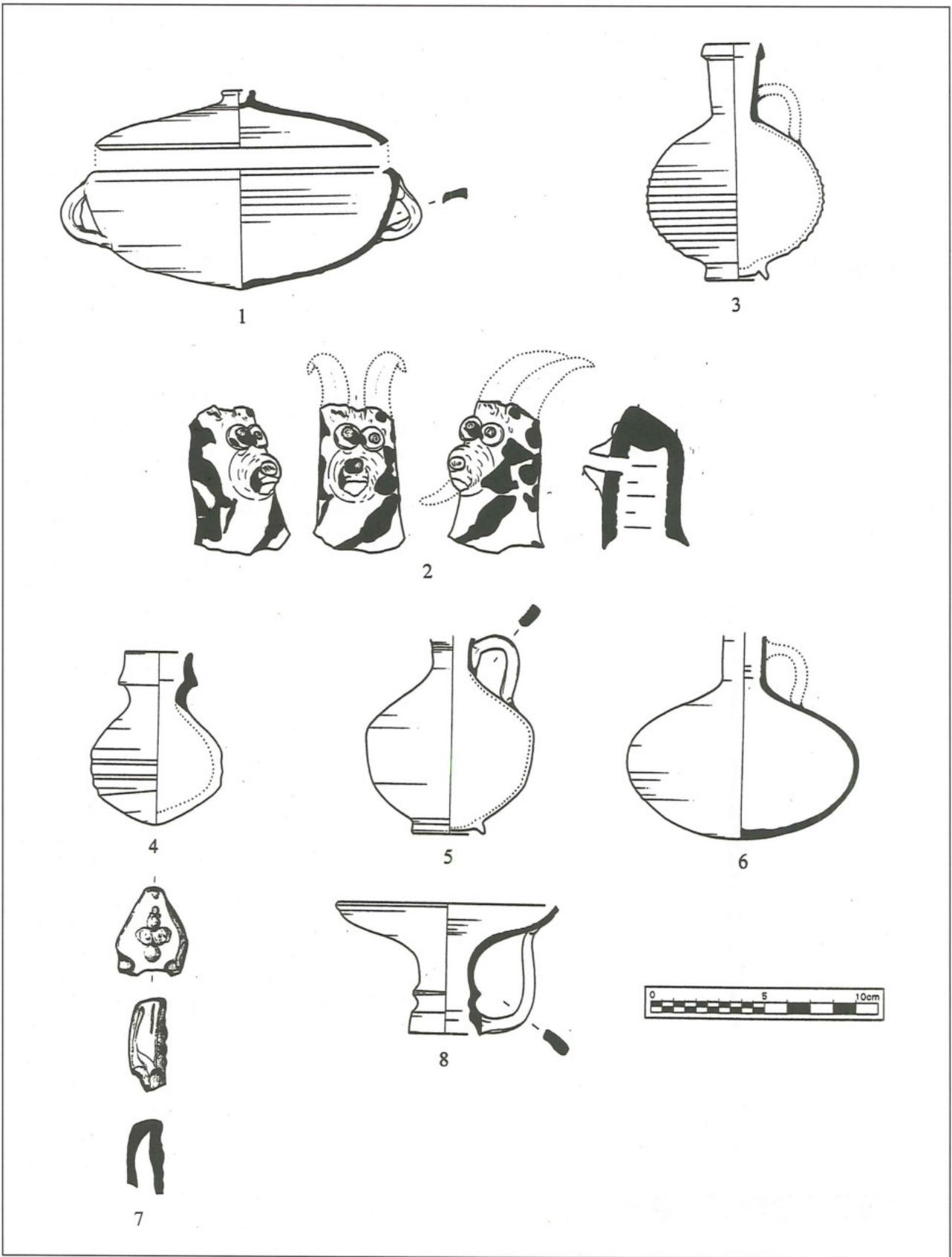
*Zur 97.KVII.04/ JP5029 (Kiln VII interior)* (Fig. 7:4). Small pottery bottle with pointed base. Complete except for chipping at the top of the rim, medium perforation at shoulder. Ware: 5YR 6/6 reddish yellow; unevenly fired surface: 7.5 6/4 light brown - 5YR 6/6 reddish yellow. Many small to medium calcite, mineral red and sand inclusions.

*Zur 97.KVII.05/ JP5030 (Kiln VII interior)* (Fig. 7:5). Small pottery juglet. Rim and part of neck missing, small perforation in base. Ware: 10R 6/6 light red. Many small calcite and sand inclusions.

*Zur 97.KVII.06/ JP5031 (Kiln VII interior)* (Fig. 7:6). Small pottery juglet with round base. Broken and mended, handle and rim missing. Ware and interior: 2.5YR 6/8 light red; exterior: 7.5YR 8/2 pinkish white with patches of 5Y 5/1 grey. Few small calcite, many sand inclusions.

*Zur 97.KVII.07/ JP5032 (Kiln VII interior)* (Fig. 7:7). Moulded lamp handle. Ware: 2.5YR 5/6 red - 5YR 5/4 reddish brown; core: 10YR 5/1 grey. Few small calcite and sand inclusions.

*Zur 97.KVII.08/ JP5033 (from structure north of Kiln VII) ( Fig. 7:8). Rim to shoul-*



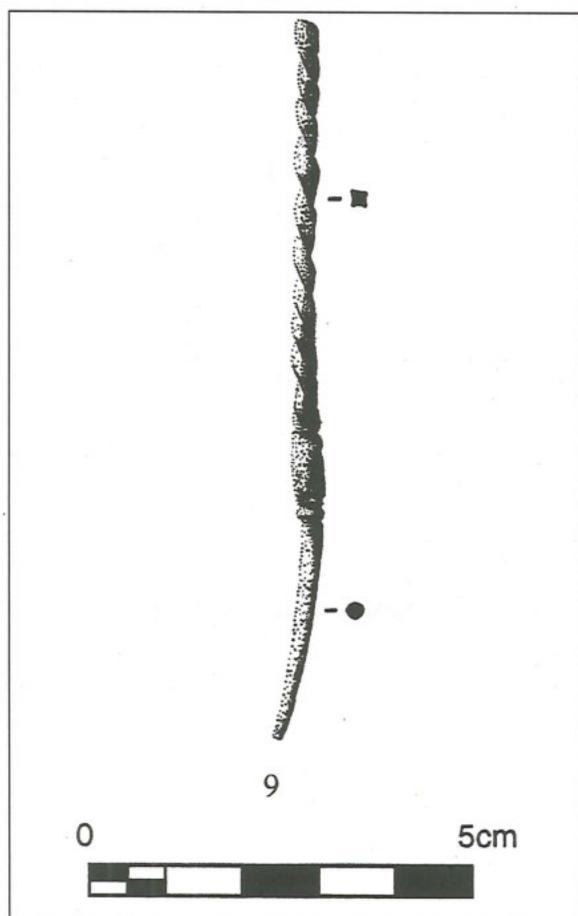
7. Registered finds from Kiln VII (drawing by Qais Tweissi).

der of jug, cut off after firing for reuse as funnel(?). Ware and interior: 2.5YR 6/8 light red; exterior: 7.5YR 6/4 light brown. Many small calcite and sand inclusions.

Zur 97.KVII.09/ JP5034 (Kiln VII interior) (Fig. 8). Bronze point with twisted handle. Probably a tool for gauging the thickness of pottery vessel walls.

### The Pottery from Kiln VI

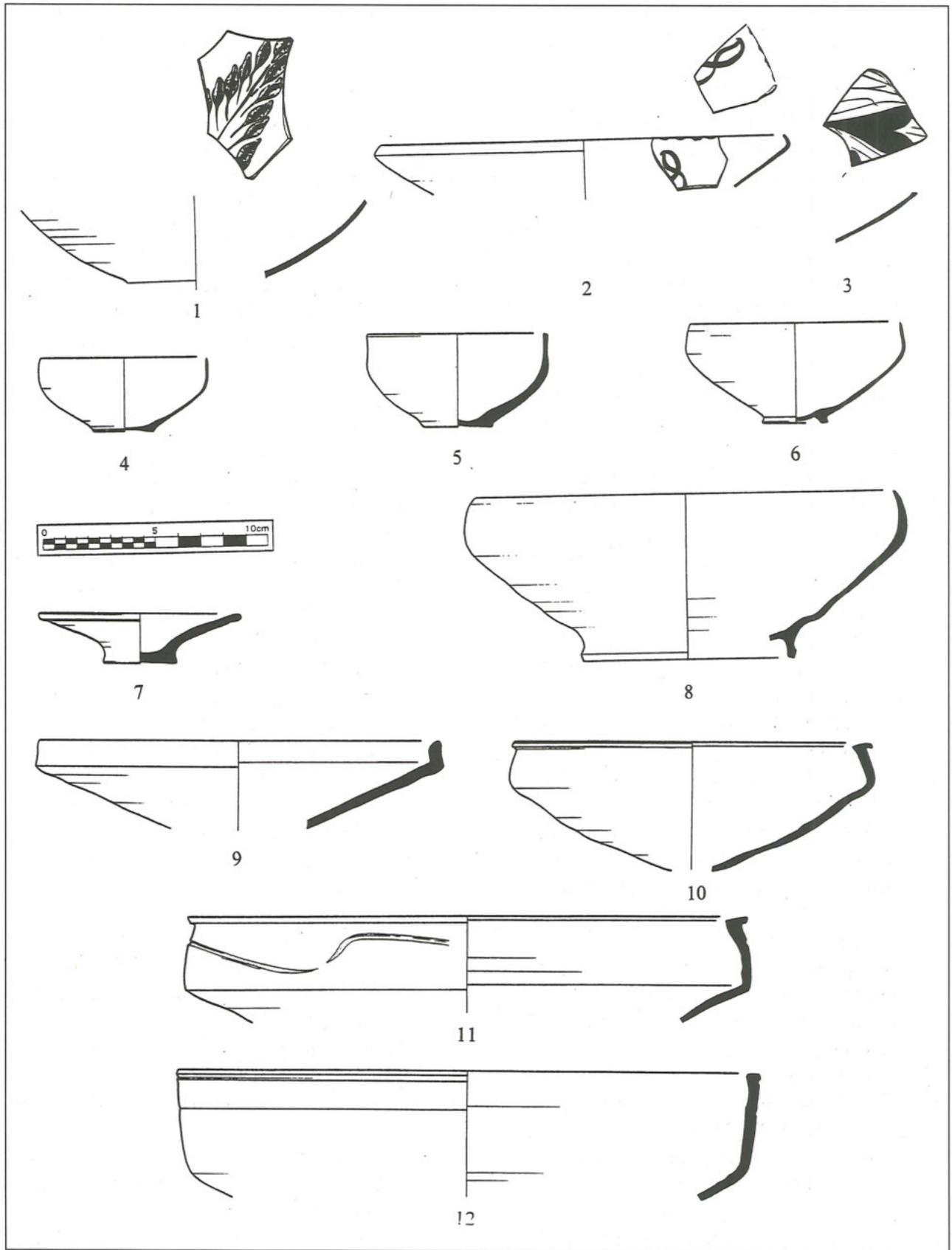
1. Painted bowl (Fig. 9:1). Ware, interior and exterior: 5YR 6/8 reddish yellow; interior paint: 2.5YR 5/6 red. Fine ware with few inclusions. *Parallel examples:* Villeneuve 1990: pl. III.4 (AD 100-150); Schmid 1995: figs. 9, 10.21 (end of the first century BC); Schmid 1996: 203 no. 690-2 (second half of the first century BC-ca. AD 20).
2. Painted bowl (Fig. 9:2). Ware and inter-



8. Bronze rod from Kiln VII (drawing by Qais Tweissi).

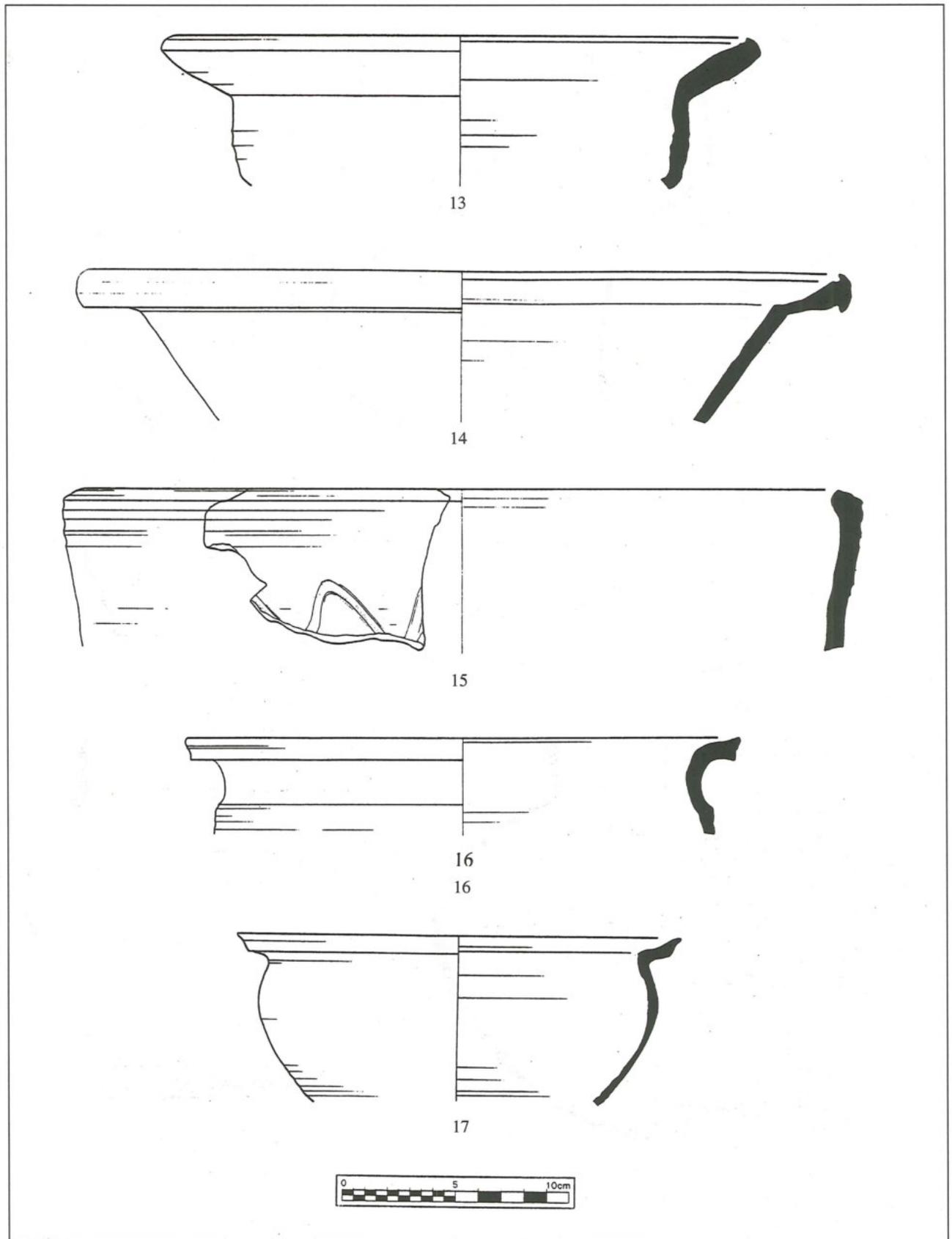
ior: 2.5YR 6/8 light red; uneven core: N5/0 grey; exterior: 2.5YR 6/8 light red with patch of 2.5YR 6/2 pale red; interior paint: 2.5YR 5/6 red; thin slip at rim exterior: 10YR 8/2 white. Many sand inclusions.

3. Painted bowl (Fig. 9:3). Ware: 2.5YR 6/8 light red; exterior: 5YR 6/4 light reddish brown - 10YR 5/2 greyish brown; interior: 5YR 7/4 pink; interior paint: 10YR 4/2 dark greyish brown. Few white inclusions. *Parallel examples:* Schmid 1995: fig. 9 (AD 20-50); Schmid 1996: 207 no. 700 (AD 20-50).
4. Cup with string-cut base (cutting through the base); more than half complete (Fig. 9:4). Ware, interior and exterior: 5YR 6/8 reddish yellow. Fine with some medium sand and white inclusions.
5. Cup with string-cut base; around two thirds complete (Fig. 9:5). Ware, interior and exterior: 2.5YR 6/6 light red; remnants of slip on exterior: 10YR 8/2 white. Many sand inclusions.
6. Cup; around two thirds complete (Fig. 9:6). Ware, interior and exterior: 5YR 6/6 reddish yellow; thin slip at exterior rim: 5YR 7/3 pink. Many small white and red inclusions.
7. Small flaring bowl or lid with string-cut "base" (Fig. 9:7). Ware, interior and exterior: 2.5YR 6/6 light red. Many white and red inclusions.
8. Bowl (Fig. 9:8). Ware, interior and exterior: 5YR 6/6 reddish yellow; remnants of slip at exterior rim: 5YR 8/1 white. Some white and red inclusions. *Parallel examples:* Schmid 1995: fig. 3.15 (ca. AD 20-100); Schmid 1996: 185 no. 642 (ca. AD 20-100).
9. Bowl (Fig. 9:9). Ware: 5YR 6/3 light reddish brown; medium core: 5YR 5/1 grey; interior: 5YR 7/3 pink near base - 2.5YR 6/6 light red toward rim, with bands of: 10R 5/6 red; exterior: 5YR 7/4 pink; slip at exterior rim: 10YR 8/3 very pale brown. Many sand, white and grey in-

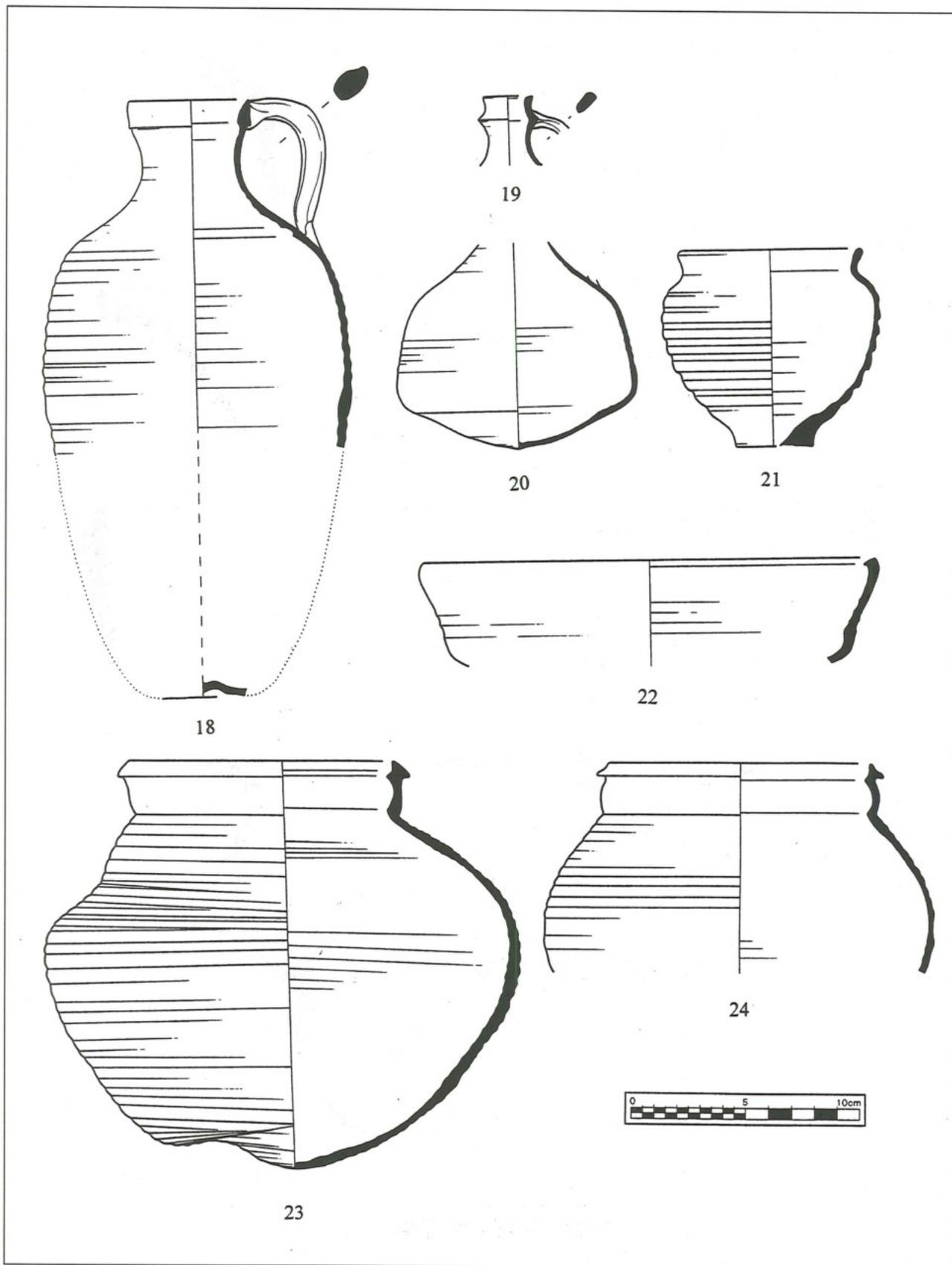


9. Pottery sherds from Kiln VI (drawing by Qais Tweissi).

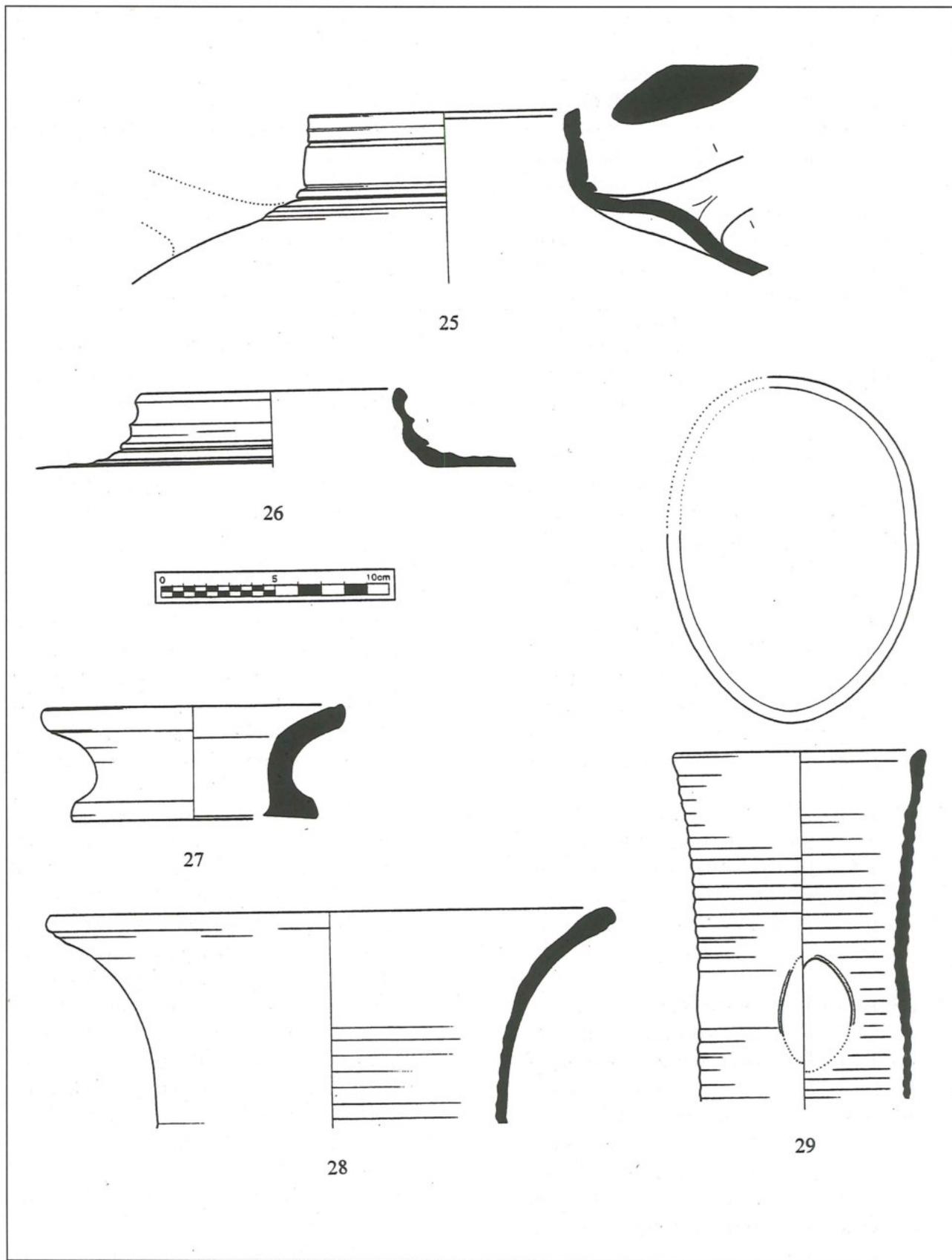
- clusions. *Parallel example: Garcia 1965: pl. LIX.2, 7, 12 (after AD 106 and probably by AD 150).*
10. Bowl (Fig. 9:10). Ware, interior and exterior: 2.5YR 6/8 light red; slip at exterior rim: 5YR 8/2 pinkish white. Fine with some white and red inclusions.
  11. Bowl with incised wavy line decoration at exterior (Fig. 9:11). Ware, interior and exterior: 2.5YR 6/8 light red; remnants of thin wash exterior rim: 2.5YR 6/6 light red. Some sand and white inclusions.
  12. Bowl (Fig. 9:12). Ware, interior and exterior: 5YR 6/6 reddish yellow; uneven slip on interior and exterior: 10YR 8/3 very pale brown where most thick. Many white and brown inclusions.
  13. Bowl (Fig. 10:13). Ware: 5YR 6/8 reddish yellow; thick slip interior: 5YR 6/1 grey; remnants of slip exterior: 10YR 8/2 white. Numerous sand and white inclusions.
  14. Bowl (Fig. 10:14). Ware: 5YR 6/8 reddish yellow; remnants of slip interior: 5YR 7/4 pink; thick slip exterior: 10YR 8/3 very pale brown. Many white and grey inclusions.
  15. Bowl/basin (Fig. 10:15). Ware: 2.5YR 6/8 light red toward the interior and 5YR 6/1 grey toward the exterior; thick slip at surfaces, exterior: 10YR 6/3 pale brown - 10YR 8/2 white; interior: 10YR 8/3 very pale brown. Numerous sand and white inclusions.
  16. Closed bowl (Fig. 10:16). Ware: 5YR 5/4 reddish brown; uneven core: 2.5YR 4/6 red; exterior and interior: 5YR 4/1 dark grey. Numerous sand, white and grey inclusions.
  17. Closed bowl (Fig. 10:17). Ware, interior and exterior: 2.5YR 6/8 light red; thin core: 2.5YR 5/6 red; slip exterior: 5YR 8/3 pink. Fine ware with some white inclusions.
  18. Jug with omphalos base; more than half complete (Fig. 11:18). Ware: 5YR 7/8 reddish yellow; exterior: 10YR 8/2 white; interior: 7.5YR 7/4 pink - 5YR 6/8 reddish yellow. Many sand, white and red inclusions.
  19. Jug (Fig. 11:19). Ware: 5YR 6/8 reddish yellow; exterior and interior: 5YR 4/1 dark grey, with remnants of 10YR 7/2 light grey slip. Fine ware with some white and grey inclusions.
  20. Jug; around two thirds complete (Fig. 11:20). Ware and interior: 2.5YR 6/8 light red; exterior slip: 5YR 8/1 white. Fine ware with some sand and white inclusions.
  21. Ampulla; more than half complete (Fig. 11:21). Ware 5YR 6/8 reddish yellow; medium core: 5YR 6/1 grey; exterior: 5YR 7/8 reddish yellow; slip upper exterior and interior: 5YR 8/2 pinkish white. Some sand, white and red inclusions.
  22. Casserole (Fig. 11:22). Ware and interior: 2.5YR 6/8 light red; exterior slip: 5YR 7/3 pink. Some sand, white and brown inclusions.
  23. Cooking pot; almost half complete, warped (Fig. 11:23). Ware: 5YR 5/6 yellowish red; wide core: 5YR 4/1 dark grey; interior: bands of 5YR 5/2 reddish grey and 7.5YR 5/4 brown; exterior: 5YR 6/4 light reddish brown with remnants of slip: 10YR 7/3 very pale brown. Some white, grey and grog inclusions (including a fragment of the rim of a late first century AD fine Nabataean bowl). *Parallel example: Gerber 1997: fig. 4B (middle to second half of the first century AD).*
  24. Cooking pot; around two thirds complete (Fig. 11:24). Ware: 2.5YR 5/8 red; exterior: 5YR 6/4 light reddish brown - 5YR 7/3 pink; interior: 7.5YR 8/2 pinkish white at rim - 5YR 5/4 reddish brown. Some sand, white and red inclusions. *Parallel example: Gerber 1997: fig. 4D (middle to second half of the first century AD).*



10. Pottery sherds from Kiln VI (drawing by Qais Tweissi).



11. Pottery sherds from Kiln VI (drawing by Qais Tweissi).

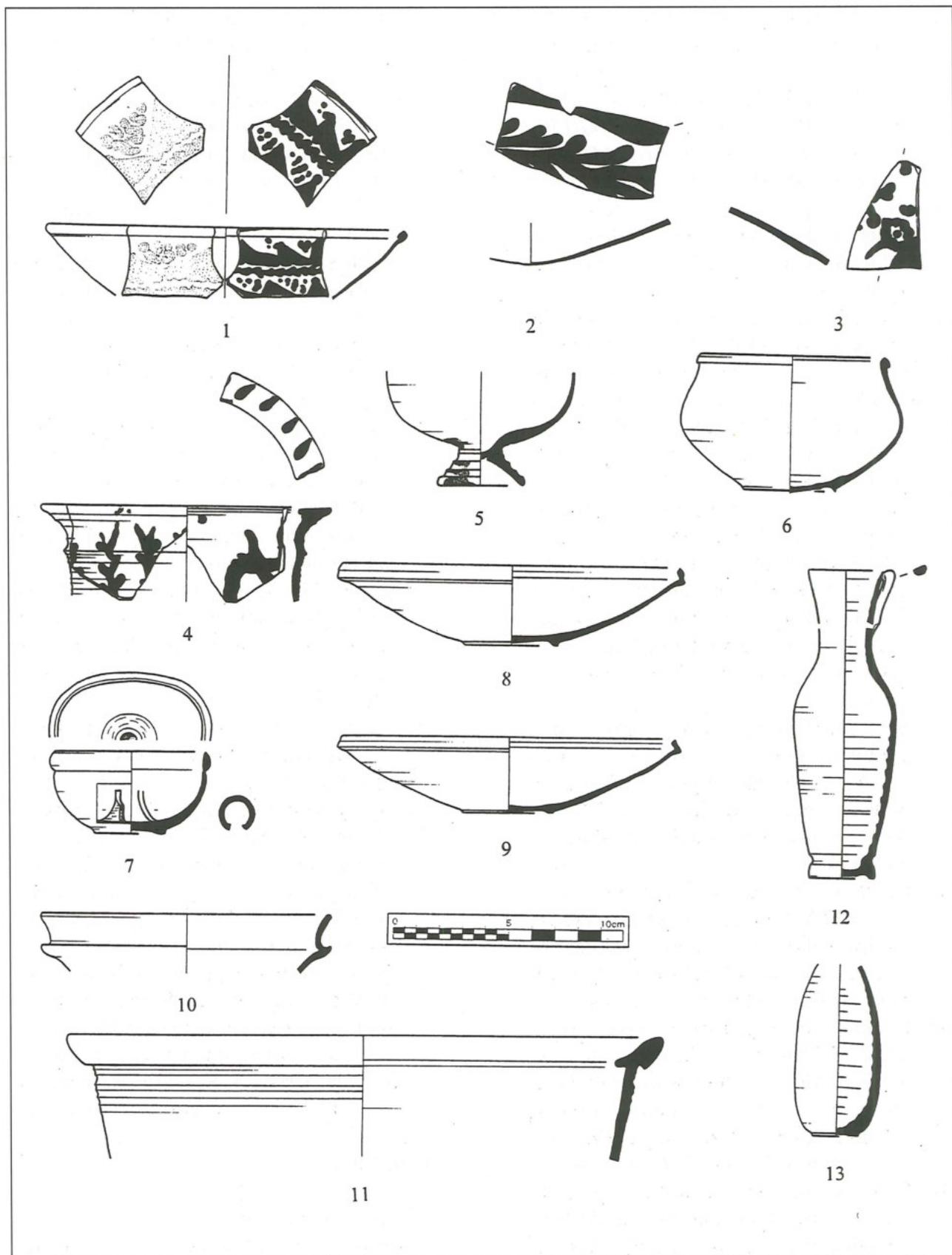


12. Pottery sherds from Kiln VI (drawing by Qais Tweissi).

25. Jar—probably with four handles (Fig. 12:25). Ware: 2.5YR 5/6 red; wide core: N5/0 grey; exterior: badly weathered with remnants of slip 5YR 6/6 reddish yellow - 10YR 8/4 very pale brown; interior: 2.5YR 6/4 light reddish brown. Many sand and grog inclusions. *Parallel example: Gerber 1997: fig. 6 (middle to second half of the first century AD).*
26. Jar (Fig. 12:26). Ware: 2.5YR 5/6 red; exterior: 2.5YR 6/8 light red - 7.5YR 8/2 pinkish white with patch of 5YR 4/1 dark grey; interior: 2.5YR 6/4 light reddish brown. Many sand, white and red inclusions.
27. Stand (Fig. 12:27). Ware and interior: 5YR 6/8 reddish yellow; exterior: 2.5YR 6/8 light red with remnants of slip: 5YR 8/1 white and patch of 5YR 6/1 grey. Many sand, grey and grog inclusions. *Parallel example: Khairy 1990: fig. 44.3 (second quarter of the first century AD).*
28. Large stand (?) (Fig. 12:28). Ware: 2.5YR 6/8 light red; slip exterior and interior: 10YR 8/2 white - 7.5YR 7/4 pink. Many sand, white and grey inclusions.
29. Flue pipe (Fig. 12:29). Ware: 5YR 6/8 reddish yellow; exterior: 5YR 5/6 yellowish red, slip: 5YR 7/4 pink; interior: 5YR 7/6 reddish yellow - 5YR 5/1 grey. Many sand, white and grog brown inclusions.

### The Pottery from Kiln VII

1. Painted bowl, with shadowing on the exterior (resulting from the evaporation of paint particles on the bowl stacked below this bowl during firing) (Fig. 13:1). Ware and exterior: 2.5YR 6/6 light red; interior: 2.5YR 5/8 red; interior paint: 2.5YR 4/1 dark grey; exterior shadowing: 2.5YR 5/2 weak red. Fine ware with few white inclusions.
2. Painted bowl (Fig. 13:2). Ware and exterior: 2.5YR 6/6 light red; interior: 2.5YR 5/8 red; interior paint: 5YR 4/1 dark grey. Fine ware with some white inclusions. *Parallel examples: Schmid 1995: fig. 9 (ca. AD 100); Schmid 1996: 209 no. 702-3 (ca. AD 100).*
3. Painted jug body sherd (Fig. 13:3). Ware: 2.5YR 5/8 red; exterior: 2.5YR 5/4 reddish brown; interior: 2.5YR 5/6 red; exterior paint: 5YR 4/2 dark reddish grey. Many sand, red and white inclusions.
4. Painted jar rim (Fig. 13:4). Ware and exterior: 2.5YR 6/6 light red; interior: 2.5YR 5/8 red; paint: 5YR 4/1 dark grey. Many white and red inclusions.
5. Painted chalice base (Fig. 13:5). Ware: 2.5YR 5/8 red; exterior and interior: 2.5YR 6/8 light red; paint: 2.5YR 4/2 weak red. Fine ware with some white and grey inclusions. *Parallel example: Villeneuve 1990: pl. III.5 (AD 100-150).*
6. Bowl (from the structure north of Kiln VII); more than three quarters complete (Fig. 13:6). Ware, exterior and interior: 2.5YR 6/6 light red; dripping slip at rim exterior and interior: 2.5YR 5/8 red. Many white and grey inclusions. *Parallel example: Villeneuve 1990: pl. II.2 (AD 100-150).*
7. Bowl with central stem and string-cut base; around two thirds complete (Fig. 13:7). Ware: 5YR 5/1 grey; exterior: 5YR 5/3 reddish brown; interior: 5YR 5/4 reddish brown. Many white and brown inclusions, some blistering at both surfaces.
8. Bowl; around three quarters complete (Fig. 13:8). Ware, interior and exterior: 2.5YR 6/8 light red, remnants of slip exterior rim: 7.5YR 8/4 pink. Fine ware with some white and quartz inclusions, some blistering on both surfaces. *Parallel examples: Villeneuve 1990: pl. IV.2 (AD 100-150); Schmid 1995: fig. 3.12 (ca. AD 100); Schmid 1996: 187 no. 657 (ca. AD 100).*
9. Bowl; around half complete (Fig. 13:9). Ware, interior and exterior: 2.5YR 5/8



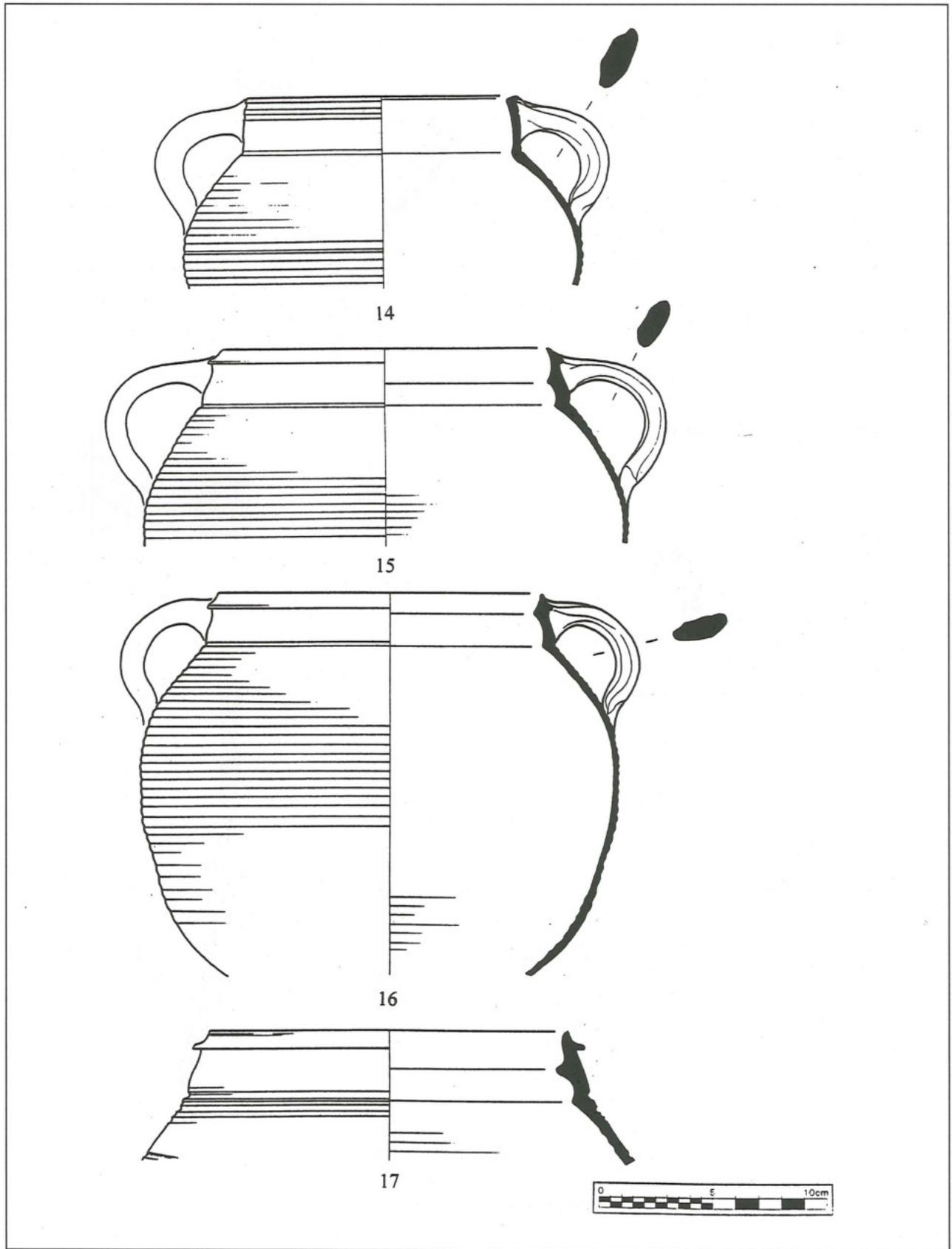
13. Pottery sherds from Kiln VII (drawing by Qais Tweissi).

- red, remnants of slip exterior rim: 5YR 7/4 pink. Fine ware with some white and quartz inclusions, some blistering on both surfaces. *Parallel examples: Ville-neuve 1990: pl. IV.2 (AD 100-150); Schmid 1995: fig. 3.13 (ca. AD 100); Schmid 1996: 187 no. 657 (ca. AD 100).*
10. Bowl (Fig. 13:10). Ware, interior and exterior: 5YR 6/6 reddish yellow. Fine ware with some small white and sand inclusions.
  11. Large bowl (Fig. 13:11). Ware, interior and exterior: 5YR 6/6 reddish yellow; core: 5YR 6/1 light grey surrounded by 10YR 7/4 very pale brown; uneven slip exterior: 5YR 7/4 pink - 10YR 8/4 very pale brown. Many sand, white and brown inclusions.
  12. Juglet; around three quarters complete (Fig. 13:12). Ware: 5YR 8/3 pink - 2.5YR 6/8 light red near exterior; thin core: 2.5YR 6/2 pinkish grey; exterior: 2.5YR 6/8 light red; interior: 5YR 8/3 pink at body - 2.5YR 6/8 light red at neck. Fine ware with few sand and brown inclusions.
  13. Bottle with string-cut base; around half complete (Fig. 13:13). Ware and interior: 5YR 6/6 reddish yellow; thin core: 5YR 5/1 grey; exterior: 5YR 7/6 reddish yellow. Some sand and white inclusions.
  14. Cooking jar (Fig. 14:14). Ware and interior: 2.5YR 5/8 red; exterior: 5YR 6/6 reddish yellow; slip exterior and interior rim: 10YR 8/2 white where thickest. Many white and brown inclusions.
  15. Cooking pot (Fig. 14:15). Ware and interior: 2.5YR 5/8 red; thick slip exterior: 10YR 8/2 white. Numerous sand, white and brown inclusions. *Parallel example: Garcia 1965: pl. LVIII.9 (after AD 106 and probably by AD 150).*
  16. Cooking pot; more than third complete (Fig. 14:16). Ware and interior: 5YR 6/6 reddish yellow; slip exterior: 5YR 8/2 pinkish white. Numerous white and brown inclusions. *Parallel examples: Garcia 1965: pl. LVIII.5 (after AD 106 and probably by AD 150); Gerber 1997: Fig. 4E (middle to second half of the first century AD).*
  17. Jar with incised combing at upper shoulder (Fig. 14:17). Ware: 2.5YR 6/6 light red; wide core: N5/0 grey; exterior and interior: 5YR 6/3 light reddish brown with streaks of 5YR 6/4 light reddish brown. Many sand, white and brown inclusions, some bloating at exterior. *Parallel example: Garcia 1965: pl. LVIII.7 (after AD 106 and probably by AD 150).*
  18. Jar with incised wavy line decoration at shoulder (Fig. 15:18). Ware: 5YR 6/4 light reddish brown; wide core: 5YR 6/1 light grey; slip exterior: 10YR 8/2 white; burnt interior. Many sand, white and brown inclusions.
  19. Stand (Fig. 15:19). Ware: 5YR 7/8 reddish yellow; slip on all surfaces: 5YR 5/1 grey with "spots" of 5YR 7/1 light grey. Many sand, white and brown inclusions.
  20. Stand; almost half complete (Fig. 15:20). Ware: 5YR 6/6 reddish yellow; slip on all surfaces: 10YR 8/1 white. Many sand, white and red inclusions.
  21. Water pipe (Fig. 15:21). Ware, exterior and interior: 2.5YR 6/6 light red; "sandwich" core: N6/0 grey at centre surrounded by 2.5YR 6/8 light red; remnants of slip exterior: 5YR 7/4 pink. Numerous white and brown inclusions.
  22. Roof tile (Fig. 15:22). Ware: 2.5YR 3/6 dark red; medium core: 2.5YR 4/6 red; remnants of slip on surfaces: 10YR 8/4 very pale brown. Rough ware with numerous sand, white and grey inclusions.

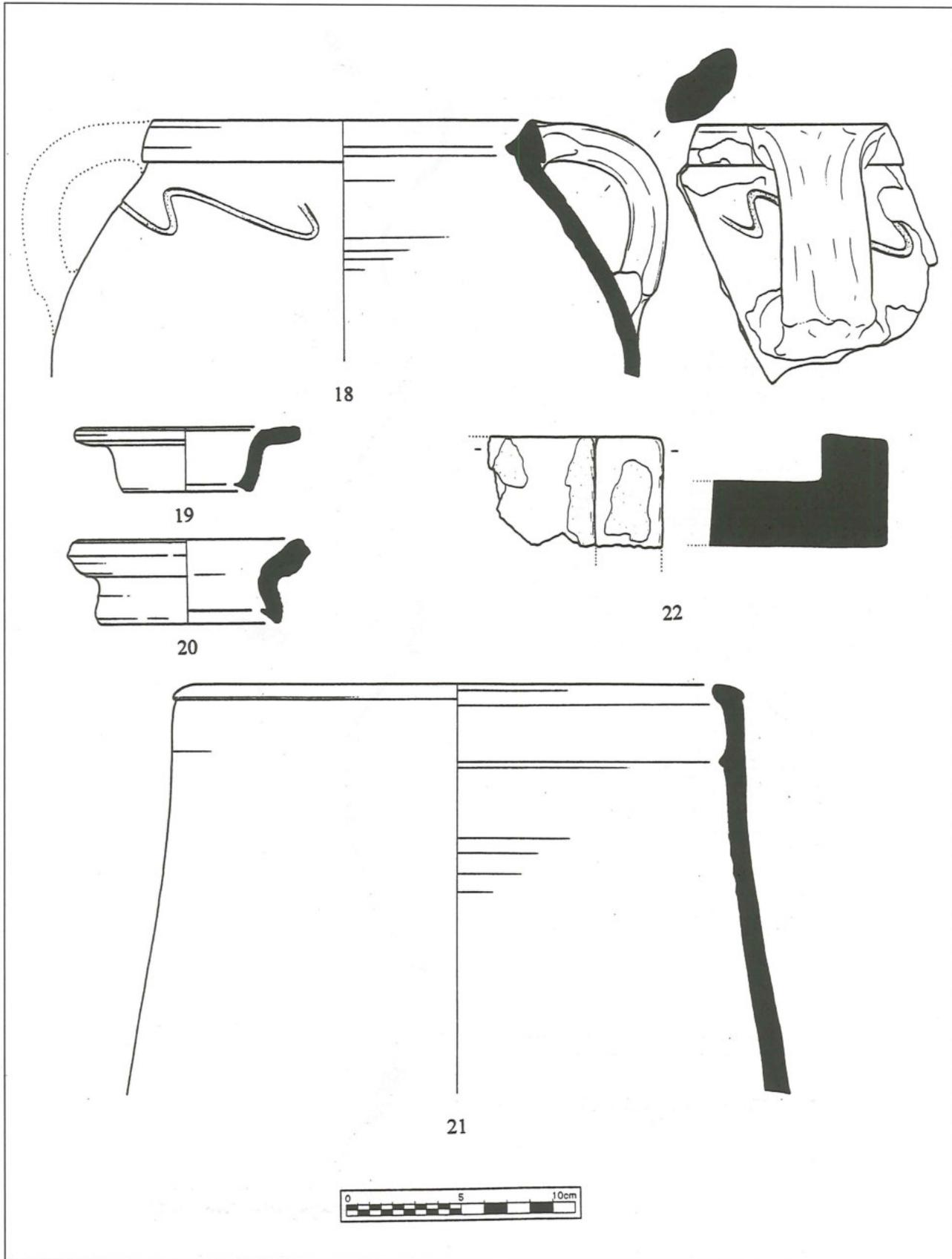
## Comments

### *The Kiln Structures*

Despite the initial impression—created by the bulldozing as well as the natural



14. Pottery sherds from Kiln VII (drawing by Qais Tweissi).



15. Pottery sherds from Kiln VII (drawing by Qais Tweissi).

slope of the site—that Kiln VII should be earlier than Kiln VI (see Fig. 1), it is more likely that the two kilns form a pair similar to the pairs of Kilns I and II, and Kilns III and IV (see Fig. 2). Similar to the previously excavated pairs, Kilns VI and VII have their stoke-holes at the northern side, and the smaller Kiln VI is to the east of the larger Kiln VII.

Also due to the natural slope of the hillside on which the az-Zurrāba production centre is located, and the fact that the kiln combustion-chambers were placed underground, the comparison of elevations is not of much use in determining the chronological sequence of spatially distant features. For example, the late first/early second century AD Kilns III and IV are around 5m higher in elevation than Kilns VI and VII, although the difference of around 70cm in the levels of the Kilns VI and VII combustion-chamber floors is equal to the difference between the combustion-chamber floors of Kilns III and IV.

Unfortunately, due to the nature of the “excavation” and the limited time available to archaeologists at the site, only the external floor level of Kiln VI could be determined and only the combustion-chamber of Kiln VII survived up to a height of around 1.0m. Assuming the same external level for both kilns, the combustion chamber of Kiln VII would be around 1.35m deep. It is more likely, however, that there was a slope or steps separating the two kiln levels (which are 70cm apart), and a depth of around 1.00m for the Kiln VII combustion-chamber is comparable to the 96cm depth for the Kiln I combustion-chamber and the 1.11m depth for the Kiln III combustion-chamber, Kilns I and III being the two larger kilns of the previously excavated pairs.

It was already deduced from the previous excavations that the az-Zurrāba kilns show “a progression from building deep, rather narrow kilns towards wider and more sha-

llow constructions with more sophisticated fireboxes (combustion-chambers)” (‘Amr 1991: 321). Structurally, Kilns VI and VII are intermediate between Kiln III “used no later than the second century AD” (‘Amr 1991: 320) and Kiln I dated “around the beginning of the fourth century AD” (Zayadine 1982: 382-384; ‘Amr 1991: 320).

Considering the factors mentioned above in combination with those stated in the *Description of the Kilns* section, then Kilns VI and VII should be closer in date to the early fourth century AD Kiln I than the simpler narrow Kilns III and IV.

### *The Ceramics*

The finds from the kilns were obviously dumped inside them after they went out of use. This dumping would most probably have occurred shortly after the abandonment of the kilns as it is to be expected that the potters had a problem in finding areas for their large dumps—mostly fuel residue, production wasters and even probably earlier dumps in undesirable locations. It should also be noted that the mixing of pottery of various dates is typical of the az-Zurrāba deposits and indicates the profusion of production through time.

Generally speaking, products of the “Classical Nabataean” (late first to early second century AD) ceramics predominate the finds from Kilns VI and VII. Still, some of the finds deserve special attention especially considering that products of the later second and third centuries are still not well defined in the Nabataean tradition, and that many Nabataean tradition forms—especially those produced after the annexation of the Nabataean kingdom—are notorious for their longevity:

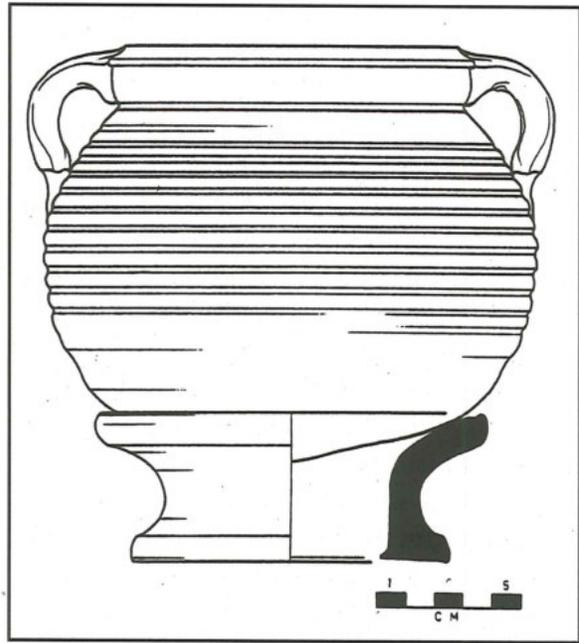
- The zoomorphic ibex head (*Zur 97.KVII.02/ JP5027*, Fig. 7:2) is rare in that it is painted. Such zoomorphic spouts became common in the “Late Roman” period, but this example is of a finer red ware than common, usually unpainted, ex-

amples. Such black paint using wide brush strokes started being common in the late second/early third century AD.

- The bowl in Fig. 9:9 is a late development of the “fine Nabataean wares”. Its gritty sandy ware and “band firing” confirm a rather late date.
- The bowls and jar in Figs. 9:10-12, 10:15-17 and 15:18 are also late developments of known classical Nabataean forms.
- The bowls in Figs. 10:13-14 and 13:11 are intermediate forms between the “Shelf-Rim Basins” (suggested date late first/second to third century AD, Magness 1993: 202) and “Rilled-Rim Basins” (suggested date late third/early fourth to sixth century AD, Magness 1993: 203).
- Although the pot-stands in Figs. 12:27 and 15:19-20 are not strictly diagnostic chronologically, Khairy (1990: 41) states that “...The lower part of these stands is heavier than the upper, so as to give a proper standing balance. However, for a similar example Murray and Ellis (1940: 14, Pl. IX.54) illogically suggest that ‘it stands on the narrower surface’”. The stands from az-Zurrāba have the heavier ends well-finished while the less heavy ends are roughly cut—while turned on the wheel—therefore the cut (unfinished less heavy) end has a better standing balance. Murray and Ellis (1940: 14, Pl. IX.54) describe their sherd as a stand “perhaps for setting a cooking pot upon”. A reconstruction drawing of such a pot stand (illustrated in Fig. 12:27) supporting a cooking pot (*Zur 97.KVI.01/JP5024*, Fig. 5:1; both vessels are from Kiln VI) is shown in Fig. 16, where the less heavy unfinished end is also too narrow to properly support the cooking pot.

*The Dating of Kilns VI and VII (and a revised date for Kilns III and IV)*

Combining all of the above data, the date



16. Reconstruction drawing showing the use of a pottery stand for supporting a rounded base vessel (drawing by Qais Tweissi).

for Kilns VI and VII should be between ca. AD 100 to 300, with a date of around the middle of the second century AD being the most probable.

Additionally, although we cannot assume that the development of the kilns versus time was linear, but also taking into consideration that the only dating evidence for Kilns III and IV was: “All the material retrieved from undisturbed levels in the balks (of Squares A.6 and A.7), including those that were covering the roof (dome) arch of Kiln III...dated to no later than the second century AD.” (‘Amr 1991: 320), then we may fairly safely suppose that the date for Kilns III and IV should be pushed back into the first century AD, a time from which we have an abundance of pottery wasters at az-Zurrāba (‘Amr 1991: 320-321).

K. ‘Amr  
A. al-Momani  
Department of Antiquities  
Amman - Jordan

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# THE BROWN UNIVERSITY 1998 EXCAVATIONS AT THE PETRA GREAT TEMPLE <sup>1</sup>

by

Martha Sharp Joukowsky

## Introduction <sup>2</sup>

With the continuing support of the Department of Antiquities of the Hashemite Kingdom of Jordan and Dr Ghazi Bisheh, then, Director-General, the sixth season of excavations were carried out at the Petra Great Temple from June 9 to August 10, 1998. With the discovery of the Temple theatron in 1997,

we have explored questions about the function(s) of the Great Temple. For the past two years a number of possible explanations for this structure's function have been suggested, which test the hypotheses that the process of rebuilding involved successive changes in the use of this structure. These hypotheses are in print elsewhere.<sup>3</sup> This report will focus only

1. Please refer to our Past Seasons Annual Reports (1993-1998) in *ADAJ*. The standard for archaeological publication is a full record of the work undertaken. The following publication has been prepared with a CD-ROM which includes all of our data collected. See M. S. Joukowsky (1999) *Petra Great Temple, Vol. I — Brown University Excavations 1993-1997*, The Petra Exploration Fund, Brown University.

2. The 1998 staff was comprised of Martha S. Joukowsky, Director; Artemis A. W. Joukowsky, Administrator and Photographer; Dr. Joseph J. Basile, Associate Director; Paul C. Zimmerman, Chief Architect-Surveyor; Deirdre G. Barrett, Finds Recording; Monica L. Sylvester, Computer Database; Simon M. Sullivan, Draftsperson; Eileen L. Vote, Photogrammetric Study; and Sara G. Karz, Glass Analyst and Archaeologist. Senior Archaeologists included Leigh-Ann Bedal; Laurel D. Bestock, Brian A. Brown, Katrina M. Haile, Elizabeth A. Najjar and the field excavators were Samuel J. Ginsberg, Joshua J. Schwartz, James M. Roger, Emma S. Libonati, and Mary E. Prendergast. Volunteers included Betsy F. Alderman, David Barrett, Francesca Bennett, Seth Bright, Michael Cary and Will Cary, Donna D'Agostino, Elliot Jerud, Nina, Murat and Sureya Koprulu and Jane, Misha and Elena Maria Joukowsky, Arnold Schaab, Forest Reed, Jane Taylor, and Robert Zeolla. We were also honored to receive the visits of Her Majesty, Queen Noor Al-Hussein of Jordan, HRH prince Faisal Al-Hussein, and E. Gordon Gee, President of Brown University and his wife, Professor Constance Baumgarner Gee.

Besides Stephen V. Tracy, epigraphist, and Donna D'Agostino our computer systems analyst, 1998 Great Temple Consultants included architectural historians Judith S. McKenzie, Jacqueline Dentzer-Feydy and Chrysanthos Kanellopoulos; Thomas R. Paradise, geologist; Zbigniew T. Fiema, archaeologist and historian; May Shaer, con-

solidation and preservation; Christian Augé, numismatics; Stephan G. Schmid, Nabataean Fine Wares analysis; Yvonne Gerber, Nabataean Plain Wares analysis, and Rip Rapp, geologist. Our intrepid Foreman, again, was Dakhilallah Qublan who also has been responsible for the carrying out of the consolidation and conservation of the Great Temple. For help in moving architectural components and soil removal the Jordanian Department of Antiquities assigned Abu Ghandi to us — his service was indispensable. Once again, the Jordanian Department of Antiquities appointed Mohammad Abd Al-Aziz Al-Marahahleh as our Jordanian Government, Department of Antiquities Representative.

The Brown University Petra Great Temple Excavations are deeply grateful to the Replogle Foundation for the generous grant, which helped to underwrite the costs of excavation. A number of private donors helped to sponsor student involvement and Brown University underwrote graduate student participation. Two undergraduates, Emma S. Libonati and Samuel J. Ginsberg, received Brown University Undergraduate Teaching and Research Awards (UTRA grants) which made their participation possible. To help us with consolidation and restoration, we were recipients of a grant administered through the Kress Foundation, and the American Express Company, World Monuments Watch, A Program of the World Monuments Fund. The publication of our Five-Year Report and additional conservation efforts have been underwritten in part by the Halmos Family Foundation and other donors.

3. The preliminary results of this fascinating research is presented in Joukowsky 1999, "Petra: Brown University Excavations of the Great Temple: Questions About Functional Analysis", Seventh International Congress on the History and Archaeology of Jordan, "Jordan by the Millennia," in *SHAJ* VII (in press), and Schluntz 1999.

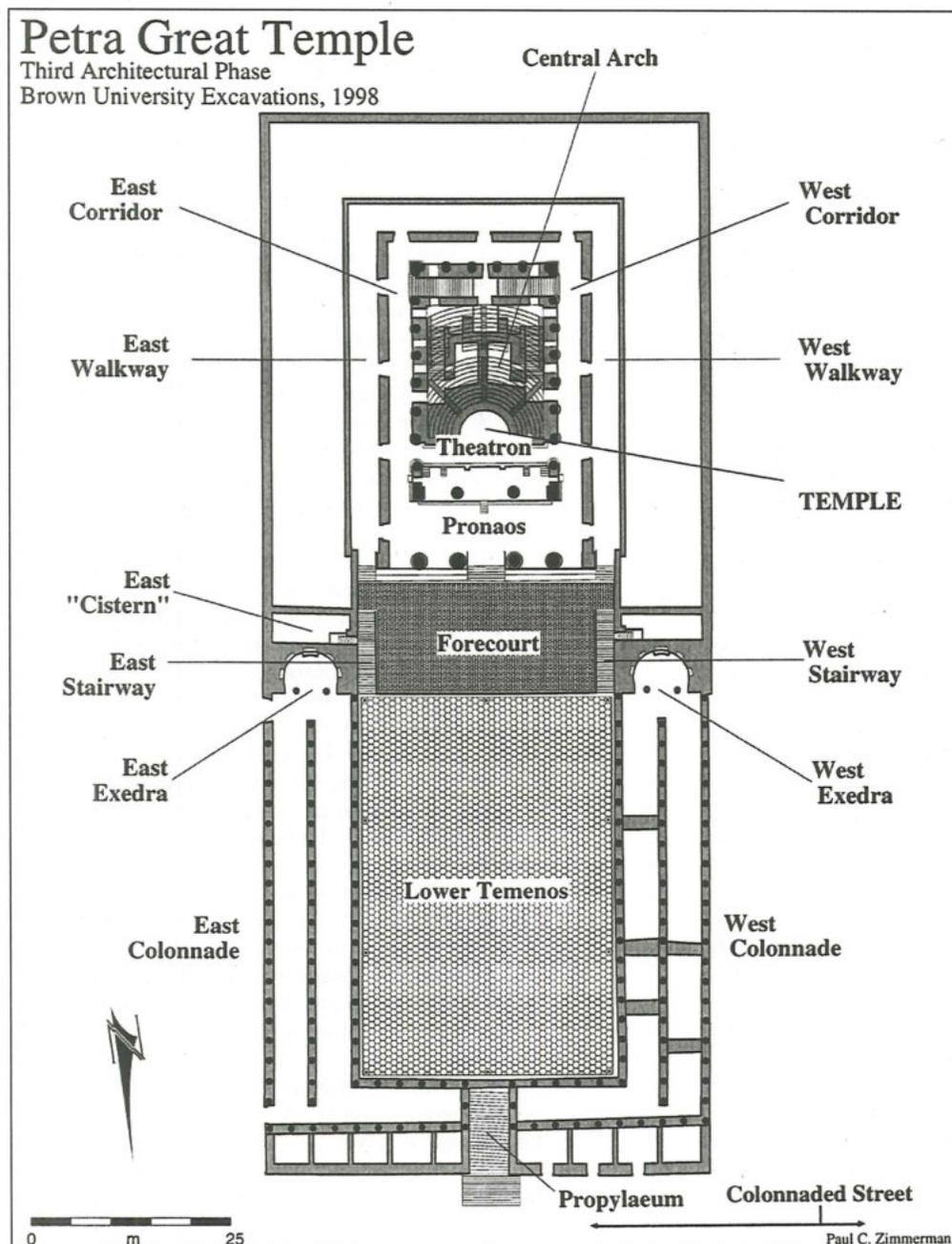
on the results of the current excavations. The 1998 plan of the excavations can be seen in Fig. 1, the 1998 trench layout in Fig. 2, and a site aerial photograph is presented in Fig. 3.

### Objectives

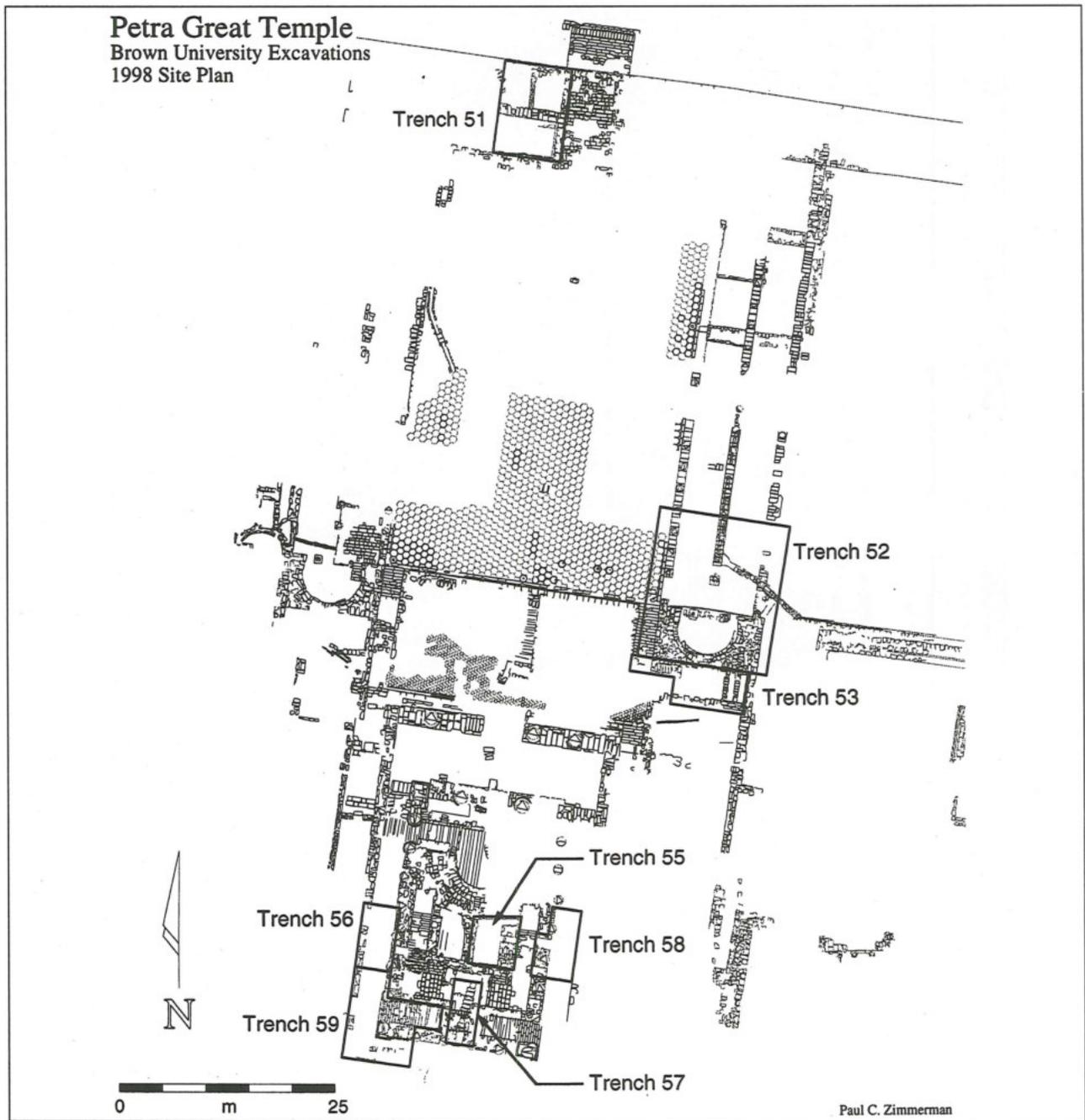
The Great Temple 1998 excavation objectives included further exploration of the Propylaeum, a north-south 11 m-by-8 m east-west trench in Trench 51 by K. Haile.

In the Lower Temenos, the partially excavated East Exedra had been consolidated during the fall of 1997, and we wished to complete its excavation, and to better understand its interrelationship with the East Colonnade. A large trench, Trench 52, 15.3 m-by-18 m was measured out. With a full season of work under the direction of J.J. Basile, the area was completely excavated.

In the Upper Temenos we wanted to continue our work in the area of the 'cistern'-lo-



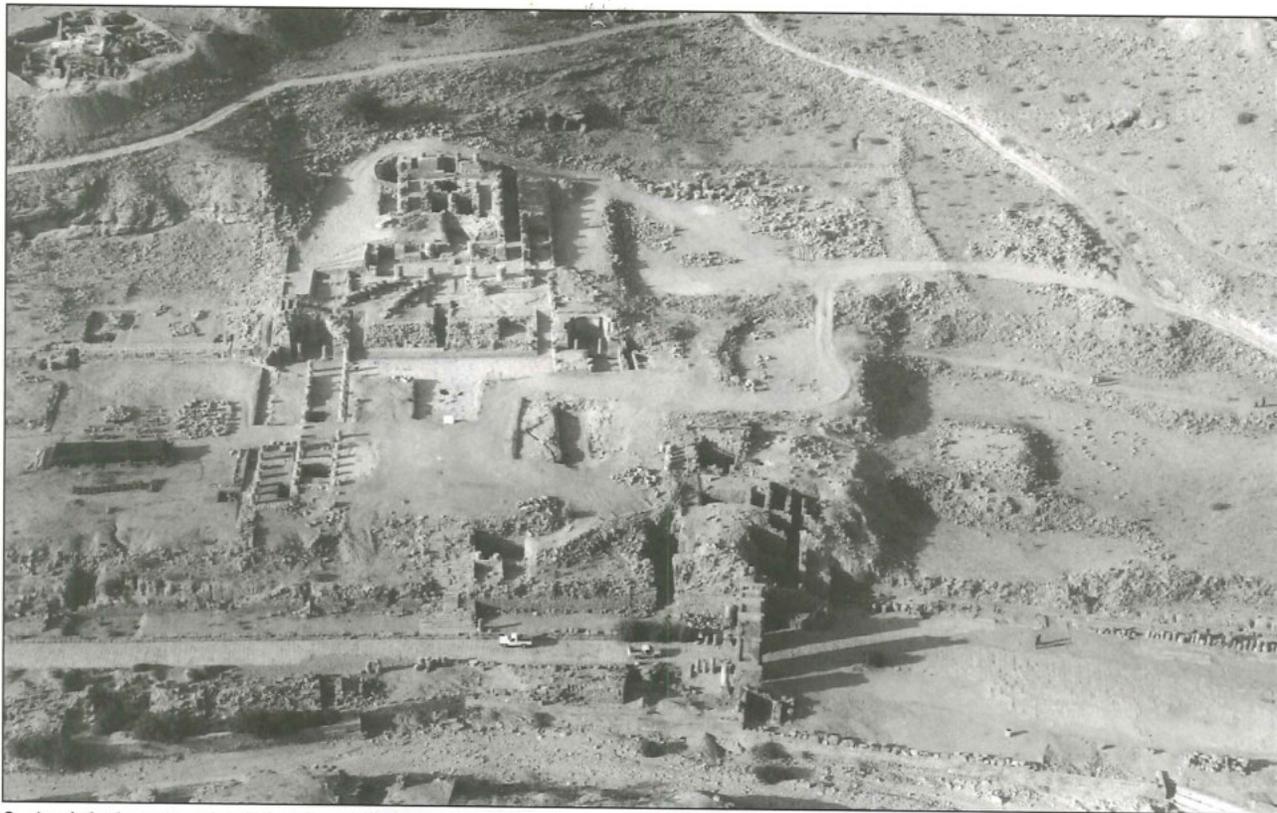
1. Plan of the 1998 Brown University Great Temple Excavations (Paul C. Zimmerman).



2. Site Plan of the 1998 Trenches (Paul C. Zimmerman).

cated just behind the East Exedra to determine its floor level and to explore if it truly served as a cistern. Here it was projected that we would excavate two trenches, Trench 53 and Trench 54 which were the continuation of the 1997 excavations in this area. However, the excavation of Trench 53 by L. D. Bestock was so time-consuming due to the depth of deposit that there was no time to excavate Trench 54.

The excavation strategy for the temple was complex. Of course we wanted to reveal the eastern half of the *theatron* discovered in 1997, but due to the overburden of earth and collapse, this could not be undertaken until both the East Chamber and the Central Arch had been completely excavated. A trench, Trench 55, which was parallel to both the West Stairs and the West Chamber in the temple rear was excavated



3. Aerial photograph of the Great Temple Precinct (Artemis A. A. W. Joukowsky).

by B. Brown, but work here will have to be completed in 1999 before we can continue our excavation of the *theatron*. Because it required consolidation before it was safe enough for excavation, work below the Central Arch had eluded us for four years. Trench 57 was devoted to the Central Arch deposit, which was completely revealed by E. Libonati and M. Prendergast. An additional objective was to work on the Temple west to clear the West Corridor, and if possible to discover if it stopped short or continued beyond the rear of the Temple. For our understanding of the architecture, Trenches 56 and 59 directed by A. A. W. Joukowsky accomplished this objective.

On the Temple East we had been confronted with a massive column fall in the East Corridor, which we cleared in Trench 58 supervised by J. Schwartz. The objective of recording the column fall and moving column drums to the east of the Upper Temenos served as the prelude to their anastylosis. Furthermore, excavation would help

to define this East Corridor.

We also wanted to explore the area beyond the Temple Precinct lying to the Temple east, traditionally known as the 'Lower Market.' This large area was designed to be a one-year survey with limited excavation to be undertaken by Leigh-Ann Bedal. Several interdependent projects were also undertaken, such as the plan to create a computer simulation using photogrammetry and virtual reality by E. L. Vote. Fortunately all of our data collection systems continued to be useful.

The 1998 field season produced more unexpected results. Before turning to examine these results which go far in explaining the nature of the short-lived Nabataean architectural and artistic tradition, we will pause to present elevations and distance measurements and the phasing of the Temple Precinct. As part of the excavation record and for the clarification of our Electronic Distance Measuring (EDM) results, I present the absolute elevations resulting from our

past six seasons at the Great Temple. We all know that archaeology is scientific opinion, not proven fact, however, we offer the elevations and dimensions of the Great Temple precinct, which are part of our factual record.

### **Elevations of Major Temple Precinct Components in Meters asl**

#### *Site Datum Points*

Al-Katūta — 911.23  
 CP 103 — 895.48  
 CP 104 — 884.34  
 CP 10 — 878.73

#### *Colonnaded Street*

Crown directly north of Propylaeum — 870.77  
 South gutter directly north of Propylaeum — 870.59

#### *Propylaeum*

Curbing — 871.10, Lowest Step — 871.19, Upper step — 877.69

#### *Lower Temenos*

Hexagonal Pavement —  $879.12 \pm 0.12$ , Easternmost Colonnade —  $879.07 \pm 0.16$  (pavers and stylobate slope downward slightly), Sondage SP 25 depth — 872.41  
 West Exedra Height (maximum) — 883.96, Porch column Stylobate — 879.79, Byzantine Platform — 880.69  
 West Stairway Lowest step-curb — 879.58, Restored upper step — 884.38  
 East Exedra maximum height — 885.60, Porch column Stylobate — 879.59  
 East Stairway: Lowest step-curb — 879.58, Last excavated upper step — 883.02

#### *Upper Temenos*

West Corridor —  $885.91 \pm 0.06$ , West Corridor maximum height — 889.46  
 East Corridor —  $885.87 \pm 0.03$ , East Corridor maximum height — 890.51  
 Temple Forecourt —  $884.46 \pm 0.04$   
 East Archway "Cistern" Arch upper eleva-

tion — 885.67, Lowest excavated elevation (quarry) — 879.20, Lowest plaster floor — 881.06

#### *Canalization System*

Temple Forecourt, capstone upper elevation — 884.29, Floor elevation — 882.04, Trench 13 lowest elevation below Hexagonal Pavement — 878.68 (approximate)

#### *Temple*

Stylobate —  $886.07 \pm 0.05$ , Pronaos —  $885.79 \pm 0.04$ , Preserved height of West Anta — 2.6, Preserved height in south — 8.5, Restored Porch columns average —  $888.40 \pm 0.10$ , West Anta elevation — 889.59, East Anta elevation — 888.19, West Walkway —  $885.98 \pm 0.01$

#### *Theatron*

Orchestra —  $885.97 \pm 0.02$ , Lowest diazoma —  $887.55 \pm 0.02$ , Lowest seating —  $887.94 \pm 0.01$ , Uppermost excavated seating — 889.03, Projected last seat (approximate) — 895.11, Lowest step — 886.415, Restored uppermost step — 890.93, Upper platform — 890.93.

#### *Southeast N-S Stairway*

Floor at the bottom of stairs — 886.05, Lowest step — 886.42, Restored uppermost step — 890.96, Upper Platform — 890.97

#### *Southwest N-S Stairway*

Floor at bottom of stairs — 886.07, Lowest step — 886.415, Restored uppermost step — 890.93, Upper platform — 890.93

#### *Central Arch*

Top of keystone — 890.95  
 Heart-shaped east rear column restored height — 892.93

### **Great Temple Precinct — Dimensions in meters**

*Precinct north-south* (from portico wall in the Propylaeum to the preserved south Pre-

cinct wall) — 135; east-west — 56, Total area — 7560 m<sup>2</sup> (3/4 hectare)

### *Propylaeum*

Stair width — 7.4; length — 17

### *Lower Temenos*

N-S (from the Propylaeum Retaining Wall to the Lower Temenos Retaining Wall) — 49

East-west — 56, Retaining Wall West — 28, Expanse of Lower Temenos from the East Exedra to the West Exedra — 32.7

*East Colonnade:* Width — 11.8; Length from the Exedrae to Propylaeum Terrace Wall — 54

*East Exedra:* east-west — 6.8; depth north-south 5.4

*West Exedra:* east-west — 6.5; depth north-south — 5.3

### *Temple*

Porch Stylobate east-west — 28, Temple north-south — 42.5, Porch inter-axial distance between the East Anta (middle line of the wall) and the East Porch Column — 4.40, East Porch Columns — 5.03, Central Porch Columns — 7.06, West Porch Columns — 5.03

### *Pronaos*

Width (from the Stylobate south edge to the front of the Anta East and Anta West — 6.5, Length — 24.7, Side Columns inter-axial distance east and west — 3.51, Rear columns inter-axial distance — 3.27

### *Theatron*

Orchestra floor diameter — 6.43, Proposed diameter of outermost seats — 33.2, Estimated seating capacity (0.5 m per person) — 565; (0.45 m per person) — 620

*West Corridor:* length from the front of

West Anta to the rear — 12, Width — 3

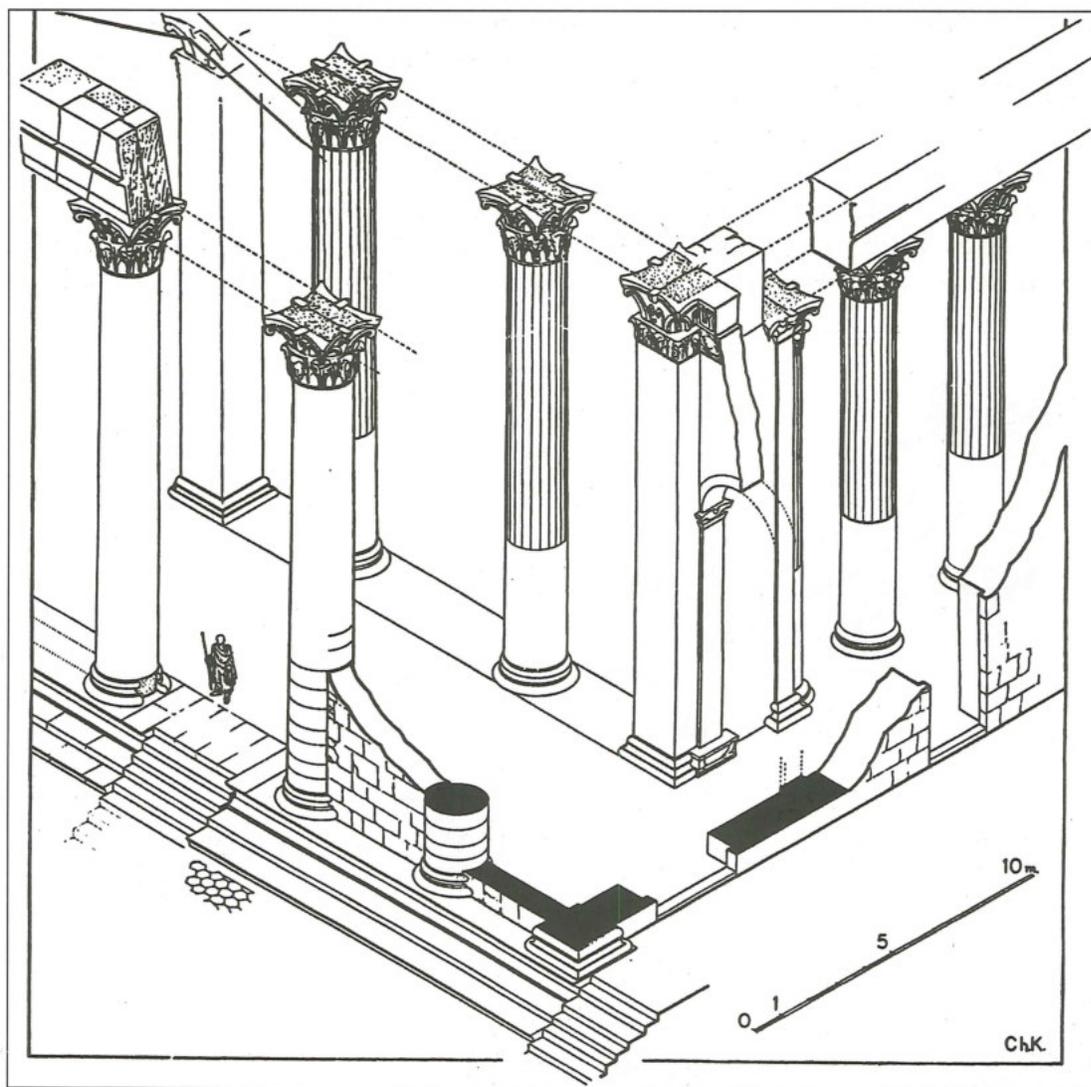
West Walkway: Excavated length from the front of the West Anta— 33.3, width — 3.7

### *Phasing*

Since 1993, we have revised our phasing of the site and the 1998 season was no exception. Based on the 1988 site deposition, our excavations have determined the general sequence of four phases (0-III) of Great Temple construction. *Phase 0* is reserved for the preparation of the site by its Nabataean builders with a vast subterranean canalization system which has been charted from the Temple rear to the Propylaeum.

*Phase I* or Nabataean I represents the major construction of the Temple precinct. The major goal was to construct a building of importance in central Petra and to orient it toward the main thoroughfare of the city. Figure 4 is a reconstruction of this phase proposed by architectural historian, Chrysanthos Kanellopoulos. The dramatic rocky backdrop of al-Katūta provided a perfect setting for an imposing structure set on a high terrace platform. Phase I included the erection of the four porch and the two Pronaos columns, plus the eight interior bichrome plastered columns on the building's flanks and six columns at the rear. Decorated with deeply carved fine sculpted limestone Nabataean Corinthian capitals, their column shafts were embellished with flat, red or yellow plaster at 3.76 m from their attic bases, and above, with white ridged plaster until the beginning of the capital. Also decorated with multi-colored plaster, corridors were also constructed to flank the structure. The evidence suggests these elements and lateral corridors were constructed sometime in the last quarter of the first century BCE or during the reigns of either King Malichus I (62-30 BCE) or Obodas II (30-9 BCE), or perhaps both.

*Phase II* is what we refer to as Nabataean II. There was a completely new, monumental rebuilding program — an archi-



4. Phase I Great Temple Reconstruction (Chrysanthos Kanellopoulos).

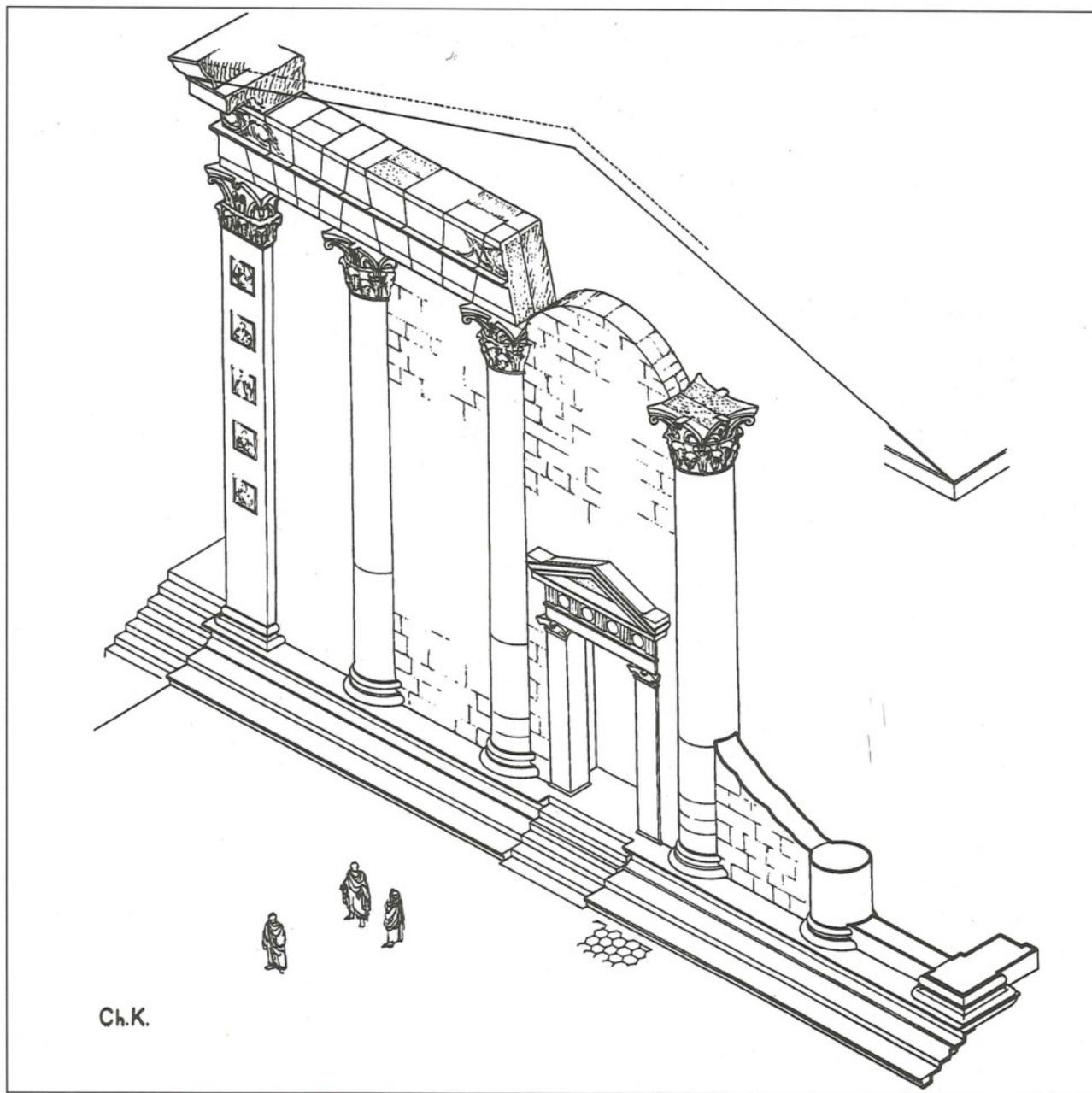
tectural metamorphosis was launched in this phase. The architects wanted to make a strong statement and epitomize the architecture of a great city. It is obvious that the rulers of Petra took pride in the embellishment of their precinct while providing for its functional demands with a sense of spatial logic. The precinct had to emanate a sense of power befitting Nabataean wealth. So, what did these Phase II architects have in mind? To begin with, there had to be the building of an elegant, columnar Propylaeum for access to the precinct, and a series of new steps had to be laid to be built up to the level of the Lower Temenos. At the same time the Lower Temenos was conceptualized as a symmetrical, formal pres-

ence that purposefully emphasized the Great Temple.

There was, however, a challenging and exasperating problem confronting the planning of the area — the Canalization System had to be reconfigured and rebuilt. This set in motion a completely new series of changes that radically transformed the design of the Lower Temenos — for how were people to access the Upper Temenos from the Lower Temenos? This may have provided the impetus for a scheme that would involve the precise planning for the complete remodeling of the Lower Temenos, approaching all aspects of the Lower Temenos design simultaneously — from the laying out of stairways and exedrae to enhancing

the area with triple colonnades. In short, the area was converted to create a vast architectural foreground for the Great Temple.<sup>4</sup> A massive east-west retaining wall had to be built on the same axis as the twin lateral stairways and the exedrae, which delimited the Lower Temenos on its south. This Lower Temenos court-plaza was then em-

bellished with a sweeping, white, limestone hexagonal pavement, which tied all the elements together. These architectural components were all interconnected features that boldly defined the precinct's spacious importance. For Phase II we have two reconstruction schemes suggested by Chrysanthos Kanellopoulos. Figure 5 shows one



5. Phase II Great Temple Reconstruction (Chrysanthos Kanellopoulos).

4. These lateral staircases had to have accompanying luxurious exedrae and other appurtenances to com-

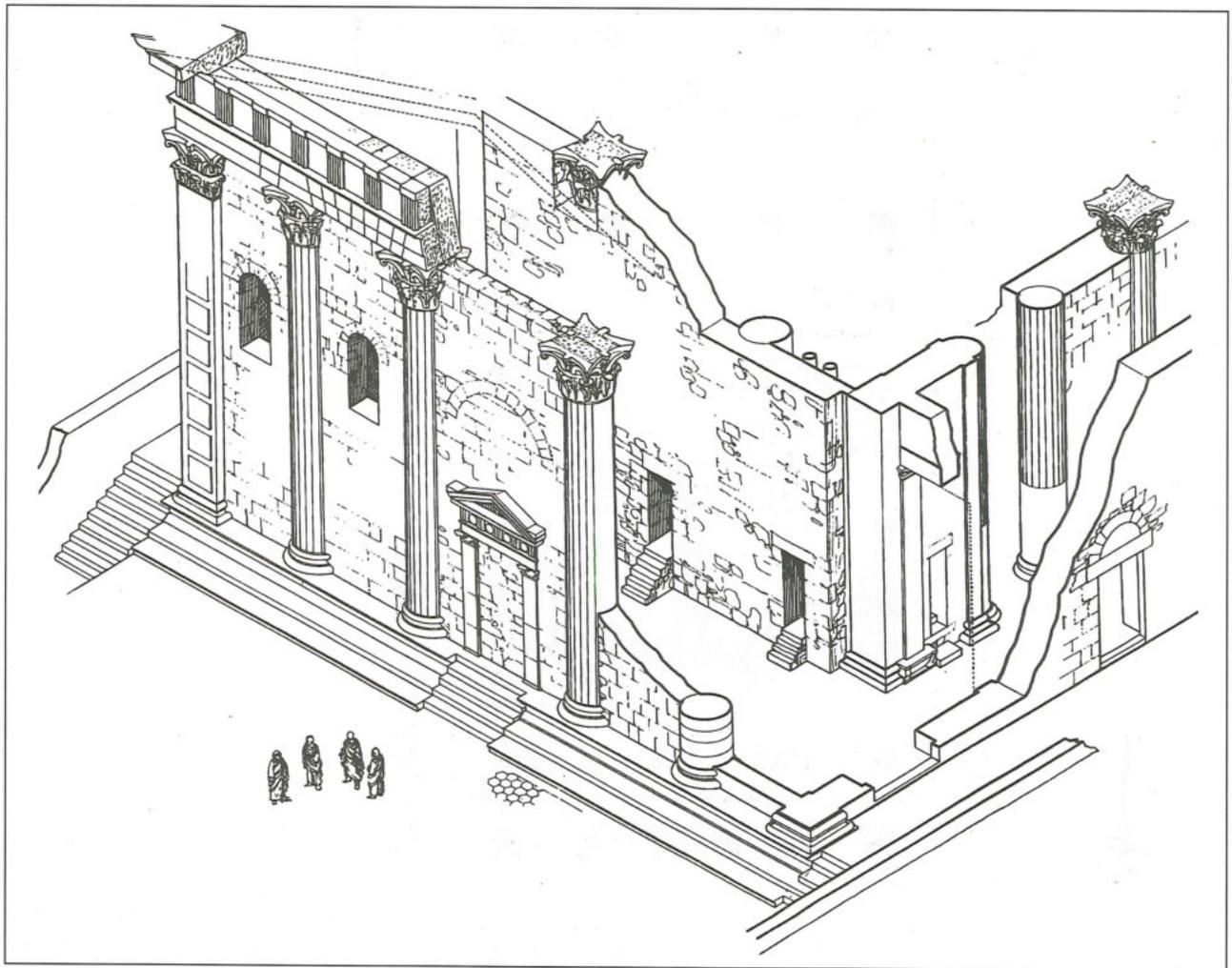
plete the finished look of the ensemble.

such scenario and Fig. 6 depicts an alternate stage where the porch was completely blocked-off.

The Phase II Temple continued to crown the composition of space, and the edifice we know today as the Great Temple emerged. Its transformation must have reflected the changed circumstances of Petra royalty. The exterior was enlarged with exterior walkways on its flanks. Also at this time, there was the major reconfiguration of the Temple interior with the elegant construction of Inter-Columnar walls with arched doorways, windows and staircases. The building of these casemate walls all but destroyed the plaster decoration of the Phase I stuccoed columns.

In Phase II the Phase I central room is re-

constructed as an open-air *theatron*. The heart of the Great Temple is now the theater, and the architects blended the proportions of the cavea seating to conform with the Phase I architecture. The projected preserved diameter of the orchestra is approximately 6.5m — it is too restricted and small for any large function, but may have been used for speeches, dramatic presentations, or simple religious rituals and ceremonies. Unfortunately the upper portions of the *theatron* are either in poor condition or are completely missing, but we project there may have been 20 original courses of seats, with a diazoma between the tenth and the eleventh rows. Thus, a conservative estimate of the seating capacity would be a minimum of 565 and a maximum of 620 persons. These

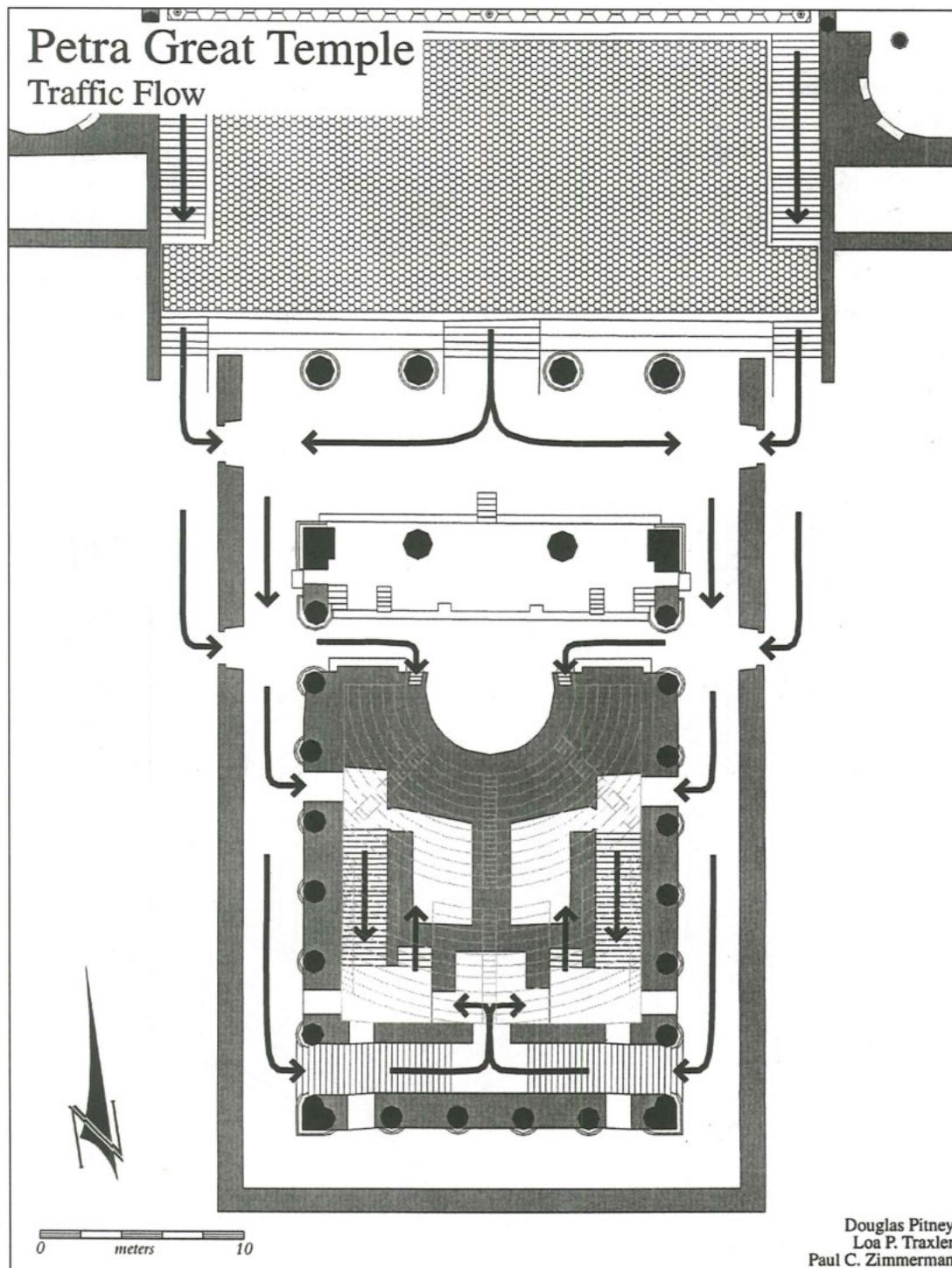


6. Phase II Great Temple Alternate Reconstruction (Chrysanthos Kanellopoulos).

calculations must remain tentative, however, until we can confirm the extent of the cavea to the south.

Given the plan for this building, the flow pattern is extraordinarily well planned and efficient (Fig. 7). Access was from the Lower Temenos, up the east or west stair-

ways, to the east or west walkways and from the walkways into the east or west corridors. Multiple sets of new stairs were installed in the Temple rear — twin east and west, plus twin north and south stairways. These led to the lateral corridors and the East and West (north-south) stairways with



7. Great Temple Flow Pattern (Paul C. Zimmerman).

adjacent east and west vaulted chambers. These four stairways directed traffic to the inner corridors, which in turn led to the Temple exits — the walkways.

Alternatively, access might also have been through the front entrance. The participant was obliged either to turn to the right or left into the corridors, and the major route would be from the corridors through the arched doorways to a set of stairways. Once these rear stairs had been mounted, access to the cavea was via the paved platforms, which accessed an additional twin small flights of steps that probably led to arched passages which exited into the cavea at the middle diazoma.

This renovation we have placed sometime near the end of the reign of Aretas IV (ca. 40/44 CE) or to the rule of Malichus II (40/44-70 CE) and possibly to the reign of Rabbel II (70-106 CE). It is therefore suggested that these modifications took place sometime in the first or early second centuries CE. But questions persist: What was the transition between the earlier Nabataean structure and what we know as the Great Temple? Why was the transition from one type of installation to another so swift, in less than 100 or so years?

The next phase, *Phase III*, we identify as Nabataean-Roman. Serving as a buffer state against the desert tribes, Nabataea retained its independence but paid taxes to Rome. Completely subsumed by the Romans under the Emperor Trajan in 106 CE, Petra and Nabataea then became part of the Roman province known as Arabia Petraea. Under Roman rule, Roman classical monuments abounded at Petra, many with Nabataean overtones; thus, it is appropriate to identify this time (post-106 CE) as the Nabataean-Roman phase. There is no reason why the Great Temple should not have continued to serve the Romans as a principal monument of the city.

When Petra entered into the "Roman" world in the second century CE, we assume

that Nabataean-Roman architects recycled the Great Temple, and this is our Phase III or Nabataean-Roman period. And if there were post-106 CE changes made to the Temple and its precinct, these changes are not altogether clear from the stratigraphy. We posit, however, that at some point during the Nabataean-Roman period — in the last half of the second century CE — the lower Stairs of the Propylaeum were modified to conform with the paving of the Colonnaded Street and were added to for ease of entry into the precinct.

As excavations continue, it must be borne in mind that this phasing is tentative and may be revised in light of future excavation. Our understanding of the site has been difficult, not because of the lack of dateable materials, but because the mixture within archaeological contexts of artifact stylistics ranges from the first century BCE to the early fifth century CE in date. Thus, we believe the Great Temple precinct was in use for approximately 500 years. There are few sealed deposits, and much more has yet to be explored before we can understand the archaeological deposition of these remains.

### 1998 Excavation Results

Following our usual pattern, the major excavated features of the 1998 season will be described from north-to-south beginning with the Propylaeum, the Lower Temenos, the Upper Temenos, and finally, the Temple.

#### *Propylaeum* (Fig. 8)

To the west of the Propylaea Steps, an arched walkway or corridor, which was constructed parallel to the Colonnaded Street, was excavated by K. Haile in Trench 51 to a 3.50 m depth. The layout of this trench can be found in Fig. 2. Between the upper and lower east-west retaining walls, this corridor was constructed earlier than the present day steps leading from the Colonnaded Street



8. 1998 Propylaeum  
(Artemis A. W.  
Joukowsky).

into the Temple precinct. The excavators noted that the Propylaea Steps wall was constructed with a number of voussoirs, and that the upper east-west retaining wall was an original terrace wall of the precinct. The lower retaining wall, however, was probably contemporary to the building of the steps and the Colonnaded Street. These observations will have to be confirmed by future excavation.

Large amounts of roof tiles suggest that this area was originally covered. Tesserae were found as well as decorative plaster and coins. Architectural fragments numbered 75, and of these six elephant sculptural elements were recovered, which suggests that the elephant capitals associated with the Lower Temenos triple colonnades may have been part of the Propylaeum architectural program.

#### *Lower Temenos*

Supervised by J. J. Basile, Trench 52 was a large trench devoted to the excavation of the East Exedra shown in Figs. 9 -11, and the Eastern Colonnade to the north. (The plan of the East Exedra is shown in Fig. 11.)



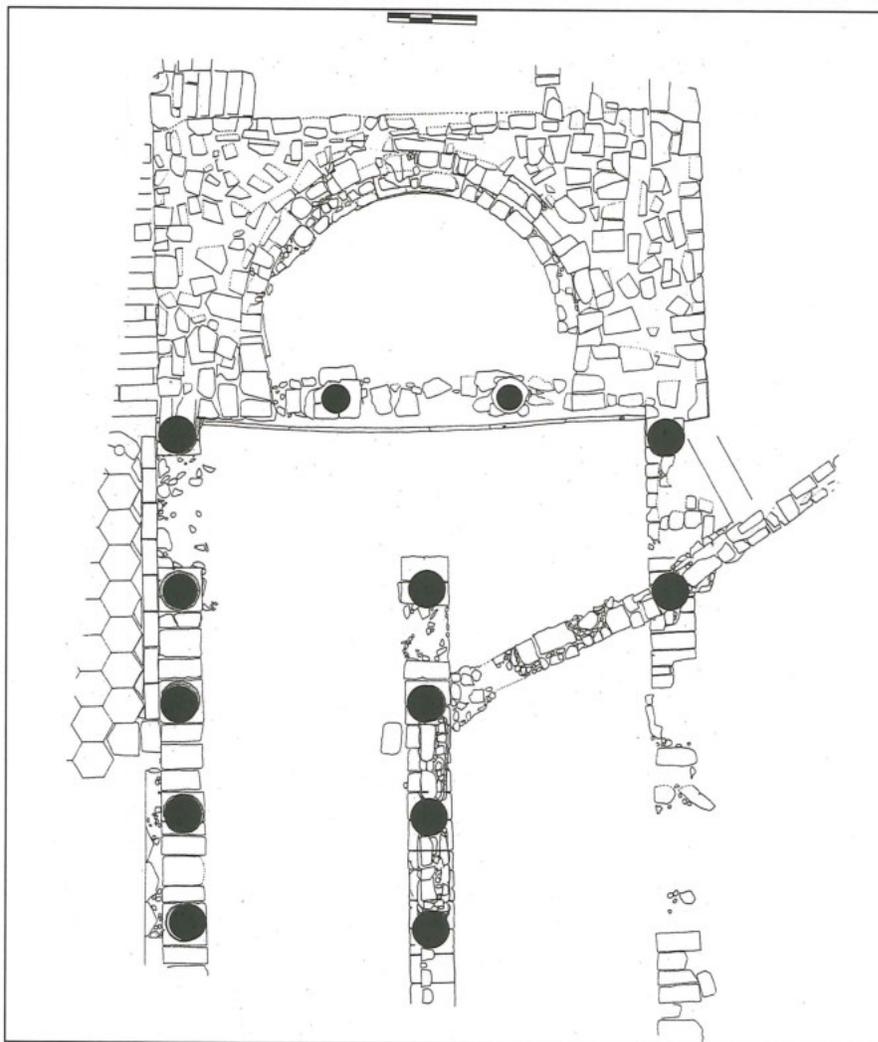
9. 1998 East Exedra during excavation showing the stratigraphy (Artemis A. W. Joukowsky).

Because the area extent of the trench was so large, it consumed the excavation season. Completely excavated, therefore, in the Lower Temenos was the elegantly-buttressed *East Exedra*, which unlike its counterpart in the west (the *West Exedra*) was found to be appointed with interior benches and a central podium, which may have served for the placement of statuary. This semi-circular structure is preserved to a 5.8 m height, a 12.4 m exterior width, a 6.7m interior width, and a 5.4 m depth from the double entry columns to its rear wall.

The walls of the East Exedra are of fine



10. 1998 East Exedra completed excavation (Artemis A. W. Joukowsky).



11. 1998 East Exedra plan (Field drawing Paul C. Zimmerman and Joseph J. Basile, drafted by Martha Sharp Joukowsky).

diagonally dressed sandstone ashlar with curved ashlar fronting the structure. The interior is embellished with four buttresses set between five niches each measuring approximately 2 m. Below the central niche is a red sandstone and limestone platform curved to abut the north face of the wall. It measures 1.63 m in width-by-0.34 m in depth and it is 1.65 m in excavated height (Its top courses are exfoliating and require consolidation). Except for that area taken by the platform, a bench of rough sandstone ashlar leveled with chinking stones encircles the interior; in the northwest its preserved height is 0.50 m. The flooring remains are comprised of sandstone flagstones oriented north south. Like the West Exedra, twin columns graced the entry of the exedra building — the western column (diameter of 0.38 m), is preserved to four drums or to a 2.14 m height, and the eastern column to five drums and to a preserved height of 2.6 m. Engaged columns define the exedra on both the east and the west with their walls bonding with those of the exedra. Sandstone and limestone architectural fragments of the exedra entablature were located just north of the structure where the corners of the pediment and curved cornice blocks were recovered. The evidence thus suggests that a broken pediment originally graced the East Exedra. To date, the East Exedra is the only structure for which we have evidence for an entablature. Now from the East Exedra there is a grand vista over the Lower Temenos triple colonnaded walkways, which originally were adorned with Asian elephant-headed capitals.

At a later time a lead pipe 10.1 m in length with a 0.09 m diameter was inserted into a crude cut through the engaged column, which appears to have its origin in the 'Lower Market' lying to the east. This piping probably extended across the Lower Temenos along the East-West Retaining Wall to the West Exedra extending to a length of

32.7 m.

Also excavated was a large section of the triple southeast Colonnade — including the area occupied by the nine southernmost columns. The East Colonnade extends up to the East Exedra. At a later time, extensive changes were made after the original exedrae and colonnades were constructed, for the East Colonnade stylobate has seen extensive damage, which indicates there was rebuilding, reuse and redesign of the area. In some cases there was reuse of stylobate sections and between the western columns rough Inter-Columnar walls were constructed with reused architectural elements. At some point in time, the easternmost colonnade probably went completely out of use and its drums were moved and reused in other areas in the Lower Temenos. A possible lime kiln here suggests that in a later phase this area may have become a quarry for decorative limestone temple elements. Additionally a later oblique wall (2.4 m in length-by- 0.5 m in width) was constructed in the southeast for as yet an unknown purpose.

### *Relief Sculpture*

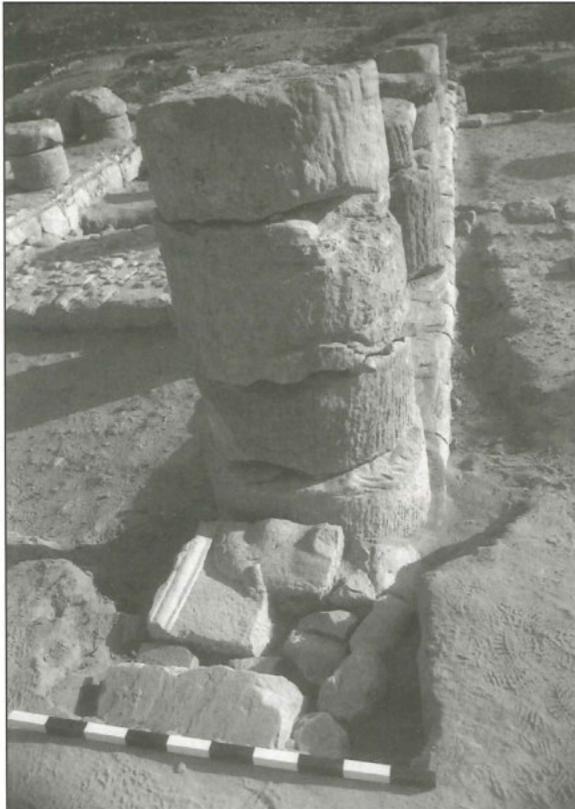
We were fortunate to find the East Colonnade Inter-Columnar wall and the aforementioned oblique wall to contain extraordinary architectural relief pilasters from the Temple façade. These elements probably fell from the Temple and were found built into the Lower Temenos inter-columnar walls, serving as recycled building components by the precinct's later builders, for the following relief-sculpted torsos were recovered lying upside down in a gray mortar deposit that extended throughout the trench. Between the stylobates was the relief sculpture of a female (Fig. 12) measuring 0.52 m in height, 0.84 m in width and 0.38 m in thickness wearing a chiton and holding a cornucopia in her left hand. The hair in ringlets falling over her shoulder was apparently in vogue in Petra — the



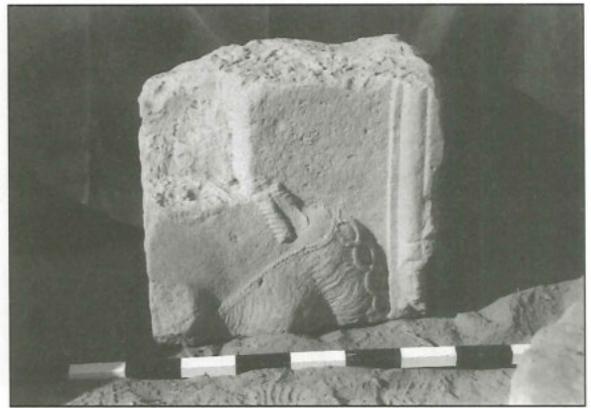
12. 1998, Relief of a Woman Holding a Cornucopia (Artemis A. W. Joukowsky).

same iconographic scheme is evidenced by very similar styles and comparable ringlets found on two of the masks found in the Temple West Walkway in 1994.

In Special Project 54 of the Lower Temenos, in the central line of columns in the triple East Colonnade was found the torso of a woman (Figs. 13-14). Bordered by a partial cyma reversa and carved in the “wet



13. Lower Temenos Inter-Columnar Wall with the relief of a woman *in situ* (Artemis A. W. Joukowsky).



14. Relief of a Woman (Artemis A. W. Joukowsky).

drapery” style lying upside down as part of the inter-columnar wall, she was recovered next to the fifth column from the north.

Measuring 0.53 m in width-by-0.38 m in height, this Amazon or Aphrodite-like figure has her left battered breast exposed; she wears a chiton with a braided border and delicately fashioned button fastenings extending down her right arm. Built into a southeast oblique inter-columnar rubble wall was the sculpted panel of yet another figure in low relief with its right bust exposed and with a chiton over the left shoulder. Including the cyma reversa this figure measures 0.50 m in height, 0.85 m in width. Most of the pilaster figures were headless — we reason that the heads were not destroyed by the iconoclasts, but rather these torsos were fitted with separately sculpted heads, perhaps sculpted by a special school of sculptors. The heads were mortared in place before the finishing touches were given to the block. Additionally re-used and installed as part of the south inter-columnar wall’s west face was an exquisite low relief (Fig. 15) of an ornamental wreath embellished with a ribbon tied at its top, measuring in length 0.82 m, in width 0.52 m and 0.24 m in thickness. J. J. Basile will discuss the details of these panels in detail.

23% of the total architectural fragments registered from the 1998 season were recovered from Trench 52, and of these 27 sculpted elephant fragments were cataloged.

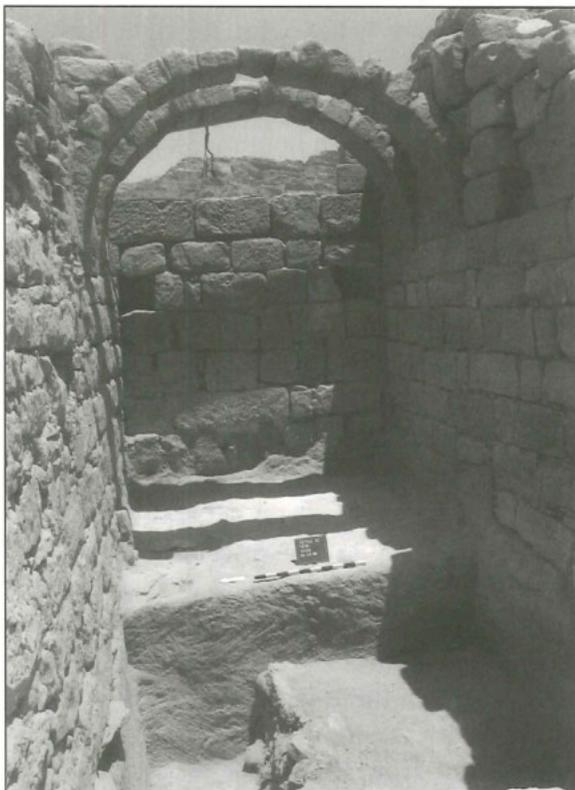


15. Low relief of an ornamental wreath built into the Lower Temenos East Colonnade Inter-Columnar wall (Artemis A. W. Joukowsky).

As for Y. Gerber's reading of the pottery, this area's closing date is placed to the early fourth century.

#### *Upper Temenos*

Fully revealed behind the East Exedra was an arched structure we have identified as a 'cistern' measuring 11.05 m east-west-by-3.15 m north-south-by-5 m in depth (Fig. 16). The vaulting of the cistern shares the



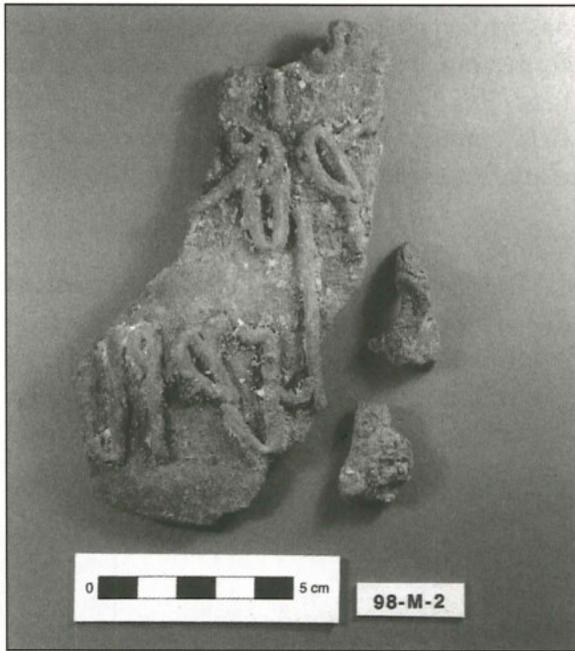
16. 1998, 'Cistern' in the Upper Temenos behind the East Exedra (Artemis A. W. Joukowsky).

rear wall of the East Exedra. Seven vaulted arches span from the East Exedra to its south wall. Constructed sometime later, a narrow (1.1 m) seven-step service staircase connected the eastern stairs and this "room." This area was thoroughly investigated save its southwest balk, which was purposefully left *in situ* to support the collapsed porch columns of the Temple east. The bottom of the 'cistern' was cut out of bedrock to a 1.7 m level below a later built plaster floor.

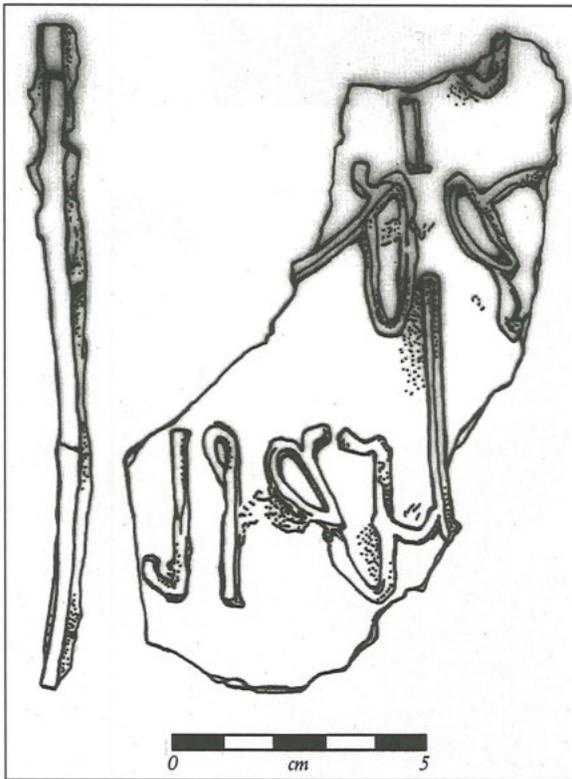
Although we have tentatively identified this feature as a cistern, its purpose has been questioned due to the fact that the plaster on the walls is decorative rather than the usual hydraulic plaster found in other parts of the site. Could this have been a decorated cistern? Or was the elegantly colored plaster in use when it served in yet another capacity? At this point there is no other reasonable explanation for this room, so we will suggest that it was originally constructed as a cistern. Finally, the pottery suggests that in ca. 100 BCE, this area functioned as a dump.

Above the cistern level large amounts of white marble were stored in the eastern part of the room. The excavator, L.D. Bestock, reasons that this area then served either as a storage area or as a marble workshop, for what might have been the remains of metal tools also were recovered in the same deposit. Associated with the workshop phase is a bronze plaque measuring 0.14 m in length-by 0.62 m in width-by-0.05 m in thickness. Shown in Figs. 17-18, it carries a Nabataean eight-letter inscription, that when translated may be a reference to a king or queen of Petra. This reading is tentative and will have to be confirmed by epigraphic experts. A smaller bronze fragment measuring 0.052-by-0.033-by-0.07 m was found, but unfortunately it does not fit the larger fragment although originally it probably belonged to it.

Above and around the stored marble



17. 1998. Bronze plaque with Nabataean inscription 98-M-2 (Artemis A. W. Joukowsky).



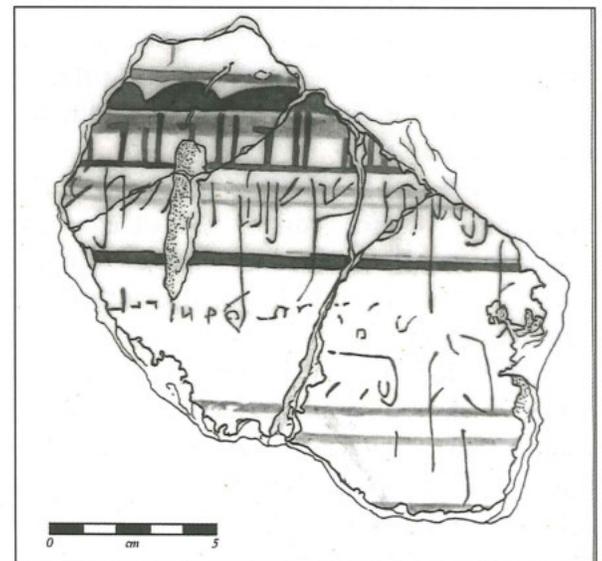
18. 1998. Bronze plaque with Nabataean inscription 98-M-2 (Drawn by Simon M. Sullivan).

blocks was a deep dump deposit, which sloped from west to east. Found was a plethora of exquisitely decorated plaster, including two wall fragments with partial

painted Nabataean inscriptions, Figs. 19-20. A provisional reading of the larger inscription by Suleiman Farajat is "Abd as-Salām," in English, meaning, "Servant of Peace." It is written in a script similar to that appearing on the at-Turkmaniyya tomb (McKenzie 1990:35) which Starcky dates to Malichus II, or to the middle of the first century CE. Also recovered were a Pompeiian red fresco fragment with an incised Greek inscription or graffito, the fresco fragment of a man's face (Fig. 21), and fragments of molded plaster, some of which were gilded. Also found were fine pottery, glass, bone implements, several Nabataean coins, shell and tesserae. Two architectural



19. 1998, Nabataean inscription on plaster (Artemis A. W. Joukowsky).



20. 1998, Nabataean inscription on plaster (Drawn by Simon M. Sullivan).



21. 1998, Fresco of a man's face, Cat. no. 98-S-65, L. 7.32 cm, W. 4.85 cm, Th. 3.26 cm. The iris of the eye is pale blue (Drawn by Simon M. Sullivan).

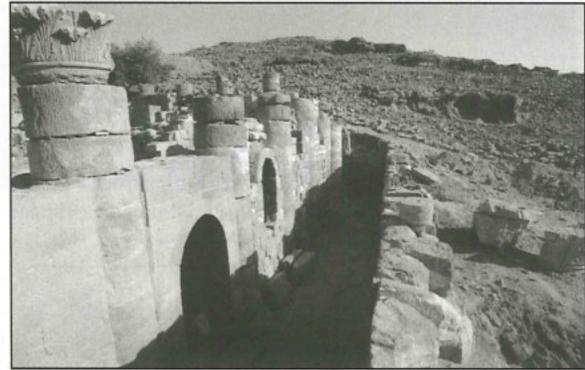
fragments are of particular interest, including a lower order exquisitely carved smaller than usual acanthus capital measuring 0.55 m in diameter carved with a grand bouquet of acanthus around its circumference. Additionally there was a Nabataean blocked out capital measuring 0.26-by-0.28-by 0.34 m, McKenzie's type 3 (1990:190) which is the first of this type we have found at the Temple site. McKenzie (1990:122) dates this type of capital to AD 129 from those found at ad Dayr and the Palace Tomb. These elements are different from those heretofore associated with the temple contexts.

These excavations also produced a full repertoire of first century Nabataean fine painted and plain wares with some complete forms. The Nabataeans liked to drink and eat from their decorated pottery — marvels of both lightness and strength with their well-fired thin wares that have a ring almost like crystal. The quality of these finds suggests that this dump deposit might possibly date from the time the Temple was being remodeled. The collection was so extraordinary in its range that we wondered if perhaps this could have been a dump for rit-

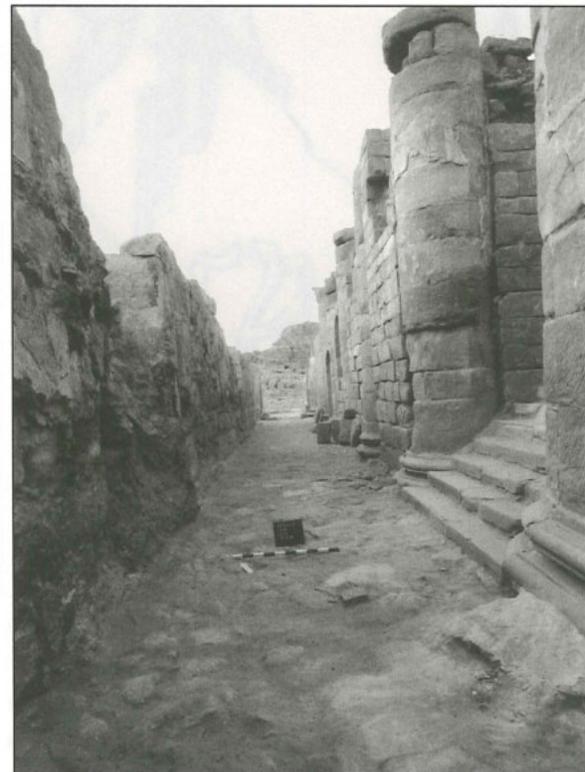
ual artifacts? The pottery read by Y. Gerber from this area places its contexts earlier than 70/80 CE or to the second half of the first century BCE, thus the terminus post quem for this Nabataean Dump is 100 CE.

### Temple

The Temple west saw the excavation of the *West Corridor* (Figs. 22-23) with frescoed walls standing to a 6 m height. This excavated area, between the West Inter-Columnar wall and the West Corridor wall,



22. 1998, West Corridor looking south (Artemis A. W. Joukowsky).



23. 1998, West Corridor looking north, (Artemis A. W. Joukowsky).

covered 20 m in length-by-3 m in corridor width-by an average 5.10 m depth. With its completion, this excavation made it possible to accurately measure the Temple length as 42.5 m.

The earliest building phase, Phase O, saw the construction of the West Corridor floor bedding; Phase I saw the construction of the West and Southwest Walkway walls and seven columns of the west Temple, including the southwest heart-shaped corner column and the two rear columns. This phase also included the simultaneous construction of the West and South walls of the Corridor with their frescoed decoration.

Also excavated was a 4 m portion of the *Southwest Corridor* from the point where the corridor took a turn to the east. It was found that in Phase O the subterranean canalization system was cut into bedrock at the bottom of the corridor floor. The roughly hewn sandstone canalization capstones measured approximately 1.50 m in length, and were irregular and uneven in appearance. Because this feature was recovered on the last day of excavation, it was not fully investigated, but we project the canalization will be found to extend under the east balk of the trench with a probable connection to the canalization found cut into bedrock under the Central Arch.

The corridor pavement bedding consisted of irregularly set stones and in a few areas there were impressions left by the pavement, but no flagstones were recovered. The bedding was found to be damaged by earthquake fall, and the assumed pre-existing pavement of limestone pavers that had been clearly delineated in the Northwest Corridor had been robbed out. What remained was irregular and uneven in appearance.

Shown on the revised plan in Fig. 1 are doorways in the Southwest and West Corridor walls, approximately 2.10 m in width leading into the west and southwest walkways. The southwest doorway had been

purposefully blocked up from the bottom in antiquity; it later may have served as a window. Internal buttresses for the doorways were destroyed to support the door, and in the upper levels, doorjambs were found. Future excavation will confirm the wall thickness although it appears to be at least 1m.

The lower courses of the heart-shaped sandstone southwest corner column were recovered in excellent condition; it stood plumb to a 4.75 m height. As there was a 0.15 m earth accumulation between the upper drums, the two upper courses were removed for their future consolidation and re-erection. With the removal of these drums, the *in situ* bonding plaster was found in fine condition along with large amounts of wood and the remains of metal fittings. Each of the eight remaining drum components was also found to be well bonded and to require little reconstruction. Some of the metal fittings were drawn to scale and samples of the wood were collected for dendrochronological analysis. Each of the eight remaining drum components was found to be well bonded and to require little consolidation.

With the removal of the upper courses of this heart-shaped column, we were able to understand how it had been laid. Just before each element of the hewn column was put into place, it was backed with reeds and plaster. For reinforcement, the Nabataean masons affixed the drum with iron bars that served as clamps to hold the joints between the four or five column drum components. Once in place, more plaster was poured onto the joints, and added to that was yet another plaster coat containing a binder of plaster mixed with ground and crushed potsherds. Once the drums were bonded and the capital was in place, the plasterers moved in to stucco the exterior drum components so their height irregularity would be masked from view.

The best preserved simple rear columns

of the temple rear have as many as 17 single *in situ* drums, rising to an 8.45 m height above the southwest corridor floor. They appear to be in excellent condition for they stand straight having been braced by the Inter-Columnar wall. This southwest area suffered less earthquake impact than either the east and west sides of the Temple.

### *Frescos and Stucco Decoration*

When the visitor views the city of Petra today, most do not suspect that a majority of the carved façades originally were covered with stucco and that these façades were brightly painted. Preserved to a 6 m height the West and Southwest Corridor west and south walls were irregularly built, intentionally constructed to provide the footing for a richly painted plaster decoration. There are many chinking stones in between its irregularly and roughly-set squared blocks that were faced with mortar, so that the thick (0.17 m) multi-plastered layers would gain a secure placement. The frescoes of the West and Southwest Corridor demonstrate that the Great Temple was lavishly stuccoed and painted, and like the Temple of the Winged Lions (Hammond 1977-8:86,91), there is some evidence of fresco motifs that in antiquity were pecked over and re-stuccoed and repainted in plain colors. First a primary coat of between 10 and 20 mm in thickness was laid, to which was added a fine homogeneous 'skin' of about 5 mm which was painted. On the east face of the west and north face of the South Corridor walls were stucco moldings as well as many painted and decorated wall plaster fragments.

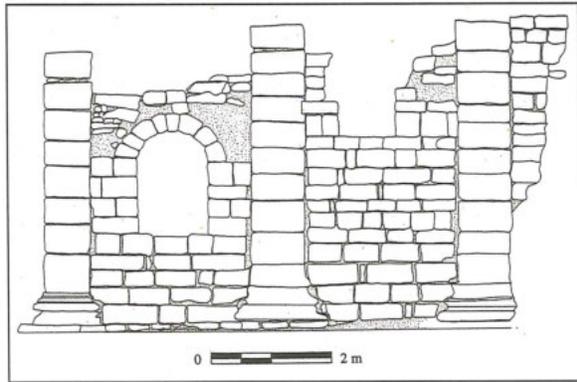
The expertise of Nabataean stuccoists is revealed in the architectural stuccos molded and fixed to decorate the upper parts of walls. Here we found the ornamental repertoire of classical moldings with rows of beads and reels, eggs and darts and denticles, enhanced by color in which yellows, blues, reds, and greens predominate. Often

fragments of bright blue painted cornices were recovered near the doorways, so it is reasoned that these fragments were part of their decorative program. Like fragments can be paralleled (McKenzie 1990:Pl. 23a-c) at the al-Khazna, the Temple of the Winged Lions and the Baths. The areas where smooth stucco decoration survived were decorated with panel fragments of finely-painted plaster in reds and yellows bordered by dark frames (The Munsell readings are dark red 10R3/6 for the main panel, yellow 10YR7/8m for the secondary panel, a greenish gray is 5G 6/1, and the border stripe is weak red or 2.5YR 5/4). The surviving details of the design are not clear, but they may depict an architectural façade, a doorway or entrance. We undertook the preliminary consolidation of one large, 2.80-by-1.00 m in height, fragmented fresco, by supporting it with a mixture of sand mortar and nails as reinforcement (Not only were many dowel holes found in the plaster to provide support, but several dowels with their plaster surround were recovered).

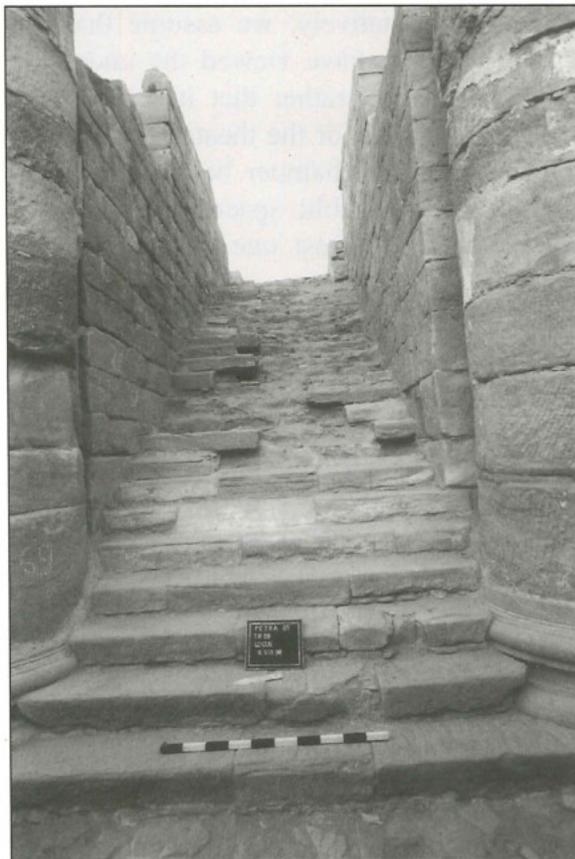
### *Temple Southwest and the Inter-Columnar Wall*

Phase II, the second and later building phase, saw the construction of the Inter-Columnar walls extending between the columns. Particularly impressive were the pristine condition of windows and arches of this western Inter-Columnar wall drawn in Fig. 24 — they appear as if they were recently constructed. Typically this west wall's neatly dressed ashlar exhibited fine diagonal tooling, tilted at forty-five degrees, used for keying the stucco, but only traces of the original stucco remain.

As part of the excavation of Trench 59, the east-west southwest stairway (Fig. 25) was completely excavated. The width of this stairway measures 2.42 m and its length is 9.50 m. Although the upper stair treads had been robbed, the bottom seven courses



24. 1998, West face of the West Inter-Columnar Wall (Field drawing by A. A. W. Joukowsky, drafted by M. S. Joukowsky).



25. 1998, Southwest Stairway extending down to the West Corridor, before conservation (Artemis A. W. Joukowsky).

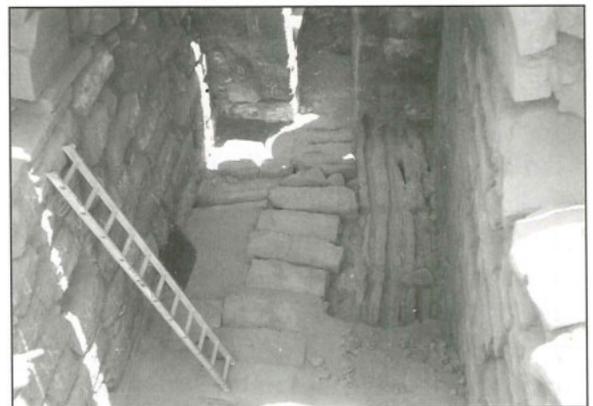
were intact and *in situ*. A large number of architectural fragments were found in the collapse resting on these stairs, including several quarter fragments of the upper order of capitals. This may be an indication that the earthquake tremors in this part of the structure shook these walls to tumble first to

the west and then to the east. On the basis of Nabataean fine wares, the earliest deposit here is dated from the last quarter of the first century BCE.

### Central Arch

We anticipated the Central Arch to be an architectural feature whose purpose was only as a support structure for theater seating. Highly informative was the tedious 1998 excavation of the arch and the chamber below it. After repeated three season attempts to stabilize the arch, we were finally able to complete its stabilization and excavation. Despite the recovery of ashlar and decorative architectural fragments that had tumbled from above into the arch area, it was our good fortune to find that the majority of the arch remained intact. The preserved height of the arch averaged approximately 3 m from its underside to the floor below.

Cut into bedrock, the arch chamber floor, measuring 8.52 m-by-3.32 m was comprised of a larger four-channeled canalization system with an additional smaller series of subsidiary shallow bedrock-cut roughly parallel channels (Fig. 26). The opening depth of the larger channels was at 885.848 m and the closing depth was at 885.548 m. The north-to-south line of capstones in the larger main channel consisted of regular capstone construction characteristic of the temple canalization found in the



26. Central Arch showing the Canalization (Elizabeth A. Najjar).

temple Pronaos and Forecourt in earlier years. These capstones were longer than they are wide with average measurements of 0.50 m in length, 0.35 m in width-by- 0.19m in thickness; they rest on chinking stones which were set above the bedrock cut canalization wall to level them.

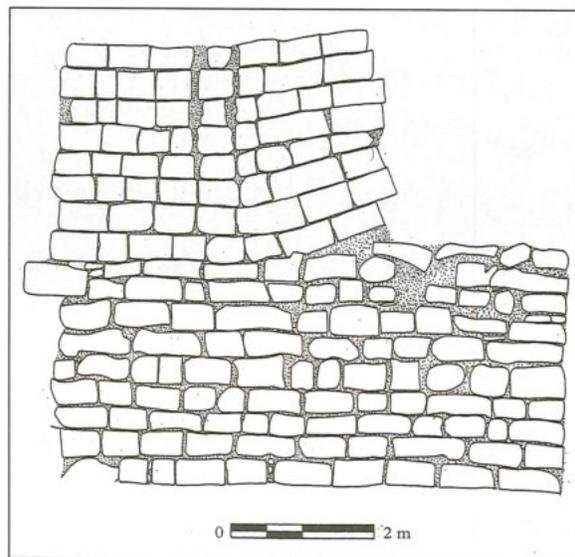
In order to expose the interior of the canalization and to collect soil samples, several capstones were removed. Within the canalization was a Munsell 7.5YR 3/4 dark brown fine silty deposit, increasing in depth as the canalization descended from south to north. Found here was a Nabataean cup. The canalization walls were mortared with a thick, water-resistant very dark gray (Munsell 5Y 3/1) hydraulic cement with inclusions of small rocks and potsherds.

In the areas where the capstones were removed, sondages determined the character of the canalization. Initially it was postulated that it was cut into the bedrock in a strictly north-south direction, traveling beneath the southern doorway to the as yet unexcavated south and to the north to continue beneath the north wall, and presumably from there into the central Temple. Beneath one of the capstones there was found an east-west intersection, forming a "T" shaped junction. The east branch continued to the east wall, whereas the western branch was followed to 0.3 m under the west wall. Thus once again the Phase 0 canalization confirmed that it predated the Temple Inter-Columnar walls of Phase II and the Phase II walls of the Central Arch.

Lying above the Canalization System was hard-packed clay "floor." In this Phase I building phase the canalization system was blocked off. The smaller shallow water channel systems were also blocked off; the channels were filled with debris and the clay "floor" was laid down so that the Central Arch chamber walls could be constructed. Although the north and south portions of the arch have collapsed, the portion that remained consisted of roughly hewn

sandstone ashlar measuring on average 0.35 m-by-0.55 m, set in rows of eight. Its 16 courses are set parallel to the bedrock in the southern half of the arch, and they then begin an upward tilt and are built-up towards the north at an angle of 60° which can be seen in Fig. 27. The arch would have extended towards the north wall, which most likely was built up to support it. The arch sandstone ashlar are of better quality than those in the supporting walls below. It is justifiable that these stones were hewn and placed with deliberate care in order to support the load-bearing weight of the theater seating. (Tentatively, we assume that the public may not have viewed the underside of the arch, but, rather that it served as a support structure for the theater seating.) It appears that the chamber below may have served not as a public space but as a store-room, during at least one of its later use phases.

In the Phase III debris above the floor were 160 coins, tentatively dated to the Late Roman period or to the second century CE. This cache was recovered from a 0.8-by-0.8 m square of deposit. Comprised of a compact, artifact-rich layer of moist, clay-like greasy soil which is patchy in areas, this de-



27. Central Arch West Wall (field drawing E. Libonati, drafted by M. S. Joukowsky).

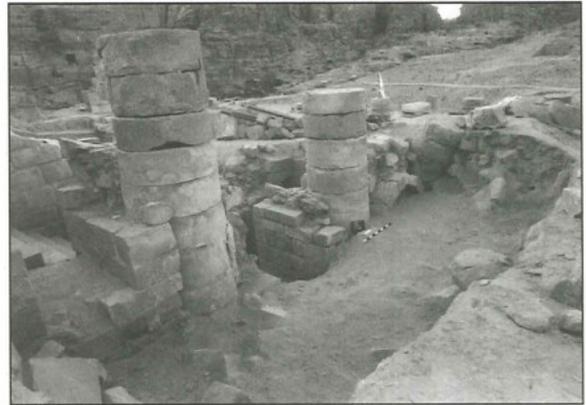
posit contained bones, burnt residue, charcoal, limestone chips, plaster chips, shells, and some sand. Artifacts included the cache of coins, along with glass, tesserae, and metal nails. The 101 architectural fragments found in this third phase include: cornice, 27.7%; acanthus leaf, 21.8%; vine, 18.8%; and other decorated fragments of pomegranate/poppies, corner volutes, pine cones, flower petals, including hibiscus petals, and cauliculi.

The pottery varied in date and large storage vessels were predominant, although jars, jugs, cooking pots, and Nabataean fine wares were also present. Cat. No. 98-L-2 was a complete Roman lamp in excellent condition that parallels a late third century CE lamp (Rosenthal and Sivan 1978:96). This lamp has a depressed discus, a small central filling hole, a perforated handle, and a rounded spout. The lamp is of pink clay, a Munsell red 2.5 YR 6/6 with splashes of red slip on its upper half. From the preliminary analysis, the closing date for the Central Arch deposit ranges to the fourth century CE.

### *Temple East Corridor*

Also in 1998 we recovered more of the East Corridor. Trench 58 was a continuation of excavations undertaken in 1996 with dimensions of 11 m north-south-by-3 m east west. The purpose of excavating this area was to remove fallen columns and capitals congesting the east corridor and to expose the East Corridor wall. Here the initial deposit was clogged with fallen column drums decorated with fruit and acanthus-laden Nabataean floral capitals. Several drums of the Temple East were removed, stabilized, and re-erected. Figure 28 shows the East Corridor after clearing.

A number of architectural features in the Inter-Columnar wall overlooking the rear east stairway were exposed including two arched windows and an arched doorway. In addition, several elegantly carved floral cap-



28. East Corridor after clearing (Artemis A. W. Joukowsky).

itals were unearthed as well as two extraordinary pine cone bosses. Other registered finds from Trench 58 included many red, white and yellow fragments of wall and column plaster, one oxidized coin, and several roof tiles that suggest this served as a storage facility. For temporary safekeeping, the architectural elements were placed along the East Side of the Upper Temenos. As a substantial portion of the fallen columns and capitals on the Temple east had impeded excavation, it is now cleared so that it can be excavated in 1999.

### *A Word About the 'Lower Market'*

To the east of the Temple precinct lies the so-called 'Lower Market,' which from our preliminary survey appears to be part of the Temple precinct. This we have confirmed was not a market at all, but is instead an enclosed formal garden with a large pool, reminiscent of a Persian *paradeisos* or pleasure park. In the center of the pool was a bridge leading to an island with the remains of pavilion embellished with marble and painted plaster. More about this unique well-preserved extraordinary feature will be reported on by L-A. Bedal who directed its excavation and research.

### *1998 Catalog*

In the 1998 catalog were 186 coins, the fragmented bronze plaque with the Nab-

ataean inscription, painted stucco, 40 additional elephant parts, 37 lamp fragments, and 24 Nabataean bowls, cups, unguentaria, and figurines. Since 1993 nearly 34,000 fragments of pottery, bone, metal, and glass now have been classified in our site database. After six excavation seasons, the catalog register includes 382 coins, several inscriptions including three in Nabataean; several fragments in Greek, and an Imperial Latin inscription (Tracy 1999:372-376). Exquisitely painted stucco fragments abound, including one with a partial human face shown in Fig. 21. 146 sculpted elephant fragments are included in our architectural fragment database numbering over 6274 elements, along with fragments of elaborate floral friezes and acanthus-laden limestone capitals. 379 lamp fragments, complete Nabataean bowls, small cups, jugs, unguentaria, and figurines are among the 149,640 pottery, glass, bone, and metal artifacts classified in our site database.

As specialist study is integrated to our research, J. J. Basile is studying the sculpted pilaster blocks from the Lower Temenos; C. Augé will be analyzing the coins, D. G. Barrett has researched the lamps, S. G. Karz the glass, and the stylistic analysis and dating of the pottery already has been undertaken by Y. Gerber.

Found in the pool-cistern in the courtyard of the Petra Church excavations was one of the Lower Temenos elephant head fragments (no. 661 1998), as well as the hibiscus petal from the upper part of a Temple capital (no. 662 1998). It is clear that the Byzantine Church builders "borrowed" the attractive architectural elements they found lying around the site.

#### *1998-1999 Consolidation and Restoration*

The fundamental philosophy of the Petra Great Temple excavations from the beginning has been that the site is a fragile, non-renewable resource that would require

protection. One of our concerns before excavation was undertaken was that we would make every effort possible to consolidate the site while the excavations were in progress. It should be made clear that we have not undertaken architectural restoration, in its true sense — restoration awaits further excavation and the expertise of an architectural historian. The measures we have taken are geared only to the reversible preservation of the structural integrity of the precinct. Exposure of the architectural features has been of serious concern, for the site is susceptible to the havoc created by heavy rains and earth tremors. This has been acknowledged and instituted by the incorporation of several additional consolidation procedures that have become part of our research design.

One of the crucial by-products of excavation is the state the archaeological site is left in after excavation. Because archaeology is a destructive science, how does the site live on after it has been excavated? Conservation and consolidation are expensive, tedious, labor-intensive endeavors that require specialists and skilled technicians. It is hoped that we have helped to preserve this monument and its precinct, for we have routinely maintained records of both the condition and treatment of the various site sectors that we have participated in recovering. Approval to carry out conservation was vigorously supported by the Department of Antiquities of the Hashemite Kingdom of Jordan. Aware of the threats caused by winter rains and earthquakes, Dr Ghazi Bisheh, then, Director-General of the Department of Antiquities, was anxious to have consolidation carried out during the excavation or as soon as possible after the close of the excavation season. During our annual excavations, consolidation plans have been undertaken, and those measures that interfered with the excavation process were postponed until the excavations had concluded. Each year we envisioned a more extensive,

organized plan for the consolidation of the Great Temple architecture, which has been on-going under the expert guidance of Dakhilallah Qublan and some 20 local workmen. We have also made several studies of consolidants<sup>5</sup> for the conservation and restoration of standing structures. We have also diagnosed a wide variety of sensitivities in order to slow the process of sandstone and limestone deterioration. With this in mind, yearly conservation surveys of the excavated portions of the Temple have been carried out with a view to preserving and restoring various architectural features.

Now that all the temple columns have been located, their reversible re-erection has been undertaken. On occasion mortar has been used between the drums — as was the case with the entry columns of the West Exedra and the restoration of the East Colonnade. Using a tested mortar, which in composition is similar to the original Nabataean mortar, we have consolidated architectural elements — the aforementioned columns and walls that have been imperiled both from 2000 years of erosion as well as by recent excavations.

Applications have been made to the World Monuments Fund, which has granted us two awards (1996 and 1998, respectively) expressly for site preservation, conservation and consolidation. Thus the Great Temple consolidation projects have been made possible in part by a grant from the Samuel H. Kress Foundation through an American Express Award through World Monuments Watch, a program of the World Monuments Fund. These funds were matched several times over by special subventions through donations to Brown University. Briefly stated, budget constraints

have forced us to be selective of what we could undertake.

Among the completed projects involving the consolidation and conservation was the anastylosis and re-erection of 11 courses of the heart-shaped southeastern column of the Temple rear. The East and West Stairways leading from the Lower Temenos to the Temple Forecourt were also restored and also completed was the anastylosis of the West Corridor east Inter-Columnar wall along with its arches and windows. Beginning with the Temple precinct north, the following list of projects was scheduled for 1998-1999 consolidation — I am pleased to report they all have been completed.

- \* The Propylaeum's arch springers were in a state of collapse and required consolidation. Consolidation has taken place.
- \* In the Lower Temenos, six columns have been restored to different heights in the East Colonnade to a maximum of 6.80 m height (their original height we assume was 8 m). One of the elephant-headed capitals from the Temenos Gate was placed on top of the highest column so that visitors will have an understanding of the layout and sculptural canon of these features (Fig. 29). The East Exedra urgently required stabilization — this was undertaken with the replacement of deteriorating blocks that had weakened the structure and its integrity; it was in danger of collapse — consolidation was completed.
- \* In the Upper Temenos, the 'cistern' required its walls to be pointed and reinforced; its two free standing arches also required re-pointing (these arches were first stabilized in 1997). The steps leading to the West Walkway had to be re-

5. Whether or not these mortar consolidants have limitations is a complex question. Stone, particularly sandstone deterioration is appreciable in the Temple's erosion. The long term efforts of the mortar on the sandstone is difficult to predict. It is a matter of judgment of the conservator. For each

stone there are differing porosities, differing salt, water and acid absorption rates and difference in how they react to sunlight. Here is a very complex question, for each individual stone has its own problems.



29. Lower Temenos Restoration of the East Colonnade with the placement of the Elephant-headed capital on top of the column (Dakhilallah Qublan).

placed for some of these were broken and slumped out of position, while others had been robbed out. Consolidation was completed.

\* In the Temple itself, the Central Arch exhibited complex needs, for it required collapse prevention by the construction of a wall of 55 ashlar blocks built up to stabilize the arch. Another project entailed the southwest heart-shaped column's upper drum elements which were restored to their original positions. The Southeast East-West stairway has some 23-24 steps; all but the lowest seven steps were robbed out in antiquity. For passage into the structure some 18 or 19 steps were replaced with new treads. As for the southwest east-west stairway, where the condition was similar, these steps were also replaced. The West Corridor frescos were treated during the field season, but they required further cleaning, stabilization, support and protection to prevent their disintegration. Finally, the fallen ashlar blocks that were originally part of the West Corridor wall were replaced to their original positions. Additionally, the protective

fencing surrounding the site again had to be increased for the surround of the excavated areas, but also to protect our "Sculpture Garden" where pilaster blocks and decorative capital elements are stored.

### 1998-1999 Publication

The 1998 publications included the basic reference to the 1997 excavations in *ADAJ* as well as Associate Director J. J. Basile's coverage of the Tyche head. We now await the multi-disciplinary publication of *Petra: The Great Temple, Vol. I — Brown University Excavations 1993-1997*, with its accompanying CD-ROM.<sup>6</sup>

### 1998-1999 Research Projects

- \* Erika L. Schluntz defended her Ph.D. dissertation entitled *From Royal to Public Assembly Space: The Transformation of the "Great Temple" Complex at Petra*, at Brown University. This valuable work seeks to test the idea of the function of our complex. With essential theoretical ideas Erika questions and challenges the building's identification and argues convincingly that it served a civic function.
- \* Adam Brin of Brown University revamped the Petra Web page which can be accessed at <<http://www.brown.edu/Departments/Anthropology/Petra/>>.
- \* Eight Great Temple fresco fragments were analyzed by the Institut Canadien de Conservation under the direction of M-C. Corbeil and K. Helweg. The results of their findings are presented in ARL Report 3779, dated March 19, 1999. The fragments analyzed originated in the Trench 53 'cistern' area in the Upper Temenos East. In summary the report states that the fresco support was contained mainly of sand (quartz) with a small amounts of

6. As this five year report is in press I am conscious of the fact that some of the material already has become dated due to the pace of our excavations. It is hoped that this volume will promote catalysts for ideas among archaeologists and will broaden

public awareness of and support for our work. The publication of a revised and expanded Volume II report will be undertaken as the conclusions of our excavations in or around 2004.

calcite and traces of gypsum. No organic binding medium was detected. Two green fresco fragments were identified as green earth; the red fragments were of red earth — a mixture of hematite and associated minerals such as kaolin. Two blue fragments were identified as Egyptian blue which the researchers mention has been found in Pompeii and at Dura Europos. The yellow pigments were yellow earth, i.e., a mixture of goethite and associated minerals such as clays. One black colored fragment held a yellow layer underneath its black surface. The black was a carbon-based black whose source was undetermined. The analysis also suggested that the Great Temple frescos are true fresco — there was no binding medium and the pigments were placed directly onto the wet support. These same pigments were found on frescoes from the Roman fort excavated by John Oleson al-Humayma.

\* E.L. Vote processed data from a 1998 photogrammetric survey of selected areas of the Upper Temenos. While in Petra she produced a series of measurable photos with a calibrated 35 mm camera and referenced control points plotted on temple elevations. The control points were confirmed by our team surveyor, P.C. Zimmerman. Vote has succeeded in producing 3D models of several areas with a high level of accuracy. For example, over a span of 1 m, measurements generated from the photos were approximately 6 mm different (per one meter of elevation covered) from control points taken from the EDM survey. Working with the measured photos she produced a modeling software package developed by the Brown University Graphics Laboratory with the hope of generating a model of the extant architectural remains and a full reconstruction.

Additionally she has been working with GIS results to plot artifacts in the context of the entire Great Temple excavation. This will enable her to generate a variety of 3D site diagrams with concentrations of different artifact finds in trench and locus locations.

### Conclusion

The Great Temple contains eclectic exquisite art and architecture from the Nabataean period and demonstrates that the values of the Nabataeans of Petra during this period who felt that aesthetic decoration of structures with frescos and architectural sculpture were sufficiently significant on which to expend time, money and energy. This blending of different cultures is seen in this palatial building and its precinct with the use of elephant heads, frescos, elegantly carved pilasters and capitals. There is a high level of skill and technology possessed by these builders as well as a high level of organized government that was required to construct this monumental structure. The Great Temple is one of the key sites in the Nabataean Petra, and it is a significant for our knowledge of the development of the city. The lives of the Nabataeans were influenced by a unique blend of cultures, and the Great Temple is no exception. Its study enriches the web of knowledge we possess regarding both Petra and the people who created it. The 1998 season at the Great Temple proved to be provocative and propitious as many more questions were raised about this fascinating precinct.

Martha S. Joukowsky  
Brown University  
Providence RI 02912  
USA

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# PRELIMINARY REPORT OF THE NOTES ON THE HEAD OF THE GODDESS TYCHE FROM PETRA, JORDAN

by  
Joseph J. Basile

## Introduction

In the summer of 1995, excavators from the Brown University expedition to the Great (Southern) Temple at Petra discovered a sculpted head of local al-Quwayra sandstone, subsequently identified as the goddess Tyche. The head was published in *ADAJ* 1997;<sup>1</sup> since that time, new information concerning the piece has been discovered, prompting this brief re-examination to be submitted to *ADAJ*.

## Initial Identification in Bachmann, *et al.*

The first important piece of new evidence to surface was the recognition, by Ms. Leigh-Ann Bedal of the University of Pennsylvania, that the Tyche head recovered in the Brown University excavations of 1995 was the same head mentioned by Bachmann (Bachmann *et al.* 1921: 44-45) (Bedal, pers. comm.).<sup>2</sup> It is also illustrated, as figure number 37, and the text states that Bachmann discovered the head, 39 centimeters high and of local sandstone, in the rubble of the area of the Lower Temenos. The description of the head, and the photograph listed as figure 37, seem to indicate that this is indeed the same head recovered by the Brown University team. While the 1997 article lists a Tyche head illustrated in Bachmann *et al.* as an example of the appearance of that goddess in the art of the Nabataeans at Petra, it does not state that the piece is in fact one and the same with the head discovered - or, more accurately, "rediscovered" - by the Brown

University team (Basile 1997: 257).

This realization has important ramifications for one of the hypotheses advanced in the 1997 article - namely, the idea that the rubble scarp in which the head was found consisted mainly of spolia from the various excavations of the famous Baths complex, north and west of the Lower Temenos of the Great Temple (Basile 1997: 255, n. 2). If the head was to be seen in the Lower Temenos as early as 1921 - prior to all of the significant excavation projects at the Baths - it seems less likely that it found its way to the area through archaeological research. While the author still stands by the argument that, on stylistic grounds, the fragment should most likely be assigned to the Temenos Gate (or an associated monument) with a date of between the third quarter of the first century BC and the first quarter of the second century AD (Basile 1997: 261-262), this new discovery calls into question the process by which the head was deposited in the Lower Temenos of the Great Temple.

## Identification of a Possible Source-Block

A second new development was the identification, by the author, of a possible source block for the Tyche head recovered in the Brown excavations of 1995. In the 1997 article, it was argued that the Tyche most closely resembled the winged "Hermes" head in the Petra Museum (Basile 1997: 261), which has been assigned to the sculptural decoration of the Temenos Gate (Parr 1957: 7-8, pl. 3; Glueck 1965: pl. 151;

1. See J.J. Basile, A Head of the Goddess Tyche from Petra, Jordan. *ADAJ* (1997) 41:255-266.

2. Mr Danny Herman, a graduate student at the Hebrew University in Jerusalem, also recognized this

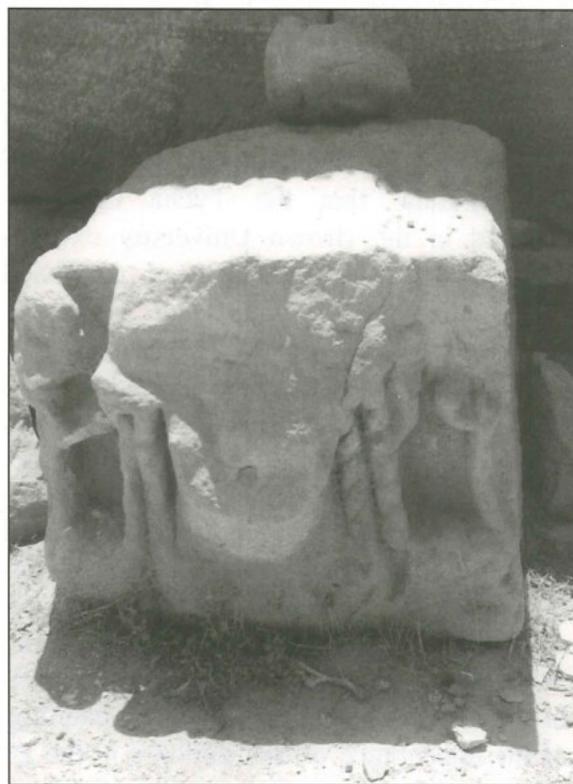
error (pers. comm.). Additionally, the piece is listed as no.54 in McKenzie's catalog of Petra sculptures in the *PEQ* 1988:94.

McKenzie 1988: 87, 88, 91, Fig. 12a; McKenzie 1990: 134, Pl. 58d-59a). This head was most likely part of a relief bust, projecting outward from a carved block like the famous limestone Serapis bust, also linked to the Gate (Parr 1957: 6-7, Pl. 1-2; Glueck 1965: Pl. 151; Maurer and Maurer 1978: Pl. 65; Berthud and Hatch 1985: Pl. 59; Lindner 1985: 47; Zayadine 1986: 215, Fig. 1; McKenzie 1988: 87-88, 91, Fig. 12b; McKenzie 1990: 134, Pl. 58b-c). The author, working on the hypothesis that the Tyche head belonged to a similar kind of bust, made a survey of the sculptural fragments of the central Petra valley in the summer of 1997, and identified a block just east of the Temenos Gate (on the south side of the Colonnaded Street, against the retaining wall and near the Propylaia Steps of the Great Temple), which might belong to such a sculpture. This block is of the same red sandstone as the Tyche head, is of the proper size and scale (44 cm wide, 39 cm high, and 68 cm long), exhibits a break pattern similar in shape to that on the back of the head, and although badly weathered clearly depicts the neck and shoulders of a female figure with curled tresses and perhaps the remains of a veil (Figs. 1-3).<sup>3</sup> Damaged and enigmatic carvings to either side of the figure may represent vegetal motifs, thyrsoi, cornucopiae, or other attributes.<sup>4</sup> The most prominent feature of the block is however the preserved neck - it is 18 cm wide at its greatest extent, the same width as the neck of the Tyche head. This block was first published by McKenzie as "female head coming out of acanthus leaves;" interestingly, she considered it to be contemporary with the carvings of the Temenos Gate, based on stylistic grounds (McKenzie 1988: 94, no. 51). An

attempt was made by the author, with the assistance of Mr. Brian Brown, to fit the Tyche head to the block, but both the back of the head and the front face of the block were too badly weathered to all articulation. Nevertheless, the similarities in material, size and scale, break pattern, carving technique, style, and location suggest to the author the strong possibility that the Tyche head was originally attached to this block, which in turn belonged to the sculptural program of the Temenos gate or of a similar and contemporary monument nearby.

### Conclusions

It is hoped that these notes clarify certain issues concerning the Tyche head recovered in the Brown University Great Temple ex-

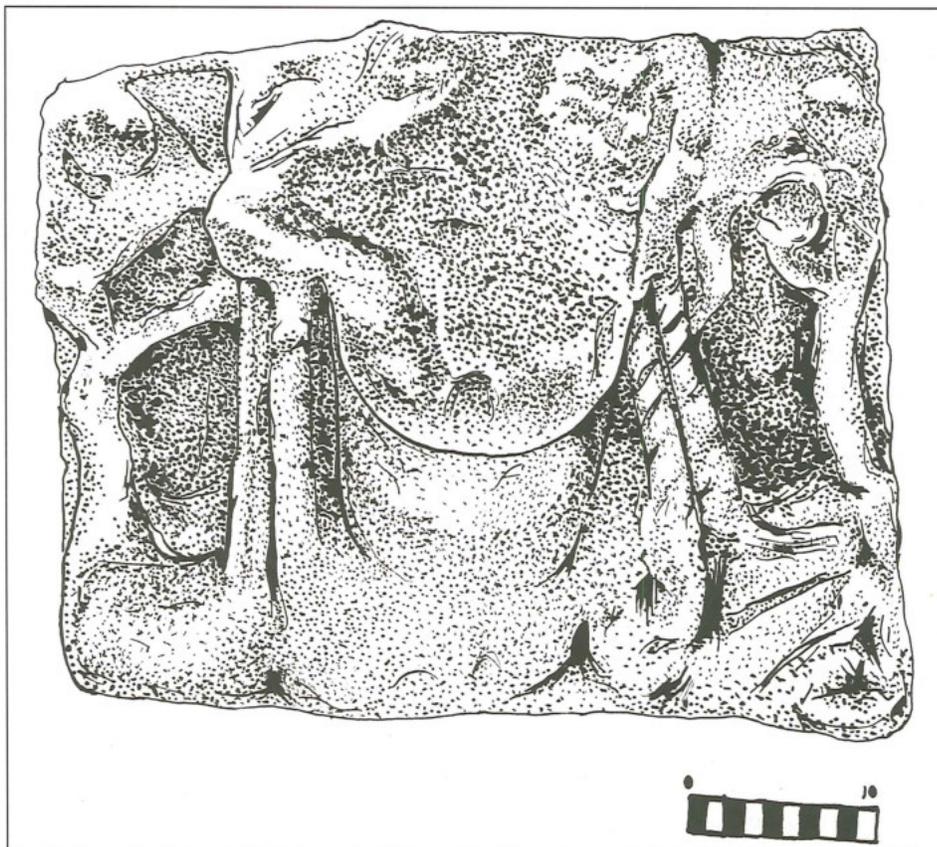


1. Possible source block for the Tyche head, photograph *in situ* (J. Basile).

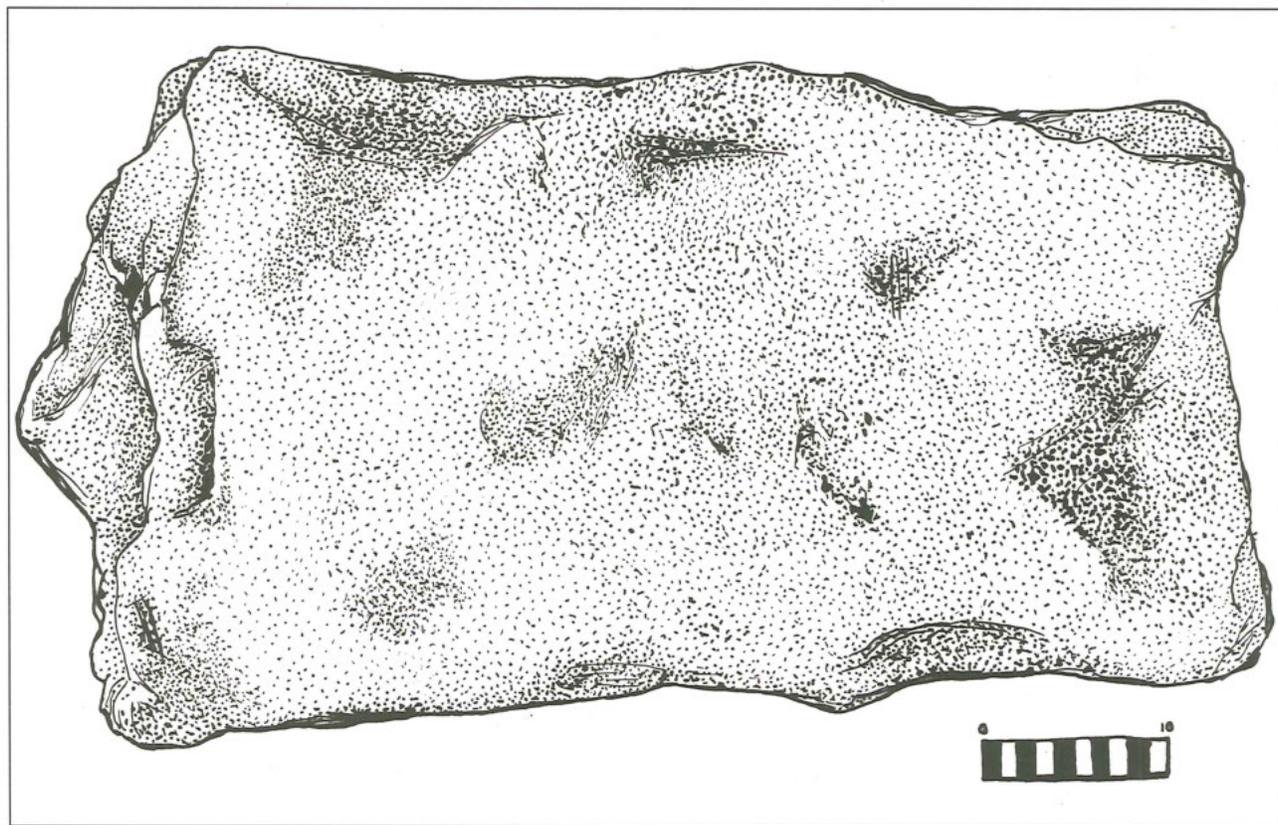
3. The resulting hairstyle-wavy hair parted down the middle, pulled into corkscrew curls falling in front of the shoulders-would resemble Classical and Hellenistic models such as the famed Caryatids of the Erechtheion, the Eirene of Kephisodotus, the Demeter of Knidos, and important Tyche figures

like the Prusias-ad-Hypum type.

4. The block also bears the number "582" on the back (south) face, and an iron screw has been driven into the top left corner of the east (side) face.



2. Possible source block for the Tyche head, illustration of front side (J. Ragosta).



3. Possible source block for the Tyche head, illustration of west side (J. Ragosta).

cavations in 1995, and shed further light on a possible place of origin for the fragment. It is also hoped that they demonstrate a continuing need for systematic study of the sculptural remains of the central Petra valley, and not only of their more famous cousins which decorate the carved tombs of the necropolis.

### Acknowledgements

The author wishes to acknowledge the assistance of the following individuals: Prof. Martha S. Joukowsky, director of the Brown University Excavations at the Great Temple

in Petra, Jordan, Ms. Leigh-Ann Bedal, Mr Brian Brown, Mr Jason Ragosta, and, as always, Ms Monica Sylvester for her encouragement and support. Any errors or shortcomings contained in these notes, however, belong solely and exclusively to the author.

Joseph J. Basile  
Department of Art History  
Maryland Institute, College of Art  
1300 Mt. Royal Avenue  
Baltimore, MD 21217  
USA

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# A PARADEISOS IN PETRA: NEW LIGHT ON THE 'LOWER MARKET'

by

Leigh-Ann Bedal

## Introduction

Despite decades of excavation in and around Petra, archaeologists continue to grapple with the issues of chronological development and the organization of the city as a center of political and economic importance. Contributing to the incomplete nature of our understanding of Petra is the fact that significant pieces of the puzzle have managed to elude archaeological investigation. One of these is a large, open area located in the center of the city, south of and overlooking the colonnaded shop-lined street, amidst the temples and other civic structures that make up the city's core. Its central location, monumental scale and labor-intensive construction, cut deep into the side of a rocky slope and perched on a large stone-built platform, suggest that this area was part of the ceremonial, economic and political center of the city, and therefore must have had an important role in the organization and life of Petra.

In the early part of this century, the area in question was labeled the *Unterer Markt*, or 'Lower Market', the westernmost section of a larger marketplace divided into three distinct and relatively equal parts—'Upper Market', 'Middle Market', and 'Lower Market' (Bachmann *et al.* 1921:37-41). Although its designation as a market suggests

some empirical knowledge of the function of the area, the truth is that the identification was based purely on the expectation that a major entrepot such as Petra required a large centralized marketplace. The *raison d'être* of Petra was its role as a caravan city located on the axis of a network of ancient trade routes, particularly those devoted to the trade in frankincense and myrrh, linking Arabia with the Mediterranean and much of the ancient world (cf. Miller 1969; Van Beek 1969; Groom 1981). Despite its international economic importance during the Hellenistic and Roman periods, little is known about the organization of Petra's economy, its trade and commerce. Arguably, the identification and systematic study of a marketplace in Petra would provide valuable information about economic activities within the city.

During a two-month field season in the summer of 1998 (Bedal 1998; 1999), a survey and excavation was conducted in the 'Lower Market' in order to determine its function, historical development, and its relationship to the adjoining Great Temple and other monuments in the city's civic center.<sup>1</sup> Work began with the creation of an accurate map of the 'Lower Market', which measures roughly 6,150 m<sup>2</sup> (75x82 m), using the same Electronic Digital Mapping system (EDM) as is used by the Great Temple project, in or-

1. The Petra Lower Market Survey, directed by the author (L. Bedal), was made possible with an ACOR Near and Middle East Research and Training Act Pre-doctoral Fellowship, a National Science Foundation Doctoral Dissertation Improvement Award, and the generous collaborative efforts of Martha Sharp Joukowsky, director of the Brown University excavations of the Great Temple at Petra. The survey and excavation project was carried out with the cooperation of the Department of Antiquities of Jordan, in particular Dr Ghazi Bisheh, then Director-General, and the on-site representative Muhammed Abdul-Azziz. A special

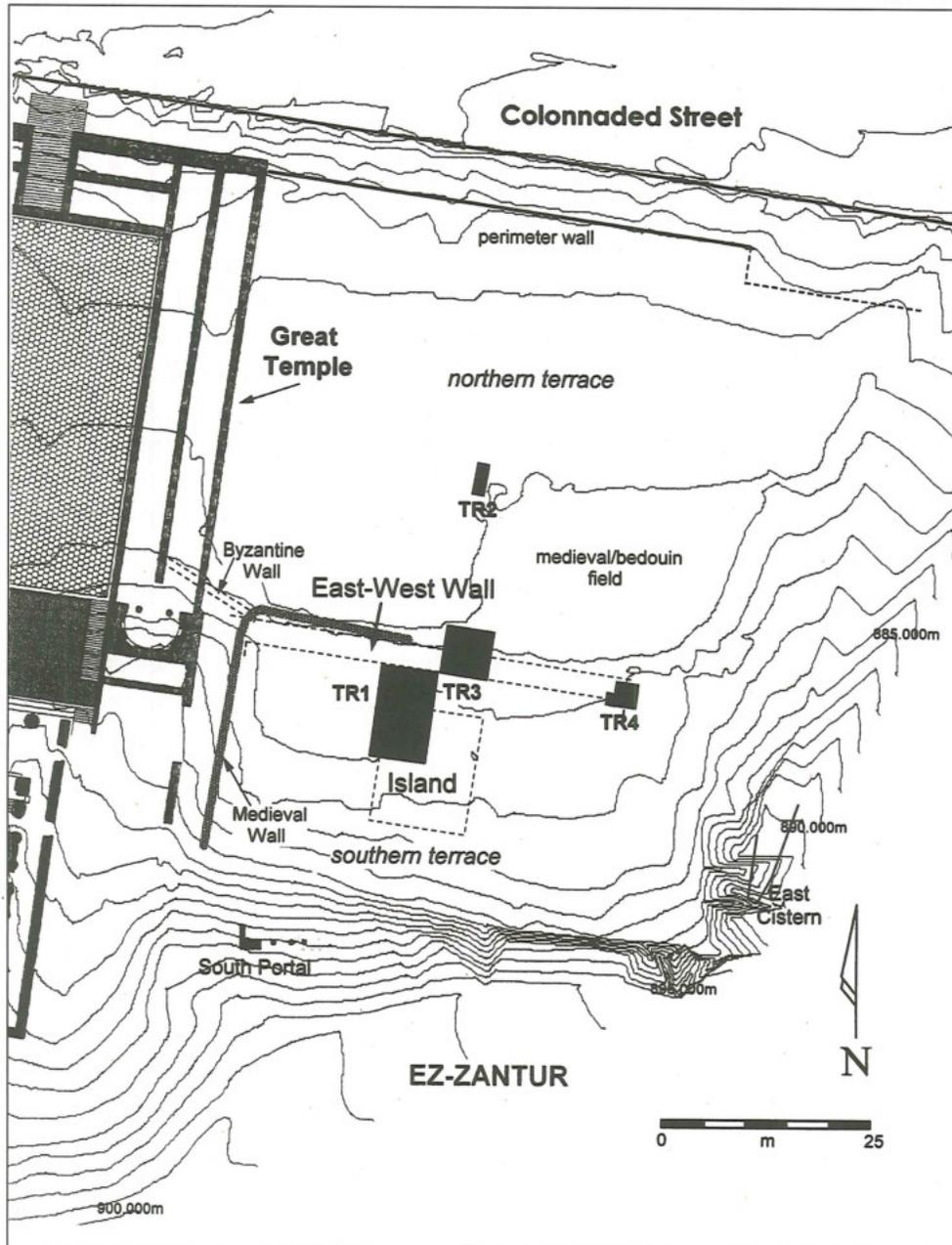
thank you goes to Elizabeth Najjar, Paul Zimmerman, Yelena Rakic, James Roger, Dakhillalah Koblan, and an exceptionally hard-working Bedouin team for their invaluable assistance in the field. In addition, I would like to thank the entire staff of the American Center for Oriental Research, especially Fatma Marii, for their help during my post-season residency in Amman, and to express my gratitude to Drs. Yvonne Gerber, Andrea Vanni Desideri, and Zbigniew Fiema for their kind assistance. All plans and photos are by the author unless otherwise indicated.

der to maintain consistency in the recording of the two adjoining areas.<sup>2</sup> Relevant surface features and architectural components revealed through subsequent excavations were surveyed in and added to the overall site plan (Fig. 1).

### The Northern Terrace

The northern (lower) terrace is laid out on

a platform rising more than six meters above the Colonnaded Street. It is likely that the platform is constructed of a series of supporting walls and arches similar to that of the Great Temple's lower temenos (Joukowsky 1999) which is level with the northern terrace of the 'Lower Market' (Fig. 2). The most visible feature on the northern terrace is a field occupying the southeast quadrant



1. 1998 site plan with trenches and major architectural features (for the complete plan of the Great Temple see Joukowsky 1999). [P. Zimmerman and L. Bedal].

2. The Electronic Digital Mapping System (EDM) used by the project was provided by the Museum's Applied Science Center for Archeology

(MASCA) of the University of Pennsylvania, and operated by Paul Zimmerman of the University of Pennsylvania.

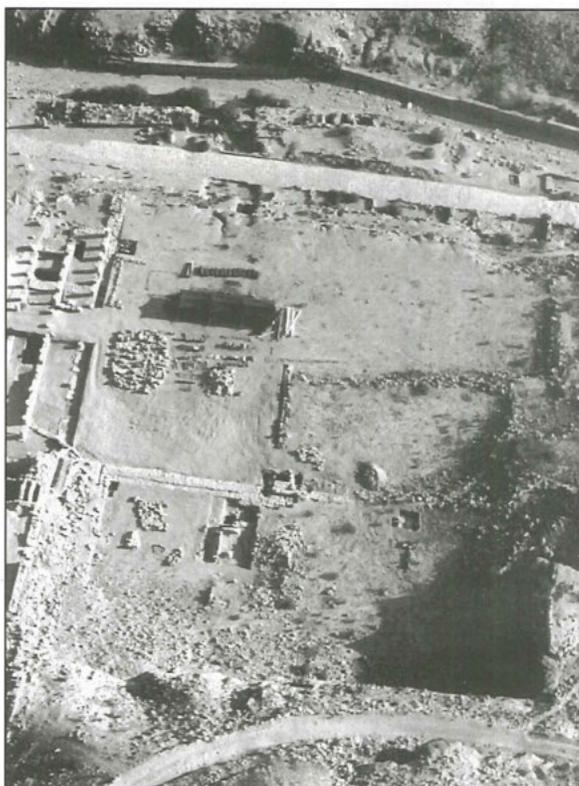


2. Aerial view of the 'Lower Market' as it appeared in 1996, looking southwest. The Great Temple complex is in the foreground.

(Fig. 3), an artifact of agricultural activity in the 'Lower Market' that continued well into this century. A variety of architectural elements - capitals, column drums, fragments of decorative moulding - originating from nearby monuments, are lined up to form the northern and western borders of the field. The northeast corner of the field border is founded on a small section of wall located near the center of the northern terrace - the only architectural feature visible on the large expanse of the northern terrace (75x52 m). Limited exposure in Trench 2 revealed that this wall is 3.6 m long (north-south) and stands one course above a cobbled surface built up to its western face (Fig. 4). The close proximity of Trench 2 to the excavation's tool yard and tent, however, limited the extent of exposure of these features during the 1998 season.

### Southern Terrace

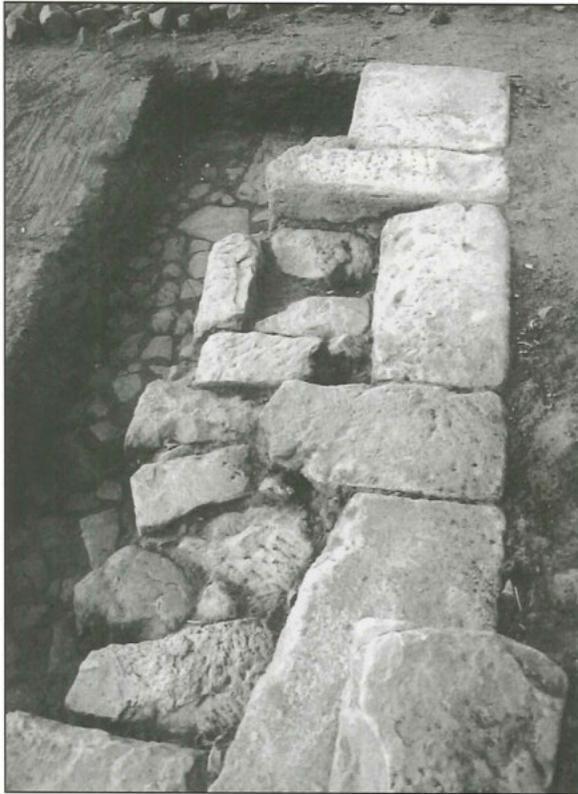
Excavations focused mainly on the south-



3. Aerial view of the 'Lower Market' as it appeared post-season in 1998, looking north.

ern half part of the 'Lower Market' where substantial architectural features were visible on the surface. The East-West Wall bisects the site and as a retaining wall for the southern terrace. This wall was omitted from all maps of Petra's city center despite the fact that it is clearly visible on the ground and from the air prior to excavations (Fig. 2). The omission may be explained by the fact that the Bedouin (the local bedouin tribe and long-time inhabitants of Petra) identified the wall as "bedouin" and described its use in the irrigation of their fields. It is likely that the map makers were satisfied that the prominent East-West Wall post-dated the Nabataean and Roman periods of the site and thus omitted it from their site plans.

The southern terrace is an artificial platform partially created by quarrying into the rocky slope of az-Zanṭūr, which forms the backdrop for the southern half of Petra's civic center. The 'Upper Market' was cut into the mountain in a similar manner further to



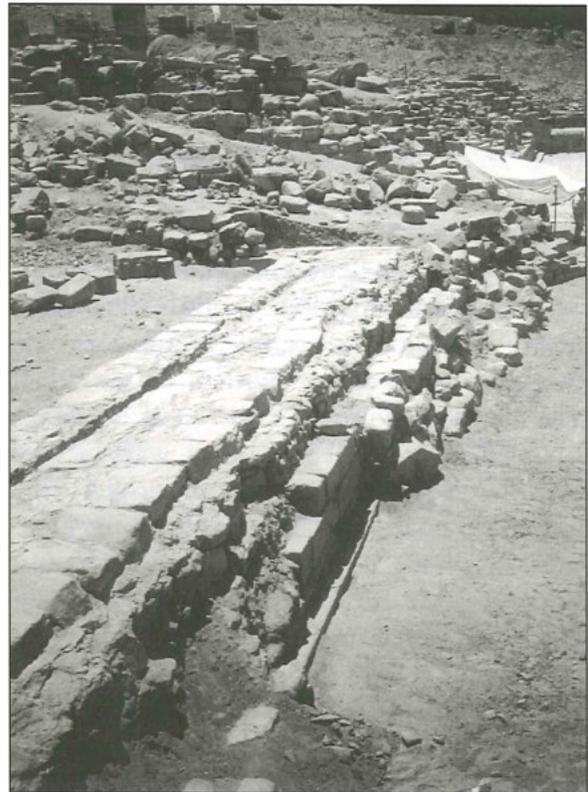
4. Wall and cobbled surface in the center of the northern terrace (Tr 2).

the east. The southern terrace is bounded to the south and east by a vertical rock escarpment sixteen meters in height, and on the west by the Great Temple (see Figs. 2 and 3). At the center of the southern terrace are the ruins of a rectangular stone structure (11.5 x 14 m). A plan of this structure, based on visible surface features, is included on the earliest plans of the city center and virtually every reproduction thereafter (cf. Bachmann, *et al.* 1921:map1; Parr *et al.* 1975:Fig. 1; McKenzie 1990:maps 6-8). In one reconstruction of the 'Lower Market', which shows a large open plaza with small tent-like shops around its perimeter, this building is depicted as a solitary rectangular structure with a gabled roof in the style of a Graeco-Roman temple or shrine (Browning 1973: Fig. 83). Like the plans, there is no indication of the East-West Wall in the reconstruction.

#### *East-West Wall*

A major clearing effort was conducted

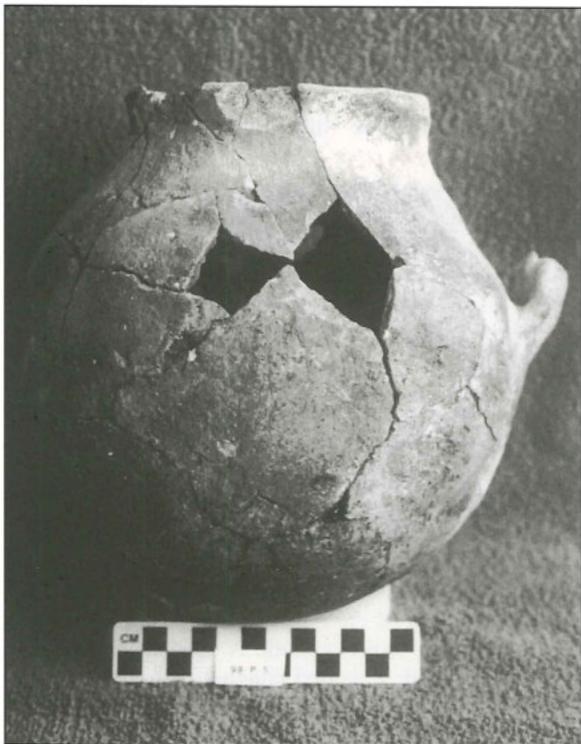
along the west half of the East-West Wall. By following the top of the wall from east to west and carefully articulating the stones, it became possible to distinguish three walls of different construction and from different time periods: Nabataean-Roman, Byzantine, and post-Classical (Medieval) (Fig. 5). The post-Classical wall was a haphazard construction of piled stones along the western and northern borders of the southern terrace, partially overlapping the two earlier walls. It was built as a barrier to direct the water runoff from az-Zanṭūr down to the field in the southeast quadrant of the northern terrace. A 12th century cooking pot (Fig. 6) found nestled in a hole in the wall indicates that the wall was present as early as Petra's Medieval period (cf Vannini and Desideri 1995: 530, Fig.16; Vannini and Tonghini 1997: 379f, Fig. 16). The 'Lower Market' was ap-



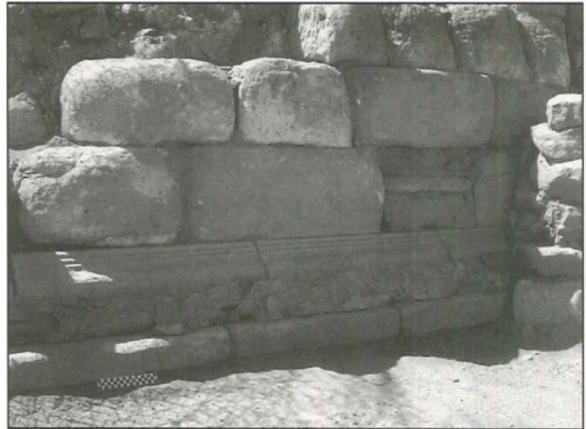
5. West half of the East-West Wall, looking west. A channel transported water across the top of the wall. The Medieval Wall is built up against the north face of the East-West Wall and along the top of the southern terrace's western border. The Great Temple excavations are in the background.

parently cultivated by the crusader and/or bedouin inhabitants of the 12th century, an activity which persisted into the modern era with the continued use of the wall and field terrace by the Bedoul.

After articulating and recording the Medieval Wall, it was partially removed to expose the monumental structure behind it. The East-West Wall, which has been traced up to 50 m across the width of the 'Lower Market', stands 2.5 m high and is 3.5 m wide (Fig. 5). Its solid construction is composed of alternating rows of sandstone blocks and rubble bonded with an impervious white mortar. The north face is constructed of ashlars typical of Nabataean masonry. Running the length of the wall, about one half meter above the base and topped by a stringcourse of moulding is a line of interlocking segments of ceramic pipe. Although much of the pipe is badly broken or missing, most of it is held in place with mortar and stone chinking (Fig. 7). An effort to trace the wall westward to the Great Temple was im-



6. Hand-made coarse ware cooking pot with upturned lug handles (one missing) dated to the 12th century CE.



7. Detail of the north face of the East-West Wall showing the ceramic pipeline installed below a stringcourse of moulding. At right is the south end of the Byzantine Wall where it is built up against the East-West Wall.

paired by a wall dating to the Byzantine period that was built at an oblique angle across the Great Temple's eastern colonnade and abuts the East-West Wall (see Fig. 1). It is presumed that the ceramic pipe in the East-West Wall connects with the system of pipes and gutters that cross the Great Temple's lower temenos and continue westward toward the baths (see Joukowsky this volume). Clarification of the relationship with the Great Temple must wait for a future season

### *Pool*

The most exciting part of the season came when the north half of Trench 1 was excavated to establish the relationship between the building on the southern terrace and the East-West Wall. It was discovered that the two structures were separated by a body of water 2.5 m deep, its walls and floor lined with a thick layer of gravel-tempered hydraulic cement. The monumental scale of this body of water was realized when its northwest corner was located underneath the bend in the Medieval Wall, 23 m to the west of the central north-south axis. It became clear that the construction of the East-West Wall across the site transformed the quarried-out space to the south into a large collective pool (46 x 23 m). Presuming a symmetrical arrangement, Trench 4 was opened

23 m to the east of the central axis in the hopes of locating the corresponding northeast corner. Less than one-half meter below the surface, we came down on the sought-for corner which, like the northwest corner, was lined with hydraulic cement (Fig. 8). Built into the northeast corner is a stone staircase for entrance into the water. Four rectangular pavers (ca.86x35 cms) on the east edge of the pool (Trench 4) are the remnants of a promenade that once encircled the pool's perimeter (Fig. 8).

### *Pavilion*

The identification of the body of water as a pool implies a recreational function as opposed to the purely practical function of a reservoir and is based, in part, on the presence of the island pavilion erected at the center of the pool. Excavations in Trench 1,

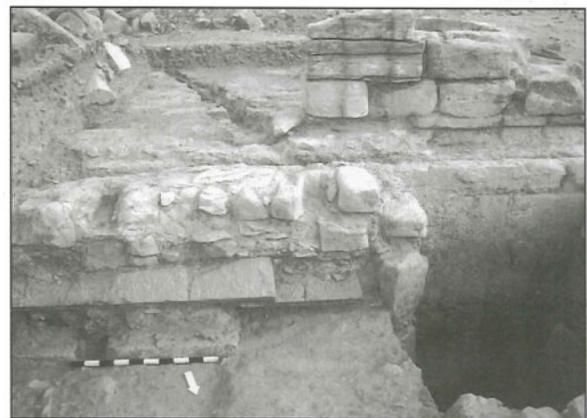


8. The northeast corner of the pool with staircase (Tr 4), looking east. At left are channels that transported water across the east half of the East-West Wall.

which exposed the northwest quarter of the island, revealed important information about its structure as well as its decorative elements.

The pavilion is perched on a rectangular pedestal standing 2.5 m in height, a solid foundation of tightly packed sandstone bonded with a white impervious mortar. A great effort was made to prevent water from seeping into the structure through its submerged foundation. The exterior surface of the foundation was lined with a thick coat of hydraulic cement. In addition, a thin layer of white lime plaster covered the foundation's top surface and this was covered with a layer of water-resistant mortar made from a mixture of lime and ash. The interior floor was originally covered with rectangular pavers (ca.16 x 28 cms); these were robbed out in antiquity, leaving their impression in the underlying lime-ash mortar. An interior water channel may be associated with an installation - fountain? libation basin? - located at the rear of the building. This channel cuts diagonally across the interior space and connects with another channel that encircles the exterior of the pavilion (Fig. 9).

Open on three sides, the pavilion has a

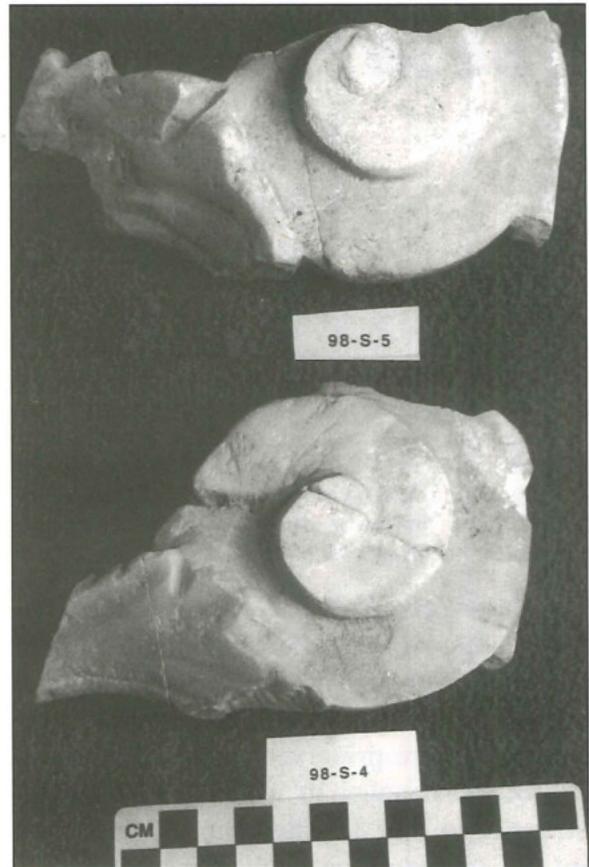


9. The west half of the north façade of the island pavilion (Tr 1), looking south. A channel in the floor intersects with a second channel that encircles the exterior of the pavilion. In the foreground is the footing for the vaulted bridge that allowed access to the island. The deep probe in the lower right corner was excavated down to the pool's floor 2.5 meters below the surface.

wide front entrance (4.5 m wide) with recessed frame and two side entrances approximately 3.0 m wide. The walls are preserved three courses above floor level in the north and five in the south. They are constructed of two rows of sandstone blocks bonded with the same impervious mortar used in the construction of the foundation and the East-West Wall. A single sandstone pier, preserved 1.14 m in height, stands just inside the west doorway. Its base is faced with white marble and thick plaster is held in place by iron nails imbedded in holes in the sides of the pier. The interior walls were plastered, and several fragments of painted stucco - pompeian red, orange, and bright blue - and fragments of stucco moulding with dentils, give some indication of the building's interior decoration. Two marble volutes (Fig. 10), a five-petaled flower (Fig. 11), and numerous fragments of worked marble and other colored stone of non-local origin, testify to the special attention given to the adornment of this unique building. The footing and springers of a vaulted bridge were found, built up against the pool's interior walls between the north face of the island and the East-West wall (Fig. 9). This bridge (6 meters wide and spanning 4 meter), which provided easy access to the island pavilion from the East-West Wall, may have been a later addition to the original pool design as it is not bonded to either the island or the East-West wall and its surfaces have remnants of a sandy gray plaster and not the strong cement that lines the entire pool interior.

### *Hydraulics*

A recurrent theme throughout the 'Lower Market' excavations was water. As the reconstruction plan of the pool in Figure 12 illustrates, water was transported around the northeastern and northwestern corners of the pool in channels and pipelines, part of an elaborate water distribution system incorporated into the construction of the East-

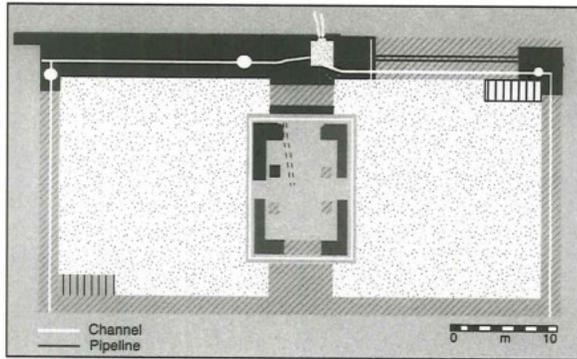


10. Marble volutes from inside the pavilion.



11. Front and side views of a marble flower from inside the pavilion.

West Wall. In addition to its role as a retaining wall for the pool, the East-West Wall functioned as an aqueduct. Narrow channels in the top of the wall (see Fig. 5) transported water that entered the 'Lower Market' from the slopes of az-Zanṭūr; shallow basins along these channels filtered sand and silt from the water as it passed through. In addition to the narrow channel, the east half of



12. Reconstruction plan of the pool and pavilion showing the layout of channels, pipelines, and water tank incorporated into the construction of the East-West Wall. A hypothetical rear (south) entrance to the pavilion and access bridge is included in the reconstruction, as well as a staircase in the pool's southwest corner.

the East-West Wall had two parallel pipelines set into a large channel along the top of the wall. Although no trace of the original ceramic pipes was found, their rounded impressions were preserved in the cement lining of the channel in which they were installed (see Fig. 8). The channels and pipes on the east were probably fed by a cistern that is perched on top of the east escarpment; the walls and floor of the cistern are lined with the same gravel-tempered hydraulic cement as was found lining the pool's interior.

Excavations in Trench 3 exposed the middle section of the East-West Wall where more hydraulic features were uncovered. Built into the wall, immediately east of its center point, is a *castellum divisorium*, a central holding tank (ca.9 m<sup>3</sup>) in which water was collected and then redistributed into various directions. Channels to the east and west carried water across the relatively horizontal plane of the wall and emptied into the top of the tank. The two pipelines approached the tank from the east at a gradual decline, entering the tank 0.60 m below the top of its east wall (Fig. 13). Three holes in the top of the wall near the southeast corner of the tank possibly held a lever or gate used to control the flow of water into the tank (Fig. 14). That the *castellum* was originally



13. The water tank (Tr 3), looking east. The large channel at center was originally installed with ceramic pipes.

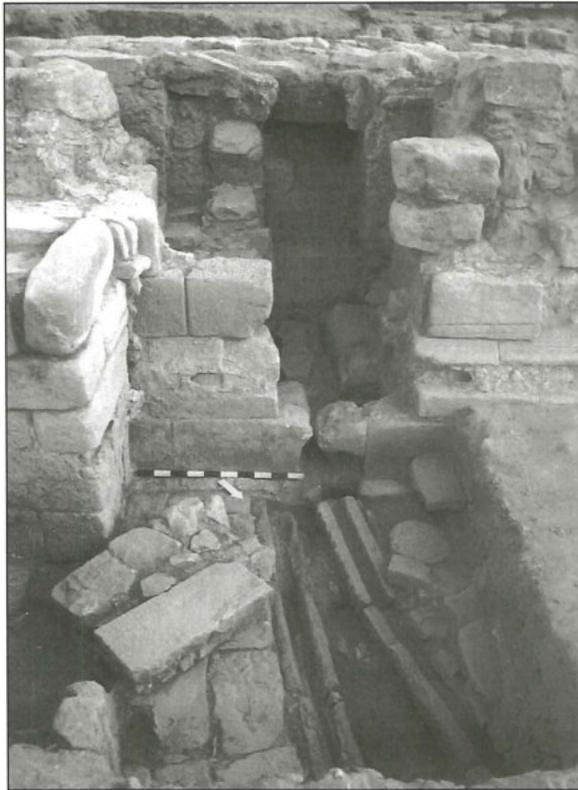
roofed is indicated by the remnants of a supporting arch springer mid-point on its south wall. Immediately to the west of the arch springer is a square opening (60 cm high x 80 cm wide), the opening to a short passage that originally allowed water to pass from the *castellum* directly into the pool. At some point, this passage was sealed, probably at



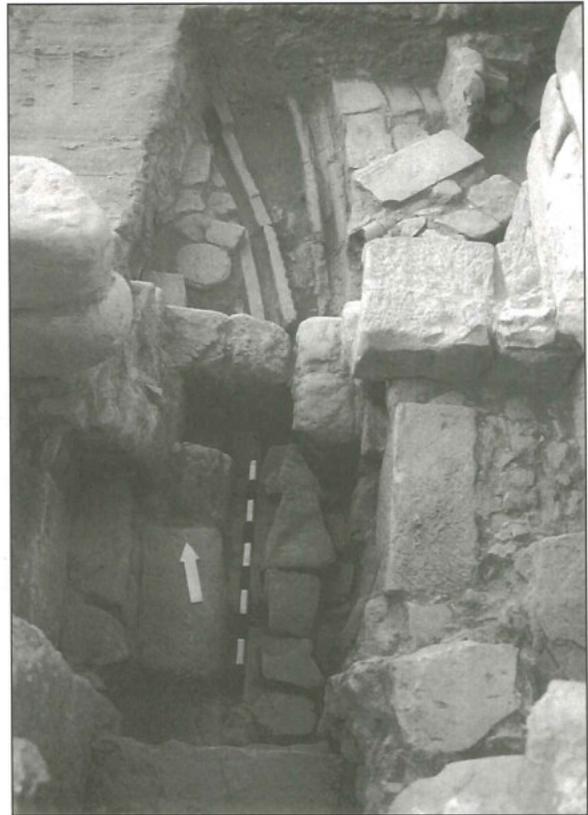
14. Postholes found in the top of the East-West Wall near the water tank (Tr 3), looking north.

the time of the construction of the bridge which would have blocked off the tunnel on the pool side. A small lead pipe (4 cm dia.) protrudes from the base of the tank's south wall allowing water drainage from the pool to the tank (Fig. 15). This pipe was also apparently blocked with the construction of the bridge.

Water exited the tank through a hole cut into the base of the wall's north face (most of which is robbed out) and fed into several conduits that distributed the water out across the northern terrace (Figs. 15 and 16). Two stone channels carried the water under a stone pavement toward the north and northwest; a large ceramic pipe carried water above the pavement toward the northeast.



15. Water tank and conduits (Tr 3), looking south. Stone channels transported water northward under the pavement, and a ceramic pipeline (with stones built up along either side for protection) transported water northeastward over the pavement. A later wall, at left, is built up against the north face of the East-West Wall; ceramic pipes installed along the face of the walls transported water eastward and westward from the central holding tank.



16. The water tank and conduits, looking north.

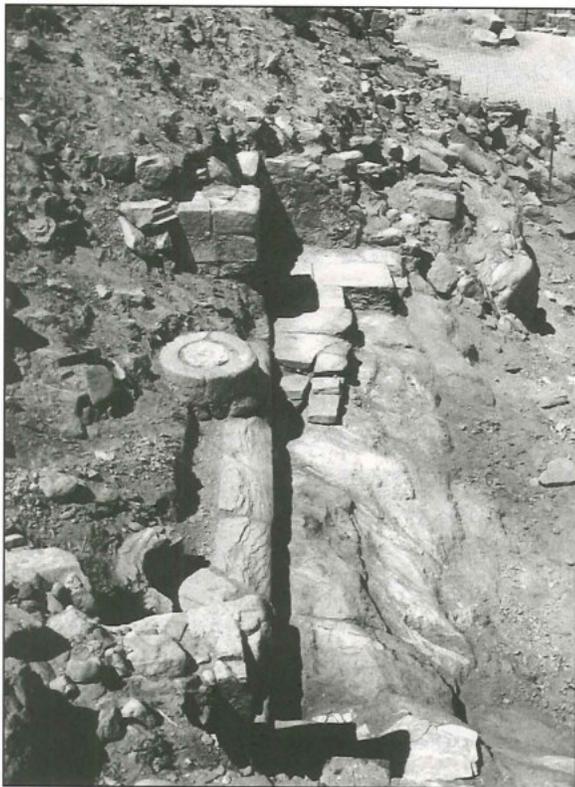
Sometime after the original construction of the East-West Wall and its associated hydraulic features, another wall was constructed east of the water tank, built up against the north face of the East-West Wall and on top of the pavement (a later addition). The ceramic pipeline installed along the north face of the East-West Wall (described above) carried water westward across the Great Temple's lower temenos in the direction of the baths and eastward in the direction of the 'Middle Market'. The fact that the eastern portion of the pipeline is diverted around the later wall (Fig. 15) indicates that the pipeline was a later addition to the original hydraulic system, probably installed at the same time that the bridge was constructed and the passage connecting the pool and the castellum was sealed up.

### A Garden in Petra

Based on the results of the 1998 season - the discovery of an ornamental pool with is-

land pavilion associated with an elaborate system of water conduits converging onto the northern terrace - it can be deduced that the area known as the 'Lower Market' was not, in actuality, a marketplace. Instead of being a hub of economic activity, this was apparently a place of refuge, an ornamental garden within the city's civic center. This is a unique discovery in that it is the only example of a formal garden known from Nabataean context, and the only archaeologically known examples of a public garden in the region.

How one entered the garden is still unclear. A break in the perimeter wall near the northeast corner of the northern terrace may be indicative of an entrance off the Colonnaded Street (see Fig.1), and a possible southern entrance was discovered up on the southern escarpment. Two column bases (each composed of two half stone cylinders placed around a stone core) frame an open-



17. South Portal, looking west.

ing in the wall that crowns the rim of the escarpment (Fig. 17). Immediately below this portal, are pavers that may be remnants of a broad staircase leading down to the southern terrace from the residential district on az-Zanṭūr (Bignasca 1996). The main access, however, was probably from the west through the lower temenos and eastern colonnade of the Great Temple complex (Joukowsky 1999).

Ornamental gardens, or *paradeisoi*,<sup>3</sup> were introduced to the Mediterranean world following the eastern campaigns of Alexander the Great in the fourth century BCE. The Persian gardens and hunting parks encountered by Alexander and his army, were described by Xenophon (*Oeconomicus* 4.13, 4.20-24) and emulated by the succeeding Hellenistic rulers (cf. Sackville-West 1953:260; Gleason 1996:385). Certain palace complexes, such as those in Alexandria and Antioch, were directly influenced by Persian precursors, and they, in turn, inspired the design of palace complexes throughout the Hellenistic world (cf. Nielsen 1996). The *paradeisos* was an important element in Hellenistic palace complexes, part of the recreational facilities which included pavilions, pools, fountains, promenades, aviaries, zoos, and theaters (Nielsen 1994). In the Roman World, the Hellenistic tradition was further developed with gardens becoming an important element in both the private and public spheres (cf. MacDougall and Jashemski 1981; Farrar 1998). Civic structures such as theaters, temples, markets, and the forum, were often incorporated into beautifully landscaped settings embellished with elaborate waterworks (cf. Farrar 1997:175ff).

Examples of *paradeisoi* dating to the Hellenistic and Roman periods are known archaeologically from Palestine. In the early second century BCE, the vassal king Hircanus the Tobiad built his palace at Tyrus,

3. Xenophon used the Greek version of the Persian word *paradaeza*, which means "enclosure" and re-

fers to smaller formal gardens as well as large hunting parks.

modern 'Irāq al-'Amīr, in Transjordanian (Will 1991). In his description of Hyrcanus' estate, Josephus (*Antiquities* XII:228-234) describes banqueting grottoes and large park-like enclosures. At the center of a large artificial lake was a marble palace or banqueting hall, adorned with carvings of lions and birds, and accessible only by boat. Visitors to the estate could stroll the promenade encircling the lake and climb onto an observation deck for a panoramic view of their surroundings (Netzer 1998).

Later that century, the Hasmonean dynasty of Judea built a winter palace at Jericho. The original palace, which acted as a recreational retreat, was occupied, altered and enlarged by each succeeding ruler. The main palace was set in a large *paradeisos* intermingled with pavilions, banquet halls, enclosed gardens and swimming-pools, watered by aqueducts from nearby springs (Netzer 1996). Following the Roman occupation of Palestine and the enthronement of Herod the Great in Judea (37-4 BCE), an ambitious building campaign was undertaken that included the construction and expansion of several private palaces. Based on the archaeological and historical records, Herod's palace complexes - at Jerusalem, Caesarea, Masada, Jericho, and Herodium - included ornamental gardens and/or parks and, with the exception of the official palace at Jerusalem, all of these had monumental swimming-pools (Netzer 1977; 1987; 1991; 1996; Nielsen 1994:183ff; Gleason 1998). Of particular interest in relation to Petra's garden are Herod's pleasure gardens at Herodium. Situated at the base of the conical mountain fortress is a large terrace (125x105 m) bounded on three sides by colonnaded peristyles. At the center of this garden terrace is a monumental pool (72x46x3 m) with a small round island pavilion that could be reached only by swimming or boating (Netzer 1987:32).

Hammond suggests that Herod's magnificent public works may have contributed

to the rapid urban development of Petra (Hammond 1996:556). The long history of interaction between the Nabataeans and Judeans, and with Herod in particular, lends credence to the idea of cross-cultural exchange; it is possible that the Nabataeans modeled their *paradeisos* on the pleasure gardens that graced Herod's palaces. The Great Temple, with which Petra's *paradeisos* is associated, has been roughly dated to the first century CE (Joukowsky 1999). Fragments of Nabataean fine ware obtained from the pavilion's floor mortar, include a few examples of the distinctive Phase 3b type CE (Bignasca *et al.* 1996:166, Abb.701-703). The pottery evidence suggests a *terminus post quem* for the pavilion-pool at the beginning of the second century, although it is possible that the pool-pavilion was originally built in the first century and then refurbished (and the floors redone) sometime in the early second century, around the time of the Roman annexation (106 CE). Based on the findings from the deep sounding in Trench 1, the pool continued in use into the fourth century CE when the pavilion walls collapsed filling the pool with debris. This destruction was most likely caused by the 363 CE earthquake. One major difference between Herod's gardens and the garden at Petra is that the latter is not associated with a palace nor situated on a private estate. The urban setting of Petra's *paradeisos* corresponds to the concept of public gardens that flourished with the Romans.

A garden would have offered a refreshing retreat from the inevitable hustle and bustle of the city's center. Visitors could lounge by the pool or escape the burning heat of the desert sun by relaxing in the pavilion surrounded by cool water, or stroll through the garden under the shade trees that, presumably, would have been present. Future excavations on the northern terrace will be aimed at uncovering important details about the general layout of the garden and the variety of plants cultivated there.

In addition to its function as a sanctuary at the heart of a teeming metropolis, Petra's garden would have played an equally important role. The presence of a large formal garden, a virtual oasis, in Petra would have made a powerful statement to visitors arriving in the city after a long journey through the harsh desert environment. The Nabataeans were ingenious in devising ways to collect water and channel it into reservoirs and cisterns for use during the dry summer months. The Greek geographer Strabo described Petra as "having springs in abundance, both for domestic purposes and for watering gardens" (*Geography* VII:

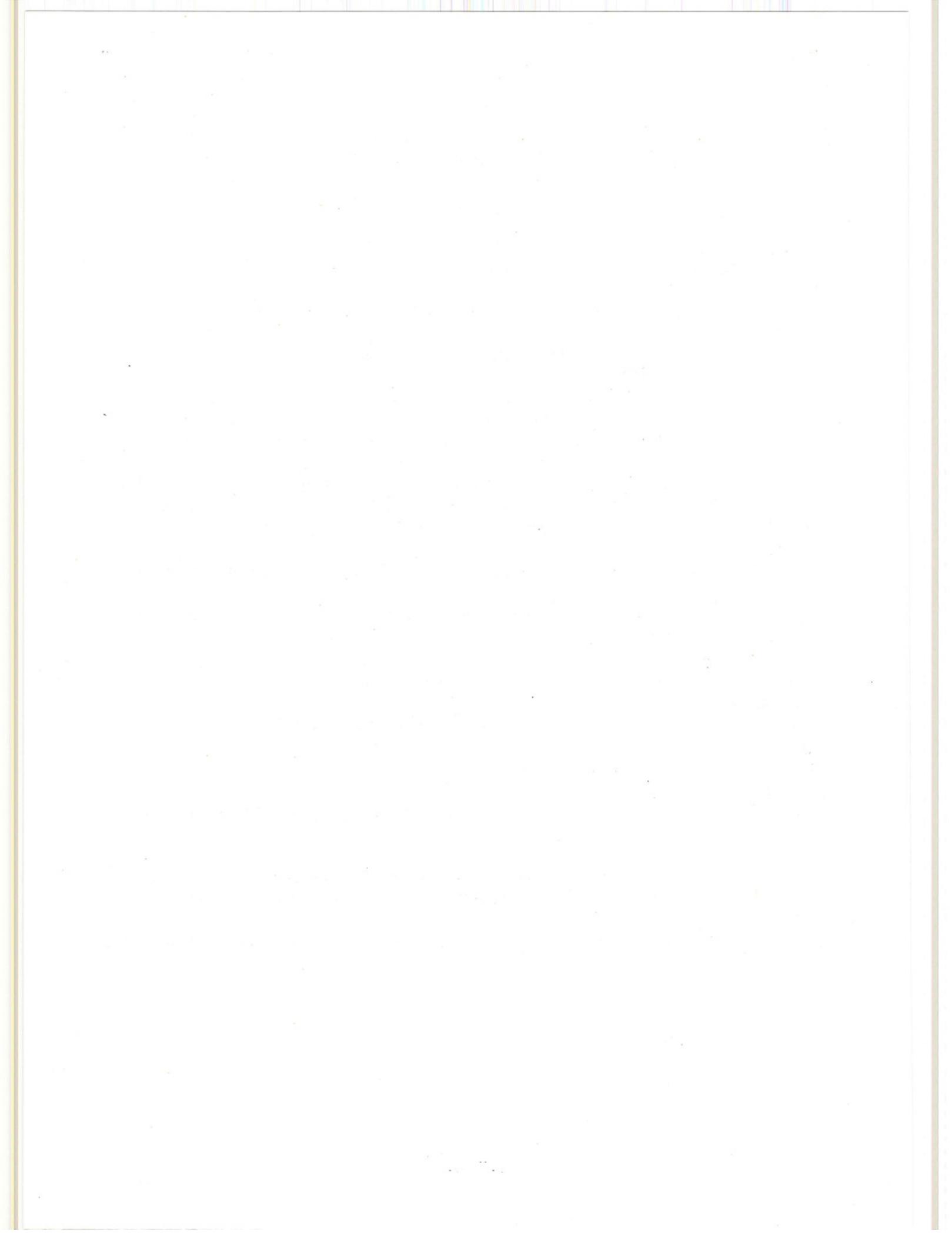
16.4.21). Despite their noted accomplishments, few would have imagined that the Nabataeans had excess water, enough to fulfill the demands of a public garden fitted with a monumental pool. Any traveler passing through Petra would have been impressed by the gratuitous display of conspicuous consumption, a symbol of the flourishing status of Petra during its classical era.

Leigh-Ann Bedal  
 Anthropology Department  
 University of Pennsylvania  
 Philadelphia, PA 19143  
 USA

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# NABATAEAN POTTERY FROM THE 'CISTERN': SOME FINDS FROM THE BROWN UNIVERSITY EXCAVATIONS AT THE PETRA GREAT TEMPLE

by

Laurel D. Bestock

## **Abstract**

*During the 1997 and 1998 seasons of excavation at the Petra Great Temple a room thought to have been built as a cistern was cleared. In addition to unexpected architecture, this room yielded a surprising number of artifacts. The most significant finds from the cistern were ceramics; over thirty complete pottery vessels were recovered. While many of the forms in this assemblage are typical, a few are unusual and hence deserving of note. Also significant is the fact that the pottery has all been dated to the first century CE or earlier. The light which this discovery sheds on our understanding of the Temple itself, is as important as the pottery itself. The presence of certain types of vessels may help explain the function of the building, and certainly the early date of all the pottery helps to establish a *terminus ante quem* for the construction of the temple. A secure date for this important building is vital to the understanding of Nabataean monumental public architecture on the eve of Roman domination.*

## **Introduction**

During the 1996 season of excavations at the Petra Great Temple, the tops of two typically Nabataean arches were exposed directly south of the East Exedra. This discovery was made at the end of the season and therefore excavation of this feature was postponed for a year. In the meantime, the tops of the arches were consolidated to make it safe to work beneath them. The 1997 season of excavation delineated the outline of a

room over which the arches had extended. This excavation determined that there had originally been seven arches. Over the course of the 1997 and 1998 seasons, this room was all but completely excavated.<sup>1</sup> Both the room and the artifacts within it are remarkable.

The function of the room is still not completely understood, although its architectural features suggest that it may have been intended for use as a cistern. There are no conclusive signs of water and even if a cistern was intended, it may not ever have been used in this fashion. What is certain is that, post-cistern or later, the room was used as a dump primarily for plaster, pottery and shells. This occurred not long after 100 CE, at a time when the rest of the Temple building was still in active use.

## **The Context**

The room within which the deposit was found is a rectangle of 3.1 m north-south by 10 m east-west. The room was originally vaulted with a series of seven arches. The walls and arches of this room bond with those of the East Exedra making it almost certain that the two were constructed at the same time. In the eastern part, the floor of the room is composed of bedrock with a plaster bed on top. In the western part, the floor is four centimeters thick with the plaster poorly laid on top of large stones and earth fill; in the middle of a trench excavated in that area, the plaster floor is not present and appears to have been disturbed. The area where there is no plaster was the *in situ* position of many artifacts including frag-

1. A balk was left in the south-west corner of the trench. The earth which remains supports two drums from the easternmost pronaos column which collapsed over the forecourt and part of the

area which had been the cistern. This collapsed column will not be removed and so the excavation of the cistern is as complete as it ever will be.

ments of bronze and the earliest painted wares from the trench. These were all found at approximately the same level as the plaster floor; the fill below that was completely barren. In the north-west corner of the trench is a stairway of seven roughly cut stairs which connect to the large East Stairway of the Temple. These stairs, unlike any others at the Great Temple, were found completely intact. They do not reach the plaster floor but stop approximately a meter above it. The construction of these stairs and the plaster floor indicate that originally this area may have been intended as a cistern.

Whatever its original purpose, it seems that this room was filled in soon after its construction and long before the Temple went out of use. The very bottom layers of debris have pottery sherds all of which have been dated by Yvonne Gerber to before 100 CE. These strata are level over the entire trench and are very thin. Directly above those are the dump layers which held the majority of the pottery and other finds such as shells and plaster. These layers are heavily sloped down from the west to the east, suggesting that objects were dumped into the room by someone standing on the stairs. There is great differentiation between these strata, with some being almost white from plaster residue and others being black from fire remains. However, the pottery from all of these sloped strata is very similar in form and date. This multi-layered deposit is several meters thick in the western area near the stairs, but is only about 0.75 m thick in the eastern area. The dates from the pottery suggest that it was discarded into the cistern in the early second century CE. The dates for complete vessels are corroborated by the reading of the sherds done by Yvonne Gerber. Pottery dated to later periods is not found except in the uppermost strata of the trench; this soil was washed down the hill and accumulated over the entire temple after the building was no longer in use.

The cistern must have gone out of use when the dump was established. The pottery

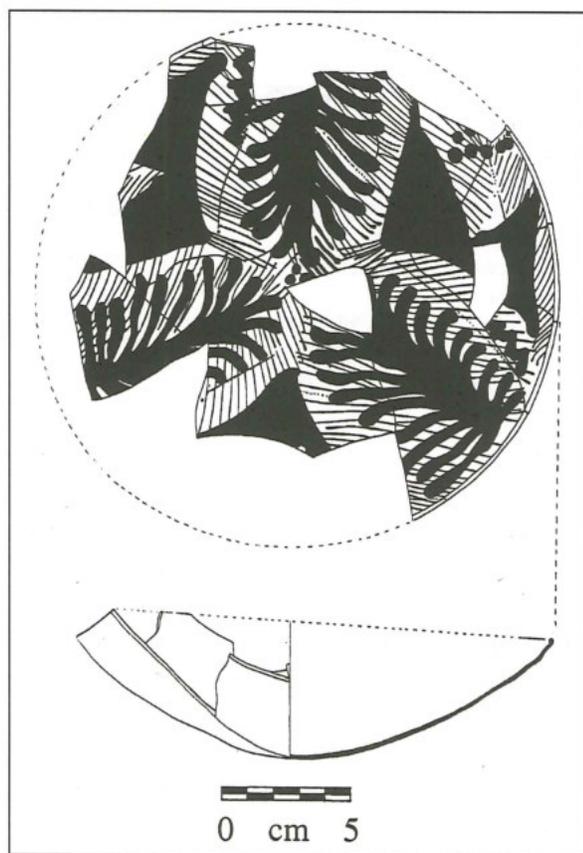
suggests that this happened early in the second century CE, a time when we know that the rest of the building was in use. Unfortunately securely datable deposits are extremely rare at the Great Temple and hence it is difficult to sequence the closing of the cistern in relation to other phases in the use of the Temple. It is known, however, that the building did undergo at least one major reconstruction (see Joukowsky in this issue) during which time the inter-columnar walls and the theatron were constructed. It seems quite possible that the closing of the cistern coincides with this remodeling, and also that the dump deposits were materials from around the Temple. Thus, the author suggests that the material found in the cistern can tell us a great deal about the decoration of the building prior to remodelling and the types of vessels which were in use. We can now make a reasonable assumption about the types of vessels which were used in large Nabataean religious or civil complexes prior to the rule of the Romans.

As the painted wares show, this pottery collection becomes much more interesting when related to its context. The dating of the pottery from the cistern is vital to our understanding of the construction of the Great Temple. It is possible that this collection helps in dating a major phase in the construction of the building: the addition of the theatron in the central area. Certainly the earliest deposits in the cistern were laid after the original structure had been built; this guarantees that there was a monumental structure, of which the East Exedra and cistern were part, prior to 100 CE. At the outset of excavation at the Great Temple it was not thought that the exedrae were part of the original structure. The pottery from the cistern, however, suggests that either the exedrae were part of the first monumental building on the site or the original building was much earlier than previously believed. The excavation of a collection of pottery from a setting which was not domestic, funerary or commercial is re-

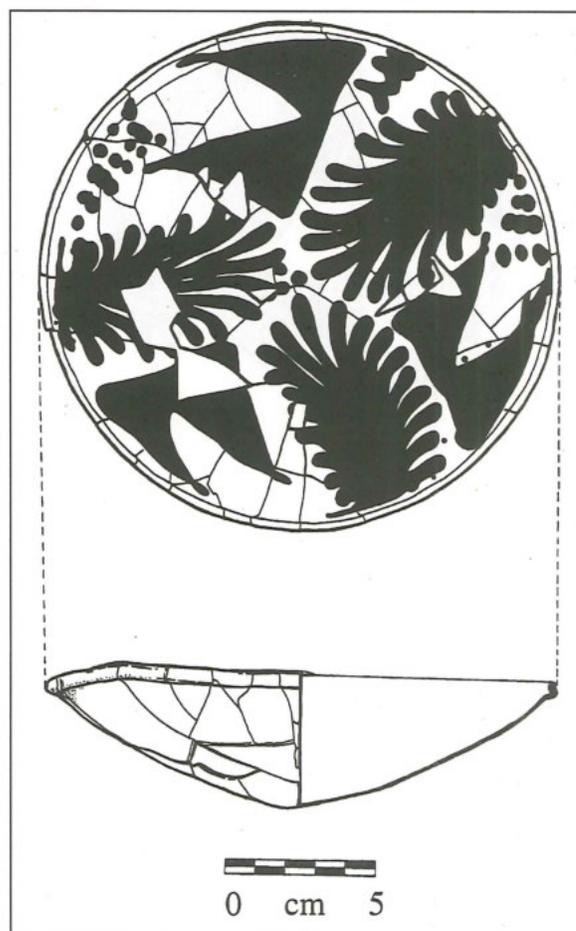
markable. That it helps establish a date and a phasing rational for the Petra Great Temple lends even greater interest to the pottery recovered from the cistern.

**The Pottery (Figs. 1-13)**

A significant percent of the pottery from the dump strata in the cistern is Nabataean fine ware, of stamped, painted and un-decorated varieties (Figs. 1-4 and 6-8). Of the tens of thousands of sherds found, 34 vessels were either unbroken or could be reconstructed well enough to give a complete profile of the vessel. The most common forms were the ridged cups or vases (Fig. 5) of which nine complete examples were



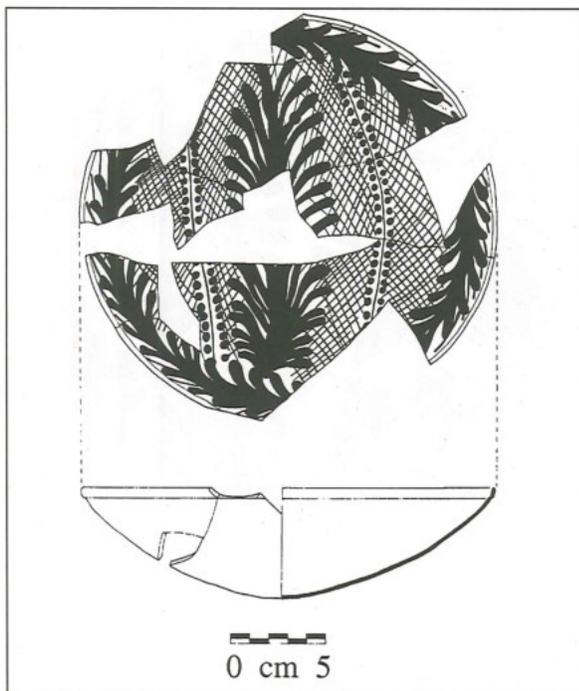
1. Painted Bowl:  
 Shallow rounded base, inverted rim  
 Dimensions: diameter: 20.5 cm  
 height: 5.5 cm  
 Colors: ware: 2.5 YR 5/8  
 interior slip: 2.5 YR 5/8  
 interior paint: 10 R 4/6  
 exterior: no slip  
 core: uneven, black



2. Painted Bowl:  
 Shallow  
 Dimensions: diameter: 17 cm  
 height: 4.5 cm  
 Colors: ware: 5 YR 5/6  
 interior slip: 5 YR 5/6  
 interior paint: 5 YR 4/3  
 exterior slip: 5 YR 5/6  
 core: even

found, and unguentaria of varying sizes (Fig. 9), of which eight complete examples were found. Many of the reconstructed vessels were of the same type and this article seeks only to represent one of each type of vessel found.

While the range of vessel types from the cistern agrees very well with most major varieties of Nabataean fine wares familiar from other sites, there are some pieces which are of particular interest. One of these is the small globular bowl with stamped impressions around the rim (Fig. 13) which was found in 1997. The rim and decoration of

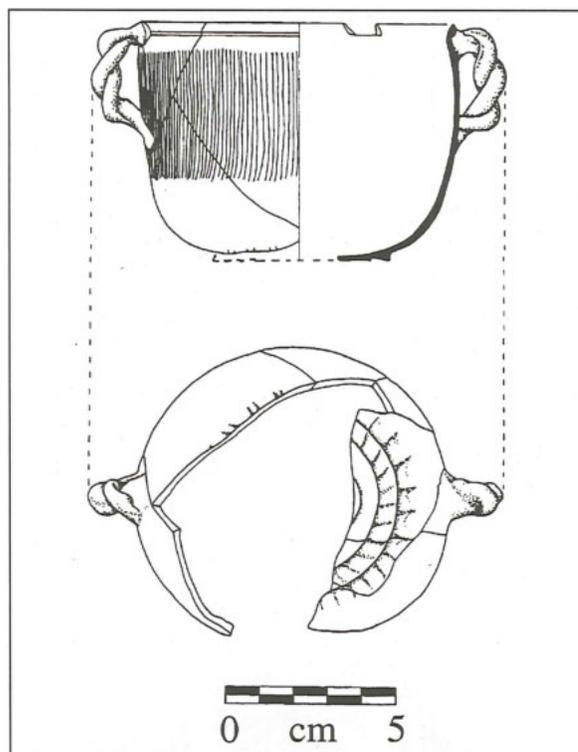


3. Large Painted Bowl:  
Shallow  
Dimensions: diameter: 22 cm  
height: 6 cm  
Colors: ware: 2.5 YR 5/6  
interior slip: 2.5 YR 5/6  
interior paint: 2.5 YR 4/4  
exterior slip: 2.5 YR 5/6  
core: even

this bowl are relatively well known, but it is uncommon to find a complete example. In this instance there is no added base; the rounded bottom of the pot has a ring incised around it but nothing which would have allowed the bowl to sit upright on a flat surface.<sup>2</sup>

Another interesting vessel is the unpainted and un-stamped vase with the horizontal rim (Fig. 11). A few published examples of this form have come from other Nabataean sites but seldom so complete and never without some sort of decoration. A close parallel in form is G. and A. Horsfield's (1942) #343, however their vase has

2. This vessel bears an amusing resemblance to the nw bowls which are so frequently depicted in Egyptian scenes of kings giving offerings. The specific use of this type of vessel has not been determined, but I would suggest that the lack of a

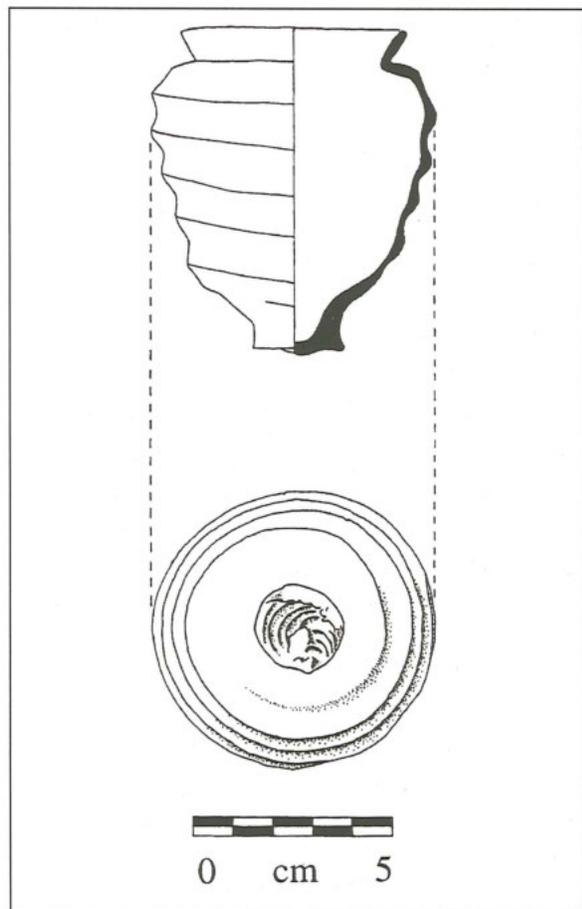


4. Bowl with Twisted Handles:  
Small bowl with vertical sides, twisted handles and rouletted base  
Dimensions: diameter: 9 cm  
height: 7.4 cm  
Colors: ware: 2.5 YR 6/8  
interior slip: 2.5 YR 6/8  
exterior slip: 2.5 YR 5/8  
core: even

paint and an incomplete profile. The only direct parallel for this vessel that I have found also comes from the Great Temple (see Joukowsky 1999, catalog number 94-P-03). The vessel from the cistern is also anomalous in relation to the pottery with which it was excavated; while the medium itself is very fine and has almost no temper, the vessel is much thicker than the majority of the others found and has an orange color which is unique.

Deserving special mention, also, is Vessel 10 (Fig. 10), what we called in the field the "Turkish Coffee Pot." This is a small,

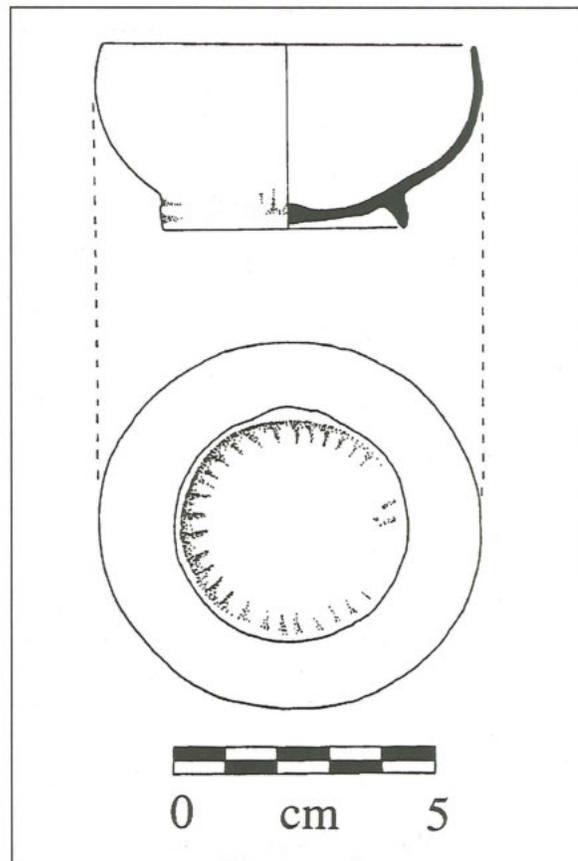
suitable base for the bowl, the find of the bowl within a possibly religious building and the parallel to scenes of Egyptian cultic bowls make a ritual use for this vessel at least a possibility.



5. Cup or Vase with Ridged Exterior:  
string-cut base, ridged exterior, unbroken  
Dimensions: diameter: 7.1 cm  
height: 8.2 cm  
Colors: ware: 5 YR 6/8  
interior slip: none  
exterior slip: 7.5 YR 6/4 uneven  
core: unknown

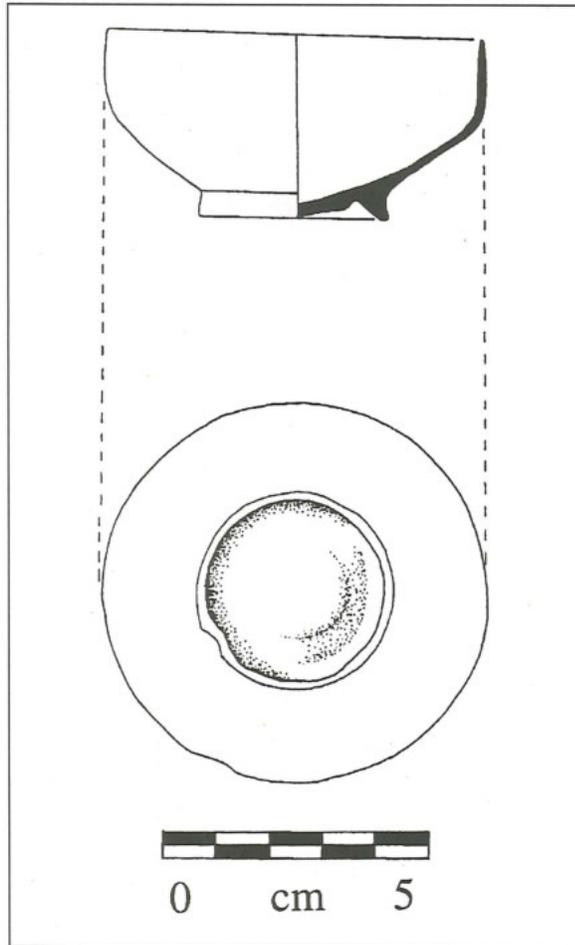
undecorated bowl with a slightly flared rim, a rounded base and a sharp carinated shoulder about halfway up the vessel body. There is a single handle extending from the side of the vessel; this is broken but appears to have come straight out of the vessel and certainly did not attach to the rim. The handle is formed of a hollow tube of clay and was originally thought to be a spout, but upon cleaning it became obvious that there is no hole leading from inside the bowl to the handle. There are no parallels for this vessel and its function is unknown.

It is interesting that while many intact forms were found, including some relatively

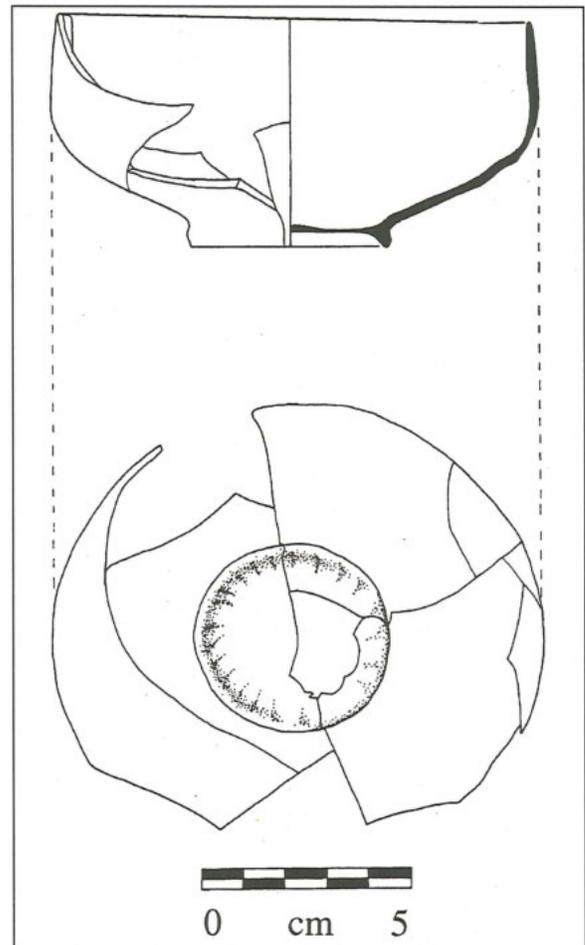


6. Small Bowl with Rouletted Ring Base:  
Dimensions: diameter: 7.4 cm  
height: 3.6 cm  
Colors: ware: 2.5 YR 6/8  
interior slip: 2.5 YR 6/8  
exterior slip: 2.5 YR 6/6  
core: even

thin wares, no intact painted plates were recovered. Two painted plates were able to be almost completely reconstructed; four others were able to be reconstructed enough to have a recognizable pattern and an estimate of size. No large fragments of painted ware were found; the complete plates were in more than 50 fragments and the partial plates were in similar sized pieces. It is quite possible that these plates were either broken when dumped or were dumped because they had already broken. However it is also possible that they were smashed on purpose. Philip Hammond (1962: 173) rejected this use of painted plates on the grounds that more painted sherds would be found in temples than elsewhere were this



7. Small Bowl with Ring Base:  
 unbroken  
 Dimensions: diameter: 7.1 cm  
 height: 3.5 cm  
 Colors: ware: unknown  
 interior slip: 2.5 YR 6/8  
 exterior slip: 2.5 YR 6/8  
 core: unknown



8. Bowl with Rouletted Ring Base:  
 Dimensions: diameter: 11.6 cm  
 height: 5.2 cm  
 Colors: ware: 2.5 YR 5/6  
 interior slip: 2.5 YR 5/6  
 exterior slip: 2.5 YR 5/6  
 core: even

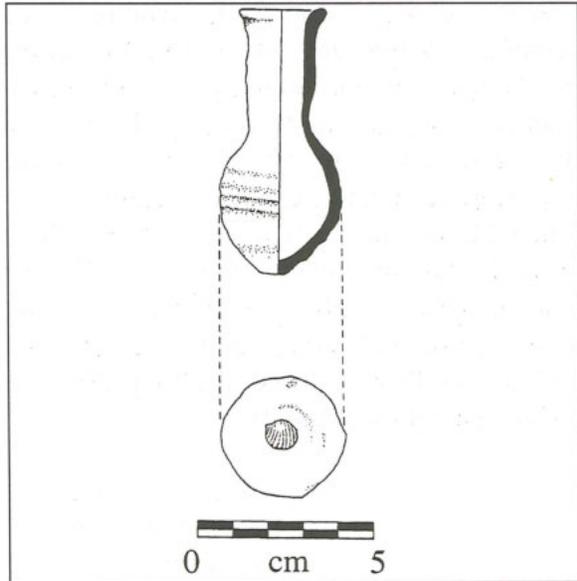
cultic use intended. However multiple uses for painted wares (they are practically ubiquitous and must have served many purposes) are possible and do not exclude a cultic function which may have included their ritual smashing. The only other complete early painted wares which have been found at the Great Temple were also smashed and in association with water works, namely the Lower Temenos subterranean canalization system (Joukowsky

3. Joukowsky does not mention ritual smashing as there was no probable interpretation of the plates in question without further parallels in the Temple.

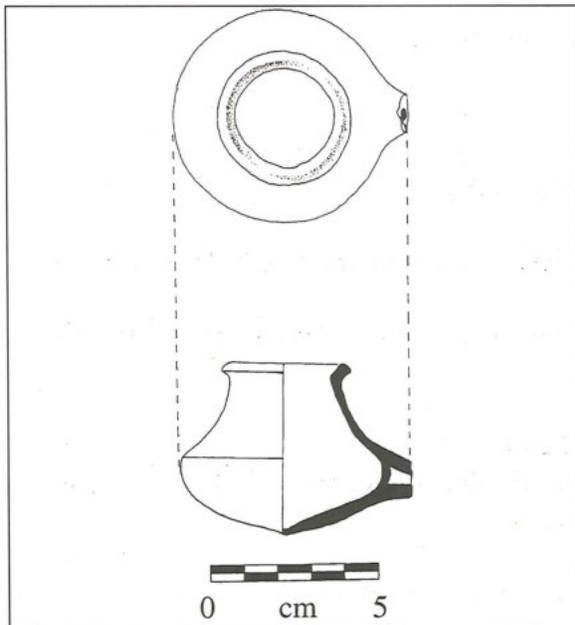
1998).<sup>3</sup>

The pottery recovered from the cistern at the Petra Great Temple is of enormous significance. The pottery itself is beautiful and includes types which are either rare or unknown. The discovery of these forms in the context of one of the most important public buildings in Petra, be it religious or civil, may help us to understand better the usage of certain vessel types. This application works both ways; the pottery is also ex-

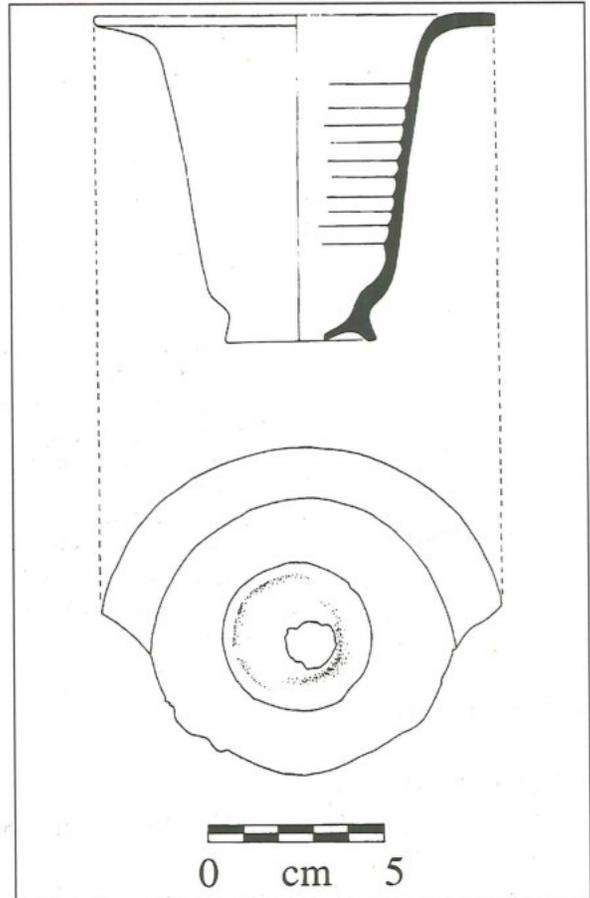
This explanation is by no means certain and was only suggested by the excavation of multiple examples in related contexts.



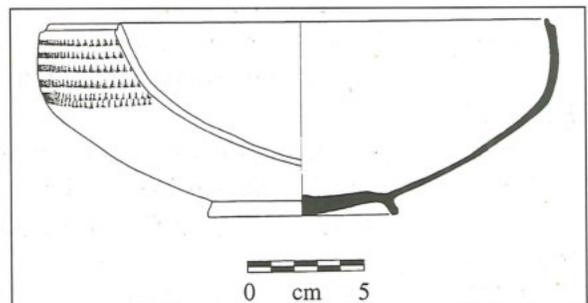
9. Small Unguentarium:  
 Unguentarium, ridged body, string-cut base, un-  
 broken  
 Dimensions: diameter: 3.5 cm  
 height: 7.8 cm  
 Colors: ware: 10YR 5/6  
 interior slip: unknown  
 exterior slip: 10 YR 6/4  
 core: unknown



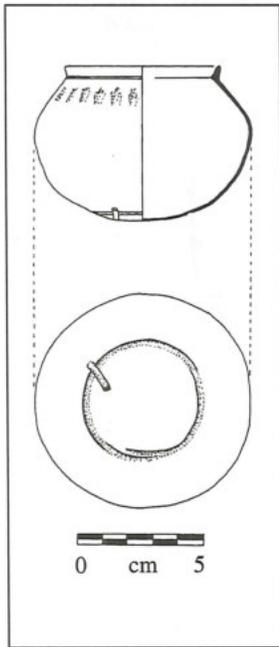
10. Vessel of Unknown Function:  
 Single broken handle, flaring rim  
 Dimensions: diameter: 6.8 cm  
 height: 5.2 cm  
 Colors: ware: 2.5 YR 5/6  
 interior slip: 2.5 YR 5/6  
 exterior slip: 2.5 YR 5/6  
 core: even



11. Vase with Horizontal Rim:  
 horizontal rim, ring base  
 Dimensions: diameter: 11.4 cm  
 height: 9.5 cm  
 Colors: ware: 2.5 YR 6/6  
 interior slip: 2.5 YR 6/6  
 exterior slip: 2.5 YR 6/6  
 core: uneven, black



12. Large Bowl with Impressed Rouletting on Ex-  
 terior:  
 ring base, rouletted decor  
 Dimensions: diameter: 22.3 cm  
 height: 8.5 cm  
 Colors: ware: 5 YR 6/6  
 interior slip: 5 YR 6/6  
 exterior slip: 5 YR 6/6  
 exterior paint: 2.5 YR 5/6



13. Stamped Bowl with Rounded Base:  
Small bowl, rounded base, stamped design  
Dimensions: diameter: 8.5 cm  
height: 6.3 cm  
Colors: ware: 10 R 5/8  
interior slip: 10 R 5/8  
exterior slip: 10 R 5/8  
core: even

tremely relevant to our understanding of the Temple. While any suggestions regarding the function of the building are only hypothetical, dates are quite certain. Because of the homogeneously dated pottery from the cistern we can definitively state that the monumental building which we call the Great Temple was constructed prior to 100 CE. We can also reasonably assume that some reconstruction and perhaps a change in the use of the building occurred not long after the original erection of the structure.

Laurel D. Bestock  
Brown University  
Box 4325  
Providence, RI 02912  
USA

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**PRELIMINARY REPORT ON BRIGHAM YOUNG UNIVERSITY'S  
FIRST SEASON OF EXCAVATION AND SURVEY  
AT WĀDĪ AL-MAṬĀḤA, PETRA, JORDAN**

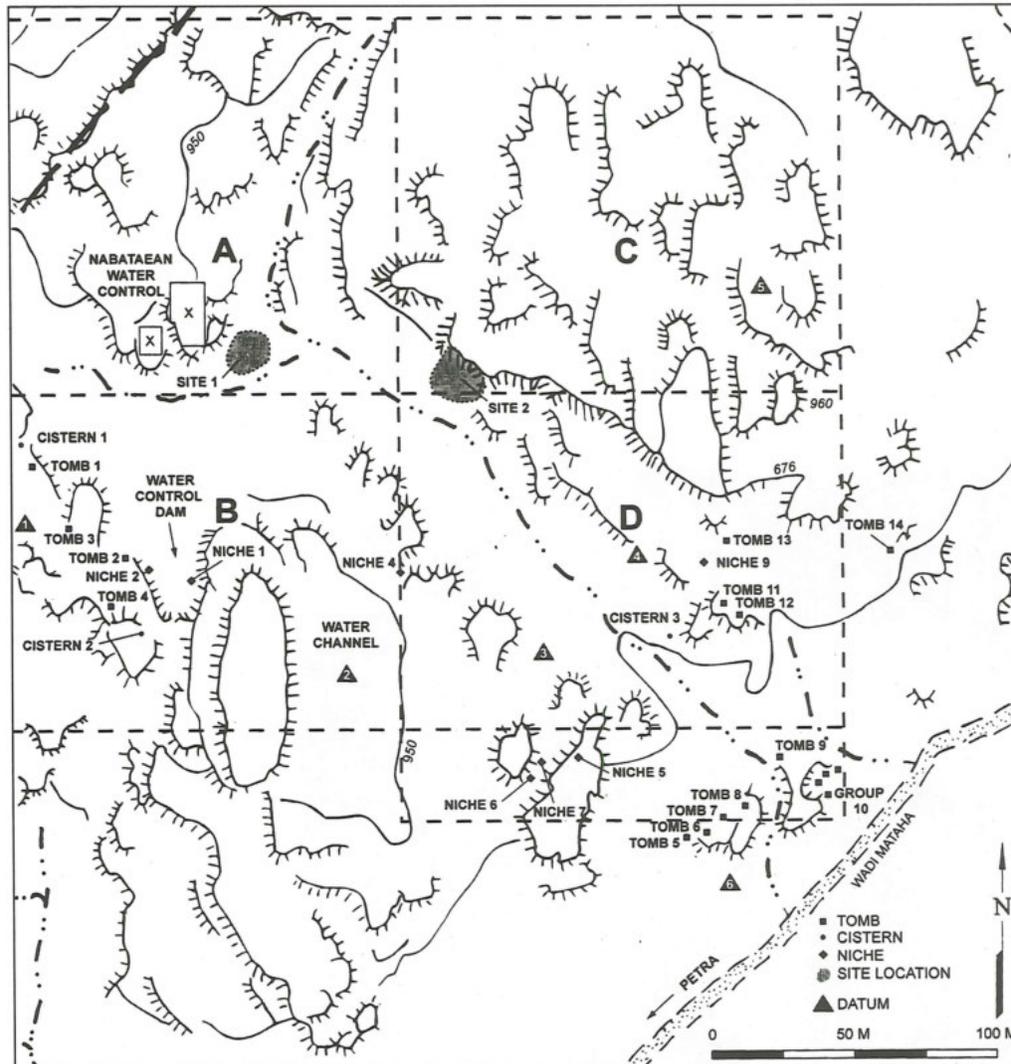
by

David J. Johnson, Joel Janetski, Michael Chazan,  
Sarah Witcher and Richard Meadow

**Introduction**

The first season of photo reconnaissance, survey and excavation at Wādī al-Maṭāḥa lasted for two weeks between June 28th and July 10th, 1997. The area of study consists of the drainage of a small wadi flowing into the main Wādī al-Maṭāḥa from the west, and the ridges of sandstone massif that separate it from the area of the Mughur an-Našāra on the south west and the area of

Mughur al-Maṭāḥa to the north east (Fig. 1). It is located at UTM coordinates 75600 East and 3358800 North. The area lies between the main Wādī al-Maṭāḥa and the Nabataean rock-cut road system running along Wādī Umm Ṣayḥūn (Figs. 2 and 3). The fringes of the area were briefly surveyed and reported on by Dentzer and Saulpin (1997). The three major goals of this initial season of work in the Wādī al-



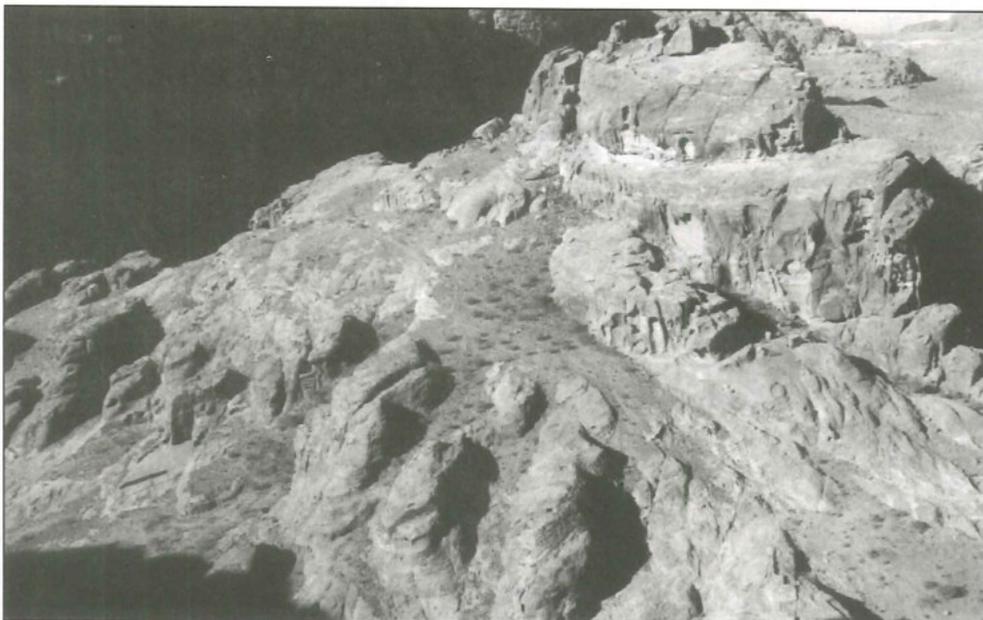
1. Feature Map of Wādī al-Maṭāḥa survey area.



2. Study area from Jabal al-Khubtha, looking west.

Maṭāḥa were to:-

- a. document photographically and visually all major Nabataean and other cultural features in the study area.



3. Southern half of study area looking south.

- b. determine the extent and date of the burial area at the western edge of the study area, designated Site 1.
- c. determine the nature of, date and extent of the cultural deposition next to the southern face of the northern ridge in the study area. This deposition, designated Site 2, was previously identified as early Natufian based on the presence of Helwan retouch in the lithic assemblage.

### Photographic Survey

The photographic survey was conducted in two phases. First of all, the study area was divided up into 100 m designated as A-F beginning in the NW corner of the area and running to the SE corner of the study area near the main Wādī al-Maṭāḥa. Each square was then systematically surveyed for cultural features and notes made of each feature's characteristics and location. Each feature was later photographed and roughly sketched.

### Mortuary Features

Two types of mortuary features were noted. These were rock cut tombs with façades and cist graves cut into the bedrock. Fourteen rock cut tombs were identified in the study area (Table 1).

**Table 1.** Rock cut tombs with façades from Wādi al-Maṭāḥa.

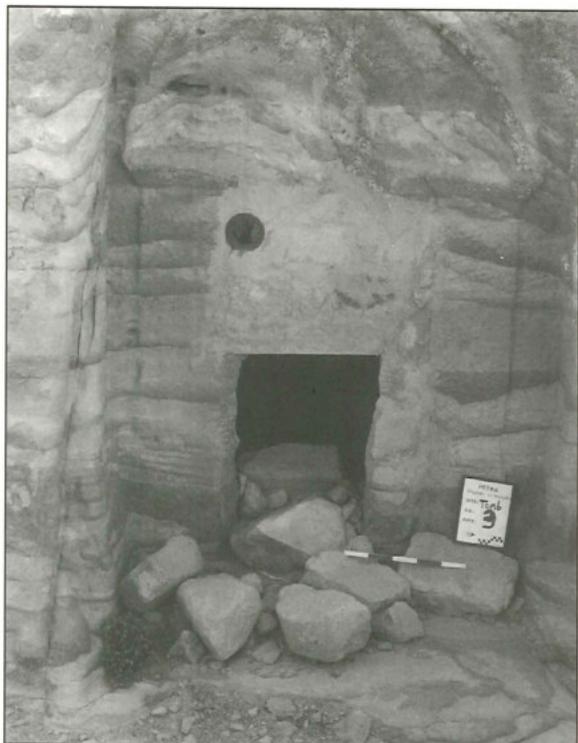
No.	Location	Direction	Façade	Chamber Type	Assoc.
1.	Area B	East	Extremely worn Pilaster	Square Triclinium No loculi Modern reuse	Nab. fine painted red orangeware
2.	Area B	East	Double crowstep Painted or plaster upper register Lintel, inscribed?	Square Triclinium Loculi, SE corner	Nab. fine painted red on orangeware
3.	Area B (Fig. 4)	S. West	Half-circle Pilasters	Small Square chamber	Modern reuse
4.	Area B	North	Plain façade	Step down	None
5.	Area D (B. D. 665)	South	Pillared Façade Inset Lintel Crowsteps on Side	Three loc. on N. side. Four Loc. W. side	None
6.	Area D (Fig. 5) (B.D. 666)	Southeast	Single crowstep	Square chamber	None
7.	Area D (B.D. 667)	Southeast	Double crowstep Dushara block? Square side pilasters	Four large loc. in western wall (Fig. 6)	None
8.	Area D (B.D. 668)	Southeast	Single Register Square side pilaster	Two large loc. West wall	None
9.	Area D (B.D. 669)	South	Circular Façade Register above lintel. 2nd façade in interior.	Large chamber with two loc. to the north Back chamber with roof hole	Nabataean letter <i>mim</i>
10.	Area D	N., E., S.	Group of 5 Tombs		Heavy deposition
11.	Area D	South	Collapsed façade	Square with niche and block in back.	Painted symbol
12.	Area D	South	Collapsed façade	Small square chamber	Nab. fine dark red painted ware
13.	Area D	South	Collapsed façade	Large square interior	Plastered cistern Grinding stone
14.	Area D (B.D. 671) (Fig. 7)	East	Tomb complex with ashlar wall enclosing tomb, cisterns and niche	Loculi in north south and west Covered opening in roof.	Exterior stairs leading to roof (Fig. 8)

A number of cist graves, many robbed out, lie along the western edge of the main Wādi al-Maṭāḥa in the study area.

### Cultic Features

Cultic features functioned in a ritual way in the worship of the supernatural. Main fea-

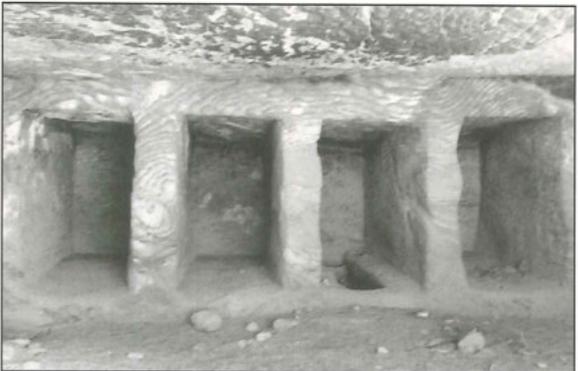
tures are altars, niches, blocks, shrines and associated triclinium. Niche 1 is located in area B about four meters above the ground surface facing west. It is a rectangular niche 60x 30 cm in size, 50 cm deep reached by a set of small rough cut steps in front. There is a shallow depression or trough cut into the



4. Tomb 3 façade.



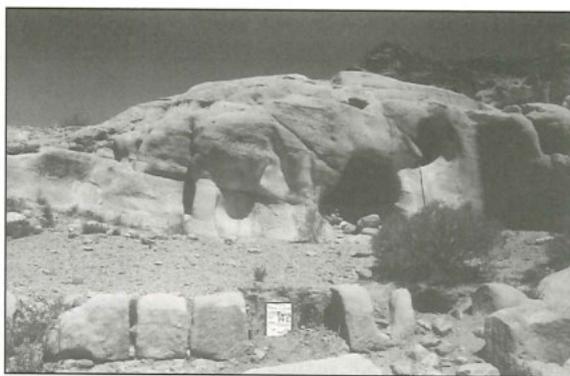
5. Tombs 6,7,8,9.



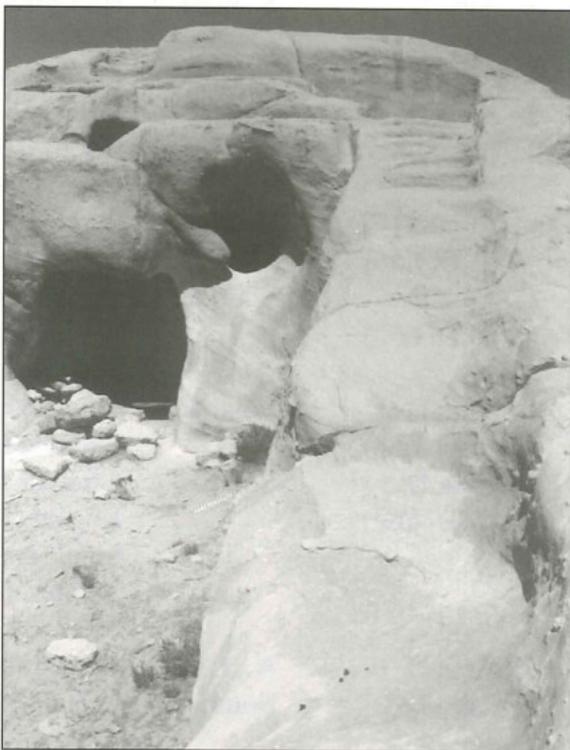
6. Tomb 7, interior.

floor of the niche.

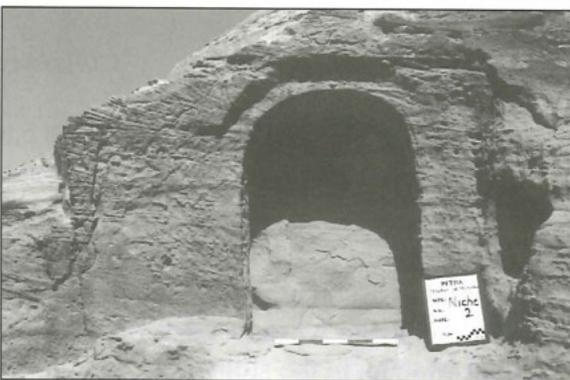
Niche 2 (Fig. 9) is located above and to the south of Tomb 2, and is reached by a



7. Tomb 14 exterior.



8. Tomb 14, stairway to west leading to top of tomb.

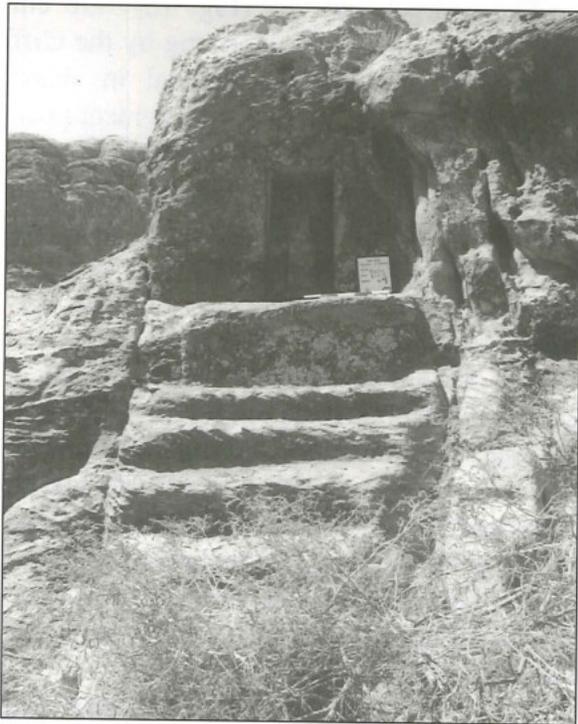


9. Niche No. 2, circular top.

well cut access stairway. It is rectangular, 104 x 75 cm, 39 cm deep with a circular top as well as a rectangular trough in the front. It

faces east. Niche 3 is located immediately to the north of Niche 2 and is rectangular in shape, 117 cm x 90 cm, 32 cm deep but very well worn. It also faces east but no trough was visible.

Niche and Block 4 (Fig. 10) consists of a shrine with a stairway leading up to a platform and deep niche with a rectangular block in it. There is a faint inscription directly above the block, possibly reading DSHR. The shrine faces north and is 90 x 45 cm in size, 20 cm deep while the block 35 x 18 cm with a trapezoidal support below it. No trough is visible. In shape and form, this niche and block are similar to blocks with trapezoidal bases catalogued by (Roche 1988) at Petra from the Theater area ( XI 8, Pl. 51), Sadd al-Ma'āgin ( XXX 55, Pl. 118), al-Khubtha (XXXII 18, Pl. 131) , al-Madras (IV.33,35,53, Pl. 16,17,25) and at Bostra (242, Pl. 159). Roche identifies the rectangular blocks with a trapezoidal base as representing Dhushares (107, 219,220). This is also suggested by the faint inscription in this niche as well as by a similar niche and block found at the



10. Niche and Block # 4.

Temple of the Winged Lion on the exterior of the cella wall, directly in line with the altar platform. This block would have paralleled the built niche in the interior that contained the eye idol representing the goddess of the Temple, either Allat or al-'Uzza and probably should be associated with her consort, Dhushares.

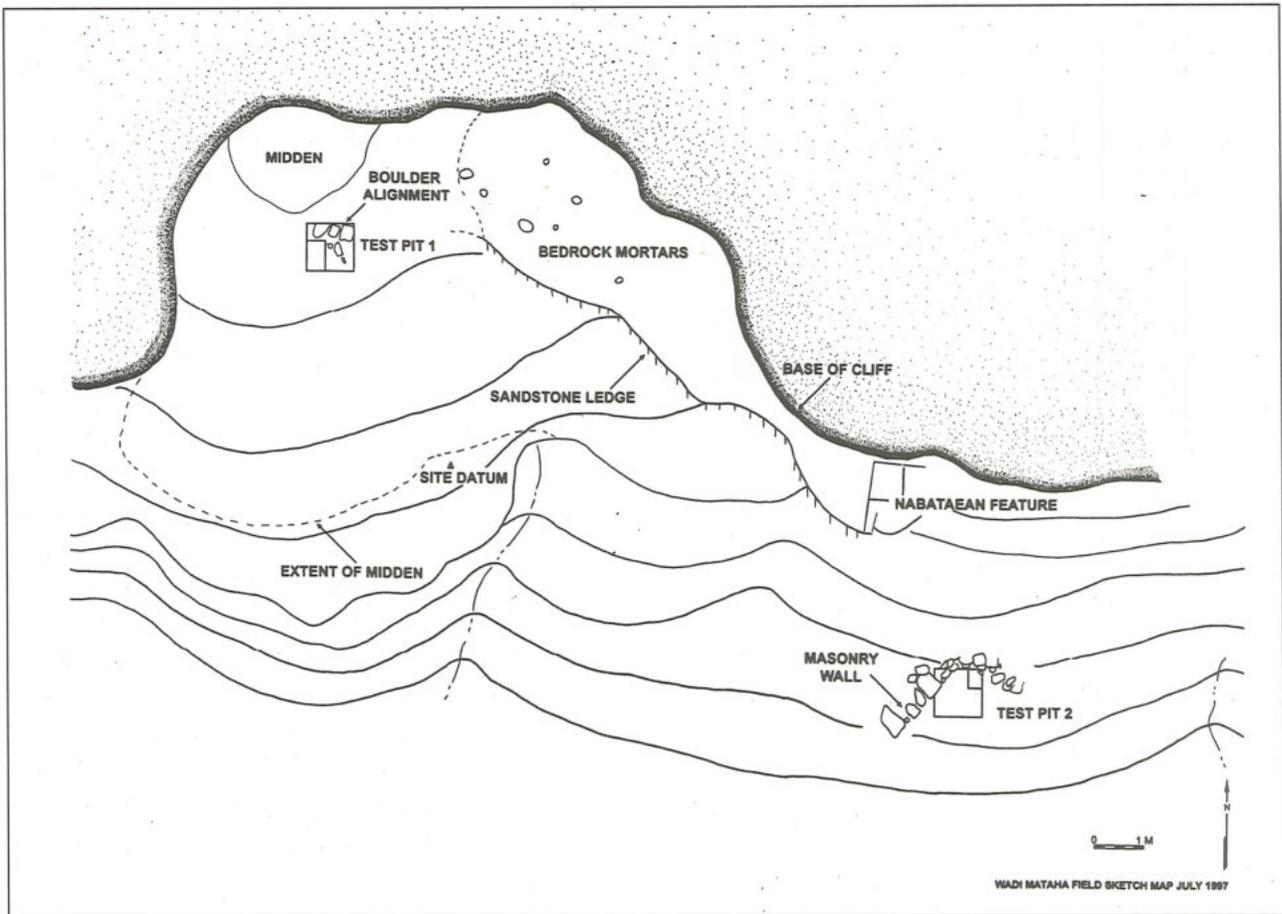
Niche 5 faces west, with side pillars, 65 x 60 cm in size, 9 cm deep with a larger and smaller trough at its base. Niche 6 also faces east, is rectangular in shape, 62 x 49 cm in size, 12 cm deep with a well worn trough. Niche 7 also faces east, is rectangular in shape, 65 x 40 cm in size, 40 cm deep without a trough. Significantly, most of the niches without actual carved blocks contain troughs or depressions that probably held portable cultic blocks, most being with a single block but some with double blocks.

### Water Control Features

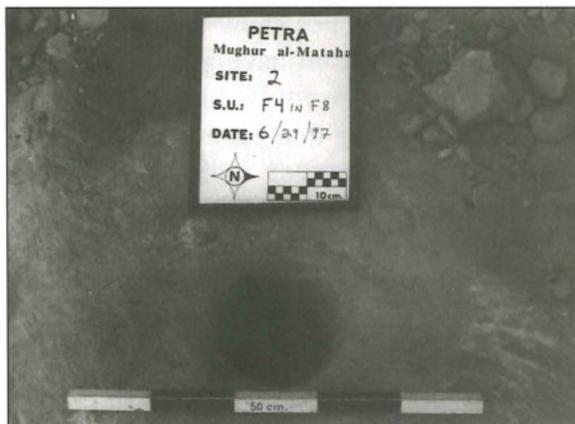
Three water collection and control systems were surveyed in the study area. System D1 is made up of a collection channel directly behind the Mughar an-Našāra, running south to north and sloping gradually into a rock cut cistern No. 1, cut into the southern sandstone massif at the western end of the small drainage near Tomb 1.

System D2 collects runoff water from the high sandstone ridge to the south of the small drainage and opposite the Natufian Site 2. It is made up of a complex system of channels and cisterns. Channel A (Fig. 11) is a narrow 40 cm wide and 25 cm deep channel running along the north face of the ridge at an upper level in a western direction that drops into a middle system at the western edge of the sandstone massif. It then flows south down slope towards a square Cistern No. 4 at the tip of the western edge. Channel B is on south face of the ridge and slopes west directly into Cistern 4. Channel A seems to drop directly near Cistern 4 into the lower larger Cistern No.2 but may overflow into Cistern 4, if water pressure is sufficient. Wa-





12. Wādi al-Maṭāḥa, Site 2.



13. Bedrock mortar.

mortars. The midden contained abundant chipped stone artifacts and animal bone in a context of coarse sand and sandstone rubble. At about 30 cm below ground surface, excavators encountered several flat sandstone slabs and an apparent alignment of large rounded sandstone boulders. Associated with the slabs were two ovicaprid horn

cores. A sounding in the southwest corner found an additional 70 cm of cultural deposits below the slab layer. The sediments below the slabs were markedly different from the overlying deposits in that the sandstone rubble was nearly absent, giving way to a homogenous gray-brown sand. Animal bone, chipped stone tools and debitage as well as occasional marine shell continued. This lower level contained tools characteristic of the Late Mushabian period. The maximum depth of culturally stained deposits in Test Area I is about 1 m.

Test Pit 2 (Fig. 14) investigated a gently curving alignment of stone masonry on a steep slope near the top of the talus but below the sandstone ledge containing the mortars. The alignment ended abruptly at about 30 cm below current ground surface, clearly demonstrating that it had been purposely laid. Sediments above the bottom of the ba-



14. Test Pit 2 .

sal stones contained abundant sandstone rubble, chipped stone tools and flaking debris, animal bone, and an occasional marine shell. Included among the chipped stone tools was a unifacially flaked borer, end scrapers on blades, and lunates with Helwan retouch. The latter argues that this deposit was Early Natufian. Deposits below the stone foundation were essentially sterile, although they continued for an additional 75 cm before bedrock was encountered. No compacted use surface was detected. It is likely that any such surface had eroded downslope, a probability borne out by the sloping nature of the cultural sediments. The bone from this test was heavily encrusted with carbonates. Both test trenches as well as the seven bedrock mortars were backfilled to prevent erosion and vandalism at the end of the season.

### Site Age

Chipped stone tools recovered from the two test pits provide the only chronometric data available at this time for Wādī al-Maṭāḥa. Preliminary sorting by Michael Chazan of the University of Toronto has identified three periods of occupation: 1) Pre-Natufian or Ramonian at the base of Test Area 1, marked by the presence of Ramon points and some Helwan retouch; 2) Early Natufian in Test Area 2, characterized by lunates with Helwan retouch; and 3) Late Natufian in the upper levels of Test Area 1, which contained steeply backed

small lunates and no Helwan retouch. Estimated ages for these cultural periods are 15,400-12,500 BP for the Late pre-Natufian, 13,000-11,000 BP for the Early Natufian, and 11,000-10,00 BP for the Late Natufian (Fig. 15).

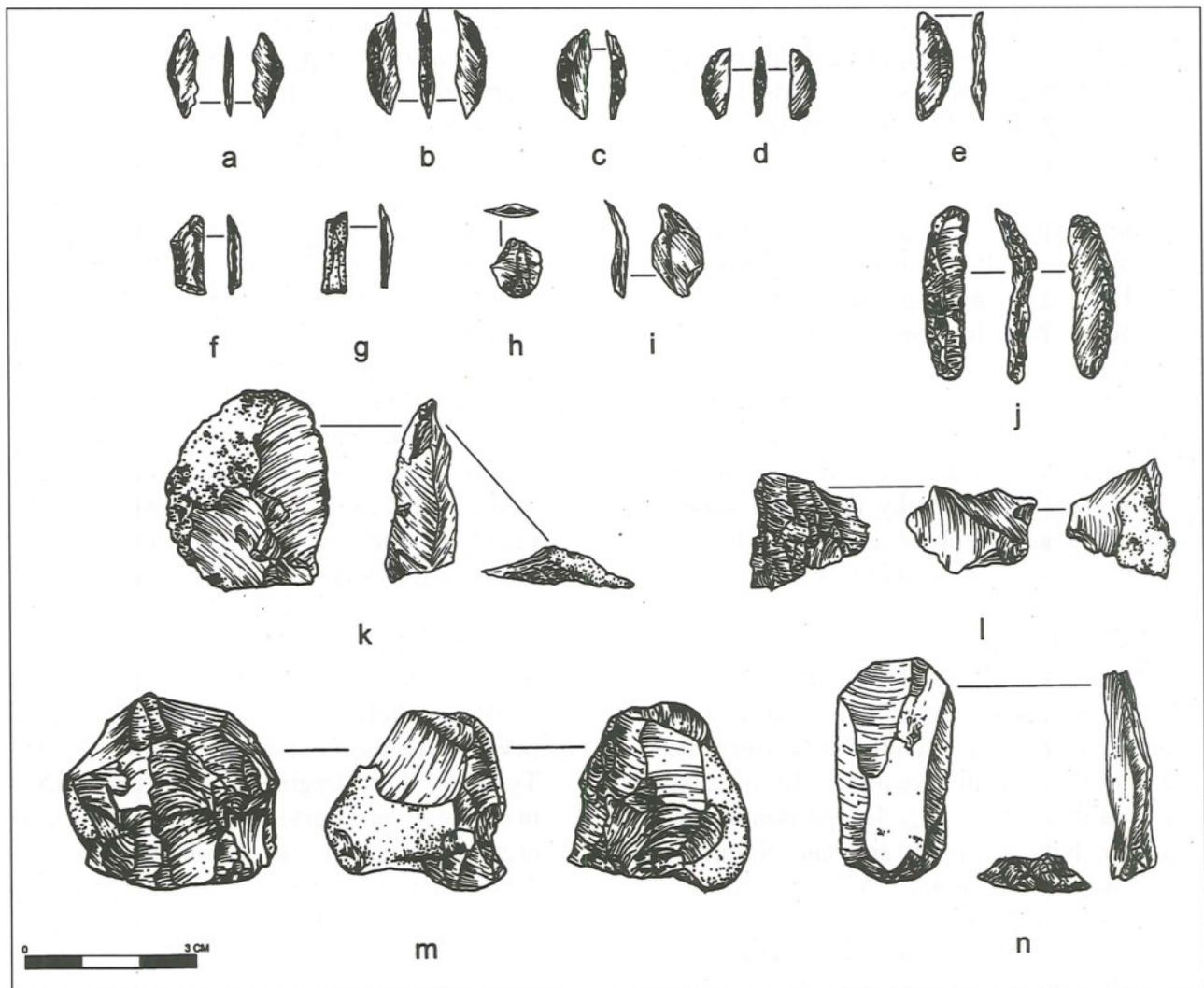
### Faunal Analysis

Of the 1339 animal bones recovered from the test excavations at Wādī al-Maṭāḥa, 108 were identified both to taxon and to element. Caprine bones dominate the assemblage at over 40% of the total identified specimens. The next most common taxa is gazelle at 28%. The predominance of caprines at a site situated as Wādī al-Maṭāḥa is not unexpected. While gazelle bones often comprise over 80% of assemblages at forest and coastal sites, they are less frequent than caprines in steppe and desert sites (Byrd 1990:176). The remainder of the fragments identified by taxon is made up of birds and land tortoises, which are represented by 11 bones each, dog, fallow deer, hare, and equid represented by one bone each, and rodents represented by two bones.

While a few bones show signs of gnawing, and erosion from having been ingested by carnivores, at least 10 bones have tool cut marks, attesting to human activity. Some specimens are charred, indicating contact with elevated heat, although there is no direct evidence, such as "spit marks" for cooking over the open fire.

### Caprines

Of the 50 caprine bones from Wādī al-Maṭāḥa, 35 are determined to be from goats. Whether these are the bones of *Capra aegragrus* or *Capra ibex* remains unclear. Wādī al-Maṭāḥa lies within the known ancient range of both species of wild goat. While Wādī al-Maṭāḥa is situated within the southernmost extent of the range of *C. aegragrus*, it lies much more comfortably within the range of *C. ibex* (Uerpmann 1987: 118-121).



15. Lithics: a-e= lunates; f,g,h,i= microburins; j= archbacked blade; k= Ramon point; l,m= bladelet cores; n= end-scaper.

Two well-preserved horn cores were also recovered in the excavations, one of which provided a clear cross-section. The anterior margin is rounded and lacks the characteristic keel of *C. aegragus* horn cores and its oval cross section is typical of *C. ibex* (Meadow 1986: Fig 2).

### Gazelle

The size of the gazelle bones from Wādī al-Maṭāḥa suggest that they are from the larger species *Gazelle gazella*, the mountain gazelle, rather than *G. dorcas*. Differences between the two species are size, horn core shape, and certain cranial features (Tchernov *et al.* 1986) of which the first two are

relevant to the collection.

The Wādī al-Maṭāḥa assemblage includes one gazelle horn core from a young individual. In general the *G. gazella* horn core is elliptical in cross-section, while that of *G. dorcas* is egg-shaped with a wider posterior margin (Tchernov *et al.* 1986). This horn core is elliptical in shape, and its shape and size index falls well within the range of *G. gazella*.

### Other Animal Bones

Like those of caprines during the Natufian, equid bones occur more frequently in steppe and desert sites. At Wādī al-Maṭāḥa, only a single bone could be identified as

equid- a left central tarsal. It is too small to be *Equus ferus*, but might be from one of the other three species of equids known from the Southern Levant, namely, *Equus africanus*, *Equus hydruntinus*, or *Equus hemious*.

One metatarsal fragment was determined to be from a small member of the genus *Canis*. This single canid specimen comes from a context which has been attributed to the Late Natufian.

Seven of the eleven bird bones were from a species of partridge (*Alceatoris sp.*). The chukar (*Alceatoris chukar*) is common in this area, on dry rocky mountain slopes with or without scrub vegetation. It breeds and is present year round in this area.

#### *Temporal Variation*

The greatest change seen in the Wādī al-Maṭāḥa bone assemblage is in the relative proportions of gazelle and goat between the pre-Natufian and the Natufian. In the Late pre-Natufian, the gazelle predominates, while in both the early and late Natufian, goats, are more common. Although this observation is based on a small number of animal bones, it may represent a significant shift in exploitation practices in the Natufian. Within the Natufian itself, it is intriguing that there appears to be a broader spectrum of exploitation in the Late Natufian than in the Early Natufian. These apparent differences, however, need to be evaluated when a larger assemblage is available.

#### **Preliminary Analysis of Shell**

A total of 35 whole and fragmented shells were recovered from the 1997 test excavations in Site 2, representing a minimum of nine taxa. Shell was not concentrated in any one context but was found throughout the deposits. The largest amount of shell came from the middle stratum in Test Pit 2, which yielded nine shells, mostly *Dentalium* sp. The shell remains are described below

by taxonomic category.

*Dentalium* spp. (n=19) or tusk shells were the most abundant type recovered. All consist of rather short sections of shell that were likely broken segments for use as beads. Only five exhibited a degree of polish and only one appeared to be smoothed on one end. At least two, and perhaps three, species of dentalia are present: a smooth surfaced tusk, a thin ribbed tusk and a more thickly ribbed tusk. The smooth and thin ribbed specimens most closely resemble *Dentalium vulgare* and *Dentalium Octangulatum* respectively (Abbot and Dance 1982:283). It is possible that the thickly ribbed tusk is *D. elephantinum* as these were found in the natufian levels at Bayḍa (Reese 1991:619). These beads and shell fragments varied in length from just under 5mm to nearly 20 mm in length.

Worm shell (cf. *Vermitedae*) fragments (n=5) were the next most common shells. Typically these fragments were short, small in diameter, and curving. The longest measured 15 mm and was 2 mm in diameter. These may have been used for beads but none showed polish or other evidence of use.

*Nerita* spp. (n=3) shells represented at least two species. The largest specimen (15 mm across the aperture) was quite polished and eroded, presumably from wave action, but otherwise unworked. The smaller specimens (11mm across the aperture) both had been punched on the top of the whorl, presumably for stringing. The often distinctive columellar teeth were quite eroded on these specimens and the whorls are somewhat eroded making species identification difficult.

One *Olivella* sp. fragment was found. It consisted of only a portion of the lower or body whorl and aperture. Also, two small whorl fragments of marine gastropods and one very small complete gastropod were recovered from the excavations. These fragments are eroded but one could be a frag-

ment of *Nassariidae*. The complete gastropod is enigmatic and no similar types were found (Abbot and Dance 1982). The thinness of the outer lip could suggest an immature shell. At least three bivalve taxa are represented in the assemblage. All are small fragments. One with a strongly ribbed outer surface may be a cockle or scallop shell but the fragment is too small for certain identification. A very small fragment (9 mm by 9 mm) has a distinctively pearly or iridescent interior. The third fragment, although clearly a marine bivalve, is too small to identify further.

One disk bead was found in Test Pit 2. It measures 7 mm in diameter and is 2 mm thick. It is dark gray in color, presumably from burning, and is slightly cupped, suggesting it was made from a whorl of a gastropod. The perforation is conically drilled from the inside of the whorl.

Marine shells occur throughout the sequence at Wādī al-Maṭāḥa i.e. from pre-Natufian levels as well as early and late Natufian. This reinforces Reese's (1991) findings that marine shell, although an important commodity during the Natufian period, was also being procured during the earlier Epipaleolithic periods. Additionally, the as-

semblage is diverse with at least nine taxa represented from the two test pits excavated in 1997. The source of the shell, according to the identifications made to date, tend to favor the Red Sea. According to Reese (1991:613), for example, *Nerita* shells do not occur in the Mediterranean and *D. Elephantinum* is from the Red Sea. These findings foreshadow a rich shell assemblage at Wādī al-Maṭāḥa.

### Acknowledgments

The B.Y.U. Wādī al-Maṭāḥa Expedition was sponsored by the Department of Anthropology and the College of Family, Home and Social Sciences of Brigham Young University. Special thanks go to Dr Ghazi Bishah then, Director-General of the Department of Antiquities for his assistance while we were in Jordan, and to Ahmed Kalifa and Mohammed Abdel Aziz, representative of the Department of Antiquities.

D.J. Johnson  
J. Janetski  
M. Chazan  
S. Witcher  
R. Meadow

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# SWISS-LIECHTENSTEIN EXCAVATIONS ON AZ-ZANTŪR IN PETRA, 1998

by

Bernhard Kolb, Laurent Gorgerat and Matthias Grawehr

## Introduction (B.Kolb)

The ninth excavation campaign in Petra by Basel University, under the patronage of the Swiss-Liechtenstein Foundation for Archaeological Research Abroad (SLFA), took place from August 15 till October 20 1998. The staff included the archaeologists Yvonne Gerber, Daniel Keller and Christoph Schneider, as well as the students of archaeology André Barmasse, Laurent Gorgerat, Matthias Grawehr and Annegret Reber. Jacqueline Studer of the Musée d'Histoire Naturelle in Geneva analysed the osteological material, while Christiane Jacquet and Olivier Mermoud of the ETH Zuerich took care of the archaeobotanical remains. The small finds were restored by Christine Pugin, drawn by the draughtswoman Irma Haussener and documented photographically by Othmar Jäggi. The analyses of the restored coins was again possible thanks to the numismatist Markus Peter. The 1:20 scale top plan was completed by architect Ulrike Mayer and by Annegret Reber. Ulrich Bellwald was again responsible for the consolidation and preservation of the structures on the sites EZ III and EZ IV.

I would here like to thank all members of the team for their zeal and devotion. Special thanks are due to Prof. Dr R.A. Stucky, who, despite his withdrawal from the direction of the excavation in 1995, has remained closely associated with the project. He has, through his continued support and helpfulness, remained the irreplaceable patron of these excavations. Throughout the campaign we were accompanied and supervised

in an exemplary manner by Suleiman Farajat, as representative of the Jordanian Department of Antiquities.

The 1998 excavation campaign would not have been possible without the financial support of the SLFA (Zuerich), the University of Basel, the Max Geldner Foundation (Basel), the FAG (Basel) and Novartis International (Basel).

## EZ III

The excavation on EZ III was limited to the exposure of room 121 which had been started in 1997 (see plan of EZ III in Kolb 1998: 266, Fig. 11). The interstice of a blocked door in wall BS was discovered, which had originally connected room 121 with room 120 which lies just to the north of it, and thus with courtyard 111. A floor of beaten earth only a few centimetres thick lay directly over the rock of the outcrop. Three Nabataean coins, found at floor level, cover the period from 4/5 BC to 106 AD<sup>1</sup> and give further proof of the first phase of the structures on EZ III which had been analysed by Maxime Boillat recently<sup>2</sup>.

Important finds in the form of a fragmentary wall painting and cornice mouldings came to light in the lower starta of the collapsed walls. The wall painting, as far as it is possible to tell, represented satyrs and erotes at the vintage. The figures move within a scrollwork of vines and acanthus and are reminiscent of the well-known paintings in house 849 in neighbouring Bayḍa (McKenzie 1990: Figs. 113-115). The recovered stucco mouldings are all of the same

1. EF 1334: Aretas IV (5-4 BC); EF 1341: Aretas IV-Rabbel II (18-106 AD); EF 1339: Nabataean.

2. M. Boillat, *De la roche, des murs, des hommes. Essai de compréhension des structures archéo-*

*logiques de la terrasse inférieure d'ez Zantur à Petra / Jordanie (unpubl. MA, Basel University 1998)*

type and, taken together, reach a length of 3m. They were probably part of the cornice, which, when the room was intact, formed the upper border of the wall decoration. Another well-represented moulding consists of a simple stucco fillet with a fascia underneath decorated with a very nicely preserved painted white scrollwork on a dark green background.

#### *Restoration and Consolidation*

The completion of the excavation on EZ III allowed us to begin with the urgent task of consolidating the walls. The uppermost courses of the dry stone walls were freed of the remaining sandy core and then filled with a mortar consisting of local sand, unslaked lime and a small quantity of white cement. The mortar was mixed with small stones, firstly to reduce the amount of mortar needed, and secondly to ensure that the crown of the walls would look as authentic as possible at completion. After 9 weeks of work an approximately 60 m length of wall had been consolidated in this manner by the architect Urs Hüsey and his team<sup>3</sup>. The other part of the consolidation work consisted of removing the dump material from EZ I and EZ III which had accumulated over the last 10 years along the northwestern edge of the terrace. The terrain below the northern face of az-Zanṭūr was thus restored to the state in which it was found in 1988.

The intention is to complete the consolidation of the walls on EZ III during the 1999 campaign and to make the site as attractive and safe as possible for future visitors.

#### **EZ IV: The Nabataean Mansion**

The continued excavation in 14 grid squares (350 m<sup>2</sup>) of the large Nabataean building on EZ IV produced important new findings concerning the layout and function of the rooms. The excavation area from the

1997 campaign was extended to the south, east and west (Fig. 1).

#### *Room 6*

In square 90/AQ-AR the remaining small area of ca. 3x2m was excavated so that room 6 is now completely clear. At the western end of wall K we came across a doorway which had been blocked off at a later date, but had originally opened northwards onto corridor 11 (Fig. 1). Huge quantities of stucco wall panelling in an extraordinary good state of preservation were found in loci 3081 / 3085. It is impossible to tell whether the room was completely redecorated when the doorway was walled up, or whether the existing panelling was simply extended over the new wall space. Fragments of painted stucco which had been used as fill for the repair in a wide crack in the masonry of pillar P1 indicate that the walls of room 6 had been redecorated at least once.

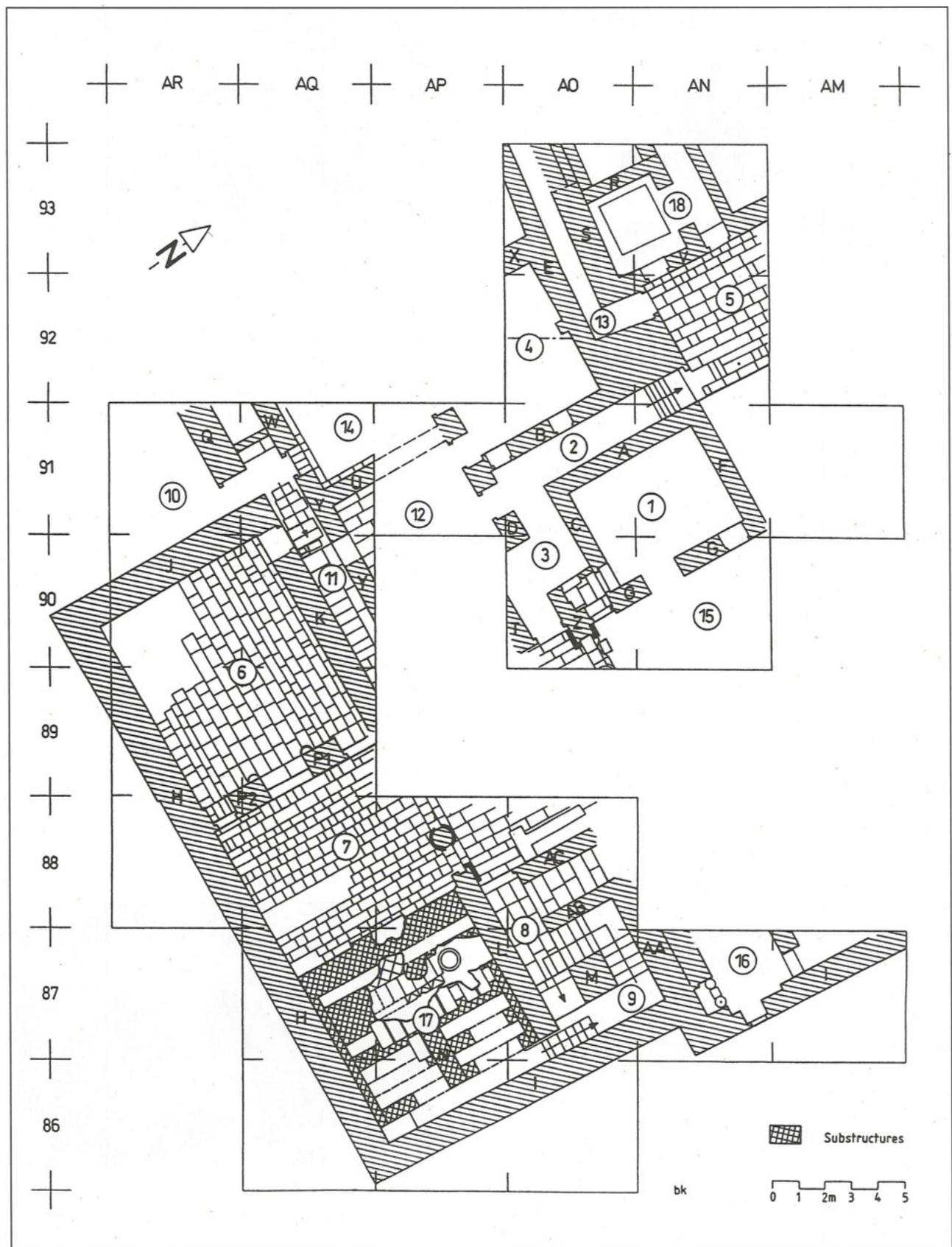
The rich finds from the last phase of use in the fourth century AD, sealed beneath the debris of walls ruined during the earthquake of 363 AD<sup>4</sup>, are worthy of special mention; pieces of wood were found together with bronze and iron fittings (EF 3091: Fig. 2), a bronze key and an iron bowl. It seems therefore, that various wooden boxes with metal fittings were stored, together with pottery vessels, in the northwest corner of the room, possibly on a wooden shelf.

#### *Restoration and Consolidation*

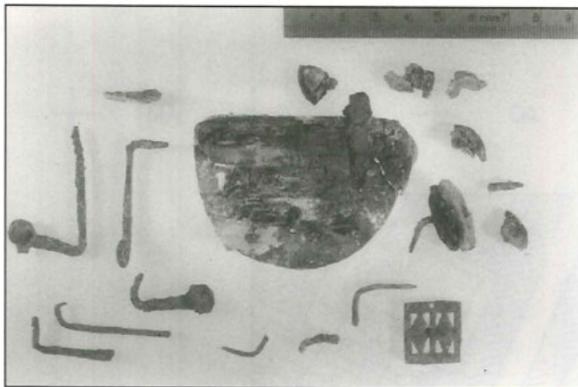
After the work in room 6 was finished the restorers rebuilt the southwestern corner H/J which was in a very poor state of repair, using ashlar from the excavation. The threatened continued collapse of the structure and the loss of further flagstones was thus halted. The remains of the rough plaster on the walls of room 6 were secured with a neutral retouch.

3. Walls AB, AF-AH, AM-AO, AR, BB - BC, BK - BO, BS, BX - BZ, CM, CY and CZ.

4. Russell 1980: 47ff.; Peter 1996: 112ff.



1. EZ IV. Schematic plan of the structures. (drawing: B. Kolb).



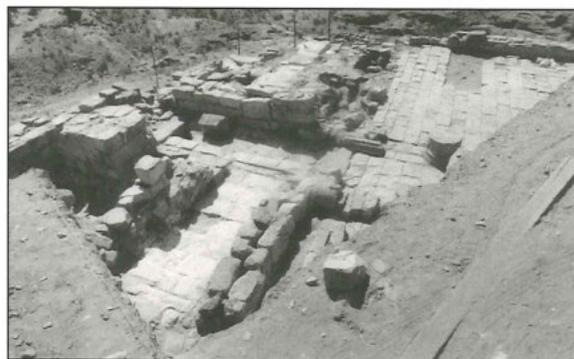
2. EZ IV, room 6. Bronze fitting of a lock, bars and nails of a wooden chest. (photo: O. Jäggi).

### Rooms 7 and 17

The investigation of square 87/AP brought clear evidence that room 7 did not extend as far eastwards as wall I, as was supposed last year, but that it is actually a squat *exedra* measuring 6.5 x 7.4 m (Figs. 1 and 3). An Attic column base (diam. of base: 1.00 m; diam. of column: 0.74 m) exposed at the northern edge of the *exedra* and a similarly formed pilaster base at the western end of wall L suggest that room 7 ended with 2 columns *in antis* to the north. The "openings" in the bipartite bases and the traces of scraping from the doors on the flagstones to the west of the stylobate, are witnesses to the doors which had once been mounted between the supports.

Although the dividing wall between rooms 7 and 17 has almost completely disappeared (see Fig. 3) it is possible to reconstruct at least the original position of the entrance: a five-piece band of narrow paving stones at the eastern edge of the floor in room 7 marks the position and length (ca. 2.1 m) of the lost threshold between rooms 7 and 17. This passageway lies opposite the central entrance to room 6, which was also "open plan", and shows that the three rooms 6, 7 and 17 were planned as an ensemble.

The parts of the arched substructure of room 17 exposed in last year's campaign, which had collapsed in places, had given little cause to hope that there would be any in-



3. EZ IV. View of the rooms 7, 17, 8 and 9 from the north - counter-clockwise. (photo: D. Keller).

tact flooring in the unexcavated area of square 87/AP. The 1998 findings were therefore particularly welcome: in the western portion of room 17 we came across a 2 x 3 m segment of a plundered *opus sectile* pavement with its substructure intact (Figs. 1, 3 and 4). The pattern in the mortar bedding left by the tiles, which had been removed at a later date, bear witness to three decorative zones running north-south. Diamonds in squares in the western zone give way to a row of rectangular pavers which are bordered in the east by a narrow band of triangles. The fragments of marble and alabaster, which came to light by the dozen, give an indication of how opulent the floor decoration was originally. Fragments of phase 3a painted Nabataean pottery in the mortar bedding of the *opus sectile* pavement in room 17 confirm the *terminus post quem* of 20 AD for the first building phase<sup>5</sup>.



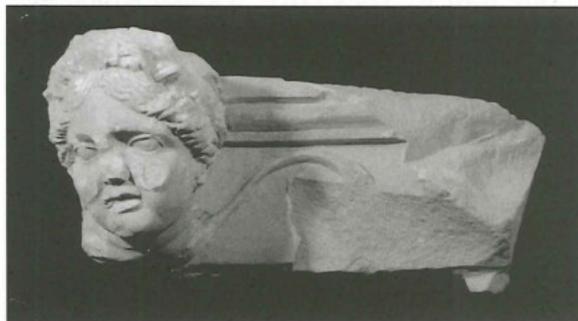
4. EZ IV, room 17. Mortar bedding of *opus sectile* pavement with fragments of marble tiles. (photo: D. Keller).

5. For the typology and chronology of the painted Nabataean ware see Schmid 1997: 131ff.

A selection of well preserved capital fragments belonging to McKenzie's floral type 1<sup>6</sup> give an impression of the beautiful crownings of the supports in room 7 (Figs. 5 and 6). The *cauliculi* of the pilaster capital in Figure 5 are entwined with vines and grapes that hang from the corner volutes. Vines in low relief also decorate the abacus and transmute into a finely worked Medusa head just above the volutes. A similar capital fragment, of unknown provenance, stands on the northern retaining wall of the Burckhardt Centre in Petra. A fragment of an abacus with a female head in high relief, which appears to grow out of a vine, is shown in Figure 6. Her abundant curly hair is parted in the middle, combed back behind her ears and plaited at the back of her head. The plaits are wound around her head and knotted over her forehead. *Pathos formulae*, such as the head leaning to the left, the mouth slightly open, together with the rather fleshy



5. EZ IV, room 7. Fragment of a Nabataean pilaster capital of the floral type. (photo: O. Jäggi).



6. EZ IV, room 7. Abacus fragment of a Nabataean capital with a female head in high relief. (photo: O. Jäggi).

cheeks are reminiscent of Near-Eastern Hellenistic prototypes and the remarkable Aphrodite relief in Petra (Zayadine 1981: Pl. 1.3). The capital fragments, of excellent workmanship, and the column and pilaster bases found *in situ* show that the luxurious decoration on EZ IV was not limited to wall painting and stuccoed architecture.

Parallels for the room ensemble 6 / 7 / 17, consisting of a central *exedra* with two flanking rooms, are to be found in Herodian and Ptolemaic architecture. The room combination 458 and 521 in the early Herodian core of the Western Palace on Masada, dated to the 30's of the first century BC (Netzer 1991: 232f.), is comparable, although lacking one of the flanking rooms. The reception/banqueting room 458 has, like room 6, one central and two side entrances. It is also remarkable that the ground plans of the two *exedrae* 521 (7.1 x 6.9 m) and 7 (7.4 x 6.5 m) are almost identical and that they both open northwards with two columns *in antis*. The only difference between the two *exedrae* worth mentioning is that the intercolumniations in room 7 were furnished with doors.

Three room groups of the described type are to be found in the Macedonian palatial architecture from the end of the fourth century BC onwards (i.a. Nielsen 1994: 84ff.). In this context it is quite revealing that in the late Hellenistic *Palazzo delle Colonne* in Ptolemais (Cyrenaica) a three room group is to be found to the north of the garden peristyle (Pesce 1950: Fig. 11). One would like to interpret the *Palazzo delle Colonne* as a geographical and chronological link between the Macedonian architecture of the late fourth century and the Judaeon/Nabataean buildings from the first centuries BC and AD. It can be assumed that the three room group was well established in Ptolemaic architecture and that the Herodian Western Palace as well as the Nabataean mansion on

6. See McKenzie 1990: 116f. with 190, diagram 14.f.

EZ IV must be seen in conjunction with Ptolemaic prototypes, which themselves were inspired by Macedonian architecture.

#### *Rooms 8, 9 and 16*

The exposure of staircase 9 was completed in 1998 (see Fig. 1). The stairwell has a quadratic ground plan of 4.23 x 4.26 m and is constructed around the central staircase pillar M (1.43 x 1.52 m). One is reminded of the Nabataean staircase towers as described by Avraham Negev e.g. in the phase III temple at Iram (Tholbecq 1998: 242, Fig. 1), or in "building II" in Mampsis (Negev 1973: 367, Fig. 2). Only the foundations are preserved of the steps which once descended from corridor 8 in two flights. The steps were removed during a later phase of occupation and reused elsewhere. An explanation for the removal of the steps may be a collapsed section in the southern face of wall AA. Areas of repair in the northern face of wall AA prove that the damage must have occurred before the final destruction of the building in the earthquake of 363 AD. These structural findings are supported by the pottery finds from the last phase of use of the staircase, which date from the late third / early fourth centuries AD. Three excellently worked steps were found just below the surface in the debris between wall A and staircase pillar M. They certainly belonged to an upper flight of stairs which had originally led up to the first floor. The steps are about 1.30 m long and show clear signs of wear at the exposed edge. It is possible, on the basis of these steps and the *in situ* foundations, to reconstruct a stairwell which connected the ground floor with the basement rooms under room 17 and the as yet intangible rooms of the upper storey.

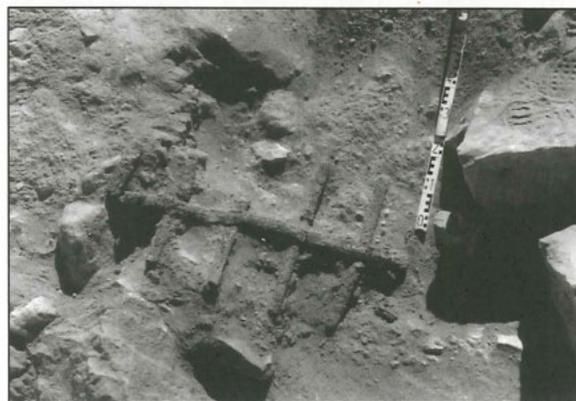
Room 16 that is still only partially investigated, has a very badly preserved and carelessly laid floor of split flagstones in a variety of sizes. The room has a peculiarly narrow doorway of only 50 cm breadth in its east wall I. It is rather astonishing that there

is no sign of steps in the excavated strata to the east of and below the threshold despite the fact that wall I reaches down ca. 1 m deeper than that part currently visible.

The floor of room 16 was covered with a thick layer of ash mixed with fourth century AD pottery - again documenting the final destruction of the building during the earthquake of 363. Two well preserved iron window grates lay in the debris to the east of wall I in square 87/AM (Fig. 7). Traces of mortar on the ends of the main strut and the bars indicate that the grates were embedded in the wall to a depth of about 7 cm on all four sides. The grate visible in Figure 7 consists of a central iron strut onto which short bars are riveted at regular intervals. The second grate has two vertical struts close together and is correspondingly somewhat wider. The narrow slit windows which had been protected by these grates measured ca. 0.3 x 0.9 m and 0.45 x 0.9 m respectively. These two finds will be a great help in the reconstruction of the building since until now no wall has been found that is preserved to a height where windows would have been positioned.

#### *Rooms 10, 11 and 14*

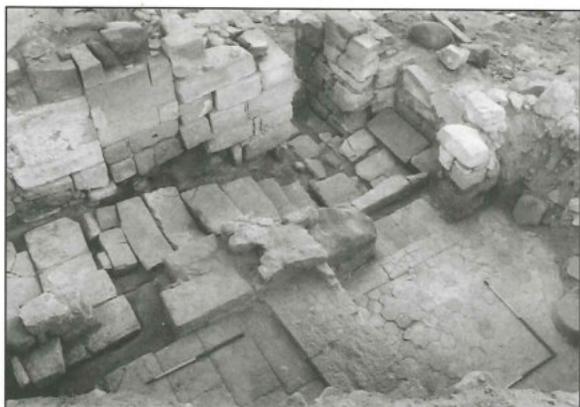
The westerly corridor 11 is 1.2 m wide and runs along the same axis as corridor 8 in the east (see Fig. 1). The flagstones from the original building context are still *in situ* along wall K. They cover a canal which was



7. EZ IV. Iron window grate as found east of room 16. (photo: D. Keller).

probably connected to a cistern in the central area of the house (squares 89/AN-AP), which has not yet been investigated. The corridor ends in a poorly constructed flight of steps in its western extension (Fig. 8). Hewn areas in the bedrock beneath the threshold of the blocked door in wall K and below wall Y which is opposite, show that the flight of steps originally started just east of the door and was far steeper: a height difference of a metre had to be spanned by the steps in a length of just 1 m<sup>7</sup>. In the course of cleaning the canal, which also runs through room 10, the steps in room 11 were removed to be shoddily reconstructed later out of spoils. This process is particularly clearly visible in the *opus sectile* pavement of the preserved part of room 10; the pavers of white limestone and slate, which had been ripped out from the simple *opus sectile* floor, were not returned to their original position after the canal had been cleaned but were reused to cover the canal (Fig. 9).

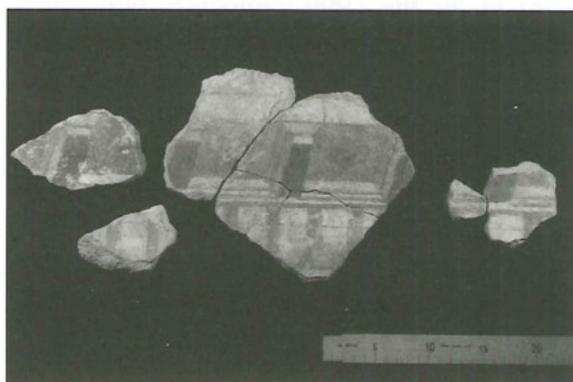
A few interesting fragments of wall painting (Fig. 10) lay in front of the walled-up door in wall K. A polychrome painted modillion cornice is recognisable. Over dentils painted in white, yellow and brown follow the modillions which are painted bright red underneath. The dark blue cassettes between the modillions are decorated with golden rosettes. It is no longer possible to tell which



8. EZ IV, rooms 11, 12 and 14 from the north. (photo: D. Keller).

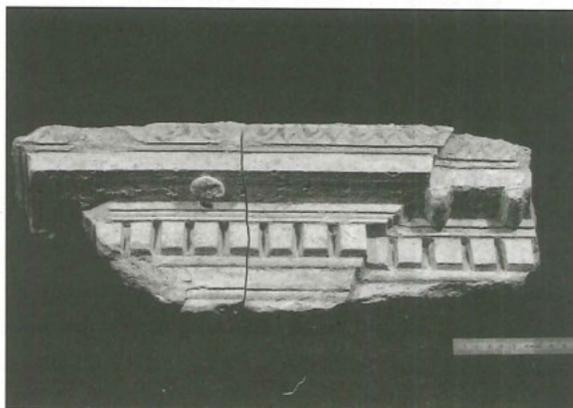


9. EZ IV, room 10. Canal and remains of *opus sectile* pavement from the east. (photo: D. Keller).



10. EZ IV, room 11. Fragments of an illusionistic architectural painting. (photo: O. Jäggi).

wall was originally decorated with these paintings because no other fragments were discovered in corridor 11. A comparison with a moulded stucco modillion cornice from room 6 (Fig. 11) shows how closely related the painted and moulded decoration of



11. EZ IV, room 6: Dentile cornice with modillions and rosettes. (photo: O. Jäggi).

7. Level of the eastern corridor: 923.75 m; level below the steps: 923.76 m.

the building were. The dentils are set off from the geison with an identical profiled fillet followed by modillions and rosettes or discs.

Room 14 opens onto corridor 11. It is furnished with a floor of hexagonal sandstone paving (see Figs. 1 and 8). The floor has collapsed in two places and the substructure is visible: the floor lies on tiles placed at right angles to one another - a manner of construction typical for the hypocausts of Roman *caldariae* (Adam 1984: 291, Figs. 628-9). The complete exposure of the room, planned for the 1999 campaign, will reveal whether the mansion was really furnished with a Roman style bath, as was house V 1 in Nabataean Khirbat adh Dharih which was also of a comparable size (Al-Mouheisen and Villeneuve 1991: 751f. with Fig. 8). Significant remains of the wall decoration with stuccoed corner pilasters decorated with cassettes were retrieved along walls U, Y and W.

#### *Rooms 5, 13 and 18*

The small, simply furnished rooms around courtyard 5 were probably part of the household tract. The floor space of room 18 is dominated by a quadratic basin (2 x 2.1 x 0.8 m) lined with flat stones. The pool is sealed with grey hydraulic mortar. In the west corner of the basin is a round, bowl-like depression, about 20 cm deep. The basin was not fitted out with a drain but there are also no apparent signs of a feed pipe. The installation was certainly not connected to the two channels which run below the pavement of courtyard 5: one of the channels drained southwards in the direction of room 2, the other runs westwards below the pavement of courtyard 13. The question as to the function of this basin cannot be answered at the moment, especially since it was filled with sterile material later on. Room 18 opened onto corridor 5 through two doorways in the first building phase; these were then walled up in a later phase.

28 kg of amphora sherds were collected in the strata above and next to the basin. It is quite possible that room 18 was used as a rubbish dump after the two doors had been sealed off. The coin and pottery finds date the last use of this group of rooms to the fourth century AD.

#### *Room 15*

The partially exposed flagstone floor and pilaster Z in square 90/AO were probably two elements of the centrally placed courtyard which borders on room 7 to the north (see Fig. 1). The bipartite Attic pilaster base and a column base of the same type can be seen in Figure 12. Both bases stand on a stylobate which runs east-west and have counterparts on the northern side of room 7 (see Fig. 1). The space between pilaster Z and the column base (0.98 m) is the same as that between the pilaster and column bases of room 7. The openings in the two bipartite pilaster bases are also identical but the width of the opening in the base of pilaster Z (0.48 m) is significantly wider than that of the column base in room 7, which can be reconstructed with wooden door frames. The findings indicate a reconstruction of the north side of the courtyard with screen walls between the supports.

A number of unusual findings and finds came to light in square 90/AN. The east face of wall G which was only preserved to the height of two courses of ashlar, revealed a blocked up doorway from the first building



12. EZ IV, room 15. Bipartite Attic base of pilaster Z and column base in the bulk. (photo: D. Keller).

phase. The fact that the lowest 20 cm of the fill in the door consists of layers of stucco mouldings is rather surprising. The sealed up doorway is hidden by the wall painting on the western face of wall G. One can conclude from these findings that the wall painting preserved *in situ* in room 1 does not belong to the first phase of the building, but to a second phase which is also present in room 6 (see above). There is no direct evidence for the dating of this second building phase. The phase 2 repairs to the damaged pillar P1 in room 6 could be taken as an indication for an earthquake due to the limited structural damage and changes as well as redecoration of certain rooms.

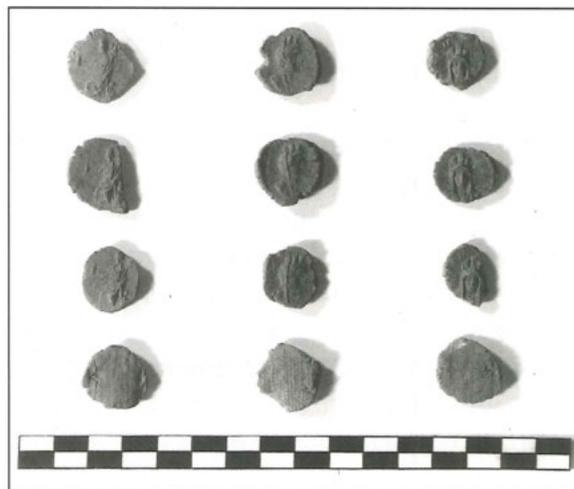
*Clues to the Dating of the First Building Phase*

The earliest stratigraphically secure pottery finds are homogenous and belong to phase 3a (20-70/80AD; see Schmid 1997: 134f.). They all come from the mortar beddings of the *opus sectile* pavement in rooms 1, 10 and 17. It seems rather unlikely that the floors in three rooms would have been replaced with an *opus sectile* pavement during a renovation; we can assume that these sherds are dating evidence for the first phase of building unless contrary evidence appears. Light may be thrown on the dating and interpretation of the mansion by the building inscription of a cavalry commander, which is dated to the 18th year of the reign of Aretas IV (10 AD). Dr Fawzi Zayadine was kind enough to draw attention to this inscription which was discovered in the late 60's close to EZ IV (Starcky 1978: 50, No. 44).

*A Hoard of Bullae from the Second Century AD from Room 15*

The 1996 and 1997 campaigns brought almost no finds from the second and third

centuries AD to light, which is not particularly surprising considering the fact that the structures were in use up until the earthquake of 363. However, we were lucky enough to uncover a hoard of about 80 clay impressions (*bullae*) from official Petraean seals of the second centuries AD which lay buried in room 15 beneath the debris of the natural catastrophe of 363 (Fig. 13). This find is the first evidence of its kind to have come to light in Petra. The only three published *bullae* from Petra, are those from the necropolis in Mampsis (Negev 1969: 90). Dr Haim Gittler from the Israel Museum in Jerusalem kindly drew my attention to another, unpublished Petraean *bullae* which was found in Moa. The most common type within the hoard shows the Tyche of Petra<sup>8</sup>. Three sub-types can be distinguished (Fig. 13 from left to right): 1) Tyche with turreted crown and veil, sitting on a rock facing left. In her outspread right hand she holds a stela (?) and with the left she shoulders a *tropaeion*; 2) Bust of Tyche with turreted crown and a veil, facing right; 3) Frontal bust of Tyche with turreted crown and veil. The Greek legends are unfortunately mostly lost or severely worn. The reverses of the *bullae*



13. EZ IV, room 15. The three main types of *bullae* of the 2nd century AD (photo: L. Gorgerat).

8. A sculptured head of Tyche was found in the excavation of Martha Sharp Joukowsky in the so-

called South Temple in Petra. See Basile, *ADAJ* (1997) 41: 255; Joukowsky 1997: 86, Fig. 85.

have the definite imprint of the papyrus documents which they originally sealed. The small holes from the lost cords which originally bound the papyrus documents can be seen on a few of the *bullae*. Tyche representations appear on Petraean coins for the first time under the Emperor Hadrian (117-138; Wenning 1997: 104, Fig. 113a-b). Hadrian visited Petra in 131 AD and bestowed the status of a metropolis on the town. Official seals could only have been made in imitation of this coin design from the Hadrianic period onwards. If the reading of "col" being for *colonia* on one of the *bullae* is correct, then the series continues into the 3rd century because Petra was only raised to the status of a colony under the Emperor Elagabal (218-222).

Since room 15 has not yet been completely excavated the analysis of the hoard within its context has to be delayed. The fact that the *bullae* were closely packed, showing no traces of burning, and that none of the papyri which they had originally sealed were found suggests that they had been ripped off the documents and stored in some sort of receptacle. The only comparable hoard of *bullae* is one which was stored in a vessel and was found near the Solar Shrine at Lachish and is dated to the seventh century BC (Usishkin 1993: 909f.).

### Nabataean Fineware from Room 15 (L. Gorgerat)

An interesting pottery ensemble came to light on a floor level of beaten earth in room 15 east of wall G (Figs. 1 and 14)<sup>9</sup>. The ensemble consists of EF 3194, a complete juglet (Fig. 15a); EF 3195, fragments of a painted bowl with handles (Fig. 16: a, b) and EF 3196, a complete small bowl (Fig. 15b).



14. EZ IV, room 15. Nabataean fine ware-ensemble *in situ*. (photo: D. Keller).

### Juglet and Small Bowl

The intact juglet has an opening of 4 cm diameter (Fig. 15a). The base ring is clearly set off from the rounded body which reaches a maximum diameter of 6 cm in the lower third of the vessel. The transition between the body and neck is smooth and ends in a protruding lip. The pointed spout is also unusual. The handle, which is disproportionally small in comparison to the rest of the juglet is attached to the lip and neck.

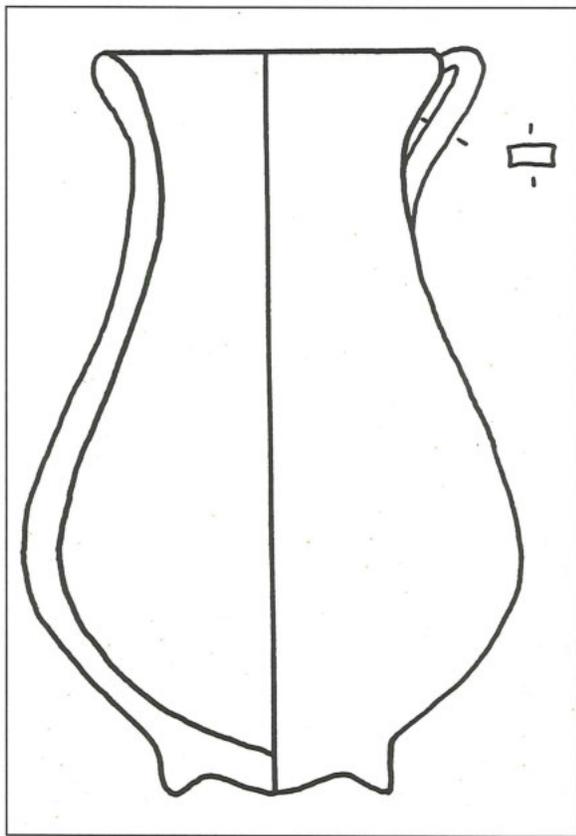
Juglets or pitchers with slender necks and protruding lips were already found on EZ I (Schmid 1995: 137f.). Although most of the examples on EZ I were significantly larger than the vessel presented here, its form is similar to that of type G 9a 291 (Schmid 1995: 137). The problem of dating this type of closed form lies in their relatively long span of production. The type mentioned appears in phase 1 (second half of the second century BC - ca. 50 BC) and 2a (50 BC-20 AD) but still appears in phase 3 (20-100 AD)<sup>10</sup>.

A complete bowl was found in the same locus (Fig. 15b). The opening of this vessel

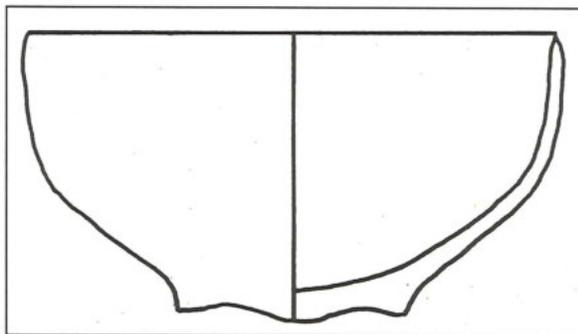
9. Locus 3158: the juglet came to light during the cleaning work on wall G. It was decided that the ensemble would be excavated immediately in order to prevent any further damage to it. Since the excavation of locus 3158 is not finished there are no precisely datable finds yet such as coins avail-

able from this locus.

10. The final date of this phase is particularly clearly defined - it finishes with the destruction level on the lower terrace of EZ I around 100 AD. See *Petra - Ez Zantur I*: 163f.

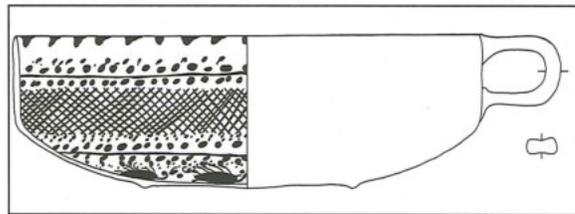


15a. EZ IV, room 15. Plane Nabataean fine ware.  
(drawing: L. Gorgerat)  
EF 3194 : juglet light red reddish yellow (Munsell 2.5 YR 6/8 – 5 YR 7/8)  
Diam. Open: 4.0 cm  
H.: 9.1 cm

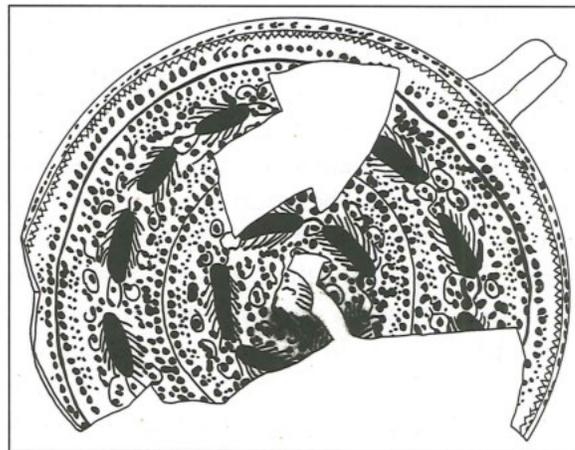


15b. EZ IV, room 15. Plane Nabataean fine ware.  
(drawing: L. Gorgerat)  
EF 3196: bowl light red (Munsell 2.5 YR 5/8)  
Diam. Open: 7.2 cm  
H.: 3.9 cm

measures 7.2 cm in diameter; it is 3.9 cm high. The unprofiled stand ring supports a slightly bulging body which transforms into a vertical, sharp edged rim, from the middle



16a. EZ IV, room 15. Painted Nabataean bowl.  
(drawing: L. Gorgerat)  
EF 3195 red (Munsell 10 R 5/8)  
Diam. Open.: 11.4 cm  
H.: 7.7 cm



16b. EZ IV, room 15. Painted Nabataean bowl.  
(drawing: L. Gorgerat)  
EF 3195 Decoration scheme.

of the vessel. The profile of this vessel places it in group 8 of the unpainted main forms from az-Zanţūr (Schmid 1996: 155 Figs. 659-662). The type E 3a 2<sup>11</sup> within this group, which belongs to phase 3, is especially close to the bowl described.

#### *Painted Bowl*

About 2/3 of a painted bowl with handles (Fig. 16: a, b) could be reconstructed from the numerous fragments in locus 3158. The vessel has a diameter of 22.8 cm and a wall thickness of 0.3 cm. The profile of the bowl (Fig. 16a) is slightly rounded and is topped with an inset vertical rim. The slightly concave handle is joined to the vessel just above the bend between the wall and rim and at the sharp edge. Given the large diameter of the vessel it seems probable that it had two such handles. A bowl similar in

11. Small bowls of this type were excavated on EZ I (EF 872 and 886-889).

form but somewhat smaller is found in a private German collection<sup>12</sup>. So the closest parallel to our vessel does have two handles.

The most striking feature of the painting are the two concentrically arranged rows of zoomorphic figures (Fig. 16b). One can assume that the centre of the vessel was painted with a similar creature whose extremities are preserved. These zoomorphic creations are characterised by a long oval body which is sometimes completed with one or two projections. The extremities are attached along the length of the body and sometimes end in a dot. The zoomorphic decoration of this bowl is complimented by rows of dots and eyes. The border between the wall and the rim is decorated with an irregular grid pattern<sup>13</sup>. The inside of the rim is decorated with blob-like drops. A fragmentary unstratified find from Horsfield's excavation has similar drops around the edge (Horsfield 1942: 179, Fig. 39, 342). It is also painted with concentrically arranged rows of dots. The rim profile with a bend and handle is also similar to that of the bowl in room 15. The ornamental decorative elements of the bowl found in room 15 and the brownish tone of the paint are typical for the group of bowls belonging to decor phase 3a (20-70 AD)<sup>14</sup>.

Zoomorphic figures are rare on the painted ware from az-Zanṭūr (Schmid 1995: 170). That they do occur on phase 3a ware is however known from finds from other places. The closest parallel is from N. Khairy's excavation on al-Katūta and is now exhibited in the museum in Petra (Khairy 1990: 39 No. 9 Fig. 42,9 Table 23,8). The handleless bowl is decorated with grid patterns, and rows of dots and eyes enclosed by a row of drops along the rim, in addition to the concentrically arranged zoomorphic creations and is thus very close to the bowl from EZ

IV 4. The bowl in the private German collection mentioned before (Schmitt-Korte 1980: 184 No. 35) has two zoomorphic representations set in an asymmetric decorative field. That these representations can reach sizeable dimensions is shown by the fragment of a bowl from a pottery workshop in Oboda<sup>15</sup>. A. Negev dates the installation in Oboda, on the basis of the coin finds, to 30 BC-50 AD (Negev 1974: 45). It can therefore be said that our fragment also dates from this period and this substantiates its attribution to decor phase 3a (20-70 AD).

### **An Ensemble of Lamps from Room 121 (EZ III) (M. Grawehr)**

An ensemble of lamps was found in Room 121 on site EZ III. The latest coin found on the floor dates from the reign of Commodus (180-191 AD) and provides a *terminus post quem* for the abandonment of the room at the end of the second century AD. The evidence of fine and coarse ware supports this date. This discovery provides the opportunity to survey a part of the repertoire of lamp types in circulation at the end of the second century AD at Petra. This ensemble deserves special attention because it may throw light on the otherwise poorly understood pottery chronology of the Nabataean/Palestinian region during the second and third century AD.

#### *Nabatean Lamps of the Negev Type 1*

Two lamps have been recovered nearly intact, and two additional fragments belong to one or two other examples. These sherds are of the variety of the well attested Nabataean lamps - Negev's Type 1<sup>16</sup>. Its chronological range is generally set within the 1st century AD, although it persists into the first half of the second century AD. Lamps of

12. Schmitt-Korte 1976: 42, 44, Fig. 20,27.

13. A similar grid pattern over the transition from wall to rim occurs on one of the handleless bowls from EZ I; see Schmid 1995: E 18a 379.

14. *Petra- Ez Zantur I*, Pp. 166-168, Table 5,2, Fig.

699.

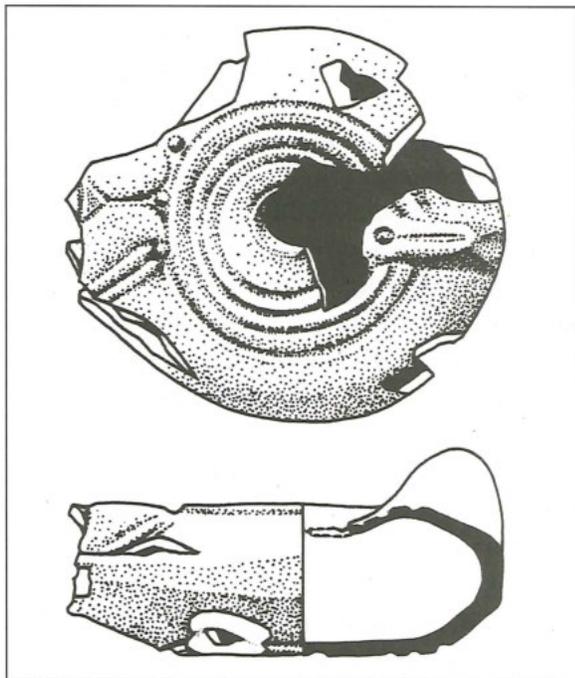
15. Negev 1974: 18, no.32 Table 11, 32.

16. Negev 1986: 134ff; other designations: Elgavish 1962, type 4; Amr 1987: 30, type 2.

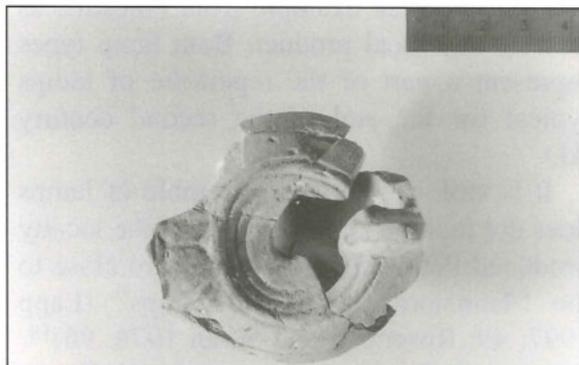
Type 1 are found for example in the destruction level of EZ I dating to the early second century AD (Stucky 1996: 21), as well as slightly later in the destruction level of Khirbat adh Dhariḥ (Villeneuve 1990: 370-371, 375).

*Imported Lamp of the Second Century AD*

It was possible to reconstruct one lamp from 14 fragments (Fig. 17: a, b). Only a few sherds are missing, most conspicuously



17a. EZ III, room 121. Imported lamp of the 2nd century AD (drawing: I. Haussener).



17b. EZ III, room 121. Imported lamp of the 2nd century AD (photo: O. Jaeggi).

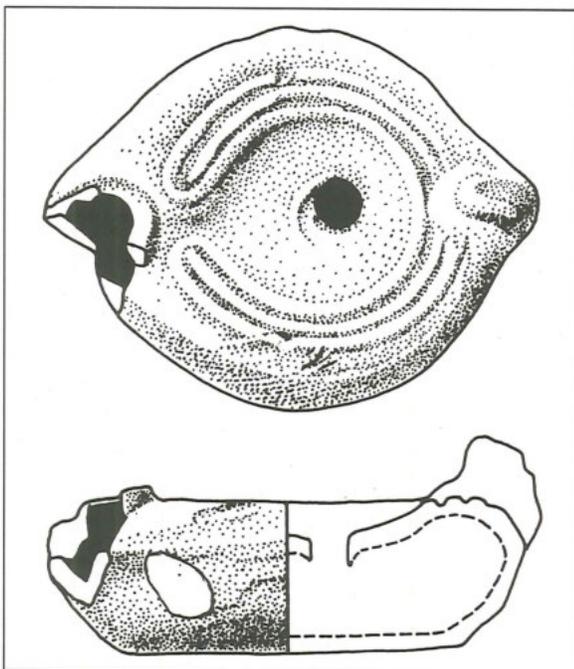
the nozzle. The body of the lamp is pear-shaped, and its width of 6.4 cm with a preserved length of 6.8 cm that is average for a lamp of this type. The shoulder is decorated with a plain impressed motif. The handle is positioned mainly on the shoulder, although it overlaps slightly onto the disk of the lamp. It is not pierced, but it is decorated with one groove. Three concentric circles are pressed into the bottom of the lamp. The clay is pink in colour (Munsell 7.5YR 8/4) with white grits. No traces of a slip survive. This lamp can be placed in the type commonly called “northern stamped”<sup>17</sup>, which is found in Northern Palestine. The center of production for these lamps was most likely in Galilee. The example in discussion is definitely an import, not only because the clay is uncommon to this area, but also because the lamp represents the only discovery of this type in Petra to date. The subtype to which this example belongs is the earliest of the “northern stamped” class and can be dated to the second half of the second century AD (Sussmann 1989: 23-55).

*Local Lamp of the Later Second Century AD*

The third lamp is almost completely intact (Fig. 18: a, b). Its form is almond-shaped; the handle and nozzle are placed slightly over the circle of the shoulder, but remain fully integrated into the design. The profile of the lamp consists of a large flat base, steep sides and, due to this, a relatively flat top. The shoulder rises in a slightly convex curve and the disk forms a shallow round concavity. The nozzle extends a little bit higher than the body. The handle lies on the shoulder and is a steep amorphous knob; it is unpierced and lacks a rim. It is reinforced on the side with a small support. At the transition from the shoulder to the disk there are three raised fillets. The outer and

17. Sussmann 1989, Lapp 1997; other names: Avigad 1976: 184-189, Beth Shearim; Fernandez 1983:

Types L 10.1, L 10.2, L 14.



18a. EZ III, room 121. Local lamp of the later 2nd century AD (drawing: I. Haussener).



18b. EZ III, room 121. Local lamp of the later 2nd century AD (photo: O. Jaeggi).

the inner fillet meet at the nozzle, forming a channel-like composition. The base of the lamp is flat and undecorated. The filling-hole is slightly off center and measures approximately 0.9 cm in diameter. The diameter of the entire lamp is 6.4 cm; the length is 8.2 cm. The clay is light red in colour (Munsell 10R 6/8) and relatively coarse in texture. Traces of a red slip (Munsell 10R 5/8) survive.

To date, this type is not well attested in

Petra. A possible example of the same type was excavated in Tomb 64B in Petra (Zayadine 1982: 371). Four additional fragments found hitherto in the excavations at az-Zanūr (loci 1071/1135/1146, 1206), as well as the one intact lamp originating from the as-Siq at Petra (Keller forthcoming), prove that this type is a local product. The fact that local features figure in the production means that this type cannot be compared directly with lamp types outside Petra or Nabataea. Roman lamps (Broneer 1930: 83ff.: Type XXV; Bailey 1980: 293, 336: Types O or Q) can be considered a common archetype. The example under consideration is typologically closer to the well-attested production from Petra of the late first century AD (i.e., Rosenthal and Sivan 1978: 97f.), than to the again well-attested Petraean-Early Byzantine lamps of the fourth century AD (Zannoni 1996: 319). Interestingly, the lamps of the type discovered in room 121 did not appear in the destruction level dating to the end of the first or the beginning of the second century AD. The appearance of this type should thus probably be placed approximately in the middle of the second century AD; the lamp exposed in room 121 would then have been buried in the course of the second half of the second century. This ensemble contains, beside the two Negev 1 lamps, already out of fashion in the second century AD, an imported example from Palestine as well as one local product. Both lamp types represent a part of the repertoire of lamps typical for the end of the second century AD.

It is striking that this ensemble of lamps does not include any specimen of the locally produced Petraean lamps which are close to the "Transjordanian round lamps" (Lapp 1997: 49; Rosenthal and Sivan 1978: 96)<sup>18</sup>. The typical feature of these lamps is the enlarged filling-hole, or, put another way, the

on display in the museum at Petra.

18. Khairy 1990: 143, Nr. 39; another nice and intact example with floral design from the same site is

diminished disc; a development that foreshadows the Petraean-Early Byzantine lamps in the fourth century AD. Lamps of this type often bear a stylised floral design on the rim. The stylistic tendency mentioned above and the absence of this type of lamp in the ensemble of Room 121 may indicate that they can be dated to the third century AD. However, if one does not wish to over-emphasize the evidence, a production of these lamps in the late second century AD cannot be ruled

out, as a parallel development to the aforementioned examples.

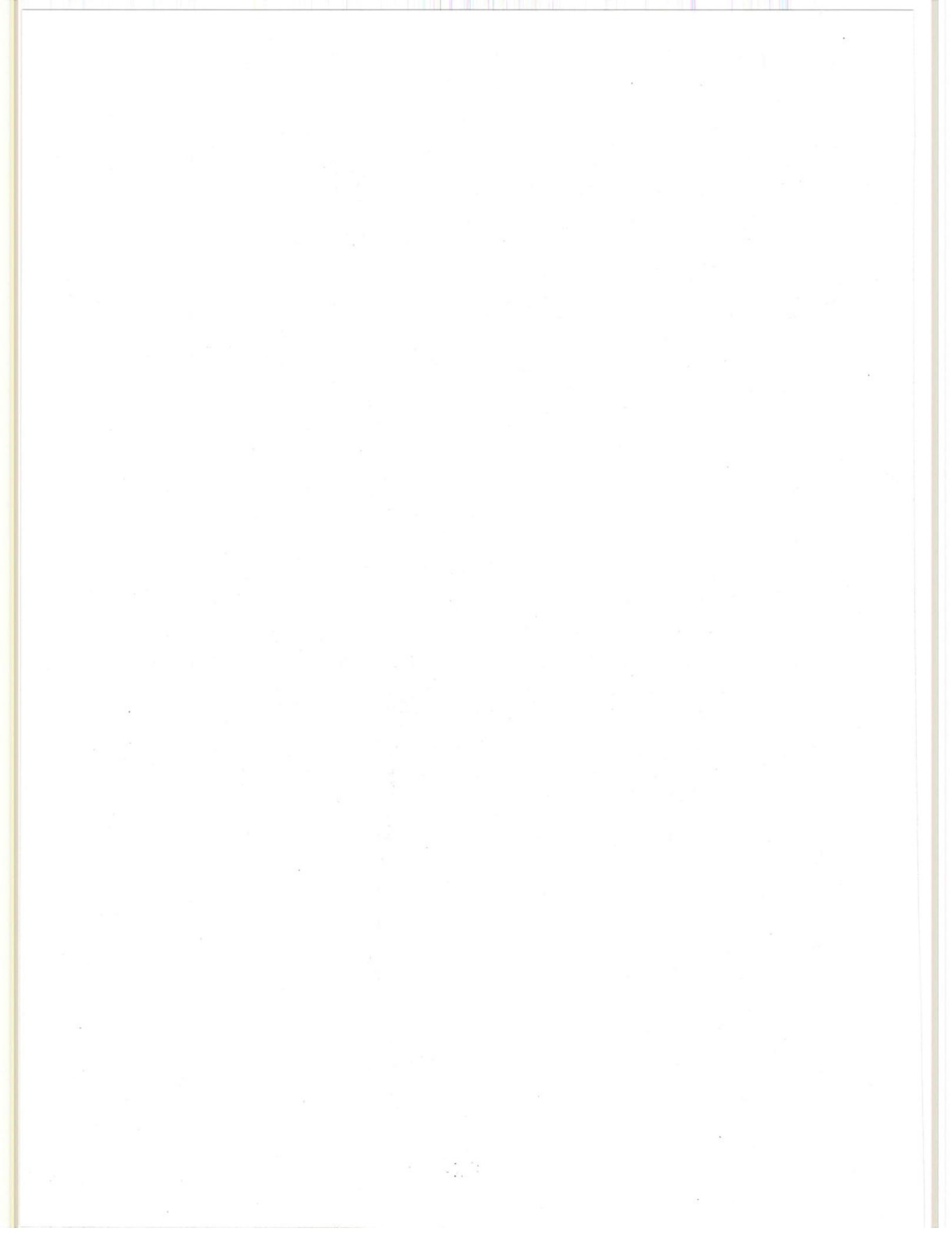
Bernhard Kolb  
 Laurent Gorgerat  
 Matthias Grawehr  
 Archäologisches Seminar der  
 Universität Basel  
 Schönbeinstrasse 20  
 CH - 4056 Basel  
 Switzerland

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## UN ROI NABATÉEN À DÉLOS?\*

Par  
Stephan Schmid

### Abstract

The sculpted head A 7403 in a museum on the Greek island of Delos has been interpreted until now either as a Ptolemaic of the second century BC, or as a head of Apollo from the Late Hellenistic period. The analysis of the characteristic hair style shows, however, that most probably both interpretations have to be rejected. Further, stylistic considerations point towards the end of the first century BC for the date of the head's manufacture.

The best comparisons for the so-called Libyan haircurls can be found on Nabataean coins showing kings Malichus I (62-30 B C) and Obodas III (30-9 BC). Further, the Nabataean "prime minister" Syllaios

devoted an inscription in the honour of Obodas III at a sanctuary of Dusares on the island of Delos in the year 9 BC when he was travelling to Rome. Therefore, it is suggested that head A 7403 from the museum at Delos was once part of this dedication, belonging to a statue of Obodas III.

La tête du musée de Délos (Figs. 1-4)<sup>1</sup>, dont il va être question dans la réflexion suivante et dont les dimensions sont légèrement inférieures à la nature, a déjà été interprétée différemment selon les chercheurs. La première mention de cette pièce se trouve dans une étude publiée en 1962 par B. Conticello, qui, la comparant à une tête conservée à Providence, pensait y reconnaître un portrait

\* L'auteur tient à remercier la 20e Ephorie des Antiquités Préhistoriques et Classiques du Ministère de la culture grecque, sa directrice S. Samartzidou et l'épimélète P. Chatzidakis, de lui avoir accordé l'autorisation d'étudier la tête A 7403 du Musée de Délos; l'Ecole Française d'Athènes pour son accueil chaleureux à la maison de fouille à Délos; H.-A. Cahn (Bâle) pour l'autorisation de publication des fig. 5 et 6 et le British Museum (Londres) pour les fig. 7-10; B. Demierre (Lausanne) et M. Golubic (Fribourg) pour la traduction française, ainsi que Ch. Papastamati et D. W. von Moock (Athènes) pour l'assistance technique, F. Zayadine (Amman), D. Keller (Bâle/Amman), B. Kolb et Ch. Schneider (Bâle) pour la lecture critique du texte. Les abréviations des périodiques suivent la liste donnée dans *Année Philologique* 66, 1995 (1998): XXI-XLV, à l'exception de ADAJ.

1. Musée de Délos, Inv. Nr. A 7403. Tête d'un jeune homme. Marbre granuleux, légèrement jaune avec cristaux bien visibles. Couche supérieure fortement endommagée par les influences atmosphériques. Le nez a disparu mais les trous marquant l'emplacement des narines sont encore discernables. Partie inférieure du cou endommagée. La cassure sur le haut de la pomme d'Adam comporte une réparation moderne. Fissure sur la boîte crânienne. Partie gauche du menton endommagée. A l'origine, on devait trouver des élé-

ments décoratifs dans les cheveux ou sur les côtés du front, sur les tempes et sur les boucles retombant de part et d'autre (voir à ce sujet plus bas). Le crâne proprement dit n'était composé que de cheveux travaillés à la manière d'un bonnet, comme on peut encore le voir par endroits du côté droit. Traces évidentes de l'ajout d'un bandeau ou d'un diadème, probablement en métal. La tête était travaillée de façon à être rattachée à un buste ou une statue.

Dimension. en cm: H. totale: 34,5; Hs bas des épaules - sommet de la tête: 24,4; H tête/cou: 20,0; H. visage (pointe du menton - naissance des cheveux): 12,9; largeur bouche: 4,5; longueur nez: 5,3; distance ext. entre les deux yeux: 8,9; distance int. entre les deux yeux: env. 2,7; longueur oeil droit: env. 3,2; longueur oeil gauche: env. 2,9; épaisseur depuis l'arrière de la tête jusqu'à la base du nez: 17,0 (épaisseur max.); épaisseur depuis l'arrière de la tête jusqu'au sommet de la lèvre supérieure: 16,7; naissance des cheveux - base du nez: 3,2; bout du nez - milieu de la bouche: 1,8; milieu de la bouche - bout du menton (endommagé): env. 1,8.

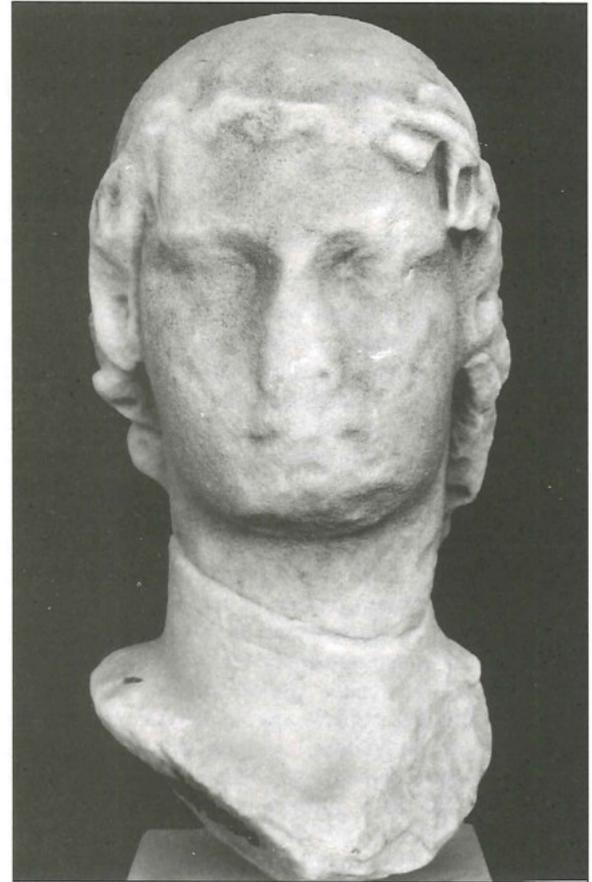
Les indications "gauche" et "droite" sont toujours données par rapport à l'objet. Le lieu de découverte exact de la tête sur l'île est inconnu; voir Marcadé 1969: 421 n. 4.

de Ptolémée VI (Conticello 1962: en particulier 51-54). Cette identification a été reprise, avec réserve d'ailleurs, par G. M. A. Richter.<sup>2</sup> Quant à J. Marcadé, réticent, il considérait la pièce d'une manière générale comme étant un prince ptolémaïque sans donner de nom précis (Marcadé 1969: 421-422, pl. 74). Dans son étude très détaillée des portraits ptolémaïques, H. Kyrieleis est le premier à émettre une interprétation différente, regardant la tête de Délos non pas comme un portrait, mais comme un Apollon (Kyrieleis 1975: 58, n. 216). Cette proposition a été récemment reprise par F. Queyrel, qui interprète à deux reprises la tête comme Apollon (Queyrel 1990: 348-349; Queyrel 1996: 108-109, no 44).

Dans le cas d'une attribution à Ptolémée VI (181 à 145 av. J.-C.), nous possédons un indice de datation correspondant à son règne, alors que F. Queyrel la date du II<sup>e</sup> ou du début du I<sup>er</sup> s. av. J.-C. Une datation de la tête de Délos dans la première moitié du II<sup>e</sup> s. av. J.-C. serait quelque peu surprenante dans le cas d'un portrait. En effet, les représentations des souverains à cette époque étaient empreintes d'un caractère pathétique nettement plus marqué.<sup>3</sup>

Avant de nous lancer dans une interprétation concrète de la pièce, il est nécessaire d'observer de plus près des questions liées aux deux propositions traditionnelles déjà évoquées, en l'occurrence: s'agit-il d'un portrait ou d'une figure idéalisée? Dans cet ordre d'idées, quelques petites irrégularités dans le modelage de la tête me semblent être dignes d'intérêt. Comme l'a déjà remarqué F. Queyrel (Queyrel 1996), elle est légèrement orientée vers la droite. Cela provient du fait que le milieu de la tête – comprenant le milieu du front, le nez et le milieu de la bouche – n'est pas aligné sur le creux séparant les deux par-

ties de la cage thoracique mais légèrement tourné vers la droite. Cette orientation de la tête a pour conséquence, entre autres, une tension de la mâchoire inférieure gauche, alors que la mâchoire inférieure droite semble plus détendue du fait que la moitié droite du visage paraît plus charnue (Fig. 1). De plus, il convient de signaler que l'oeil gauche mesure environ trois millimètres de moins que l'oeil droit. Il faut en conclure que la vue principale du visage était non pas la vue frontale (Fig. 1) mais celle qui, une fois le haut du corps ajouté, montrait la tête tournée vers la droite (Fig. 2). C'est dans cette position seulement que l'observateur ne remarquera pas les inégalités entre les deux

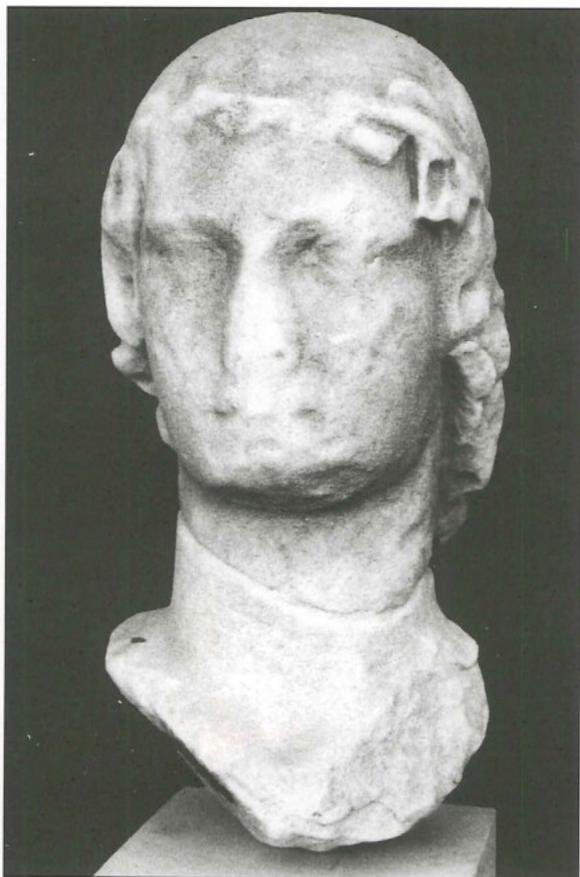


1. Musée de Délos, no. d'inv. A 7403. Tête de jeune homme avec boucles "libyques" (photo de l'auteur).

2. Richter 1965: 266; dans la nouvelle édition de R. R. Smith revue en 1984, on ne trouve plus aucune mention de la tête (*ibid.*: 234-235), alors que Smith 1988a: 183, no 22 considère la pièce non

pas comme un portrait mais comme une sculpture idéalisée ou éventuellement un dieu.

3. A ce sujet, voir avec de nombreuses références bibliographiques: Jaeggi, Schmid 1996.



2. Musée de Délos, no. d'inv. A 7403. Tête de jeune homme avec boucles "libyques" (photo de l'auteur).

yeux et l'effet plus charnu de la joue droite.

Pour une reconstitution plus concrète de la sculpture, il faut signaler également l'irrégularité dans le modelage de l'espace entre le cou et les deux épaules. Ce qui reste de l'épaule gauche semble indiquer qu'elle était abaissée de manière assez abrupte alors que

l'épaule droite semble plutôt horizontale. On peut en déduire que le bras droit était levé tandis que le gauche devait pendre le long du corps.

Les irrégularités constatées, sans doute liées à l'orientation intentionnelle de la tête vers la droite par rapport à la vue frontale, sont plus typiques des portraits que des sculptures idéalisées.<sup>4</sup> L'absence totale d'un type caractéristique de chevelure dans la représentation statuaire me semble être un argument contre l'interprétation de la pièce comme Apollon.<sup>5</sup> Les seuls indices qui feraient pencher l'interprétation de la tête comme celle d'un éventuel Apollon sont les représentations des gemmes ou des monnaies romaines (Queyrel 1990: pl. 51, 2; Simon 1984: 391-392, nos 106-121). Ces dernières sont censées représenter une statue colossale punico-hellénistique qui fut amenée à Rome comme butin suite à la prise de Carthage (Simon 1984: 438-439). Or d'après les sources, cette statue était habillée (Simon 1984: 392, no 118; 439), tandis que notre tête devait appartenir à un corps nu du moins dans sa partie supérieure. De plus, il n'y a aucune raison concluante pour que ce type de chevelure passe de Carthage à Délos par Rome.

Les considérations avancées plus haut contre une datation du portrait au II<sup>e</sup> s. av. J.-C. s'appuient sur le manque de caractère pathétique. Notre tête inspire un certain

4. Voir L. A. Schneider, *Asymmetrie griechischer Köpfe vom 5. Jh. bis zum Hellenismus*. Wiesbaden 1973; voir aussi à ce sujet les remarques de Ph. Brize, *Göttin oder Kaiserin? Zu einem späthellenistischen Frauenkopf aus Pergamon*, *MDAI(I)* 40 (1990): 185-186 avec n. 7a.

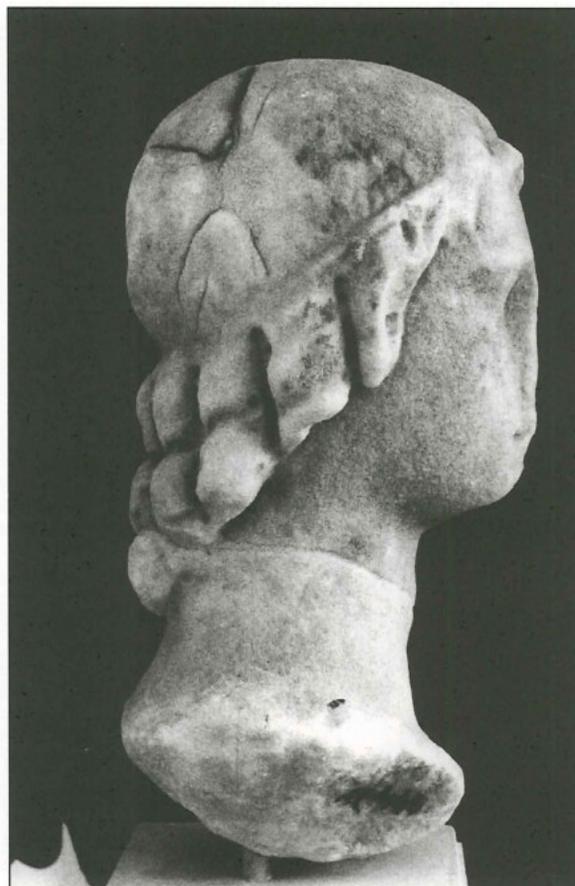
5. W. Lambrinoudakis *et al.*, *LIMC* II 1. Zurich 1984: s.v. Apollon:183-327; Simon 1984: 363-446; M. Flashar, *Apollon Kitharodos: Statuarische Typen des musischen Apollon*. Cologne 1992. Même dans les cas où Apollon porte une coiffure avec des boucles dites "libyques", il se différencie de la tête de Délos du fait qu'une partie de ses cheveux est tressée en couronne autour de la tête; voir p.ex. une tête de Thessalonique: G. Despinis, Th. Stefanidou Tiveriou, Em. Voutiras, *Catalogue of the*

*Sculpture in the Archaeological Museum of Thessaloniki, I. Thessalonique* 1997: 123, no 92, fig. 250-253. Un buste d'Apollon sur un médaillon d'argent d'Herculanum ressemble au premier coup d'oeil à la tête de Délos: B. Barr-Sharrar, *The Hellenistic and Early Imperial Decorative Bust*. Mayence 1987: 152 H 32, pl. 73. Là, il devrait s'agir d'une variante archaïsante de la coiffure d'Apollon avec les cheveux longs tombant sur les épaules qui était très à la mode à la fin de la République et au début de l'Empire: M. D. Fullerton, *The Archaistic Style in Roman Statuary*, *Mnemosyne* Suppl. 110. Leiden 1990: 163-165. 167-169; M.-A. Zaydoun, *La sculpture archaïsante dans l'art hellénistique et dans l'art du Haut-Empire*, *BEFAR* 269. Athènes 1989: 93-94. 105-110. 213-217.

calme, la partie supérieure du visage ne montrant aucune contraction au niveau du front ni des sourcils et la partie inférieure se distinguant par de grands traits lisses; malgré les dommages, on note que la bouche, aux lèvres relativement fines, est fermée. La légère orientation de la tête vers la droite ne laisse transparaître aucune impression de pathos; bien au contraire, elle devait originellement donner à la statue une apparence majestueuse que l'on retrouve sur les modèles classiques.

Dans ces circonstances, il ne faudrait pas dater la tête d'avant la fin du Ier s. av. J.-C., respectivement du début de l'Empire.<sup>6</sup>

Etant donné le très mauvais état de conservation de la couche supérieure du marbre qui a affecté l'ensemble de l'épiderme de la tête, il y a, en dehors de la coiffure, peu d'indices pour une identification. En raison du modelage de la chevelure (Figs. 3 – 4), la pièce a souvent été rapprochée d'un portrait ptolémaïque (Marcadé 1969; Conticello 1962; Richter 1965). Comme l'a remarqué à juste titre H. Kyrieleis, cette attribution n'est pas convaincante, puisque d'après les témoignages des monuments conservés, aucun membre mâle de la dynastie lagide ne s'est fait représenter avec une coiffure analogue (Kyrieleis 1975). La supposition de B. Conticello selon laquelle on ne trouverait sur la tête aucune trace de cheveux car celle-ci aurait été surmontée d'un haut diadème, c'est-à-dire de la couronne de la Haute et de la Basse Egypte (Conticello 1962: 51-52), n'est pas pertinente. Si l'on observe bien, on reconnaît sur le côté droit du crâne, immédiatement au-dessus du bandeau frontal ou du diadème, à la hauteur de la première grosse boucle, la présence de traces peu considérables de cheveux très fins sous forme de mèches légèrement ondulées (Fig. 3). Il faut



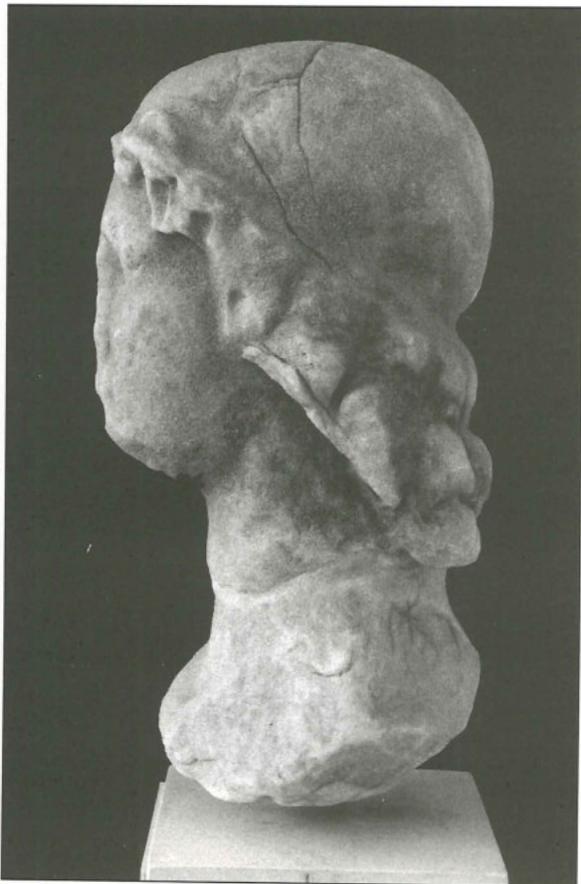
3. Musée de Délos, no. d'inv. A 7403. Tête de jeune homme avec boucles "libyques" (photo de l'auteur).

en déduire qu'à l'origine, la tête toute entière était recouverte de cheveux fins et contigus qui, en raison de la corrosion progressive, ne sont en grande partie plus visibles aujourd'hui (voir aussi Queyrel 1996).

Cependant, il est incontesté que les boucles en tire-bouchon caractéristiques proviennent originellement de la partie Sud-Est du bassin méditerranéen. On doit l'appellation de "boucles libyques" à A. Furtwängler qui, en 1889, y reconnaissait un genre de coiffure typique des représentations d'Isis, des reines ptolémaïques mais aussi des personifications de la Libye (Furtwängler 1889: 80-84, pl. 2, 2). Une vue d'ensemble

6. G. Hafner, *Späthellenistische Bildnisplastik. Versuch einer landschaftlichen Gliederung*. Berlin 1954; H. Weber, *Späthellenistische Bildniskunst*, *JÖAI* 51 (1976-77) Suppl.: 21-47; pour Délos: A. Stewart, *Attika. Studies in Athenian Sculpture of*

*the Hellenistic Age*. London 1979: en particulier 65-98; pour le développement stylistique au Ier s. av. J.-C. et au Ier s. ap. J.-C.: Jaeggi, Schmid 1996: 23-24. 32-33.



4. Musée de Délos, no. d'inv. A 7403. Tête de jeune homme avec boucles "libyques" (photo de l'auteur).

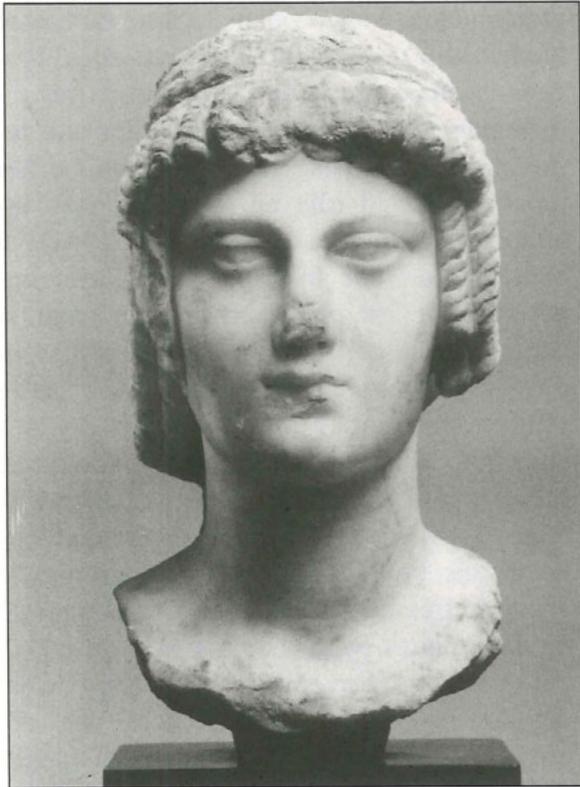
des monuments existants montre effectivement qu'une grande partie des têtes coiffées de manière analogue peuvent être attribuées à l'époque hellénistique alexandrine (Adriani 1948; Adamo Muscettola 1983: pl. 14, 3. 4; 15, 1. 2; Jucker 1983; La Rocca 1984: 13-61). Avec le temps, on trouve les boucles libyques également en dehors de l'Égypte

ptolémaïque, à savoir dans le reste du bassin méditerranéen. Sans doute sont-elles limitées la plupart du temps aux motifs liés directement à l'Égypte, en particulier aux représentations d'Isis.<sup>7</sup> La chevelure d'Isis jouait un grand rôle en Égypte depuis les temps pharaoniques (Nachtergaele 1981), si bien que sur une inscription d'époque impériale, elle est présentée comme étant la "déesse de la coiffure" (Bernard 1982). Les plus grands points communs avec notre pièce se trouvent avant tout dans les oeuvres en relief, alors que les têtes en ronde-bosse présentent la plupart du temps de petites différences. Soit qu'Isis porte également au-dessus des boucles une sorte de couronne de cheveux tressés autour de la tête composée de deux nattes partant du sommet du crâne, comme nous l'avons déjà constaté chez Apollon (voir plus haut; pour les représentations analogues à Isis, voir Jucker 1983), soit que les boucles sont alignées non sur une mais sur deux rangées, comme le montre par exemple la pièce présentée en Figs. 5 et 6 qui, avant de se trouver à New York, était sur le marché des antiquités bâloises. Il s'agit probablement du portrait d'une prêtresse d'Isis ou d'une femme initiée au culte de la déesse.<sup>8</sup> Cette tête constitue la preuve que les véritables boucles d'Isis s'accordent avec une coiffure correspondante sur le crâne (Fig. 6). Notre tête au contraire montre un arrangement de la chevelure nécessitant le port d'un diadème pour retenir les boucles qui ondulent légèrement en vagues

7. Tran Tam Tinh 1990b: 761-796; E. A. Arslan *et al.* (éds), *Iside. Il mito, il mistero, la magia* (Exposition Milan). Milan 1997; Furtwängler 1889; E. Diez, *Isis-Alexandria auf dem grossen Fries von Ephesos*, in: Bonacasa, *Di Vita* 1983: 155-161 pl. 27, 1. 2; F. Solmsen, *Isis among the Greeks and Romans*. Cambridge 1979; F. Dunand, *Le culte d'Isis dans le bassin oriental de la Méditerranée*, 3 vol. Leiden 1973; R. E. Witt, *Isis in the Graeco-Roman World*. London 1971.

8. *Münzen und Medaillen AG, Katalog 40, 13. Dezember 1969* (1969): 99, no 168 (Photo D. Widmer); R. J. Myers, *Ancient Art. Myers/Adams Auction 8, 10 October 1974* (1974): no 9. Dans le

monde gréco-romain, les prêtresses d'Isis et les initiées au culte portaient une chevelure proche de celle de la déesse mais dont la forme se rapprochait plus de celle d'un melon, ce qui correspond bien à ce que l'on trouve en figures 5 et 6; V. Tran Tam Tinh, *Essai sur le culte d'Isis à Pompéi*. Paris 1964: 97; E. J. Walters, *Attic Grave Reliefs that Represent Women in the Dress of Isis, Hesperia* Suppl. 22. Princeton 1988: 52-57; pour Isis voir aussi N. Goldman, *Isis Revealed: Cult and Costume in Italy*, in: D. M. Bailey (éd.), *Archaeological Research in Roman Egypt*, *JRA* Suppl. 19. Ann Arbor 1996: 246-258.



5. Tête de jeune femme avec boucles "libyques" (photo D. Widmer).



6. Tête de jeune femme avec boucles "libyques" (photo D. Widmer).

rapprochées (Figs. 3 et 4).

Bien qu'il ne soit pas toujours possible d'établir avec certitude le sexe d'un personnage portant des boucles libyques (La Rocca 1984: en particulier 53-60), il est peu probable que la pièce de Délos représente Isis. Comme nous venons de le voir, notre tête serait plutôt un portrait qu'une sculpture idéalisée. De plus, la pomme d'Adam bien marquée et la bouche étroite indiqueraient qu'il s'agit là d'un homme.

Dans notre recherche des comparaisons, nous devons donc laisser l'Égypte ptolémaïque de côté. Dans la mesure où nous avons observé que la tête portait à l'origine un diadème, un bandeau ou une couronne, nous pouvons nous limiter à certaines classes sociales. Nous pensons d'abord aux athlètes, aux prêtres ou aux rois, pour lesquels la coiffure est évidemment toujours à considérer. Les parallèles les plus frappants pour la tête de Délos proviennent, à mon

avis, du royaume nabatéen. Nous trouvons une coiffure analogue sur nombre de monnaies figurant des portraits de rois nabatéens (K. Schmitt-Korte, in Weber and Wenning 1997: 101-104; Weiser and Cotton 1996: 268-287; Schmitt-Korte and Price 1994; Peter 1993; Schmitt-Korte 1990: 105-133; Schmitt-Korte and Cowell 1989; Meshorer 1975). Malichus I (62-30 av. J.-C.) (Fig. 7) et Obodas III (30-9 av. J.-C.) (Fig. 8) en particulier se sont fait représenter avec des coiffures analogues.<sup>9</sup> D'ailleurs, un autre point ne rend pas convaincantes les comparaisons avec d'autres têtes aux boucles libyques: ni les portraits nabatéens conservés sur les monnaies ni la tête de Délos ne présentent les petites boucles fines en tire-bouchon, comme on peut en voir sur la tête féminine qui se trouvait sur le marché de l'art (Figs. 5 et 6) ou sur la tête d'Apollon représentée sur les monnaies romaines. On trouve au contraire d'épaisses touffes de cheveux ramenés en

9. Voir aussi Toynebee 1978: 153-155; pour la chronologie des rois nabatéens, voir Wenning 1993.



7. Londres, British Museum. Monnaie nabatéenne avec le portrait de Malichus I (62-30 av. J.-C. (photo British Museum).



8. Londres, British Museum. Monnaie nabatéenne avec le portrait de Obodas III (30-9 av. J.-C.) et sa reine (photo British Museum).

mèches, retenus par un diadème et laissant apparaître une à trois spirales. Par contre, on reconnaît aussi bien chez les rois nabatéens (Figs. 7 et 8) que sur la tête de Délos (Fig. 3) de fins cheveux contigus et ondulés au-dessus du diadème.

Avant de chercher à savoir dans quelle mesure il est possible que la tête de Délos représente un portrait nabatéen, il vaut la peine de se demander s'il existe d'autres exemples présentant une coiffure analogue dans le royaume nabatéen ou dans ses environs. Une tête en bronze qui avait été offerte au roi Georges VI d'Angleterre par l'Imam du Yémen est interprétée comme un portrait nabatéen en raison de sa coiffure (Figs. 9 et 10).<sup>10</sup> Comme le contexte exact de cette tête en bronze n'est pas connu, il est naturellement difficile de la juger sur des critères autres que stylistiques et physiog-



9. Londres, British Museum. Tête en bronze provenant de l'Arabie du sud (photo British Museum).

nomiques. Dans tous les cas, il est sûr qu'elle provient du Sud de l'Arabie et que ce type de coiffure y était répandu à l'époque.<sup>11</sup> La mode des cheveux courts devant et longs

10. Londres, British Museum; Murray, Ellis 1940: 31-32, no 37, pl. 41; D. Collon, *British Museum. Ancient Near Eastern Art*. London 1995: 202, fig. 168; H. Schlobies, *Hellenistisch-römische Denkmäler in Südarabien, Forschungen und Fortschritte* 10 (1934): 242-243. Il semble que la tête aurait été trouvée à Ghaiman lors des fouilles par le prince héritier, plus tard l'Imam Jahja, en 1931.

11. Murray, Ellis 1940 datent la pièce du Ier s. av. J.-C. et l'identifient à Obodas III, alors que J. Pi-

renne, *Notes d'archéologie sud-arabe II, Syria* 38 (1961): 300-302 y voit un roi de Saba et la date de 50-150 ap. J.-C. Les rois du Sud de l'Arabie portent une coiffure fort semblable sur les monnaies himarites: Y. Meshorer, *Sylloge nummorum Graecorum. The Collection of the American Numismatic Society 6: Palestine-South Arabia*. New York 1981: nos 1462-1478 et d'autres encore. Dans les deux cas (Obodas III ou un roi de Saba) l'absence d'un diadème reste inexplicquée.



10. Londres, British Museum. Tête en bronze provenant de l'Arabie du sud (photo British Museum).

derrière est du moins confirmée par les monnaies des autres rois nabatéens. Arétas III, conformément à son surnom de "philhellène" (87-62 av. J.-C.), porte des mèches plus fines dans le genre des autres rois hellénistiques, tel que Mithridate VI du Pont par exemple;<sup>12</sup> autrement, ce portrait très récent d'un roi nabatéen présente les mêmes caractéristiques que Malichus I et Obodas III (Toynbee 1978: 153, Fig. 304; K. Schmitt-Korte in Weber and Wenning 1997: 101, Fig. 104a). Cette coiffure, qui a varié avec le temps, se retrouve jusqu'au dernier roi nabatéen, Rabbel II (70-106 ap. J.-C.).<sup>13</sup> Effectivement, nous apprenons aussi par Pline, dans ses descriptions de l'Arabie, que la coutume voulait que les Arabes portassent les cheveux longs.<sup>14</sup>

Il existe toutefois bien avant Pline des sources concernant une coiffure "arabe" qui devait être tout à fait semblable à celle des rois nabatéens. Ainsi Hérodote, dans ses *Histoires*, rapporte que les Arabes établis en-

tre le Royaume Perse et l'Égypte "portent la même coiffure que Dionysos. Ils coupent leurs cheveux en rond en les rasant autour des tempes" (Hdt., 3, 8, 3; Zayadine 1990a: 153). Si l'on tente de se faire une image d'après cette description, on doit obtenir une tête en forme de champignon avec sans doute les favoris coupés courts pour obtenir exactement la même coiffure que celle figurant sur les monnaies (Figs. 7. 8) et sur la tête de Délos (Figs. 3. 4). Nous reviendrons plus tard sur la deuxième remarque d'Hérodote disant que les Arabes auraient porté une coiffure proche de celle des représentations de Dionysos.

Les reliefs achéménides de Persépolis constituent d'autres documents prouvant que la tradition de cette coiffure remonte loin dans le temps. La délégation 20, identifiée comme étant constituée d'Arabes en raison du dromadaire qui l'accompagne, montre une coiffure correspondant bien à la description d'Hérodote, c'est-à-dire les cheveux coupés en rond, plus courts ou rasés sur les tempes et plus longs derrière (Walser 1966: 97-98, pl. 27. 76; Hachmann 1995). Sur le même cycle de reliefs, les "Putaya", qui sont très vraisemblablement semblables aux représentants libyens, portent une coiffure analogue et ont effectivement de longues boucles dans le dos (Walser 1966: 99-100, pl. 29. 79. 80). Les caractéristiques générales de la coiffure "arabe" sont également confirmées par les reliefs des porteurs du trône du tombeau de Xerxès (Calmeyer 1991: 303, Fig. 7, 4e depuis la gauche): les cheveux courts devant, longs derrière, retombant en plusieurs rangées de boucles, alors que le crâne se distingue par une cheve-

12. Voir les indications chez Jaeggi, Schmid 1996: 23 avec n. 71.

13. Toynbee 1978: 155, fig. 310; K. Schmitt-Korte in: Weber, Wenning 1997: 103, fig. 111a. Les plus grandes différences concernant cette coiffure se trouvent chez Arétas IV (9 av. J.-C. - 40 ap. J.-C.), un souverain qui, à différents égards, se faisait passer pour "romanisé": voir à ce sujet Schmid *The Hellenisation*, et plus bas.

14. Pline, *N. H.* VI 32, 162. En rapport avec cela voir la description - d'un intérêt particulier - chez Murray, Ellis 1940: 31, selon lequel Mohammed aurait porté des nattes lors de son voyage à la Mecque, de même que les ouvriers à Pétra dans les années 20 et 30 de notre siècle qui portaient une coiffure analogue; voir aussi La Rocca 1984: 58, fig. 57.

lure finement travaillée en forme de bonnet. Il faut s'imaginer qu'en général, les reliefs achéménides représentent vraisemblablement des Arabes du Nord, respectivement du Nord-Est de la presqu'île (Graf 1990a: 143-146; Graf 1990b: 56ss.; Roaf 1974: 136).

Les parallèles les plus pertinents chez les Arabes concernant la coiffure à boucles libyques dans le dos se trouvent sur un relief néo-assyrien du palais d'Assurbanipal à Ninive (Barnett 1960: 30, no 114). Un Arabe tombé par terre présente une coiffure typique des nomades avec des cheveux longs peignés dans le dos,<sup>15</sup> alors qu'un autre porte des cheveux courts sur le crâne et des boucles en tire-bouchon dans la nuque, donc une coiffure de loin semblable à celle des rois nabatéens sur leurs monnaies ou à la tête de Délos, même si dans ce cas les oreilles sont dégagées.<sup>16</sup>

Les exemples susmentionnés devraient avoir établi clairement que la tête A 7403 du Musée de Délos porte une coiffure typique des peuples mésopotamiens et arabes, en particulier ceux qui vivaient à la limite des cultures sédentaires de la péninsule arabique.<sup>17</sup> La lourdeur de la partie in-

férieure du visage ainsi que les bajoues de la tête de Délos font penser à un Oriental.<sup>18</sup> Au contraire des Grecs et des Romains, les Orientaux se faisaient souvent représenter bien en chair, signe de richesse et de prospérité. Un des exemples les plus marquants à cet égard est certainement la statue de "Mausole" qui provient du fameux tombeau d'Halicarnasse.<sup>19</sup> Cette conscience typiquement orientale du corps se poursuit à l'époque hellénistique à travers les surnoms des souverains comme Tryphon ou Physkon.<sup>20</sup> Les rois nabatéens sont eux aussi représentés joufflus sur leurs monnaies avec une certaine lourdeur au niveau de la partie inférieure du visage. Tout comme pour la coiffure, ce sont Malichus I et Obodas III qui offrent le plus de comparaisons (Figs. 7 et 8). En dehors de cela, il faut considérer une autre petite statuette féminine (?) découverte à Pétra (U. Hübner in: Weber and Wenning 1997: 112-113, Fig. 125a. b). La tête est tournée à droite, vers le haut, dans un mouvement impulsif, trait typique de la plastique hellénistique depuis Alexandre le Grand. La tête montre d'autres conformités par rapport à la pièce de Délos: le visage bien en chair et la coiffure avec de grosses

15. Voir P. Bernard, Plutarque et la coiffure des Parthes et des nomades, *JS* (1980): 67-84. La coupe de cheveux des rois hellénistiques de la périphérie du monde classique s'inspire de manière significative de ce type nomade, même si, pour des raisons politiques, ils se présentent comme entièrement hellénisés: voir le portrait de la monnaie de Mithridate VI du Pont: Jaeggi, Schmid 1996: 23 avec n. 71.

16. Au contraire des autres Arabes du même cycle de reliefs, le personnage à la coiffure significative pour nous porte un vêtement long. On pourrait en conclure qu'il s'agit d'une femme bien qu'aucune différence sexuelle secondaire ne soit signalée. Sur le relief achéménide (voir plus haut), les dignitaires arabes sont toujours vêtus de long et nous pouvons dès lors nous demander si nous n'avons pas là un personnage socialement haut placé.

17. Le milieu mésopotamo-arabique de ce type de coiffure a également été établi par l'étude détaillée de M. Güngör, *Altorientalische Haartrachten in neuassyrischer Zeit*. Berlin 1982; en particulier les types 2 (*ibid.*: 259ss.) et 3 (*ibid.*:

302ss.).

18. Il faut s'imaginer le personnage encore plus joufflu à l'origine, étant donné qu'une partie du menton manque, comme nous pouvons clairement le constater sur les fig. 1. 2. 4.

19. G. B. Waywell, *The Free-Standing Sculptures of the Mausoleum at Halicarnassus in the British Museum*. London 1978: 40-43. 97-103, no 26, pl. 13-15; à ce sujet récemment paru: P. Higgs, A Newly Found Fragment of Free-Standing Sculpture from the Mausoleum at Halicarnassus, in: I. Jenkins, G. B. Waywell (éd.), *Sculptors and Sculptures of Caria and the Dodecanese*. London 1997: 30-34. Les observations faites plus haut sur la conservation de la coiffure du type nomade sont également valables pour ce portrait de dynaste considérablement hellénisé.

20. Voir p.ex. H. Jucker, D. Willers (éd.) *Gesichter. Griechische und römische Bildnisse aus Schweizer Besitz*. 3Bern 1983: 24-25; R. Fleischer, *Studien zur seleukidischen Kunst, I. Herrscherbildnisse*. Mayence 1991: 68-70 (Tryphon); Kyrieleis 1975: 63-64 (Physkon).

mèches travaillées en boucles libyques correspondent exactement à cette dernière.<sup>21</sup> Le port des boucles libyques chez les Nabatéens est représenté sur d'autres documents encore, tel un groupe de terres cuites masculines et de statuettes en bronze pour lesquelles, dans la plupart des cas, aucune provenance exacte n'est assurée (Parlasca 1986: 193-196; voir aussi à ce sujet La Rocca 1984: 55-60). Enfin, une petite tête barbue en calcaire provenant de Pétra, interprétée comme un roi nabatéen en raison du diadème, présente les mêmes boucles en tire-bouchon<sup>22</sup>.

Les parures ajoutées à la coiffure pourraient constituer un autre argument pour la provenance orientale de notre tête. Comme cela a déjà été signalé plus haut, des traces de parure ajoutée à la chevelure sont clairement visibles dans la région du front et des boucles latérales, sans que l'on puisse déterminer le matériau utilisé à l'origine.<sup>23</sup> Même si notre tête n'est pas conservée pareillement des deux côtés, les ajouts semblent symétriques, c'est-à-dire qu'ils semblent avoir été posés de la même manière des deux côtés de la tête (Figs. 1-4). Les traces sont bien visibles sur le côté gauche du front; sur le droit, on les devine. D'autres traces sont visibles sous la forme d'une pe-

tite perforation faite des deux côtés à la hauteur de la première grosse boucle. Ailleurs, les traces d'ajouts sont discernables différemment selon l'état de conservation: du côté droit, on reconnaît une perforation sur la deuxième boucle alors que du côté gauche, on en détecte une sur la troisième. Il n'est pas exclu que ces ajouts aient un rapport économique avec le marbre, ce qui à cet égard est typique des territoires d'Arabie et d'Égypte dépourvus de ce matériau onéreux.<sup>24</sup> Le bloc de marbre à disposition était probablement trop petit pour exécuter toute la chevelure d'une seule pièce et des ajouts ont dû être effectués. Les monnaies nabatéennes attestent des représentations avec des boucles supplémentaires.

Il est naturellement difficile d'apporter des preuves autres que la grande ressemblance avec les monnaies pour identifier notre tête à un roi nabatéen, étant donné que nous ne connaissons pas le contexte exact de sa découverte. Pour ce qui est de l'utilisation et du contexte de mise en place de la statue à l'origine, nous ne pouvons encore une fois qu'émettre des hypothèses. Il faut à ce sujet consulter l'inscription ID 2315.<sup>25</sup> Il s'agit d'une inscription votive du "premier ministre" nabatéen Syllaios,<sup>26</sup> une personnalité extrêmement difficile à juger d'un point de vue

21. Seule différence: les deux nattes partant du sommet de la tête et reliées en arrière.

22. E. French, *Two Hellenistic Heads from Petra*, *ADAJ* 38 (1994): 267-269, fig. 1-2. Le port de la barbe constitue un problème pour l'attribution de cette pièce à la représentation d'un roi nabatéen. En effet, les seuls portraits assurés des rois nabatéens sur les monnaies les figurent sans barbe. L'identification de la tête avec Obodas III divinisé proposée par E. French ne s'appuie sur aucun élément sérieux; à ce sujet, voir aussi plus bas. La tête mentionnée par La Rocca 1984: 58-60, avec n. 261, provenant de la collection de G. Bretschneider que E. La Rocca a tenté d'interpréter comme faisant partie de l'environnement nabatéen n'a, à ma connaissance, pas encore été publiée.

23. L'autopsie faite en avril 1998 n'a rien révélé des restes de corrosion métallique mentionnés par Conticello 1962: 51 avec n. 18. La question de savoir s'il s'agissait d'ajouts en métal ou bien en marbre reste donc ouverte. Pour l'apparence des

ajouts, voir aussi plus bas.

24. En Égypte, le manque de marbre s'exprimait par les ajouts fréquents mais aussi par le remaniement des portraits; voir par exemple H. Jucker, *Römische Herrscherbildnisse aus Ägypten*, *ANRW* II 12.2. Berlin 1981: 678 avec n. 35; 681-687. 690-691. 694. 700. 706. 708. 710-711. 713-714. 723; Jucker 1983.

25. Bruneau 1970: 244-245.; voir aussi Wenning 1987: 23, no 4; Roche 1996: 83-85, no 11; on doit la lecture correcte à J. T. Milik, Une inscription bilingue nabatéenne et grecque à Pétra, *ADAJ* 21 (1976): 146 n. 11, respectivement à une information analogue dans Bruneau 1970.

26. Voir Strabon, *Geogr.* XVI 4, 21; Wenning 1993: 26-27 avec n. 14; 34-35; Hammond 1973: 107-108; Jos., *Ant.* XVI 7, 6; XVI 9, 1-10, 9; N. Kokinos, *The Herodian Dynasty. Origins. Role in Society and Eclipse*. Sheffield 1998: 177-205, surtout 182-184; Bowersock 1983: 47-53; M. Lindner, in: Lindner 1974: 122ss.

historique. Syllaios occupait le poste le plus élevé après celui du roi dans le royaume nabatéen aussi bien sous Obodas III que pour quelques années sous le règne de son successeur Arétas IV (9 av. J.-C. à 40 ap. J.-C.). Syllaios, connaissant bien les lieux, servait les troupes d'Aelius Gallus en tant que guide dans l'expédition en Arabie du Sud dans les années 25/4 av. J.-C.; il porta plus tard aux yeux des Romains la responsabilité de l'échec de l'entreprise, ce qui devrait renvoyer à une représentation consciente de l'appareil de propagande romain.<sup>27</sup> C'est pour cette raison, ainsi que pour d'autres crimes prétendus ou réels, que Syllaios fut accusé à Rome devant le Princeps en 9/8 av. J.-C. et décapité finalement en 6 av. J.-C. sur l'ordre d'Auguste.<sup>28</sup> L'inscription de Délos date de 9/8 av. J.-C. et, tout comme l'inscription de Milet (Roche 1996: 80-83, no 9; Wenning 1987: 23, no 6; Kawerau and Rehm 1914: 387-389), elle concerne le premier voyage de Syllaios à Rome. Il s'agit d'une dédicace à Dusares en l'honneur d'Obodas qui fut trouvée dans la partie Nord du sanctuaire du Cynthe visiblement consacré à une divinité sémitique.<sup>29</sup>

Si nous tentons de résumer les résultats obtenus jusqu'ici, nous obtenons à peu près l'image suivante: la tête A 7403 du musée de Délos présente une nette ressemblance avec les portraits des rois nabatéens que l'on trouve sur les monnaies, notamment avec Malichus I et Obodas III. D'une manière

générale, étant donné la coiffure et l'apparence charnue du visage, la tête devrait provenir d'un environnement oriental. De plus, il a été établi qu'il y avait à Délos un sanctuaire de Dusares – la plus importante des divinités nabatéennes – également fréquenté par les plus hautes classes nabatéennes comme l'atteste la dédicace de Syllaios.

A ce sujet, il vaut la peine de revenir encore une fois sur la remarque d'Hérodote citée plus haut, selon laquelle les Arabes se vantaient de porter la même coiffure que Dionysos. Dans ce cas, ce dernier est évidemment assimilé à une divinité arabe qu'Hérodote appelle Orotalt. Il est donc particulièrement intéressant de constater que la variante nabatéenne de ce dieu de la végétation devait correspondre à Dusares.<sup>30</sup> Or, l'autre identification proposée et attestée avec Zeus/Jupiter ne doit pas contredire une assimilation avec Dionysos (pour un avis contraire, Roche 1996: 82-83; voir aussi Hammond 1973: 95-96). Lors de la confrontation avec le Panthéon gréco-romain, les Nabatéens ainsi que d'autres peuples de la périphérie de la Méditerranée se sont vus confrontés au fait que le pendant fonctionnel de leurs dieux ne correspondait pas toujours à un équivalent hiérarchique. Le Dusares nabatéen semble avoir été en premier lieu une divinité de la végétation. Par conséquent, on l'identifiait dans la plupart des cas au Dionysos grec, plus rarement à Hélios (voir plus haut; voir aussi Wenning 1989: 250-253). Dusares

27. Strabon, *Geogr.* XVI 4, 22-24; D. C., LIII 29, 3-8; S. E. Sidebotham, *Aelius Gallus and Arabia, Latomus* 45 (1986): 590-602, en particulier 598; D. T. Potts, *Augustus, Aelius Gallus and the Periplus: A Re-Interpretation of the Coinage of San'a' Class B*, in: N. Nebes (éd.), *Arabia Felix. Beiträge zur Sprache und Kultur des vorislamischen Arabien, Festschrift Walter W. Müller zum 60. Geburtstag*. Wiesbaden 1994: 212-222; Hammond 1973: 22.

28. Au sujet du premier voyage et des événements à Rome, voir Jos., *Ant.* XVI 9, 2ss.; XVI 10, 8-9; sur le deuxième voyage de Syllaios à Rome, voir Jos., *Ant.* XVII 3, 2; XVII 4, 3; Roche 1996: 92-93.

29. Voir aussi le commentaire de Bruneau 1970: 240; l'endroit serait idéal pour un sanctuaire de

Dusares, dans la mesure où ce dernier était volontiers vénéré dans les montagnes.

30. Le Dusares nabatéen est une haute divinité multiple qui, d'après les documents conservés, a pu être identifié à Dionysos, Hélios et Zeus/Jupiter; voir R. Wenning, H. Merklein, *Die Götter in der Welt der Nabatäer*, in: Weber, Wenning 1997: 105-110, en particulier 110; Zayadine 1990a; M. Gawlikowski, *Les dieux des Nabatéens, ANRW II* 18.4. Berlin 1990: 2659-2677, au sujet de Dusares 2662-2665; voir aussi Arrian, *Anab.* 7, 20, 1; Moutsopoulos 1990; Bowersock 1990; Tran Tam Tinh 1990a; E. A. Knauf, *Dushara and Shai' al-Qaum, ARAM* 2 (1990): 175-183, voir aussi plus bas. Pour l'assimilation avec Dionysos, voir Tubach 1993: en particulier 59 avec n. 16.

étant la plus haute divinité des Nabatéens, ni Dionysos ni Hélios ne pouvaient égaler cette position hiérarchique, si bien que dans les cas où il fallait comparer Dusares à un dieu de son importance, on préférait l'assimiler à Zeus. Donc, si les Nabatéens effectuaient leurs dédicaces à Dusares en deux langues – grec-nabatéen ou latin-nabatéen – dans l'espace méditerranéen, il est évident qu'ils les vouaient au plus grand des dieux nabatéens, en l'occurrence Zeus-Dusares. Par contre, dans le cas où la dédicace était faite sous forme d'une représentation figurée, par exemple une statue, il faut en déduire qu'elle devait correspondre à l'iconographie usuelle du dieu de la végétation, donc à Dionysos-Dusares.

Comme cela a été démontré, il semble qu'il existait depuis les temps anciens une coiffure de base typiquement arabe correspondant bien à la description d'Hérodote et dont la tête de Délos présente une variante hellénisée. On peut donc se demander si la similitude entre la coiffure des rois nabatéens et celle de Dionysos/Dusares ne renvoyait pas à une assimilation du roi avec le dieu. Du côté gréco-romain, on remarquera avant tout que les figurations de Dionysos jeune présentent un type de coiffure légèrement apparenté à celui de notre tête, les cheveux longs dans la nuque et des nattes tombant sur les épaules,<sup>31</sup> si bien qu'un observateur familiarisé avec l'iconographie gréco-romaine y verrait une assimilation. Du côté nabatéen, nous connaissons effectivement le cas d'un roi déifié dont le nom est

Obodas (Wenning 1993: 25, n. 5; 33; Wenning 1997: 190-192). Ce dernier était vénéré dans un petit lieu de culte sur l'Acropole de la ville d'Oboda – ainsi nommée probablement en son honneur – dans le Negev (Negev 1991; Negev 1996: 223-225 et avant tout Negev 1997: 24ss). Il est intéressant de constater qu'il y avait à Oboda de nombreuses inscriptions qui n'attestaient pas seulement le culte d'Obodas mais aussi celui de Dusares (Negev 1991: 62-63). La vénération d'un Obodas déifié est d'ailleurs aussi attestée à Pétra (Wenning 1987: 264-265; Wenning 1997: 183-190; voir aussi Lindner, in Lindner 1974: 127-128). Malgré toutes les confusions existantes, il faut très probablement y voir Obodas III divinisé (Wenning 1993: 25, n. 5; 33-34; Wenning 1987: 160. 168. 171) en raison surtout des documents qui attestent la déification d'Obodas justement sous le règne d'Arétas IV. (9 av. J.-C. - 40 ap. J.-C.). On peut donc en conclure que la déification a eu lieu *post mortem*, c'est-à-dire en 9 ap. J.-C. ou peu après.<sup>32</sup>

L'iconographie du Dusares nabatéen n'est pas facile à définir, dans la mesure où les Nabatéens vénéraient leurs dieux dans une tradition empruntée aux Arabes, sous forme de stèles aniconiques – les bétyles – qui, tout au plus, présentaient d'extrêmement rares indications telles que le nez ou les yeux. Malgré cela, il existe suffisamment d'exemples qui attestent que dès la fin du I<sup>er</sup> s. av. J.-C., la crainte des représentations anthropomorphes dans le royaume nabatéen disparut progressivement.<sup>33</sup> On ne trouve de docu-

31. A ce sujet, voir avec documentation détaillée: *Dionysos. "Die Locken lang, ein halbes Weib?..."* (Exposition Munich 1997/98). Munich 1997. Si l'identification du buste du Vatican provenant de Pozzuoli devait correspondre avec Dusares/Dionysos (Tubach 1993), nous aurions là une preuve que les Nabatéens auraient même repris la variante du type de Dionysos vieux.

32. Une monnaie d'Obodas III datant de 16 av. J.-C. ne semble pas montrer de relation vraiment précise entre Dusares et le roi de son vivant: Schmitt-Korte 1990: 110, no 19.

33. Un exemple parmi d'autres est celui d'un cycle entier de reliefs du domaine de Qaşr al-Bint à Pétra avec des représentations de différents dieux

entièrement "hellénisés". Un des plus beaux bustes de cette époque montre Dionysos avec une couronne de vigne et un thyrses; voir Freyberger 1998: 15-18 avec n. 196, pl. 11a; I. Kader, *Propylon und Bogentor. Untersuchungen zum Tetrapylon von Latakia und anderen frühkaiserzeitlichen Bogenmonumenten im Nahen Osten, Damaszener Forschungen 7*. Mayence 1996: 108-144, en particulier 132-136, fig. 65 B1; pour un autre buste de Dionysos provenant de Pétra, voir M.-J. Roche, *Bustes fragmentaires trouvés à Pétra, Syria 67* (1990): 384-385, no 5, fig. 6; pour la problématique de "l'hellénisation" chez les Nabatéens en général, voir Schmid, *Hellenisation*; Wenning 1989: 243-260.

ments sûrs concernant l'iconographie de Dusares que vers 177 ap. J.-C., lorsque l'empereur Commode fit représenter la tête de Dusares de Bostra sur une monnaie<sup>34</sup>. Dusares, dont l'identification est confirmée par une inscription, est présenté ici sous les traits d'un jeune homme. G. Bowersock le décrit de la manière suivante (Bowersock 1990: 31; voir aussi Tran Tam Tinh 1990a: 109): "The profile and the long flowing hair call more readily to mind the indigeneous coinage of the Nabataeans themselves. Dusares has the face and the hair style of the Nabataean kings". La représentation de la monnaie présente effectivement des parallèles tout à fait clairs avec les portraits des rois nabatéens, notamment l'arrangement des boucles et la lourdeur des traits du bas du visage. En dehors de ces points de repères, F. Zayadine a pu le premier mettre en rapport une représentation sur un rocher de Pétra avec Dusares.<sup>35</sup> Il est intéressant de constater que le dieu figure ici deux fois, d'abord sous une forme aniconique en temps que bétyle et par-dessus sous une forme anthropomorphe. Le relief est malheureusement très endommagé; cependant on reconnaît des deux côtés de la tête de longues boucles épaisses et une grande coiffe en forme de haut diadème ou de couronne, autrement dit l'ornement végétal du dieu.

En résumé, on peut établir que Dusares, dans sa variante anthropomorphe qui devait correspondre dans ses grandes lignes au

Dionysos grec, présente une iconographie très proche de celle des rois nabatéens. Le rapport étroit entre le portrait royal et l'iconographie des dieux remonte peut-être jusqu'à Hérodote qui, d'un côté atteste que les Arabes vénéraient Dionysos comme dieu principal et, d'un autre côté, rapporte que les Arabes étaient connus pour porter la même coiffure que le dieu. Nous pourrions ensuite démontrer que la déification d'un roi nabatéen est attestée au moins dans un cas et que ce culte a eu lieu dans un contexte où, d'après les témoignages écrits, Dusares aurait lui aussi été vénéré.

Si nous tentons d'appliquer ces remarques à notre tête délienne, que nous avons tendance à identifier avec un roi nabatéen, nous obtenons des résultats aussi remarquables que largement hypothétiques. En plus de la grande ressemblance avec les portraits des souverains nabatéens sur les monnaies, la tête A 7403 présente quelques points communs avec les représentations de Dusares/Dionysos, la plus grande divinité nabatéenne; il n'est donc pas exclu que nous soyons en présence d'un roi déifié. De cette façon, les propositions divergentes évoquées jusque là seraient rapprochées; on aurait donc un portrait et une représentation divine en un objet. Une assimilation avec Dusares pourrait au moins être justifiée par les traces isolées laissées par les ornements ajoutés sur la tête, en particulier dans la zone du front et des tempes; peut-être faut-il y voir un ajout

34. Bowersock 1990; voir aussi C. R. Morey, Dusares and the Coin-Types of Bostra, in: H. C. Butler, *Syria. Publications of the Princeton University Archaeological Expeditions to Syria in 1904-5 and 1909*, II A. Leiden 1907: après p. 295, II A 4, p. XXVII-XXXVI.; Id., Une nouvelle représentation de Dusarès et autres types de Bostra (Arabie), *RevNum* 15 (1911): 69-85; A. Spijkerman, *The Coins of the Decapolis and Provincia Arabia*. Jerusalem 1978: 66-89, nos 24. 37. 39; P. Naster, Le culte du dieu nabatéen Dusarès reflété par les monnaies d'époque impériale, in: *Actes du 9e Congrès international de numismatique, Berne, Septembre 1979*. Louvain-La-Neuve 1982: 399-408; A. Kindler, *The Co-*

*inage of Bostra*. Warminster 1983: 58-60 et avant tout *ibid.*: 79-83; pour le culte de Dusares à Bosra/Bosra voir maintenant L. Nehmé, Une inscription nabatéenne inédite de Bosra (Syrie), in: Ch.-B. Amphoux *et al.* (éd.), *Etudes sémitiques et samaritaines offertes à Jean Margain*. Lausanne 1998: 63-73, surtout 71-73.

35. F. Zayadine, Die Götter der Nabatäer, in: M. Lindner (éd.), *Petra und das Königreich der Nabatäer*. Munich 1973: 110; Tran Tam Tinh 1990a: 10 avec n. 25; Moutsopoulos 1990: 59, fig. 5.; Ph. C. Hammond, The Medallion and Block Relief at Petra, *BASO* 192 (1968): 16-21 identifie le médaillon avec une divinité féminine, opinion que F. Zayadine, à mon avis, rejette avec raison.

d'éléments végétaux<sup>36</sup>? Si, pour l'instant, seule une divinisation de roi nabatéen peut être attestée, en l'occurrence celle d'Obodas III (30-9 av. J.-C.) probablement, il serait tentant d'identifier aussi notre tête à ce monarque d'autant plus que le portrait de la monnaie (Fig. 8) présente de nombreuses similitudes avec elle. Dans la mesure où l'apothéose d'Obodas III semble s'être produite après sa mort, nous obtenons une datation de la tête en l'an 9 av. J.-C. ou peu après, ce qui nous renvoie une fois de plus à l'inscription de Syllaios. Le texte consiste en une dédicace de Syllaios à Dusares en l'honneur de la vie d'Obodas. L'inscription est datée de février 9/8 av. J.-C.; cependant Obodas III étant décédé en 9 av. J.-C., à notre connaissance, il était donc déjà mort au moment de la dédicace. Cette dernière daterait dans ce cas de 8 av. J.-C. Or l'offrande est dédiée à sa vie, ce qui, à première vue, constitue une importante contradiction, à moins que cette formule ne représente déjà sa déification. Dans ce cas, il faudrait compléter de façon plus conforme au sens "en l'honneur de la vie (éternelle) d'Obodas". C'est pourquoi il semble nettement moins fâcheux de dater l'inscription de Délos du mois de février de l'an 9 av. J.-C., un mois après celle de Milet; les deux auraient ainsi été placées sur la route de Rome.<sup>37</sup>

Malgré le fait que la question de la datation se pose toujours, de même que le fait de

savoir si Obodas III a été divinisé de son vivant ou juste après sa mort, il reste pourtant incontesté que Syllaios, le deuxième homme de l'Etat nabatéen, plaça une dédicace sur le Cynthe pour Dusares en l'honneur d'Obodas. Il avait, dans tous les cas, de bonnes raisons pour cela dans les années 9/8 av. J.-C. et sans doute aussi bien du vivant du roi qu'après sa mort. Même si les reproches à l'encontre de Syllaios, comme quoi il aurait fait empoisonner Obodas III afin de s'emparer lui-même du trône,<sup>38</sup> peuvent avoir été un complot de ses adversaires politiques, il devait certainement lui sembler opportun de démontrer son loyalisme envers Obodas dans toutes les occasions qui s'offraient à lui; une telle dédicace s'y prêtait naturellement de préférence. Qu'y a-t-il de plus simple que de mettre notre tête en rapport avec cette dédicace? En ignorant la provenance exacte de la statue à laquelle notre tête appartenait, qui pouvait donc aussi bien servir de décor dans une maison privée (voir en général Kreeb 1988) ou dans une société de marchands nabatéens,<sup>39</sup> il semble bien possible que Syllaios l'ait placée dans le sanctuaire de Dusares sur le Cynthe lors de sa visite. Le fait que les statues des rois nabatéens étaient érigées dans des lieux sacrés a été attesté par toute une série de bases de statues provenant des environs de Qaṣr al-Bint à Pétra, endroit d'ailleurs identifié comme étant un sanctuaire de Dusares

36. Voir aussi plus haut au sujet du relief de Pétra. On pourrait par exemple penser à des feuilles de vignes ou à d'autres sortes de feuilles; Tubach 1993: pl. 5, 3, 4.

37. Sinon il faudrait admettre que Syllaios a dédié l'inscription de Milet sur le chemin de l'aller et celle de Délos au moment de son retour ce qui, à vrai dire, aurait été un fait très intéressant dans le cadre de la divinisation d'Obodas III et des prétendues luttes pour le trône entre Arétas IV et Syllaios mais qui constituerait également une complication inutile de la situation.

38. Jos., *Ant.* XVI 9, 4; *ibid.*, XVII 3, 2; voir aussi Roche 1996: 92-93; Bowersock 1983: 51-52; Hammond 1973: 24.

39. Des comptoirs de marchands nabatéens ont été

identifiés à Délos et à Puteoli sur la base des inscriptions. Dans les deux cas il s'agit d'une preuve indirecte sous forme d'inscriptions à contenu religieux, notamment de dédicaces à Dusares: V. Tran Tam Tinh, *Le culte des divinités orientales en Campanie en dehors de Pompéi, de Stabies et d' Herculanium*. Leiden 1972: 127-131. 141-147; A. M. Bisi, Su una base con dedica a Dusares nell'Antiquarium di Puzzuoli, *AION(archeol)* 32 (1972): 381-387; G. Lacerenza, Il dio Dusares a Puteoli, *Puteoli* 12-13 (1988-89): 119-149; Id., Due nuove iscrizioni del tempio di Dusares dell'antica Puteoli, *AION(archeol)* 54 (1994): 15-17; Wenning 1987: 32-33, no 2; Roche 1996: 86-87. 89, nos 15. 17.

(Freyberger 1998: 11 avec n. 114; 13-14; Wenning 1989: 250).

S'il s'agit effectivement d'un portrait d'un roi nabatéen dans le cas de la pièce de Délos (Figs. 1-4), une réflexion intéressante s'offre à nous. R. R. R. Smith a pu démontrer que les portraits des rois clients de la fin du II<sup>e</sup> et du I<sup>er</sup> s. av. J.-C. suivent des directions stylistiques différentes qui s'expliquent, du moins partiellement, par des raisons politiques (Smith 1988b). Ainsi apparaissent des portraits dynamiques et empreints d'une forme de pathos dans la tradition hellénistique tardive, comme le montre par exemple Mithridate VI mais aussi des représentations qui reprennent clairement des traits et des tendances stylistiques de la fin de l'époque républicaine. Il semble que ce sont surtout les rois clients dépendants plus fortement de Rome et de la bonne volonté du gouverneur de l'Etat romain qui se faisaient représenter ainsi, afin de souligner leur attachement à la puissance protectrice.

En conséquence, il faut en conclure qu'après 30, respectivement 27 av. J.-C., cette catégorie de souverains s'adaptait également au type de représentation vêtu du début du principat (Zanker 1987: *passim*, en particulier 103-106) et se faisait représenter d'une manière calme plus fortement classicisante. La tête de Délos (Figs. 1-4) correspond très bien à cette description et il faut donc se poser la question si pour les rois nabatéens y aurait eu des raisons de se faire représenter ainsi.

En effet, les troubles consécutifs à la succession d'Obodas III montrent qu'il a dû y avoir une certaine dépendance des Nabatéens par rapport à Rome car Auguste devait tout d'abord accepter Arétas IV pour

que celui-ci puisse régner légitimement. En fait, Auguste était irrité qu'Arétas soit monté sur le trône sans demander l'approbation de Rome (Jos., *Ant.* XVI 9, 4 [295]; XVI 10, 9 [353]; Bowersock 1983: 5)! Le portrait des rois nabatéens ne présente, à première vue, aucun changement dans les années après 30 av. J.-C., si bien qu'Obodas III, tout comme Arétas IV, porte les boucles traditionnelles en tire-bouchon sur les monnaies. Par contre, on peut très bien relever un détail faisant référence à Rome: en 14/13 av. J.-C., Obodas III frappe pour la première fois des monnaies sur lesquelles il est couronné (de laurier?) alors qu'auparavant, lui-même et tous ses prédécesseurs étaient représentés exclusivement diadémés.<sup>40</sup> On trouve d'autres portraits d'Obodas III couronné sur des monnaies datant des années 13/12, 12/11 et 10/9 av. J.-C.<sup>41</sup> Il est intéressant de constater que parallèlement à cela, Obodas III se fait encore représenter avec un diadème sur d'autres monnaies (Meshorer 1975: 92, nos 32. 34. 36. 38; Schmitt-Korte 1990: 111, no 24). Immédiatement après avoir pris possession du trône en 9 av. J.-C. et jusqu'en 6/5 av. J.-C., son successeur Arétas IV figure encore avec le diadème (Meshorer 1975: 94-96, nos 46. 47. 47A. 50. 52. 55; Schmitt-Korte 1990: 116-117, nos 52-54); mais déjà en 9/8 av. J.-C. apparaît aussi le monnayage avec la couronne (Meshorer 1975: nos 48-49A) et c'est dès 5 av. J.-C. que le portrait couronné se trouve de manière exclusive sur les monnaies nabatéennes.

Les années 14/13 à 10/9 av. J.-C. furent empreintes du conflit entre les Nabatéens et Hérode le Grand (Jos., *Ant.* XV 10, 2; XVI 9, 1ss.; Meshorer 1975: 32-33; Millar 1993: 39-40; Bowersock 1983: 49-54; Hammond

40. Meshorer 1975: 92, no 33; les monnaies publiées par Schmitt-Korte 1990, avec l'appellation de Dusares, datant de 16 av. J.-C., présentent déjà sur l'avvers une tête couronnée, qui, par conséquent serait la plus ancienne représentation d'un roi nabatéen portant une couronne. En fait, ce type de coiffure semble dans le fond différent et on pour-

rait se demander s'il s'agit vraiment d'Obodas III ou s'il ne s'agirait pas plutôt de Dusares, du reste nommé sur le revers.

41. Meshorer 1975: 92, nos 35. 37. 39; le no 37 est interprété par Y. Meshorer comme portant un diadème, ce qui a été corrigé par Schmitt-Korte 1990: 110, nos 21. 22.

1973: 22-25). Dans ce conflit, Auguste soutint Hérode, à l'exception d'un épisode mémorable au cours duquel Syllaios lui fit croire qu'Hérode était le véritable agresseur (Jos., *Ant.* XVI 9, 2ss). Dans l'ensemble, la situation pour les Nabatéens se présentait assez difficile dans les dernières années du règne d'Obodas III et au début du règne d'Arétas IV, alors que Rome avait clairement pris parti pour les Juifs et avait même partiellement l'intention de donner le Royaume nabatéen à Hérode, d'où Auguste était soi-disant à peine revenu, alors que, pour lui, la position d'Hérode par rapport à ses querelles internes perpétuelles semblait trop faible: (Jos., *Ant.* XVI 10, 9 [353-355]). C'est pourquoi il dut sembler convenable aux souverains nabatéens, du moins au premier abord, de montrer leur dévouement envers Rome et le Princeps. De même Syllaios dut considérer comme judicieusement tactique, face aux accusations portées contre lui à Rome et à Pétra, de prouver son alliance avec Obodas III en lui offrant les dédicaces milésiennes et déliennes; de même il semblerait qu'Obodas III et Arétas IV aient affirmé le soutien qu'ils portaient à Auguste en reprenant la couronne<sup>42</sup>. Dans de telles conditions, ce n'est certainement pas un hasard si l'ambassade envoyée par Arétas IV remit à Auguste une précieuse couronne en or que ce dernier en réalité renvoya, fâché de l'avènement arrogant d'Arétas<sup>43</sup>. Aussi voit-

on dans cet épisode la symbolique de la couronne comme légitimation de la souveraineté. D'un point de vue stylistique, on peut également constater une ressemblance entre les portraits d'Arétas IV représentés sur ses monnaies et le monnayage romain, bien qu'il conserve également la coiffure traditionnelle avec de longs cheveux tombant sur la nuque (Toynbee 1978: 155, Fig. 308). D'un autre côté, l'épithète d'Arétas IV – Philodème – prouve qu'il avait bien essayé de représenter une politique indépendante, du moins envers ses sujets. D'où une ambivalence très intéressante: d'un côté un portrait "conforme à Rome", d'un autre côté son nom révélant un désir d'autonomie qui prouve qu'Arétas IV arrivait à la perfection à tenir son rôle sur la scène de la politique internationale dans un contexte de tensions entre le puissant Empire romain et l'ancienne tribu nomade.

Il en ressort donc que le calme classicisant de la tête de Délos (Figs. 1-4) se situe de préférence dans l'arrière-plan historique des années 9/8 av. J.-C.; c'est peut-être une raison de plus pour y voir un portrait d'Obodas III.

Stephan G. Schmid  
Ecole suisse d'archéologie en Grèce  
Skaramanga 4b  
GR-104 33  
Athènes

42. D'autres rois clients de cette époque ont également exprimé leur soutien envers Rome à travers les monnaies. Mais alors qu'Artavasdes II d'Arménie (6-2 av. J.-C.), par exemple, tranchait pleinement avec les représentations traditionnelles des monnaies arméniennes, figurant alors avec une coiffure et une couronne typiquement augustéennes, les souverains plus tardifs du

Pont et du Bosphore, bien qu'étant de véritables marionnettes romaines, se firent représenter avec un diadème jusqu'au I<sup>er</sup> s. ap. J.-C.: Toynbee 1978: 114-123 (Pont et Bosphore); 133 (Artavasdes II).

43. Jos., *Ant.* XVI 9, 4 (296): στεφανον τε χρυσου απο πολλων ταλαντων; voir aussi une épisode comparable où les Nabatéens avaient of-

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# PETRA, THE PERIPLUS AND ANCIENT INDO-ARABIAN MARITIME TRADE

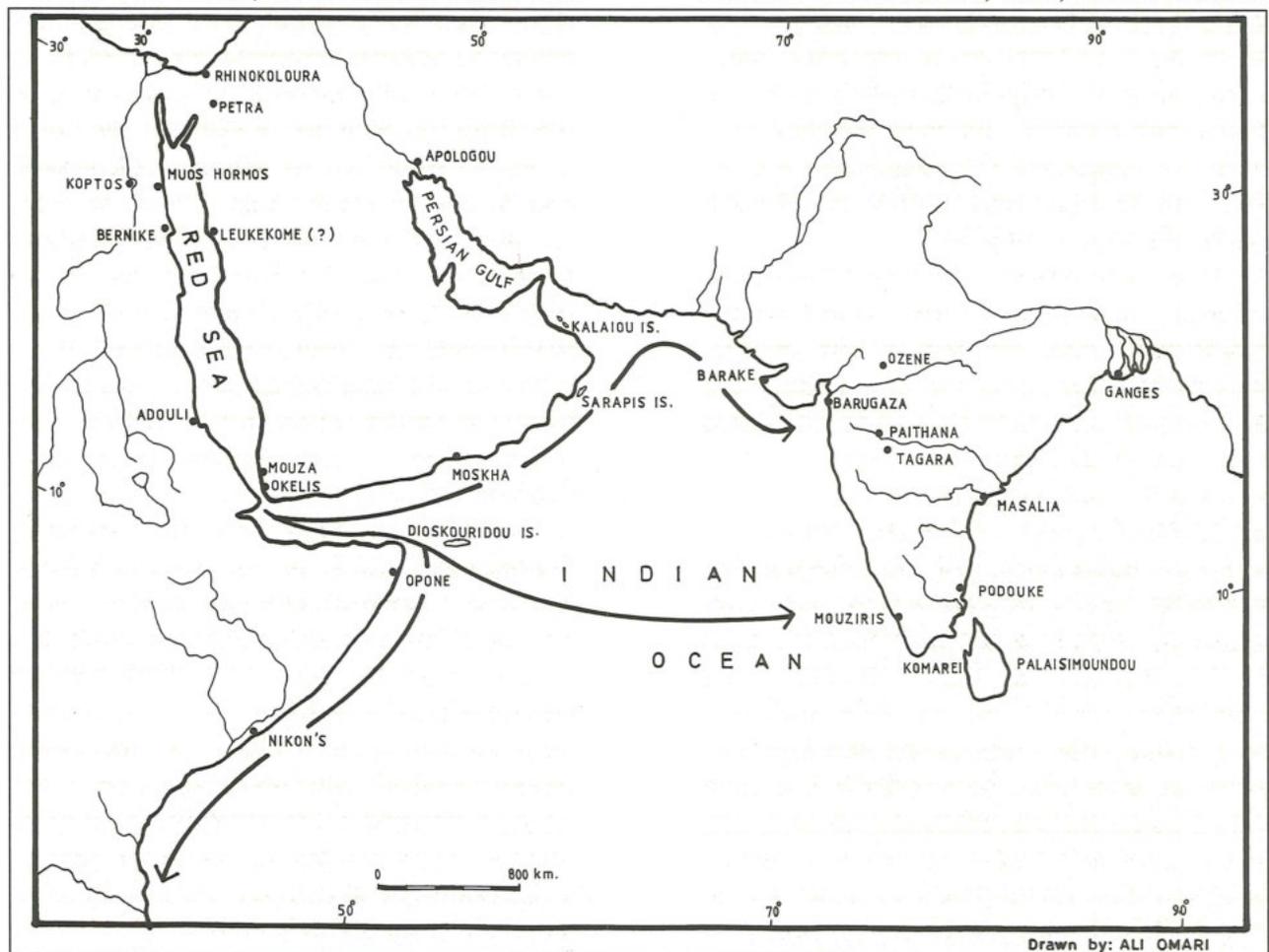
by  
Vishwas D. Gogte

## Introduction

One of the oldest authentic references to the Nabataean capital, Petra, occurs in the *Periplus of Erythraen Sea* in the context of maritime trade. This handbook was written in the first century AD by an unknown Greek merchant (Huntingford 1980:7). The author of this handbook was either a trader or shipmaster who gives a first-hand account of the sea routes starting from the Red Sea towards India and up to China. Besides the sea route to India along the coasts of Yemen and Oman, he mentions direct sea

routes to Western and Southern India giving information about the ports, harbours, roadsteads and marts together with the items of imports and exports at various places (Fig.1). Navigational aids such as how to enter difficult harbours and how to recognize the signs of coming storms and approach of land are also described. In fact, Huntingford (1980:8) puts it as an early example of a combined trade directory and an Admiralty handbook.

After the description of ports at Myos Hormos and Berenike, both, on the coast of



1. Major sea-routes and some of the ancient sites mentioned in the *Periplus of Erythraen Sea* in the context of maritime trade during the first century AD.

Egypt, the reference of Petra comes in Chapter 19 of the *Periplus* as follows: "on the left from Bernike, two or three days run from Muos Hormos eastwards, crossing the gulf which lies alongside, there is another harbour with a fort, called Leuke Kome from which there is <a route inland> to Petra, to Malikhas king of the Nabataioi. It has some reputation for the ships, though <they are> not large ones, <which come> loaded from Arabia. For this reason a collector of a tax of a quarter on imported merchandise is posted there, and for security a centurion with a garrison." (Huntingford 1980:31).

This is followed by a detailed account of the Arabian coast and then Mouza (a coastal site in Yemen). "After these <regions>, in the furthest bay on the left hand of this sea is Mouza, an established mart beside the sea, distant from Berenike, for those sailing south, at least 12,000 stads. The whole place is full of Arabs, shipmasters and sailors, and hums with business; for they use their own ships for commerce with the opposite coast and with Barugaza (modern Broach / Baruch on the west coast of India)."

As we know today, the Nabataeans were dynamic Arab traders who controlled the major trade routes between Arabia and Damascus at least during the first century BC and first century AD. It is widely believed that they traded not only with the Mediterranean countries but also with India, China and the Far East. Although, frankincense was their major trade item, they also handled materials such as animals, spices, iron, copper, gold, fabrics, sugar, medicines and ivory. The *Periplus*, in mainly chapter 6 and elsewhere, gives a list of items imported from India to the ports on the Red Sea. The items are iron, steel, the broader Indian cloth called monakhe, cloth called segmatogenai, belts, garments called gaunakai, mallow cloth, muslin, coloured lac and sugar. As the trader's handbook contains an unmistakable reference to Petra as the capital of Malikhas king of the Nabataeans, it may be safely as-

sumed that some of the above mentioned trade items coming from India were traded by the Nabataeans. Although, we understand from the *Periplus* that Arabs, Greeks and Indians participated in the Oceanic trade to and from India, it is difficult to know if the Nabataeans actually took part in the voyages across the Arabian Sea.

### Discussion

In spite of these references, no serious attempt has been made in the archaeological context to evaluate both spatially and temporally the trade of the Nabataeans with India. Considering the perishable nature of the trade items imported from India, the study of pottery appears to be a logical step in this direction. Barring exceptional deluxe, varieties pottery was not really an item of trade in ancient times. It was mainly used as containers for carrying goods required for travelers. A careful re-examination of the excavated pottery from major inland Nabataean sites such as Petra, Wādi Rumm, Khirbat adh-Dhariḥ and the coastal site at 'Aqaba would be helpful in identifying the Indian contribution. Particularly, two distinguishing fine wares from India, one, the Red Polished Ware (RPW) and the other, the Rouletted Ware (RW) should be searched in the pottery collection from the above sites as they are associated with the maritime trade of the Nabataean period.

Sherds of the RPW have been found at Sohar, the coastal site in Oman (Monik Kervran, personal communication). Mineralogical analysis of these sherds conducted by the author showed that the RPW was not mineralogically matching with the local clays or pottery from Oman but they were indeed identical with those from sites in the region in western India which has been identified as Ariake in the *Periplus*. The RPW is a fine pottery with uniform texture similar to the Nabataean fine red pottery. It is, therefore, likely that some of the RPW sherds found on the Nabataean sites could have

been mistaken for local pottery. Occurrence of this ware on these sites in Jordan would confirm the Nabataean trade with Barugaza, in particular, and western India in general.

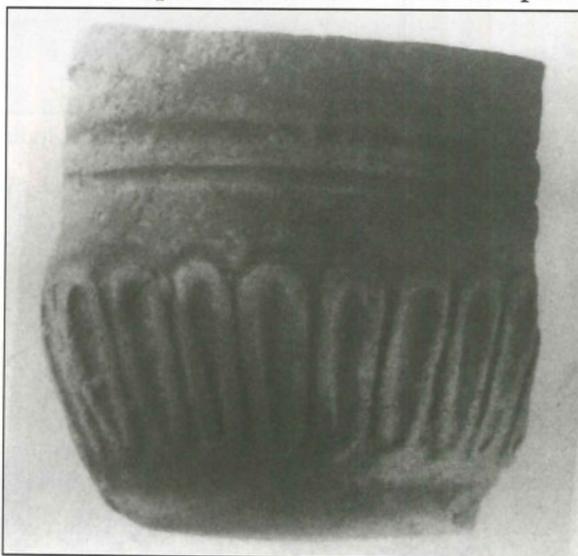
A recent comparative study by the author has produced, perhaps, the first material evidence of the interaction between the Nabataean and contemporary Indian sites. It comes from the occurrence of identical pottery known as Mold Ware (MW) at Petra (Schmitt-Korte 1984: 40) and on several Early Historic sites (100 BC-200 AD) in western India, namely, Ter (Chapekar 1969; Deshpande 1969), Kondapur (Ahmad 1950; Begley 1991), Nevasa (Sankalia *et al.* 1960) and Kolhapur (Gorakshkar 1975). The MW is small in size ranging from 4 to 6.5 cm produced from two vertical molds joined together. The vertical joint is clearly visible running from rim to bottom. The ware has different shades of red, from bright red to brownish. Begley (1991) has classified the MW into four shapes: 1. Cup with out-turned rim; 2. Straight sided bowl; 3. Deep cup with two bulges; and 4. Bottle having bulbous body and long neck.

The most common motif is long petals radiating from the bottom on the lower body of the MW. Other motifs consist of beads, ovals, bead and reel, and rosettes which appear between ridges on the upper body.

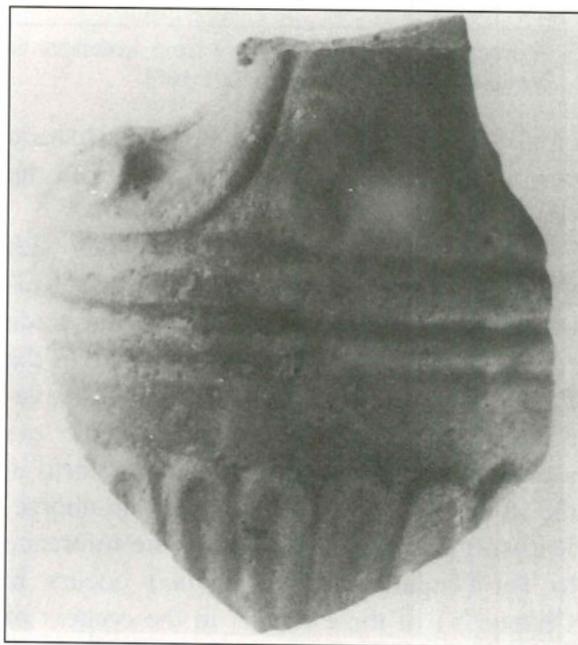
The MW from Petra as illustrated by Schmitt-Korte (1984:40) is different from the Late Hellenistic Samarian moulded ware usually found in that region, for example, at Samaria-Sebaste (Hennessy 1970:11). The Samarian ware was produced using a single mould and the scheme of floral relief decoration having lotus leaves is entirely different from that of the MW found at Petra. It is, also, totally different from the relief pottery from the collection of the Institute of Archaeology of the Hebrew University, Jerusalem as illustrated by R. Sivan (1977:143). This pottery, presumably Nabataean, has high relief decoration in two panels: one representing two antithetical

peacocks on either side of an amphora and the other, two antithetical human heads connected by a ribbon.

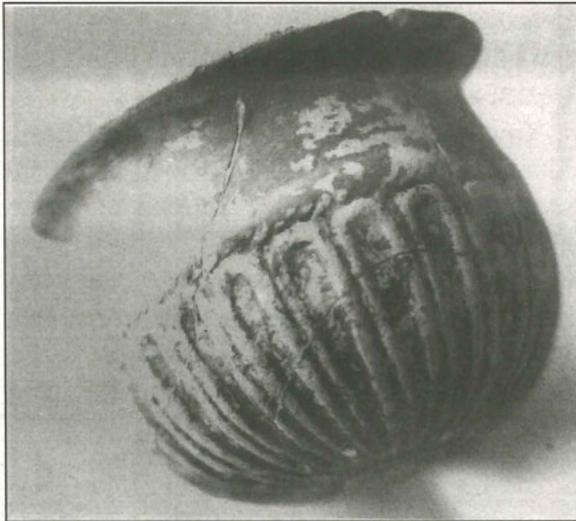
In contrast to this, the MW from Petra is identical in all respects, particularly in the production technique and the scheme of floral relief decoration, with that found in western India (Figs. 2-5). It is, however, very rare in Petra in comparison to its occurrence in large quantity in India, particularly, at Ter and Kondapur. These sites were the prin-



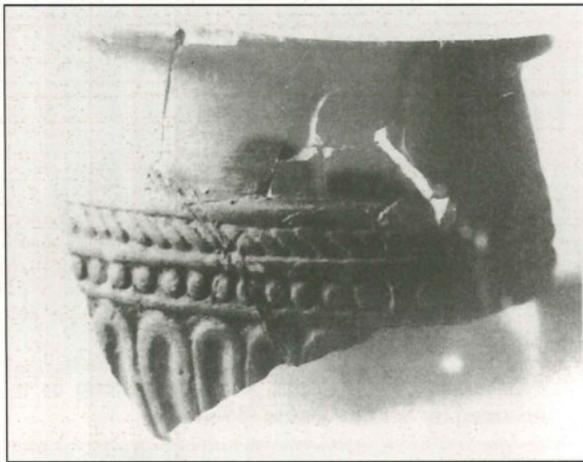
2. A fragment of the Mold Ware from Petra as illustrated by Schmitt-Korte (1984:40).



3. Another fragment of the Mold Ware from Petra as illustrated by Schmitt-Korte (1984:40).



4. The Mold Ware from Kondapur in western India (after Begley 1991:164).



5. A fragment of the Mold Ware from Kondapur in western India (after Begley 1991:165).

cipal settlements during the Early Historic periods of India and are considered as the centres of production of the MW.

The sites of Ter and Kondapur along with those of Nasik, Nevasa, Paithana and Kolhapur were interconnected by inland trade routes starting from Broach (Barugaza of the *Periplus*) on the west coast of India. Excavations at these sites have given ample evidence of contacts with the Roman World in the form of the Mediterranean amphorae, Roman glass and/ or bronzes. The reference to Ter (Tagara of the *Periplus*) occurs in Chapter 51 of the *Periplus* in the context of maritime trade. All sorts of muslins and common cloth went from Ter to the har-

bours and marts on the coasts of the Red Sea. It is, therefore, probable that the MW produced at Ter and Kondapur could have reached Petra along with other trade items. Scientific study of the MW from Petra and those from the above mentioned sites in India would provide further proof of the Nabataean - Indian relationship.

There is yet another variety of Red Slip ware from the Ganga Plains in India which is closely similar to the East African Red Pottery found at sites in Jordan. Archaeological excavations on many coastal and inland sites in south India have yielded evidence of Roman trade. A reddish pottery, for example, found at the coastal site at Alagankulam was classified as Late African red slipped ware, its probable place of origin being Tunisia (Nagaswamy 1991:252). Mineralogical analysis of this pottery has, however, shown that the pottery was coming from the Ganga Plains of North India (Gogte 1997:82). There is, therefore, a distinct possibility that the mineralogical analyses of some of the red slip wares found at, for example, the coastal site of 'Aqaba (Parker 1998:388) and classified as African pottery could reveal their Indian origin.

Perhaps, the most distinguished pottery associated with Indo-Roman trade is the Rouletted Ware. The RW has a form of a dish with an in-curved in and beaked rim, and a diameter varying from 24 to 33 cm. Fine levigated clay which fired grey was used in its production. Before firing, the flat interior was decorated with two to three concentric indented patterns, which look like rouletted decoration. The decorative motifs consisted of triangles, diamonds, dots, and wedges. This ware was treated with a slip which showed different colours: red, brown, grey and black. It was found for the first time during the archaeological excavations at Arikamedu on the east coast of India in association with the Mediterranean Amphorae and Arretine Ware (Wheeler *et al.* 1946). Subsequently, it was found mostly on the coastal

sites in India, Sri Lanka and Southeast Asia. Also, it has been found on the coasts of East Africa and at Berenice in the Red Sea.

It has now been conclusively proven that this pottery was produced in north India from the clays of the Ganga Plains of north India (Gogte 1997). An occurrence of this ware on the sites in Jordan would certainly establish the participation of the Nabataeans in the trade with India beyond any doubts. In the context of maritime trade, the coastal site at 'Aqaba appears to be the most promising place to search for the RW and other Indian pottery.

It is, however, highly surprising that no reference to 'Aqaba appears in the *Periplus* but from the mounting archaeological evidence of the Nabataean settlement from the first century BC at this site (Parker 1998), and with the availability of an easy inland route from this site to Petra, there are now strong reasons to equate 'Aqaba with Leuke Kome of the *Periplus*. Diana Kirkbride (1990: 257) has placed Leuke Kome at 'Aqaba mainly on historical grounds. From the cursory description of the long Arabian coast of the Red Sea in the *Periplus*, it appears that the author of the handbook described Leuke Kome based on hearsay rather than on the first hand knowledge. It is also possible that the author who was either a trader or a shipmaster could not visit this harbour as the trade in this part of the Red Sea was, most probably, operated and controlled by the Nabataeans. In any case, it is evident that this port site at 'Aqaba was as important as the interior trade route connecting Arabia with the Mediterranean, in the Nabataean-Roman trade.

There is an equal possibility of finding the RW at the interior sites such as Wādī Rumm, Petra and Khirbat adh-Dhariḥ. An inspection of the excavated pottery from Khirbat adh-Dhariḥ has revealed a red pottery with indented triangular patterns closely similar to that of the RW from India. Mineralogical analyses of the pottery from the

above mentioned sites, in comparison with the corresponding pottery from the coastal sites in India, would open a new vista in the archaeological study of this region.

Alternatively, it will also be interesting to search for the Arabian pottery on the ancient sites on the coasts of India. More attention has so far been given to easily identifiable Mediterranean Amphorae and Arretine ware. Also, it is quite probable that the fine, red, unpainted Nabataean pottery occurring on Indian sites, could have been mistaken for the RPW of western India.

Besides the Nabataean-Roman sites in Jordan, a search for the Indian contribution to the maritime trade on the coastal sites in Oman and Yemen would be equally instructive as the *Periplus* clearly mentions many of them in the context of the trade routes to India along the coasts of Oman and Yemen. In fact, the maritime trade between Oman and India goes back to the period of the Indus Valley civilization of 2500 BC as seen from occurrence of the Indus Pottery on the archaeological sites on the east coast of Oman such as Rās al-Hadd and Rās al-Junayz. Mineralogical analyses of the clays and pottery from these sites by the author (unpublished results) have shown that the pottery was coming to these sites in Oman from the famous Indus site at Lothal on the west coast of India. Also, as mentioned earlier, the site at Sohar on the northern coast of Oman has yielded Early Historic pottery from India. A similar scientific study of other coastal and inland sites in Oman and Yemen would throw light on the extent of maritime trade in different periods.

### Conclusion

Although, it is widely believed that the Nabataeans had trade relations with India, the first material evidence of the interaction of the Nabataean and the contemporary Indian sites comes from the occurrence of the characteristic pottery, the Mold Ware, at Petra and several ancient Indian sites. A fur-

ther search for the common archaeological material occurring at the sites in Jordan and India would, no doubt, provide additional evidence of the ancient maritime trade between them.

Vishwas D. Gogte  
Department of Archaeology  
Deccan College Research Institute  
Pune 411006  
INDIA

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## TWO INSCRIPTIONS FROM PETRA

by  
Stephen Tracy

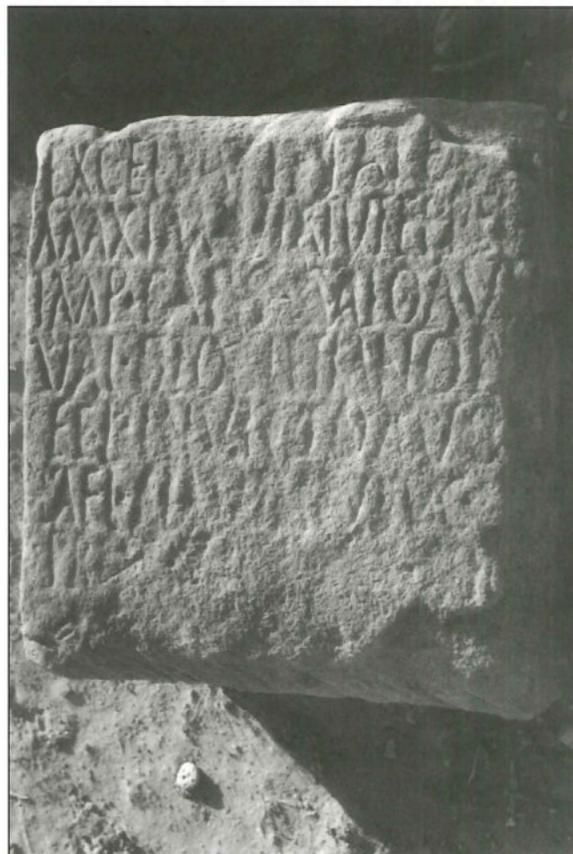
In this report the author presents two texts from Petra, one Latin, and the other Greek; the first has been published (inaccurately) as three inscriptions, namely *IGLJord* IV nos. 40-41, 53; the second has not been published. The publication of these stones was entrusted to J. Strugnell some years ago.<sup>1</sup> He has very generously allowed me to publish them and has shared with me his notes, drawings, and photographs.

### 1. Dedication to Diocletian (Figs.1 and 2).

Even though Sartre (1993), prints no photograph and even though his text differs markedly from the original, there can be no doubt that the present inscription is the one that he edited. His majuscule text of it on page 70 of *IGLJord* IV reads:

- EXCEPAIITATI  
TAMAXIM VIXITANN  
3. IMPCAESCAIOAV  
VALDIOCLETIANOC  
FELINVICTOAVG  
6. AEL.IIA NAVG  
PII- - - -

Despite the complete uniformity of lettering and spacing on this stone (Fig. 1), Sartre interpreted it as three separate texts – lines 1-2 as a fragmentary funerary inscription, lines 3-5 as a text honoring Diocletian, and lines 6-7 as an inscription mentioning Antoninus Pius. The interpretation is puzzling, and the author is not certain

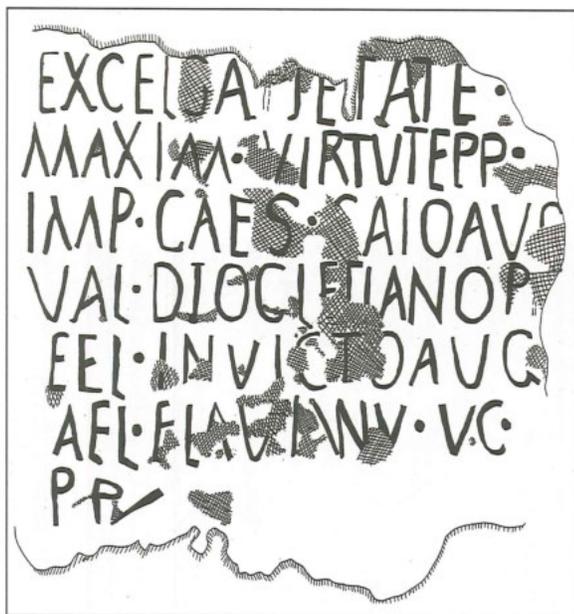


1. Dedication to Diocletian, photograph by the author.

about what is intended. Sartre seems to envision three successive uses with erasure. He describes the block in two different ways – at the bottom of page 69 as “complet mais endommagé en haut et en bas” and on page 88 as seemingly complete “en haut” but perhaps recut. The author infers from this that the first use was as the grave monument. The stone was then reworked, the upper part

1. The discovery of the first was announced by D. Kirkbride, the excavator see *ADAJ* 4-5, 1960: 121. In addition to Professor Strugnell, I owe thanks to D. Kirkbride and the Jordanian authorities for the privilege of studying these inscriptions. A grant from the College of Humanities at the Ohio State University made it possible in June of 1998 to

spend a week at Petra studying the inscriptions. There, thanks to the kindness of Professor Martha Joukowsky, I joined the Brown University Excavations at the site of the Great Temple. I am also much indebted to Professors Ch. Habicht, J. Bodet, and Ph. Forsythe for advice on a preliminary version of this paper.



2. Facsimile drawing of the dedication to Diocletian by J. Strugnell.

cut off, and reused for a text mentioning Antoninus Pius, and then much later used again for a dedication to Diocletian. This does not seem possible. First of all, careful examination of the inscribed surface revealed no evidence of erasure. Second, the text of the dedication to Diocletian ought to be complete. It does not seem to be, unless the person/entity making the dedication was understood. Lastly and most importantly, the correct reading of this text does not support it. Sartre's text is manifestly wrong at the beginning and end of line 2 and one suspects that in making his transcription he repeated the end of line 5 as the end of line 6.

The present text is based on autopsy and on a facsimile drawing made by Strugnell at the time of discovery.<sup>2</sup>

ca. 286 CE

EXCELSA PIETATE v  
MAXIM. VIRTUTE PPF

3. IMP. CAES. CAIO AVR  
VAL. DIOCLETIANO P[O]  
FEL. INVICTO AVG

6. AEL. FLAVIANV. VC.  
PRP[R]

excelsa pietate  
maxim(a) virtute p(atri)? p(iissimo)?  
f(ecit)?

3. Imp(eratori) Caes(ari) Caio Aur(elio)  
Val(erio) Diocletiano p[ro]  
fel(ici) invicto Aug(usto)
6. Ael(ius) Flavianu(s) v(ir) c(la-  
rissimus)  
Pr(aeses) P[ro]v(inciae)

For the location, brief description, and dimensions of this stone, see Sartre (1993: 69 nos. 40-41) For further description, see also *Ibid.* p. 88 no. 53. The description is neither entirely accurate nor does it mention some important features. There are, for example, remains of a small rounded moulding at the top of the inscribed surface just above the letters TAT in line 1. The top too is preserved in places and reveals rough chisel marks. There is no trace of any cutting for a dedication. Both sides are preserved (smooth); the bottom is broken. The inscription is lying on its back and could not be raised to determine whether the original back is preserved. The inscribed surface has suffered, but not greatly, since Strugnell made his drawing more than 40 years ago.

A study of the stone, the photograph (Fig. 1), and the facsimile drawing (Fig. 2) enables us to see what should never have been doubted, i.e. that this is a single text, although not without its problems. The ablatives in the first two lines are probably intended to express some kind of attendant circumstances, i.e. out of the highest *pietas*, out of the maximum of *virtus* Aelius Flavianus has made this dedication to his emperor. It would hardly be flattering to an emperor to say because of *his* highest *pietas*, etc. The possession of these qualities by the emperor is, after all, a given. The end of

2. Its accuracy can be judged by examining the photograph and facsimile drawing he made of the second

inscription here published (Figs. 3 and 4). Strugnell appears to be quite a trustworthy draftsman.

line 1 is partially broken away. Strugnell recorded a mark of punctuation that I can not see, and although there are some marks, I can discern no certain letter stroke and think this area was left blank.

The abbreviation at the end of line 2 is difficult to read with certainty. There appears to be three letters. The first two letters are almost certainly PP and only the top left part of the third is preserved. It is squared and resembles this cutter's F or E, but, it may also be a somewhat squared P. This abbreviation, if deciphered correctly, can most probably be filled out as *patri piissimo* or *patrono perpetuo* followed by *fecit* or perhaps *posuit*. Of course, the letters PP most commonly in imperial titlature abbreviate the phrase *pater patriae*. These letters always come after the emperor's name and usually last among his offices and titles. However, in this case they first appear before the emperor's name, i.e. not in the proper place for that abbreviation. The abbreviation in the last line is difficult to make out as well, where the first two letters seem to be PR. After these letters, there is a very worn area of two letter-spaces in length, followed by what appears to be a leaf. A vertical and part of the loop of pi seems to be preserved in the first of these two spaces, but I can certainly discern no letter stroke in the second. The slanting mark that begins at the bottom of the vertical of the second pi and extends up towards the right to about the middle of this second space conforms to no letter stroke and is not weathered. It is therefore a recent mark or scratch.

Since this dedication is made to Diocletian alone, it probably belongs to the first part of his reign, around the years 285 to 288, and certainly before he established the "tetrarchy" in March 293. Aelius Flavianus, the governor of Arabia around the year 286

CE, is not attested elsewhere.<sup>3</sup> He is certainly to be differentiated from the soldier of the same name who died at 30 years of age ca. 250 (*L'Année épigraphique* 1941:10) and from C. Ael. Flavianus Sulpicius who twice served as *Galatarches* (*L'Année épigraphique* 1924: 91; *Cagnat* 1906: 196-197).

## 2. Metrical Epitaph (Figs.3 and 4).

This is a rectangular limestone plaque with traces of plaster adhering to its back. The exact provenance of the plaque is unknown, but it was apparently found during Kirkbride's excavations of 1955/6.<sup>4</sup>

H. 0.25 m., W. 0.309 m., Th. 0.042 m.  
L.H. ca. 0.025 m.

saec. IV-V CE?

Ἀλφίοιο τὸ σῆμα

ὃν εἴνεκεν

3. εὐσεβιαῶν (sic)

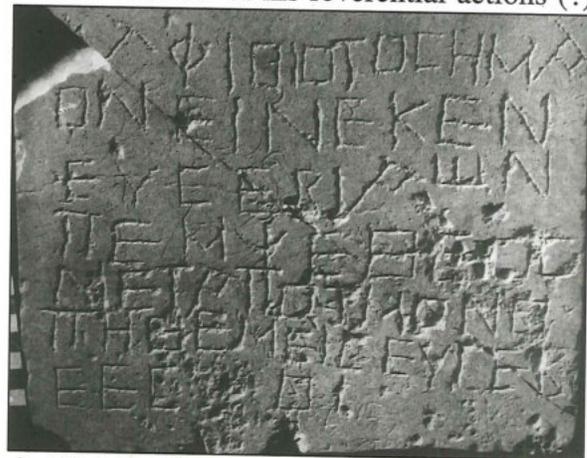
πέμψε θεὸς

μετὰ πότμον ὄ-

6. πη θ' ἐμεῖς εὐσεβ-

έες. υἱοί. vac.

Translation: "Here is the memorial of Alphios whom after meeting his fate god conducted because of his reverential actions (?)"

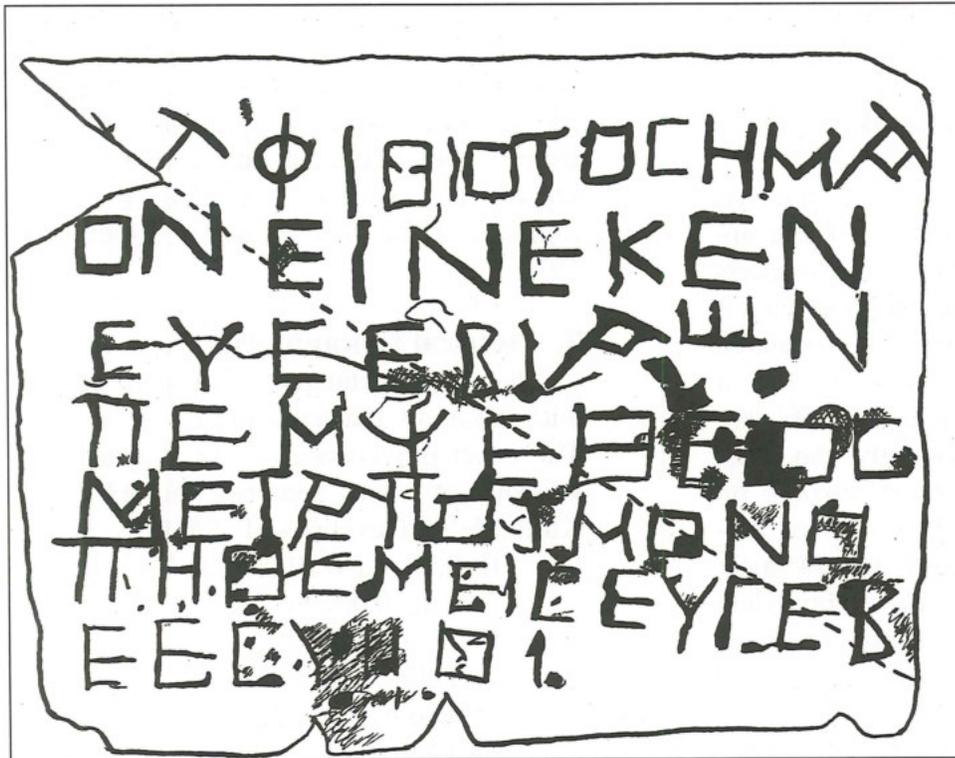


3. Metrical epitaph, photograph by J. Strugnell.

3. Sartre (1982:100) makes brief mention of him based on a report that ultimately derives from this inscription.

4. See the account in *ADAJ* 4-5 1960: 117-122. Its

present whereabouts is unknown. A thorough search of the museum and adjacent storerooms in June of 1998 failed to turn up this gravestone.



4. Facsimile drawing of the metrical epitaph by J. Strugnell.

where we also (if we are) reverent (shall go). His sons (set this up).”

The date is based on the writing which is very similar to the painted inscriptions published as no. 50 (Sartre 1993: no.50). The personal name Alphios is well attested in Arabia (Sartre 1993: nos. 32, 74, 99, 105, 124).

This epitaph is written so that it scans tolerably well for the first five lines as hexameter. The words *σήμα*. *πότμος*. the genitive in *-οιο*. the unaugmented aorist *πέμψε*. and the metrical lengthening of *εἴνεκεν* are all poetic, indeed Homeric. At the same time there is no parallel for the form in line 3. The author seems to intend a genitive plural that depends syntactically on *εἴνεκεν*.<sup>5</sup> He appears to have taken the word *εὐσεβ(ε)ία*, a collective noun that is not attested in the plural, and simply added the genitive plural ending to it.

In general, this epitaph reflects the com-

monplace idea that no one is immortal, that we too, the readers, will die. That said, there appear to be no close parallels for this particular text, although several of its elements can be found in other texts: for example, *σήμα*. (Peek 1955: nos. 635-640, 1546; Kalinka 1920-1944: 42 line 2; Mitchell 1982: 168 line 1), genitive of the proper name in *-οιο* (Kirchner 1913-1940: 11589 line 4; Peek 1956: 637, 1573), and the phrase *μετὰ πότμον* (Kraeling 1938: no. 300 line 2; Calder 1956: 156 line 4; Roueché 1989: no. 33 line 7).

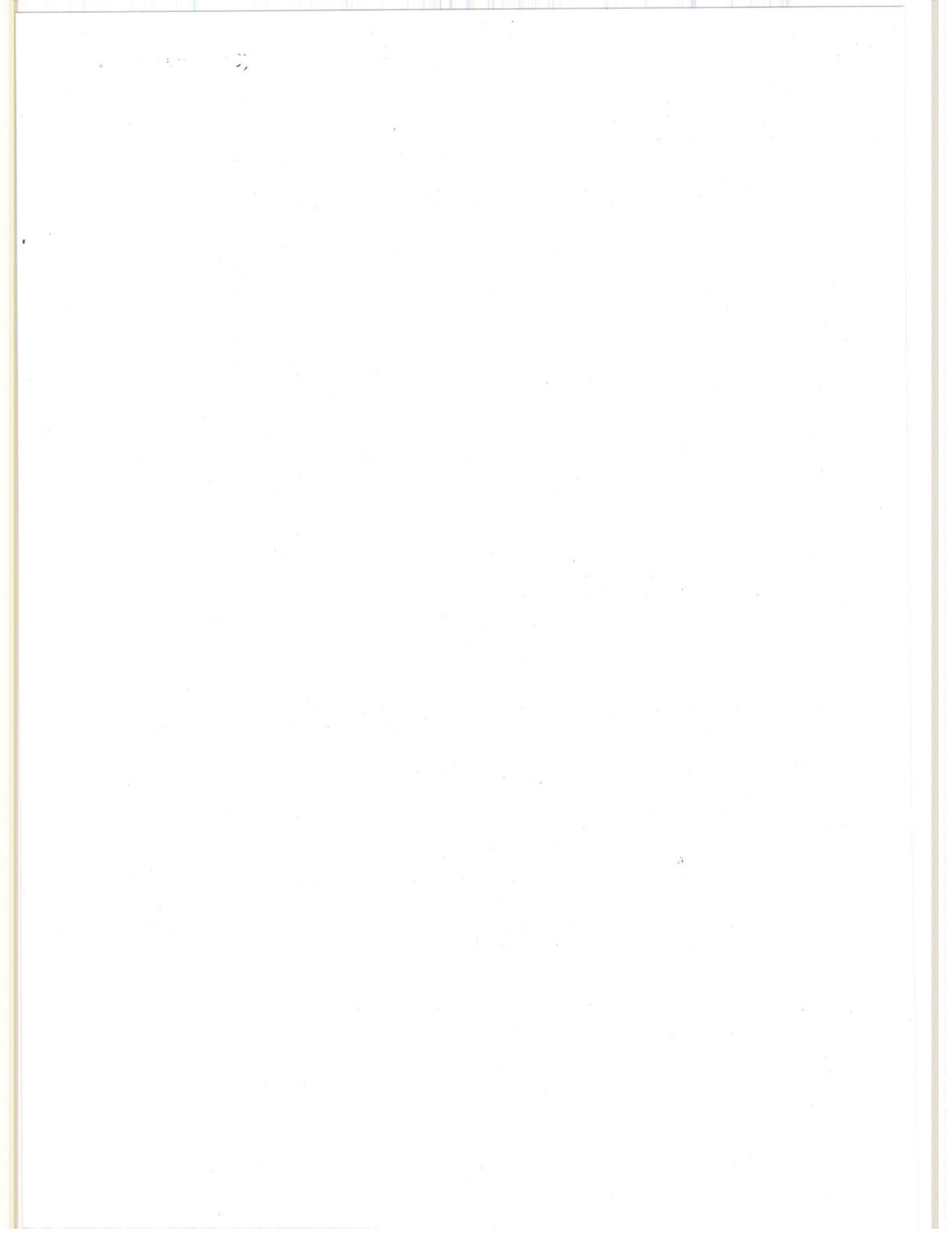
Stephen V. Tracy  
 Center for Epigraphical Studies  
 The Ohio State University  
 190 Pressey Hall  
 1070 Carmack Road  
 Columbus, Ohio 43210  
 USA

5. The lengthened form *εἴνεκεν*. not infrequently is followed by the genitive, which it governs; see, e.g., Heberdey 1941: 907 line 7, 908 line 6; Buck-

ler *et al.* 1933: 133 line 13; Calder 1956: 342 line 3; Levick *et al.* 1993: 60b line 6.

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## TWO NORTH- ARABIAN INSCRIPTION FROM JORDAN

by  
Fawzi Zayadine

I. The first inscription is on a yellowish sandstone slab, with a brownish surface, discovered in 1990 by Mr Neal Buckon from Cleveland, Ohio. It was found on the road between al-Mudawarra and Ma'ān, at about 80 km from Ma'ān. The author is grateful to Mr Buckon who kindly presented this inscription to the Department of Antiquities.

The text is inscribed in spiral, on one face of the slab ( Figs. 1 and 2 ).

Dimensions: length: 28 cm; width: 13.5 cm, thickness: 7 cm. H. of letters: nun: 5mm; qaf; 35 mm.

### Text

*Ihwd bn skr'l wnzr w tšwk w dkrt It 'šy'n*

### Translation

By Hud s. of Šakhar'el, and he was on the outlook, and he longed for and may Lat

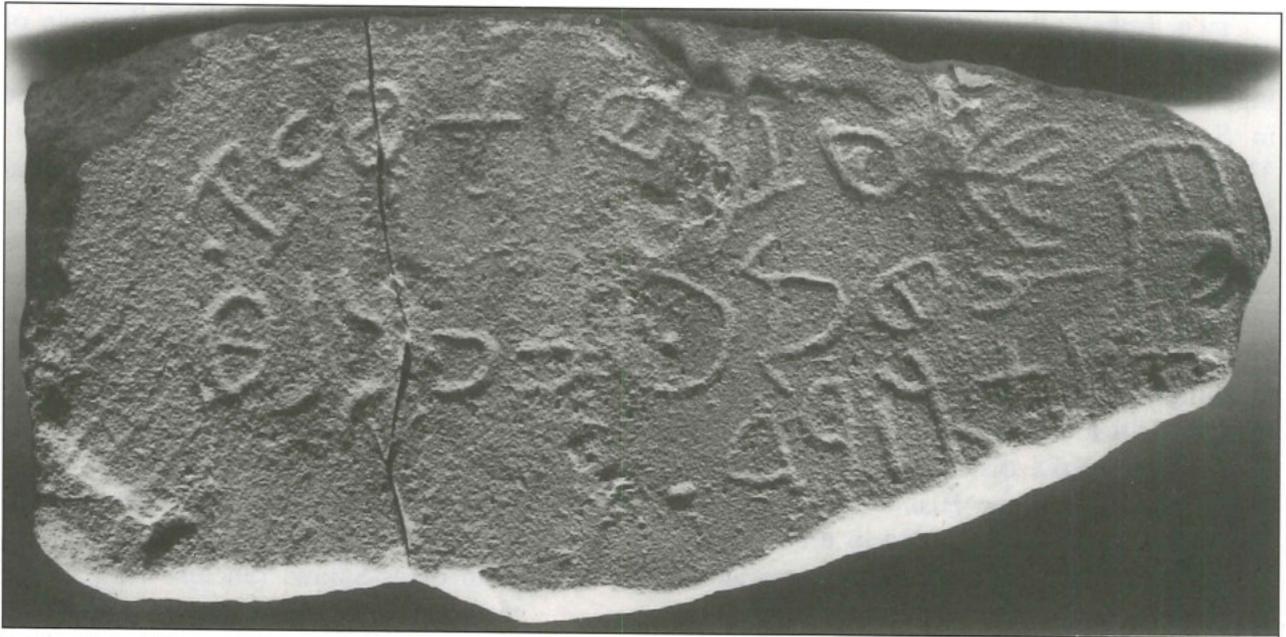
remember (my) fellow tribemen.

### Commentary

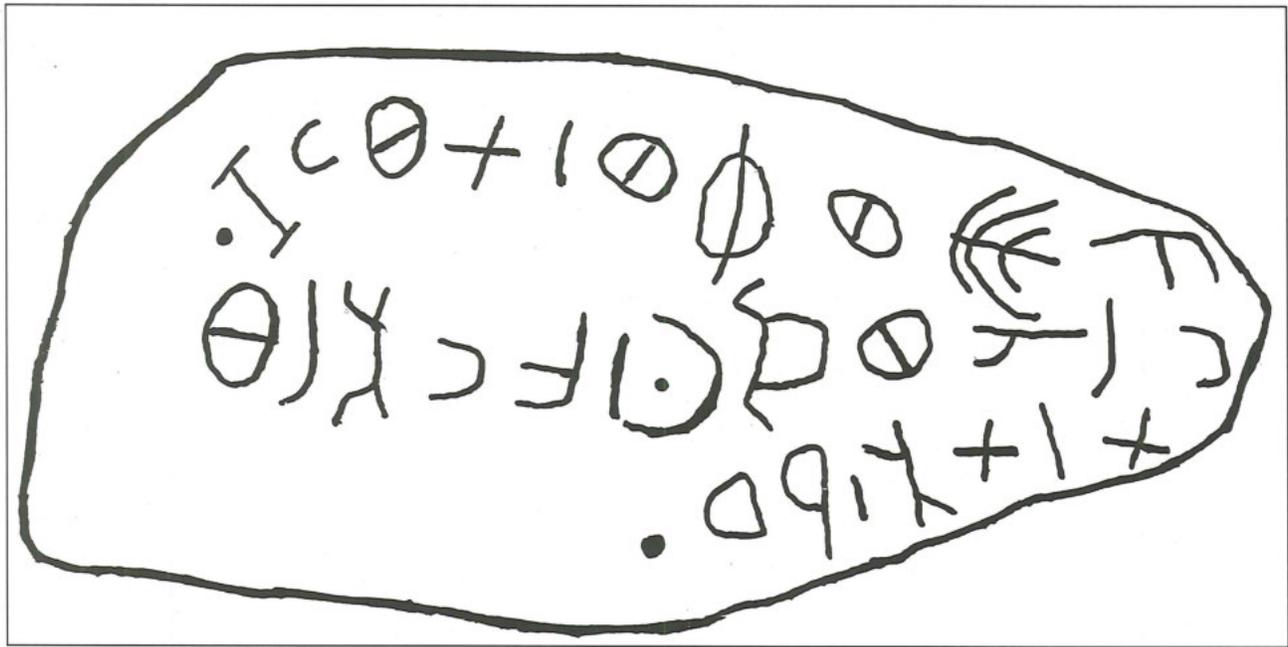
*hwd* (Hud): is a personal name, common in North Arabia, mainly in Safaitic ( Winnett 1957: N° 282: *Ihwd bn hlfn*; CIS, 34, 1920). In Arabic, *hawid* means “repentant”, “contrite” ( Harding 1971: 628). In the holy Qur'an, surat 11: 53-60, prophet Hud warned the tribe of 'Ad against the worship of pagan gods.

*skr'l*: a theophoric proper name attested in South Arabia, (CIS, 967, 989), but also in Safaitic (Milik 1980:44). The name is also common in the Nabataean onomasticon (Negev 1991: 1132; Cantineau 1932: 150)

*wnzr*: in Arabic, *nzr* means “to look at, to observe, to be on the watch”. Milik (1980: 43-44) translated this verb “ *il est chargé de surveillance*”. It can be assumed that Hwd was a watchman of the encampment during



1. Inscription discovered on the road between al-Mudawarra and Ma'ān.



2. Facsimile of the inscription.

the journey of the caravan and more precisely on night duty. This sentry function may explain the rest of the inscription: he longed for (his) tribe people and prayed the pan Arabian goddess Lat to remember them.

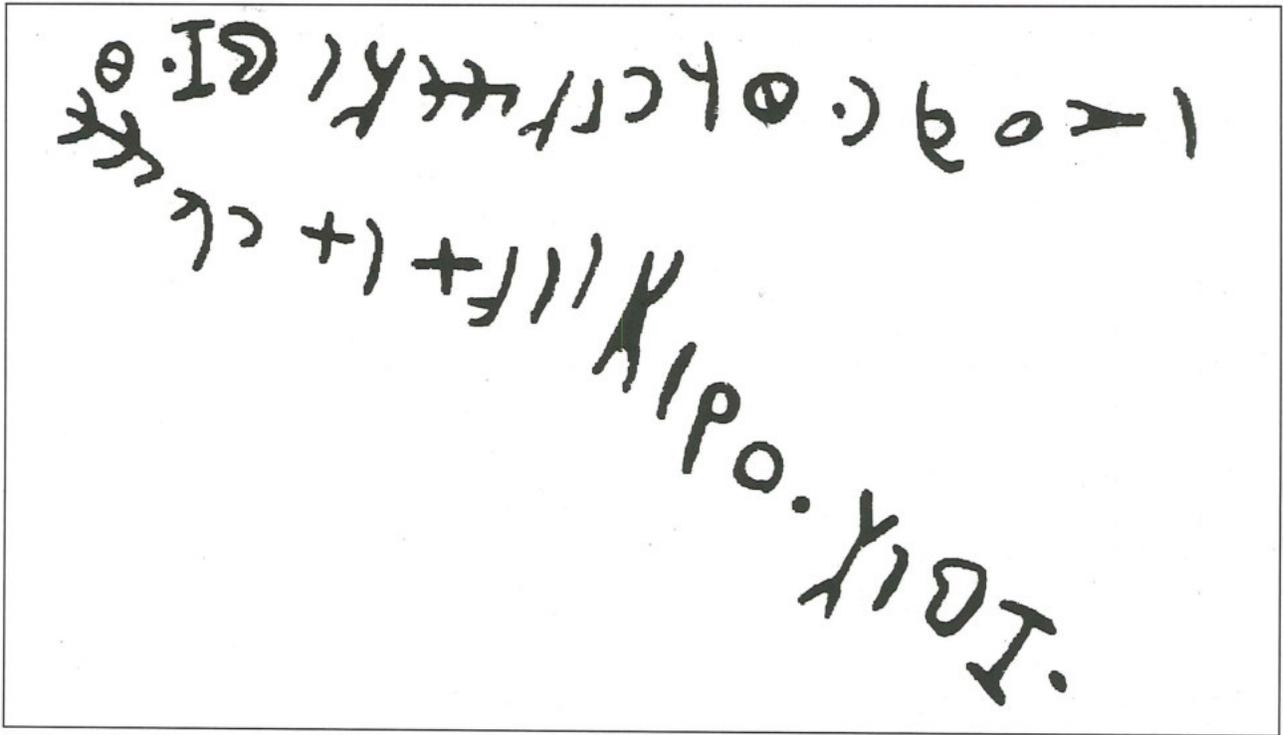
*Tšwq*: long for, is common in the Safaitic inscriptions (Harding 1953: 48; 1971: s.v. *šwq*). It is of interest to note that in general, most of the expressions and vocabulary are well attested in the so-called Safaitic graffiti.

*'šy'n*: from Arabic *šy'*: "to accompany, to bid farewell" (Al-Mu'jam al-Wasîṭ; Harding, 1971, s.v.). The substantive *'šy'* occurs in Safaitic (Winnett 1957: Nos 310 and 312). It is also attested in Wādī Iram: "*Ls'd bn whblh d'l mzn w-dkrt lt kll 'šyn'n 'l mzn*", "By Ṣa'd, s. of Wahb-Allah, of the clan of Mazen, and may Lat remember all of the Mazen tribemen" (Farès Drapeau 1996: 280-82) (Fig. 3). In this inscription the meaning of *'šy'n* is clearly the "tribe member" of Mazen.

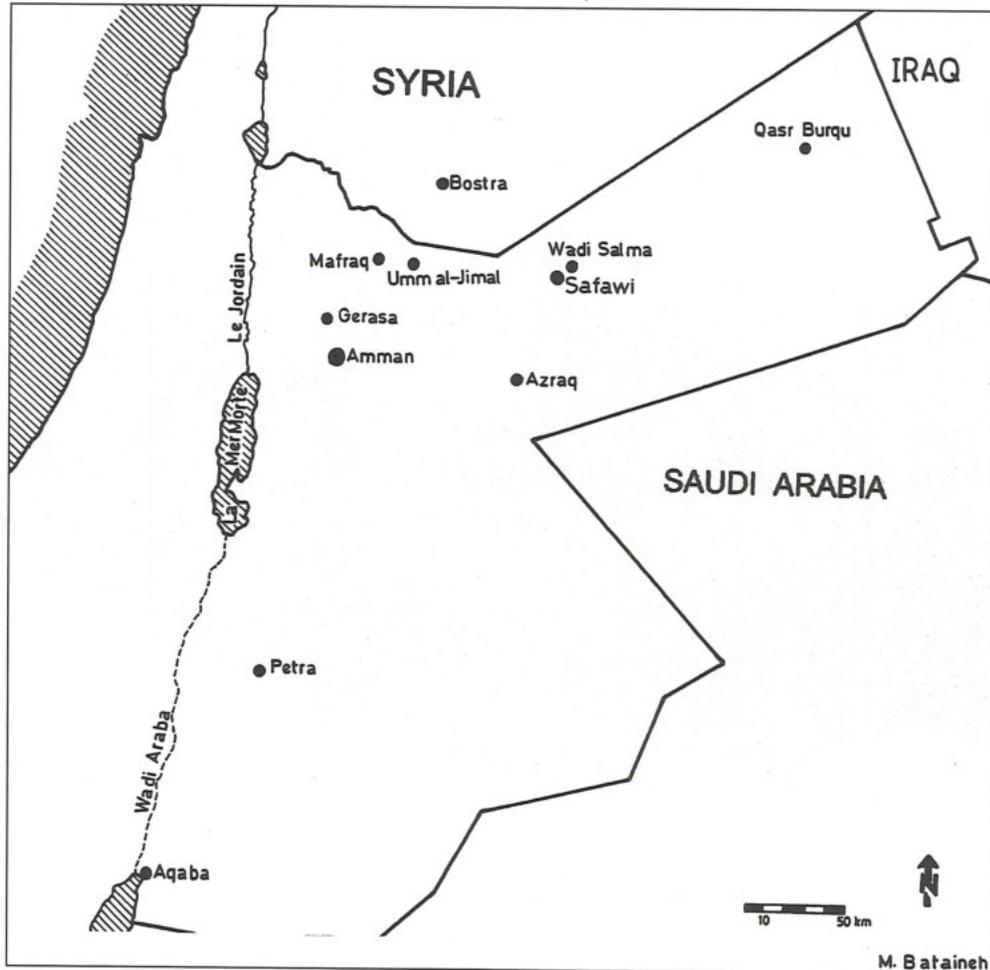
It is noteworthy that both, the authors of the inscriptions in the Ḥisma of Southern Jordan and those of the Ḥarra in the Syrian Desert were using the same expressions and vocabulary, but in their peculiar script. From the bilingual graffiti in Wādī Iram, it appears

that the Nabataeans used the so-called Thamudic E script, [or more correctly "the Ḥismaic" script], before Aramaic-Nabataean became the official writing of their transactions, religious dedications and funeral epitaphs. There was no apparent conflict between the Nabataeans and the tribes of southern Jordan. They took over the trade of aromatics from the Minaeans and remodeled the sanctuary of Lāt in Wādī Iram, which was originally founded by the tribesman of 'Ad (Zayadine and Farès-Drapeau 1998: 255-58). But several inscriptions of the Ḥarra mention the "war of the Nabataeans" (Abbadi 1996: 239-253). It can be surmised that the Nabataeans were in conflict with the so-called Safaitic tribes to safeguard the roads of their caravans to the north. Nevertheless, a Safaitic inscription of Wādī Salma, in the northeastern desert of Jordan is dated to "the year Rabel became king" ( see below).

II. The second inscription was recently discovered in Wādī Salma, at about 30 km north of aṣ-Ṣafāwī (ancient H5), in the northeastern desert of Jordan ( Fig. 4 ), at a mound called Marabb al-Ḥuṣayniyyāt.



3. Facsimile of inscriptions of Wādi Rumm-Umm Saḥm.



4. The location of Wādi Salma in the north-eastern desert.

The inscription is incised on a basalt boulder (40x21x15 cm), on two faces.

- A- On the narrow base of the basalt block one line is incised: “*l'dy bn mty bn mkbl*” “by ‘*Ady s. of Mty, s. of Mkbl*” (Figs. 5 and 6).

*Commentary*

The two first proper names from Arabic ‘*d*’ and *mt*’ have the meaning of “to walk rapidly” (see *Mu‘jam* 1972 and Harding 1971).

*Mkbl*: from Arabic *kbl*, “to bind”, to “fetter”; the passive participle *mukabbal* corresponds to “prisoner”, “captive”; this name is a contradiction with the two first names.

- B- The second inscription is incised on the main face of the boulder in a spiral form.

Text: “*l'mty bn 'dy bn mty bn mkbl wbnny 'l gyr'l h rjm bn swdn*”

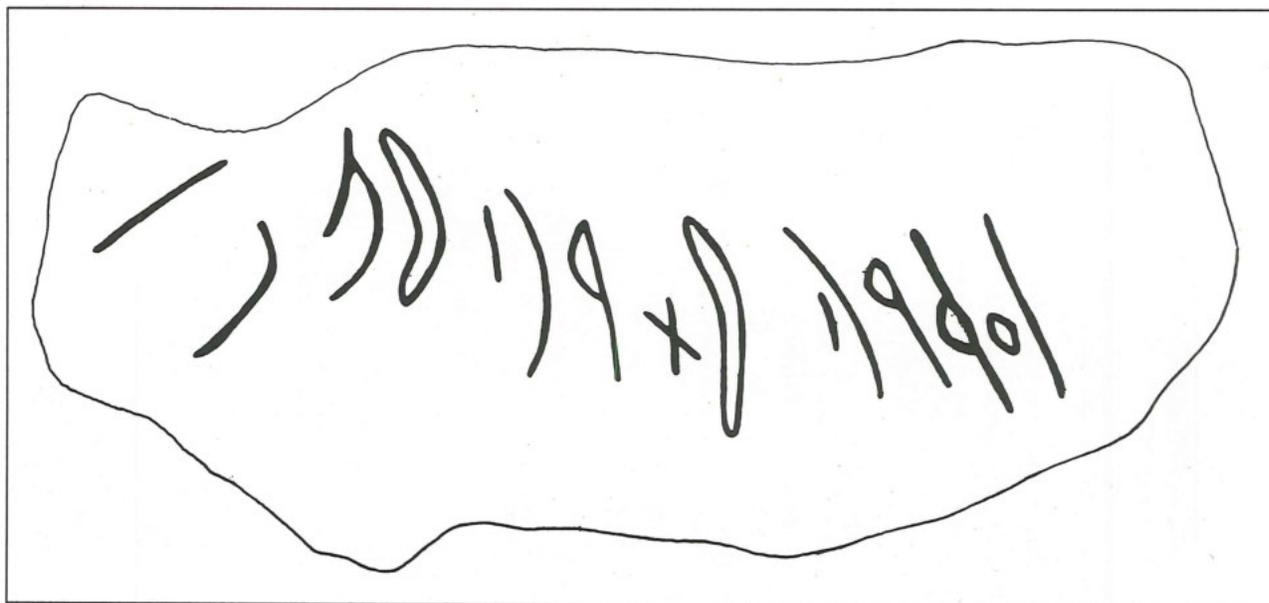
“By Mty s. of ‘*Ady Mty s. of Mukabbal* and he built upon Gyr’l s. of Swdn the cairn”.

It is evident from the genealogy that he is

the son of the precedent in inscription A. However, the relation of the son and father to the deceased Gyr’l is not specified. He does not belong to the same family, since his father’s name is not attested in the first inscription. Both names are common in the North Arabian onomasticon (Harding 1971: s.v.). The expression “*bnny 'l gyr'l hrjm*”, “he built upon Gyr’l the cairn” is of special interest for the significance of the *rujum* or heap of stones piled upon the tombs. In the Cairn of Hani’, the expression “*bnny hrjm*” appears twice (Harding 1953: Nos 26 and 36). This new inscription brings back to the attention of specialists the discussion on the meaning of the cairns. Commenting on a short inscription of the Jordan Archaeological Museum, J. 13157: “*l'qrb bn hn't d'l tm wndm 'l 'mh trht wbnny 'lh*”, “by ‘*Aqrab son of Hani’at, of the tribe of Taym, and he grieved for his mother, she died and he built upon her*”. The present author has already discussed the significance of the cairn which he interpreted as a pile of stones upon tombs (Zayadine 1980: 107-109). A. Jamme who,



5. Inscription A from Wādi Salma, Marabb al-Ḥuṣayniyāt.



6. Facsimile of inscription (A).

after his soundings at the country of 'Ar'ar in Saudi Arabia, criticized the tomb interpretation of the cairns. According to him, the cairns are landmarks or rally signs (Jamme 1971: 43). He refers to modern usage to justify his interpretation: "The Bedouins of today do the very same. According to where they happen to stop, they use a cairn, a boulder or the side of a mountain" (Jamme 1971: 43). However, modern Transjordanian traditions clearly show that the cairns are memorials for the dead: "there is a rujum in Wādī al-Mūjib (the Arnon) to indicate the battlefield between the Ṣukhūr and beni Hamida" and "the bedouins used to build piles of stones for heroes who fell in battle, which they call rujum" (Salman 1929: 197). There should be no doubt that the famous Cairn of Hani' was a funeral memorial. It is noteworthy that the author of the second inscription recorded the father's name of Ġyr'l at the end of the inscription to draw the attention of the readers on the "rujum" which was built upon the deceased. Such a practice is also known from other Safaitic inscriptions (Macdonald 1983: 572).

C. The third inscription is incised in the middle of the block and was the latest in date

because the author did not find space for his text:

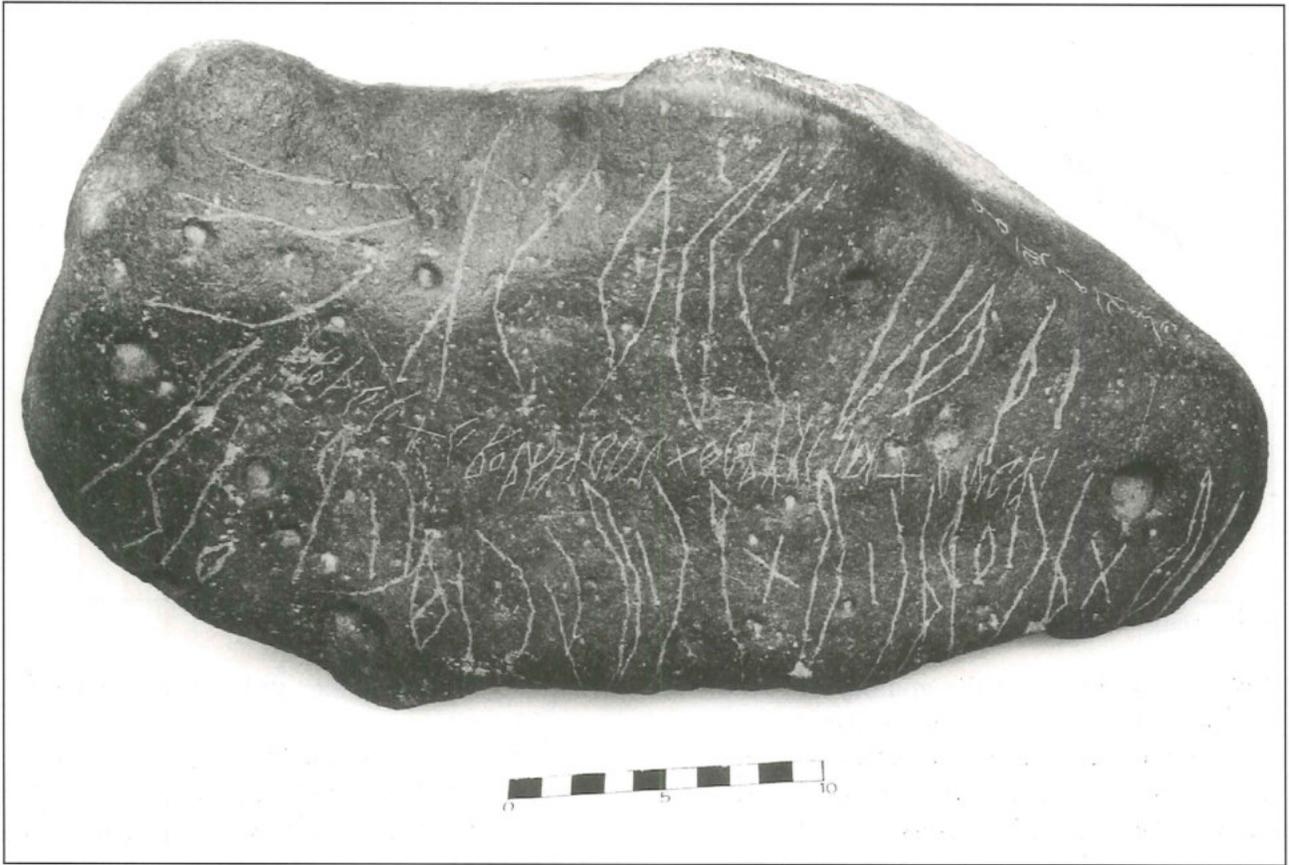
Text: "lṣ'd bn bnt bn ṣ d d'l mskt wr'y h 'bl snt mlk rb'l" ( Figs. 7 and 8).

"By Ṣa'd, s. of Bnt, S. of Ṣa'd, from the tribe of Mskt, and he pastured the camels the year Rabel become king".

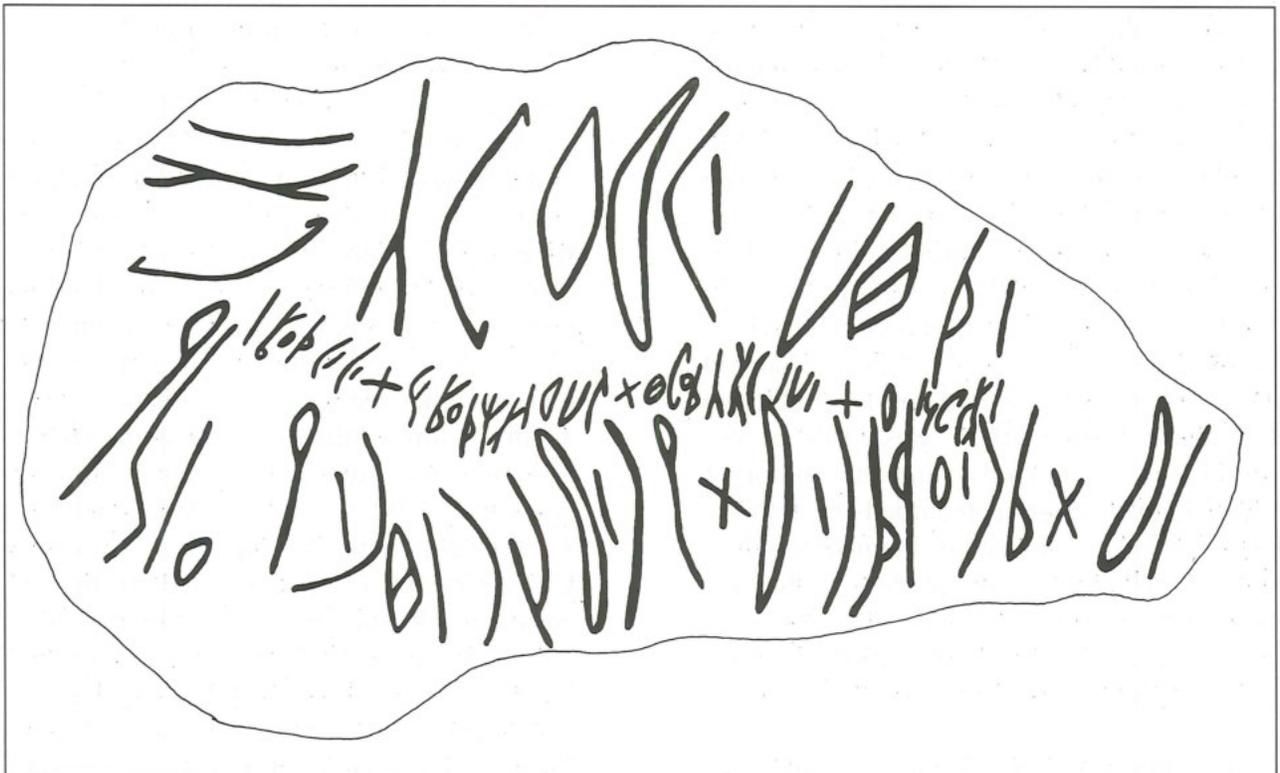
H. of letters: *alef*: 24mm; *'ain*: 4mm.

Commentary Ṣa'd, from Arabic to ascend, to raise, to elevate ( Harding 1971: s.v)

*Bnt*: Arabic *bny* to built; this proper name is well attested in the Cairn of Hani' and in several Safaitic inscriptions of Jordan. The tribe of *mskt*, Masikat? is attested at Rujum Hani', seven kilometers east of al-Azraq, north of the Baghdad highway. Harding (1953: No 116) comments: "I have seen texts by other members of this tribe at Jawa, about 20 km northwest of (Rujum) Hani'". This area was subject to a systematic prospection in 1981 by M.C.A. Macdonald and A. Searight, with the support of Yarmouk University and in cooperation with the Department of Antiquities (Macdonald 1982; 1983). To my knowledge, only preliminary reports are available. The remark of Harding was accurate, for a few years later, Winnett recorded the tribe's name *mskt* seven times at Jawa and four times at Tall al-'Abd,



7. Inscriptions (B) and (C).



8. Facsimile of inscriptions (B) and (C).

which is a huge heap of basalt blocks, near the Syrian frontier (Winnett 1957: 145).

However, the major interest of this short graffito is the dating formula: “*snt mlk rb'l*”, the year Rabel became king. The author of inscription C does not seem to have any relation to the authors of A and B. He might have been the shepherd of the tribe, since he pastured the camels. In any case, he was the last to incise his inscription, since he found no room for it except in the middle of graffito B. It can be assumed that the king is most probably Rabel II who ascended the throne in AD 76, following the regency of his mother Shaqilat II (AD 70-76). This event was certainly relevant to the inhabitants of the Ḥarra, because his accession to the throne of the Nabataean kingdom was an era of relative prosperity with no major political problems. Other dated inscriptions in the Ḥarra were recorded by Macdonald (1995). Although this dating formula is not rare, it helps reconsider the relation between the bedouin tribes of the Ḥarra and the Nabataean kingdom. In his stimulating article “Nomads and the Ḥawrān in the Late Hellenistic and Roman Periods”, 1993, M.C.A. Macdonald strongly opposed the view of D. Graf who considered the Safaitic tribes “as another component of the diverse population that existed under Nabataeans rule” (Graf 1989:359). He also did not accept Milik’s hypothesis that some Safaitic tribes were semi-nomadic, or “quasi complètement sédentarisées” (Milik 1980:46). Milik had in mind the beni ‘Amrat of Mādabā or the tribes of ‘Awidh and the Dafaites.

It is not in the author’s intention to take part in this complex issue. But it is hard to imagine that the bedouins of the Ḥarra had no close contact with the sedentary population of Damascus and other cities of the Ḥawrān. Macdonald admits: “I have never claimed that the nomads had no commercial relations in the great cities. It is highly likely that they did, although the evidence is sparse and fragmentary” (private communication of

3.8.99). If the bedouins were not included in the administration of the Nabataean kingdom, it is highly probable that they exchanged their sheep and goats for food stock and clothes in the cities and that they were “clients” of the Nabataean kings. It is significant in this context that a man by the name of “*Drb s. of Qn*” who wrote in the Safaitic script identified himself as “*hnbty*, the Nabataean” (Clarck 1979: No. 661). This evidence is of little relevance to prove the control of the Safaitic population by the Nabataeans. However, Macdonald (1993: 346-52) reviewed the “Nomads, Sedentaries and the Epigraphic Evidence” and recorded several examples of bilingual Nabataean-Safaitic inscriptions, one of which is in a tomb cut in the rock by one “*HLF*” and inscribed in both Nabataeans and Safaitic at Dayr al-Kahf (Macdonald 1993: 348). He also cites bilingual Greek and Safaitic inscription and the inscriptions of a man who calls himself “*d'l šlh*”, maybe in reference to the city of Ṣalkhad in the Ḥawrān.

To conclude this section, it is difficult to demonstrate the direct control of the Nabataeans on the bedouin tribes of the desert. But close contacts should be admitted as evidenced by bilingual inscriptions and dating formulae. If the Nabataeans were in need of the safe passage of their caravans toward the north, or to the Arabian-Persian Gulf, they no doubt had to establish a treaty of friendship with the bedouin tribes. Such tribal peaceful agreement did not survive, but we know from pre-Islamic Arabia that the tribe of Quraysh passed an agreement with other tribes for the safety of their caravans for the winter and summer journeys (*Ilaf Quraysh*, surat 106). There is no reason why the Nabataeans could not establish such treaties with the bedouin tribes.

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F. Zayadine  
 Department of Antiquities  
 P.O.Box 88  
 Amman-Jordan

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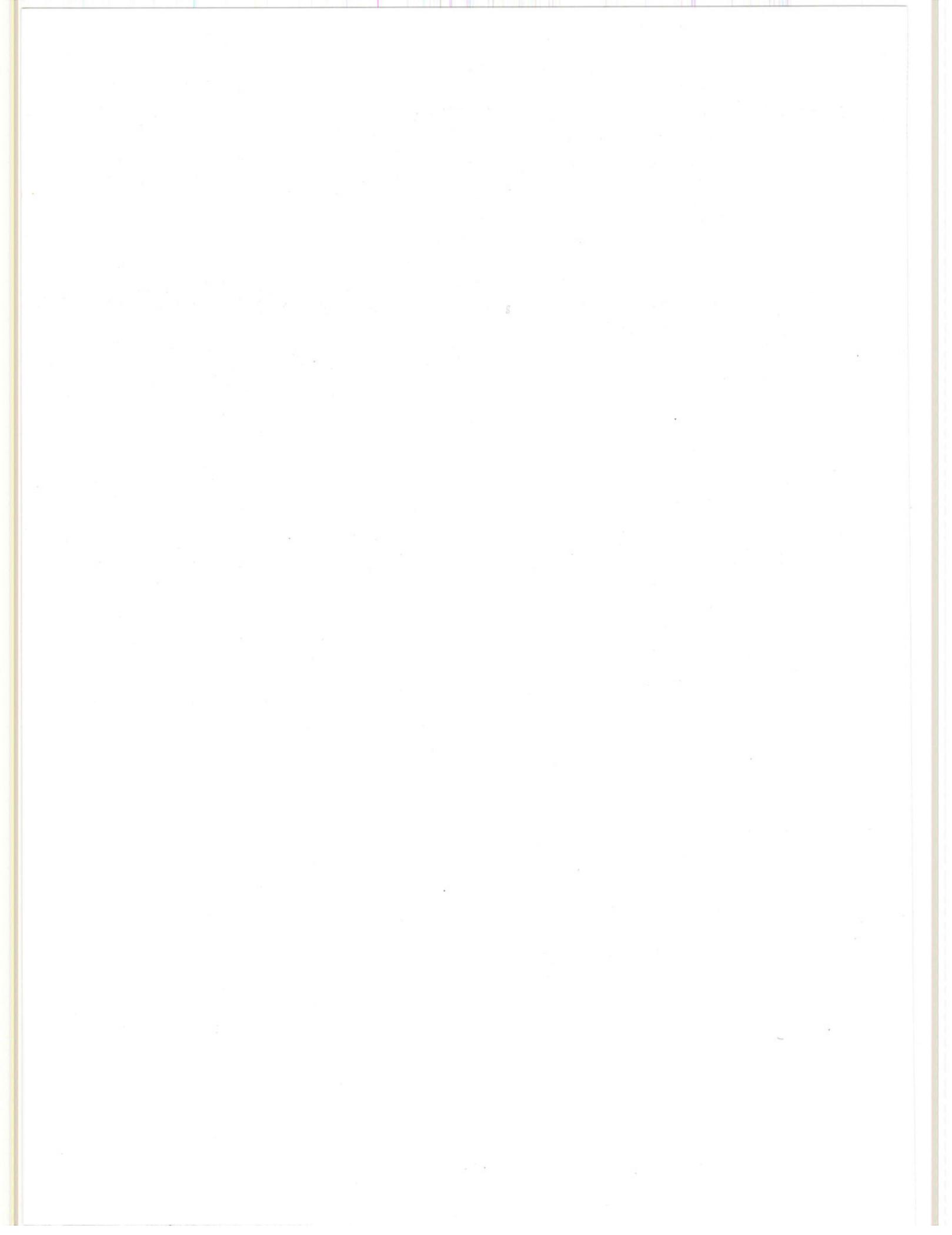
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# COMPREHENSIVE CHARACTERIZATION AND RATING OF THE WEATHERING STATE OF ROCK CARVED MONUMENTS IN PETRA/JORDAN-WEATHERING FORMS, DAMAGE CATEGORIES AND DAMAGE INDEX

by

Kurt Heinrichs and Bernd Fitzner

## **Abstract**

*The rock - cut monuments of ancient Petra in Jordan represent an outstanding world cultural heritage. On many of the monuments, damages due to weathering are alarming. Precise diagnosis is needed for the comprehensive characterization, understanding, rating and prediction of damages, and, for remedy and sustainable prevention. Identification, registration, documentation and evaluation of weathering forms are an important contribution to damage diagnosis. Monument mapping has been internationally established as an expert method. Systematic monument mapping has been executed at numerous rock monuments in Petra. The methodological approach and results are presented.*

## **Introduction**

The Nabataean city of Petra, has numerous monuments that were carved out of sedimentary rock about 2000 years ago. Brünnow and von Domaszewski (1904) catalogued more than 800 rock monuments of different size, architecture and function. They established a numbering system for the tombs which is still in use today. Most of the monuments appear in the form of rock-cut façades with chambers. It is rare that monuments with two, three or even four façades can be found. The Petra rock monuments rank among the most important historical monuments of the world, combining natural environment and craftsmanship in a very impressive way.

Ever since their construction all monuments have been suffering from environmental impact. On many of the monuments, the weathering damages – loss of stone material, detachment of stone material, struc-

tural disorders – are alarming and preservation measures are necessary. However, the protection of rock carved monuments requires careful intervention and rash intervention works should be avoided. All experts agree, that the realization of effective and sustainable preservation measures can only be achieved by means of a reliable damage diagnosis which includes a complexity of causes, mechanisms and results of weathering. Therefore, research results must be integrated into monument preservation plans.

The research project “Systematic registration and evaluation of damages at rock monuments in Petra” (1996-1999) aims at comprehensive damage diagnosis. The project – initiated by the authors and executed in close cooperation with Jordanian authorities – is funded by DFG-Deutsche Forschungsgemeinschaft (Germany). The aims and objectives of this project have been described in Fitzner and Heinrichs (1998a). The project combines extensive in situ investigation of the Petra rock-cut monuments and detailed material studies in the laboratory. *In situ* investigation comprises:

- description and classification of lithotypes according to color, grain size, bedding structures, stratigraphy
- description of monuments considering position, orientation, dimension, architecture, use, environment
- monument mapping considering lithology, weathering forms, joints
- measurements concerning the profile of stone tooling patterns, weathering profiles, water uptake, climate/microclimate, environment
- sampling
- detailed photo documentation

Methodology, results and interpretation of monument mapping are presented in the following.

### Classification and Mapping of Weathering Forms

Weathering forms on stone monuments represent visible results of weathering processes which are initiated and controlled by interacting weathering factors. By means of weathering forms, the weathering state of stone surfaces can be described according to phenomenological criteria. The scale of visible deterioration on historical stone monuments has been classified by Viles *et al.* (1997) as follows:

- microscale (cm or less)
- mesoscale (cm to m)
- macroscale (whole façades, entire monuments)

The term "weathering forms" is used for visible stone deterioration at mesoscale. The monument mapping method has been developed by the working group "Natural stones and weathering" as a non-destructive procedure for the precise registration, documentation, evaluation and rating of weathering forms (e.g. Fitzner and Heinrichs 1998b). Monument mapping can be applied to all stone types and to all types of stone monuments. The mapping method meets international acceptance and is approved as a well-tried method contributing essentially to:

- the improvement of scientific knowledge of stone weathering of monuments
- the establishment of a well-founded damage diagnosis of stone monuments
- deciding on economic and effective monument preservation measures.

By means of monument mapping, all weathering forms of monument surfaces are registered and documented exactly according to type, intensity and distribution.

An objective description, registration and documentation of weathering forms requires a classification scheme of weathering forms.

A standard classification scheme has been established, based on investigations done at numerous monuments worldwide and considering different stone types and environmental influences (Fitzner, Heinrichs and Kownatzki 1995). This classification scheme has been developed for monuments constructed with quarried stone blocks. However, it can be also used for rock carved monuments, as practical experience in Petra has shown.

In Table 1 (1.1 - 1.4) items of the classification scheme that are relevant for the Petra rock monuments are presented with definitions, symbols and intensity classification of the weathering forms. Compared to the standard classification scheme presented in Fitzner, Heinrichs and Kownatzki (1995) some of the weathering forms have been redefined to become more specific or comprehensive for the sake of characterizing the weathering state of the Petra rock monuments. Table 1 (1.1-1.4) illustrates the hierarchical structure of the classification scheme which includes four different levels. A distinction is made between three groups of weathering forms in the uppermost level (I):

- Group 1 - loss of stone material
- Group 2 - deposits
- Group 3 - detachment

In level II, each group is subdivided into *main weathering forms*, and in level III, several main weathering forms are further subdivided into *individual weathering forms*. Individual weathering forms can be further differentiated according to intensities (level IV). The intensity classification is a result of the field-survey conducted at the Petra rock monuments. Symbols are proposed for recording weathering forms in documents and for computer supported processing of information. Symbols in level IV of the classification scheme are composed of letters for weathering forms and numbers for intensities.

In mapping the monuments of Petra, the

**Table 1.1.** Classification of weathering forms; Group 1 of weathering forms "Loss of stone material".

LEVEL I					
GROUP 1 OF WEATHERING FORMS: „LOSS OF STONE MATERIAL“					
LEVEL II		LEVEL III		LEVEL IV	
MAIN WEATHERING FORM	SYMBOL	INDIVIDUAL WEATHERING FORM	SYMBOL	CLASSIFICATION OF INTENSITIES	SYMBOLS
<b>Back weathering</b>  Uniform loss of stone material parallel to the original stone surface (uniform recession of stone surface).	W	<i>Back weathering due to loss of scales</i> Uniform loss of stone material parallel to the stone surface due to falling down of scales.	sW	<b>Criterion: depth of back weathering (cm)</b>  Intensity 1: < 1 cm Intensity 2: 1 – 5 cm Intensity 3: 5 – 10 cm Intensity 4: 10 – 25 cm Intensity 5: > 25 cm	sW1, sW2, sW3, sW4, sW5
		<i>Back weathering due to loss of stone elements dependent on stone structure</i> Uniform loss of stone material parallel to the stone surface due to falling down of stone elements dependent on stone structure.	xW		xW1, xW2, xW3, xW4, xW5
		<i>Back weathering due to loss of undefinable stone elements</i> Uniform loss of stone material parallel to the stone surface due to falling down of stone material. Type of preceded detachment of stone material can not be characterized.	zW		zW1, zW2, zW3, zW4, zW5
<b>Relief</b>  Morphological change of the stone surface due to partial or selective weathering (non-uniform recession of stone surface).	R	<i>Rounding / notching</i> Relief by rounding of edges or notchiung/hollowing out. Concave and/or convex soft morphological forms.	Ro	<b>Criterion: depth of relief (cm)</b>  Intensity 1: < 1 cm Intensity 2: 1 – 5 cm Intensity 3: 5 – 10 cm Intensity 4: 10 – 25 cm Intensity 5: > 25 cm	Ro1, Ro2, Ro3, Ro4, Ro5
		<i>Alveolar weathering</i> Relief in the form of closely-spaced alveolae. Form comparable to honeycombs („honeycomb weathering“).	Ra		Ra1, Ra2, Ra3, Ra4, Ra5
		<i>Relief dependent on stone structure</i> Relief dependent on structural features such as bedding, foliation, banding etc. Frequently striped patterns.	tR		tR1, tR2, tR3, tR4, tR5
		<i>Weathering out of stone components</i> Relief due to selective weathering of stone components being susceptible to weathering (e.g. clay lentils) or due to loss of compact stone elements (e.g. pebbles). Hole-shaped forms.	Rk		Rk1, Rk2, Rk3, Rk4, Rk5
		<i>Clearing out of stone components</i> Relief in the form of protruding stone elements due to weathering of stone material around being more susceptible to weathering.	Rh		Rh1, Rh2, Rh3, Rh4, Rh5
<b>Break out</b>  Loss of compact stone elements.	O	<i>Break out due to natural cause</i> Loss of compact stone elements due to natural causes like wedge-work of roots, intersection of fractures/joints etc..	nO	<b>Criterion: volume of stone elements broken out (dm<sup>3</sup>)</b>  Intensity 1: < 1 dm <sup>3</sup> Intensity 2: 1 – 5 dm <sup>3</sup> Intensity 3: 5 – 10 dm <sup>3</sup> Intensity 4: 10 – 50 dm <sup>3</sup> Intensity 5: 50 – 100 dm <sup>3</sup> Intensity 6: > 100 dm <sup>3</sup>	nO1, nO2, nO3, nO4, nO5, nO6
		<i>Break out due to non-recognizable cause</i> Loss of compact stone elements. Cause of break out can not be characterized.	oO		oO1, oO2, oO3, oO4, oO5, oO6

Table 1.2. Classification of weathering forms; Group 2 of weathering forms "Deposits".

LEVEL I					
GROUP 2 OF WEATHERING FORMS: „DEPOSITS“					
LEVEL II		LEVEL III		LEVEL IV	
MAIN WEATHERING FORM	SYMBOL	INDIVIDUAL WEATHERING FORM	SYMBOL	CLASSIFICATION OF INTENSITIES	SYMBOLS
		<b>Soiling</b>			
		Poorely adhesive deposits of dust, soil or mud particles from the air or from surface or bottom water on the stone surface.	I	no differentiation of intensities	I
<b>Loose salt deposits</b>	E	<i>Efflorescences</i> Poorely adhesive deposits of salt aggregates on the stone surface.	Ee	<u>Criterion: mass of salt deposits</u>  Intensity 1: low Intensity 2: high	Ee1, Ee2
Poorely adhesive deposits of salt aggregates.		<i>Subflorescences</i> Poorely adhesive deposits of salt aggregates below the stone surface.	Ef		Ef1, Ef2
<b>Crust</b>  Firmly adhesive deposits on the stone surface.	C	<i>Dark-colored crust tracing the surface</i> Firmly adhesive, grey to black deposits tracing the morphology of the stone surface. Here: thin soot crusts (anthropogenically).	dkC	<u>Criterion: degree of blacking</u>  Intensity 1: low Intensity 2: high	dkC1, dkC2
		<i>Dark-colored crust changing the surface</i> Firmly adhesive, grey to black deposits changing the morphology of the stone surface. Here: thicker soot crusts (anthropogenically).	diC	<u>Criterion: thickness of crust</u>  Intensity 1: low Intensity 2: high	diC1, diC2
		<i>Light-colored crust tracing the surface</i> Firmly adhesive, light-colored deposits tracing the morphology of the stone surface. Here: thin salt crusts.	hkC	<u>Criterion: degree of surface covering</u>  Intensity 1: low Intensity 2: high	hkC1, hkC2
		<i>Light-colored crust changing the surface</i> Firmly adhesive, light-colored deposits changing the morphology of the stone surface. Here: thicker salt crusts.	hiC	<u>Criterion: thickness of crust</u>  Intensity 1: low Intensity 2: high	hiC1, hiC2
		<i>Colored crust tracing the surface</i> Firmly adhesive, colored deposits tracing the morphology of the stone surface. Here: thin brown crusts (clay particles, carbonate particles, ferritic particles etc.).	fkC	<u>Criterion: degree of surface covering</u>  Intensity 1: low Intensity 2: high	fkC1, fkC2
		<i>Colored crust changing the surface</i> Firmly adhesive, colored deposits changing the morphology of the stone surface. Here: thicker brown crusts (clay particles, carbonate particles, ferritic particles etc.).	fiC	<u>Criterion: thickness of crust</u>  Intensity 1: low Intensity 2: high	fiC1, fiC2
<b>Biological colonization</b>	B	<i>Microbiological colonization</i> Colonization by microorganisms (e.g. algae, lichen).	Bi	no differentiation of intensities	Bi
Colonization by microorganisms or higher plants.		<i>Colonization by higher plants</i>	Bh		Bh
<b>Loose salt deposits to crust</b>	E-C	<i>Efflorescences to light-colored crust tracing the stone surface (salt crust)</i> Transitional form between <i>Efflorescences (Ee)</i> and <i>Light-colored crust tracing the surface (hkC)</i> .	Ee-hkC	<u>Criterion: degree of surface covering</u>  Intensity 1: low Intensity 2: high	Ee-hkC1, Ee-hkC2

Table 1.3. Classification of weathering forms; Group 3 of weathering forms "Detachment".

LEVEL I					
GROUP 3 OF WEATHERING FORMS: „DETACHMENT“					
LEVEL II		LEVEL III		LEVEL IV	
MAIN WEATHERING FORM	SYMBOL	INDIVIDUAL WEATHERING FORM	SYMBOL	CLASSIFICATION OF INTENSITIES	SYMBOLS
<b>Granular disintegration</b> Detachment of grainy stone particles, individual grains or grain aggregates.			G	<u>Criteria: mass of detaching stone material or depth of disintegration</u> Intensity 1: low Intensity 2: medium Intensity 3: high	G1, G2, G3
<b>Crumbling</b> Detachment of larger compact stone elements (crumbs).			P	<u>Criterion: mass/volume of detaching stone material</u> Intensity 1: low Intensity 2: medium Intensity 3: high	P1, P2, P3
<b>Flaking</b> Detachment of small, thin stone elements (flakes) parallel to the stone surface. Either detachment of only one layer of flakes or detachment of stacks of flakes.			F	<u>Criteria: mass of detaching stone material or depth of disintegration</u> Intensity 1: low Intensity 2: medium Intensity 3: high	F1, F2, F3
<b>Contour scaling</b> Detachment of larger, platy stone elements (scales) parallel to the stone surface, not following any stone structure.	S	<i>Scales due to tooling of the stone surface</i> Detachment of mainly thin scales due to tooling of the stone surface by stonemason.	qS	no differentiation of intensities	qS
		<i>Single scale</i> Detachment of an individual scale.	eS	<u>Criterion: thickness (cm)</u> Intensity 1: < 0.5m Intensity 2: 0.5 – 1 cm Intensity 3: 1 – 2 cm Intensity 4: 2 – 5 cm Intensity 5: > 5 cm	eS1, eS2, eS3, eS4, eS5
		<i>Multiple scales</i> Detachment of a stack of scales.	mS		mS1, mS2, mS3, mS4, mS5
<b>Detachment of stone elements dependent on stone structure</b> Detachment of mainly larger stone elements following any stone structure (esp. bedding).	X	<i>Exfoliation</i> Detachment of mainly larger stone elements following any stone structure. Stone elements detach parallel to stone surface.	XI	<u>Criterion: thickness/mass of detaching stone elements</u> Intensity 1: low Intensity 2: high	XI1, XI2
		<i>Splitting up</i> Detachment of mainly larger stone elements following any stone structure. Stone elements detach not parallel to stone surface.	Xv	<u>Criteria: thickness/mass of detaching stone elements or closeness of splitting planes</u> Intensity 1: low Intensity 2: high	Xv1, Xv2
<b>Detachment of crusts with stone material</b> Detachment of crusts with stone material sticking to the crust.			K	<u>Criterion: mass of detaching material</u> Intensity 1: low Intensity 2: high	K1, K2

**Table 1.4.** Classification of weathering forms; Group 3 of weathering forms "Detachment" (continuation).

LEVEL I					
GROUP 3 OF WEATHERING FORMS: „DETACHMENT“ – (continuation)					
LEVEL II		LEVEL III		LEVEL IV	
MAIN WEATHERING FORM	SYMBOL	INDIVIDUAL WEATHERING FORM	SYMBOL	CLASSIFICATION OF INTENSITIES	SYMBOLS
Granular disintegration to flaking Transitional form between Granular disintegration (G) and Flaking (F)..			G-F	Criteria: mass of <u>detaching stone material</u> or depth of <u>disintegration</u>  Intensity 1: low Intensity 2: medium Intensity 3: high	G-F1, G-F2, G-F3
Flaking to contour scaling Transitional form between Flaking (F) and Contour scaling (S).			F-S	Criterion: mass of <u>detaching stone material</u>  Intensity 1: low Intensity 2: medium Intensity 3: high	F-S1, F-S2, F-S3
Flaking to crumbling Transitional form between Flaking (F) and Crumbling (P).			F-P	Criterion: mass of <u>detaching stone material</u>  Intensity 1: low Intensity 2: medium Intensity 3: high	F-P1, F-P2, F-P3
Granular disintegration to crumbling Transitional form between Granular disintegration (G) and Crumbling (P).			G-P	Criterion: mass of <u>detaching stone material</u>  Intensity 1: low Intensity 2: medium Intensity 3: high	G-P1, G-P2, G-P3
Crumbling to contour scaling Transitional form between Crumbling (P) and Contour scaling (S).			P-S	Criterion: mass/volume of <u>detaching stone material</u>  Intensity 1: low Intensity 2: medium Intensity 3: high	P-S1, P-S2, P-S3

level IV classification was applied. Plans of the monuments were prepared considering the original architecture. All occurring weathering forms and their intensities were mapped, and areas of different weathering forms or different intensities of weathering forms were delimited on the plans. Lithological mapping and mapping of joints were made contemporaneously with mapping of the weathering forms. The classification of lithotypes and results of lithological mapping will be presented in a next publication.

**Evaluation of Weathering Forms**

A computer programme was tailored for optimal processing, illustration and evalua-

tion of mapping information. The basic steps of processing are:

- digitizing monument plans with delimitations of distinct areas (*basic plan*)
- numbering and planimetric evaluation of all areas (*basic list*)
- integration of mapping information by means of symbols (*information list*)

Table 2 shows a section of an information list. The basic plan and information list represent the basis for mapping and for quantitative evaluations. Maps based on groups of weathering forms have turned out to be very suitable for the Petra monuments. Examples are presented for Tomb No. 70 located in the Outer as-Siq (Fig. 1). Figures 2-4

Table 2. Information list; example (section).

Number of area	Size (pixel)*	Lithotype	Weathering forms and its intensities
200	5932	mIN-m-fSd	sW2 F-S2 G1 fkC1 I Ee-hkC1
201	12700	mIN-m-fSd	Ro2 F-S2 fkC1 I
202	21288	mIN-m-fSd	zW2 G1 fkC1 I Ee-hkC1
203	700	mIN-m-fSd	Ro1 eS4 G2 I
204	7160	mIN-m-fSd	Ro3 F-S2 fkC1 I Ee-hkC1
205	5693	mIN-m-fSd	Ro2 F-S2 fkC1 I Ee-hkC1
206	362	mIN-m-fSd	Ro2 G2 I
207	3228	mIN-m-fSd	Ro2 F-S2 fkC1 I
208	5408	mIN-m-fSd	Ro2 F-S3 fkC1 I
209	26821	mIN-m/r-fSd	Ro3 G1 fkC1 I Ee1
210	9987	mIN-m/r-fSd	Ro3 G2 I Ee1
211	20027	mIN-m/r-fSd	Ro3 fkC1 I G1 Ee1
212	33139	mIN-m/r-fSd	Ro2 fkC1 I G-F1 Ee-hkC1
213	2378	mIN-m/y-fSd	Ro3 G2 I Ee1
214	465	mIN-m/y-fSd	Ro2 G1 fkC1 I Ee1
215	653	mIN-m/y-fSd	Ro2 G1 fkC1 I Ee1

\* Area in m<sup>2</sup> can be calculated considering scale of monument plan.

show maps down for the east façade of Tomb No. 70 which consider weathering forms of the three groups: “loss of stone material” (Fig. 2), “deposits” (Fig. 3) and “detachment” (Fig. 4). Maps like these were prepared for more than twenty monuments. The maps can be considered as “layers”, which together provide information on all existing weathering forms. By means of such maps, all weathering forms can be exactly located. Furthermore, they reveal zones of weathering forms, which can be indicators for the type or intensity of weathering processes and environmental impacts.

Computer supported processing of mapping information facilitates quick and reliable quantitative evaluation of weathering forms (Fig. 5). The comparison of mapping results enhances the information about the influence of lithotypes and monument characteristics like location, orientation and ge-

ometry, on the susceptibility of monument surfaces to weathering.

### Assessment of Weathering Progression

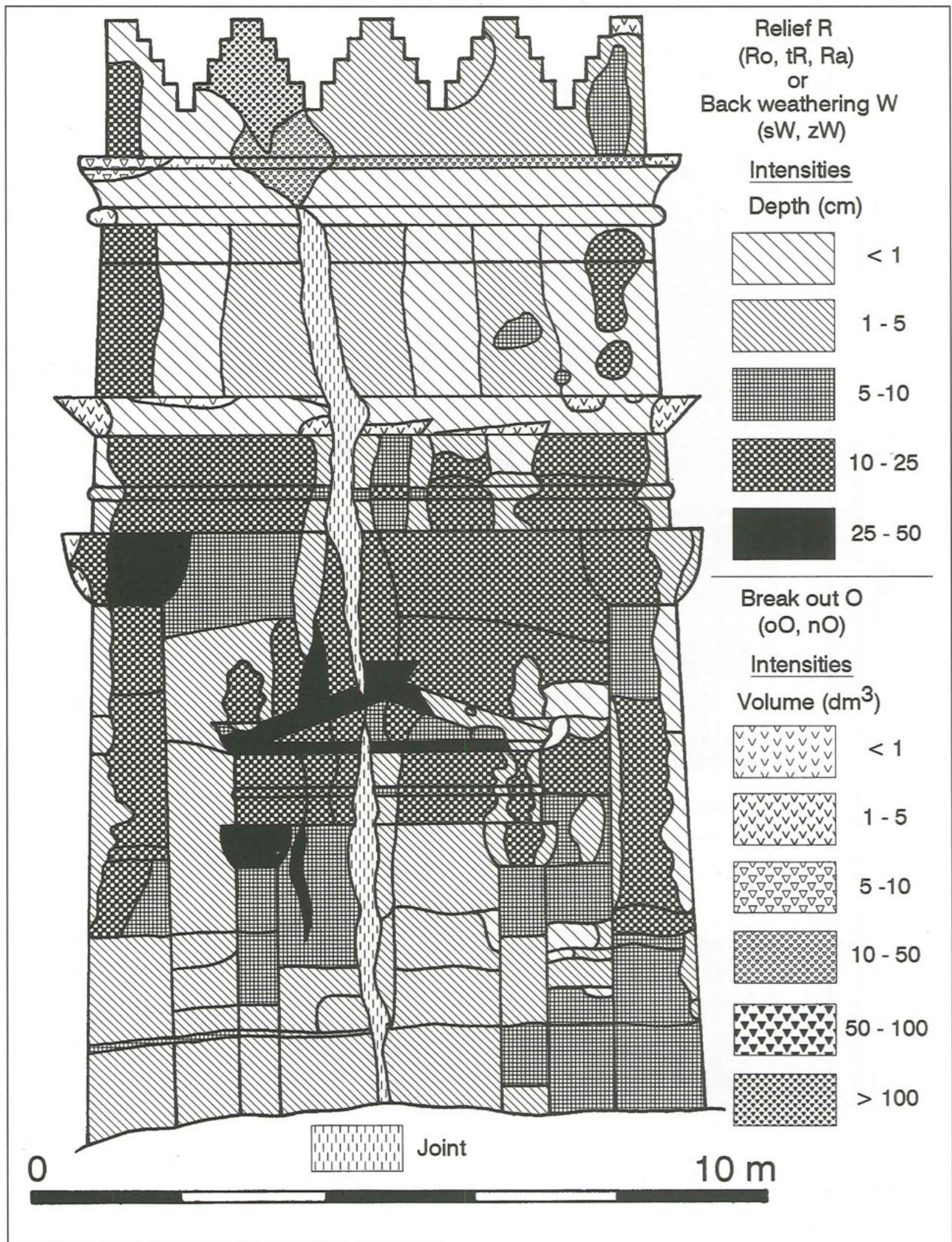
Mapping and quantification of weathering forms characterized by the “loss of stone material” allow the calculation of average weathering rates (Fig. 6). Average weathering rates contribute to reliable weathering prognoses only in a limited way, because they assume linear weathering progression. Supplementary information is needed. Interrelations and successions of weathering forms have been evaluated additionally for the assessment of weathering progression. Statistical evaluation has been made referring to the interrelation between “loss of stone material”, “detachment” and “deposits”. In Figure 7 (a and b) the relation between loss of stone material and detachment of stone material is shown for the fine-



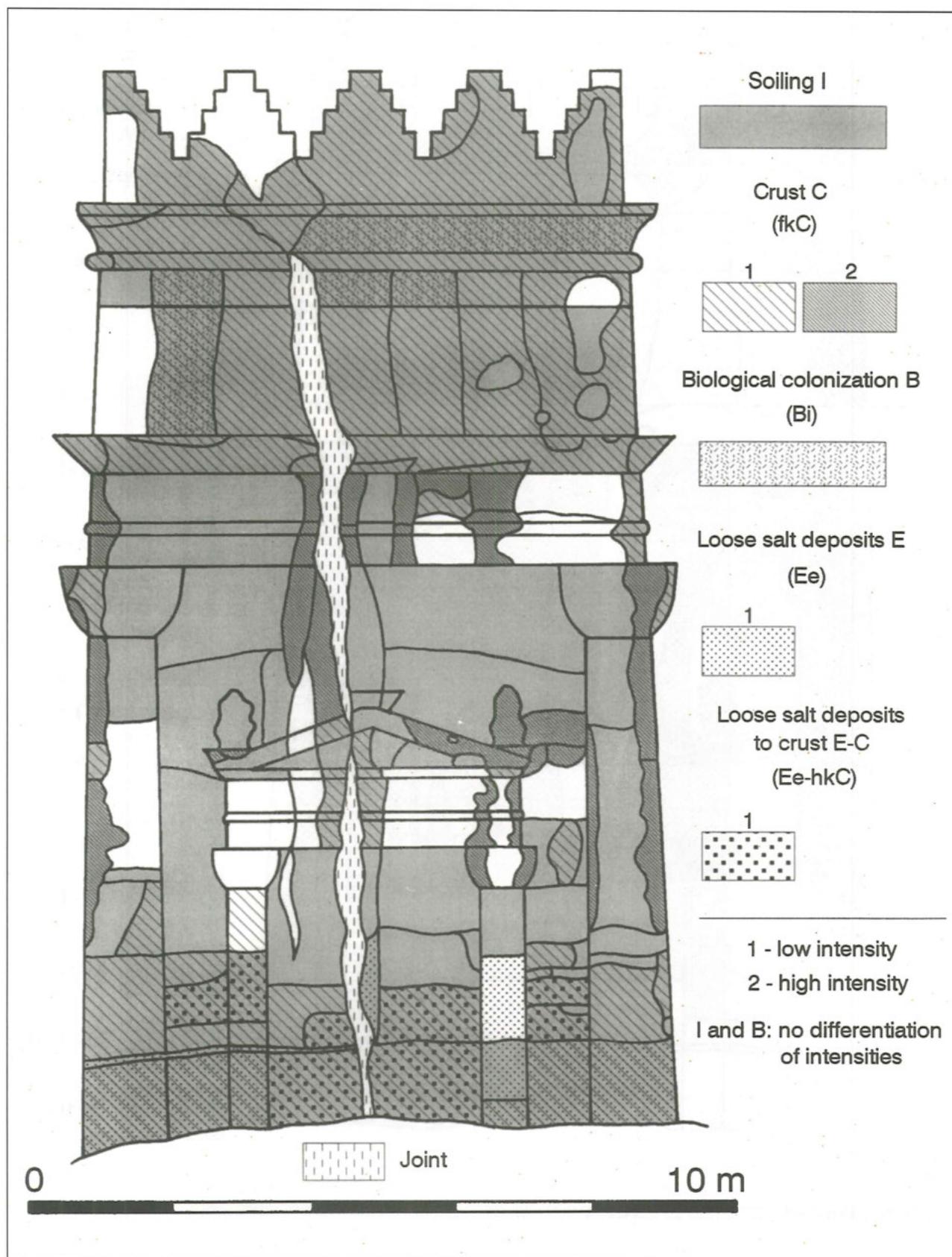
1. Tomb No. 70-east façade; Outer as-Siq.

grained lithotypes of the Umm Ishrin Sandstone Formation and the coarser ad-Disi Sandstone Formation. The four very frequent weathering forms characterizing present detachment are: contour scaling, flaking to contour scaling, granular disintegration to flaking, and granular disintegration. The order of listing of these weathering forms corresponds to the decreasing size of detaching stone elements. The increasing loss of stone material corresponds to the decreasing size of detaching stone elements from larger sized elements (contour scaling) via medium-sized and small-sized stone elements (flaking to contour scaling, granular disintegration to flaking) to smallest-sized elements (granular disintegration). Comparison of the two lithological units reflects the influence of

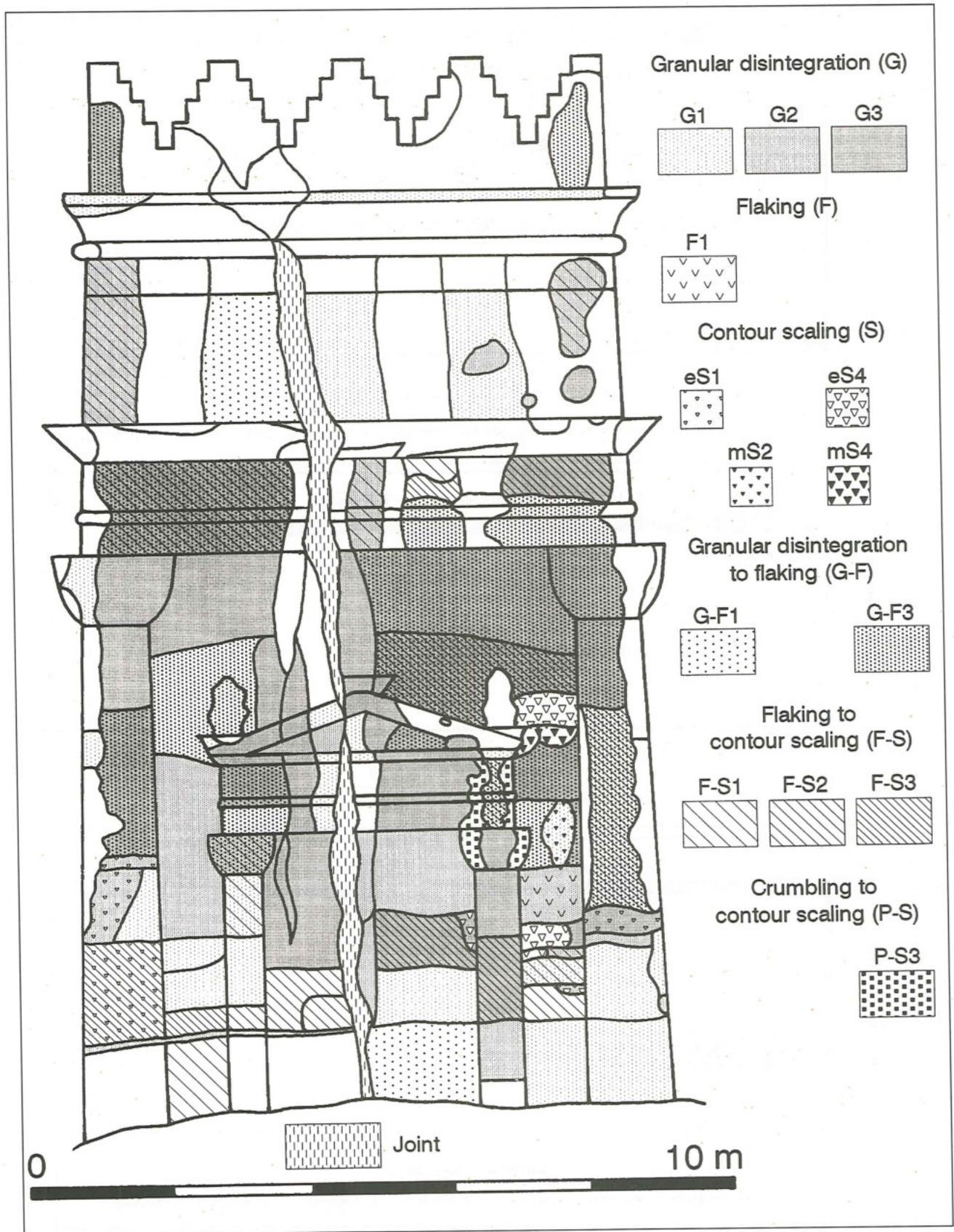
stone type on the succession of weathering forms. In case of the ad-Disi sandstone transitions from larger sized detaching stone elements to smaller sized detaching stone elements occur earlier. A less compact fabric of this lithotype can be inferred. The intensity of stone detachment has been additionally considered as a key parameter for characterizing interrelations between loss of stone material and detachment of stone material. Here, a correlation between frequency and intensity of stone detachment was found. An increasing loss of stone material corresponds to a decreasing frequency of contour scaling and decreasing thickness of scales. Frequency and intensity of granular disintegration increase at the same time (Fig. 8). Interrelations between the loss of stone material and deposits enhances information for assessing the weathering progression. An increasing loss of stone material corresponds to a decreasing frequency of soiling and biological colonization and to a decreasing frequency and intensity of crust formation, in particular, the formation of a colored crust tracing the stone surface (Fig. 9 a and b). Observations indicate that the formation of this type of crust mainly results from the deposition and consolidation of carbonatic and clayish particles from the environment due to wind and rain water. The weathering forms "soiling" and "colored crust tracing the surface" differ only in the consolidation of particles and in the degree of adhesion to the stone surface. The formation of colored crust tracing the stone surface is preceded by soiling. This finding is of vital importance for characterizing weathering progression. Soiling and crust formation need a stable stone surface for a certain period. The period increases from soiling to crust formation. The following interrelations between detachment of stone material and deposits can be derived. The succession of the weathering forms: contour scaling, flaking to contour scaling, granular disintegration to flaking and final granular disinte-



2. Tomb No. 70 - east façade; mapping of weathering forms; group of weathering forms: "Loss of stone material".



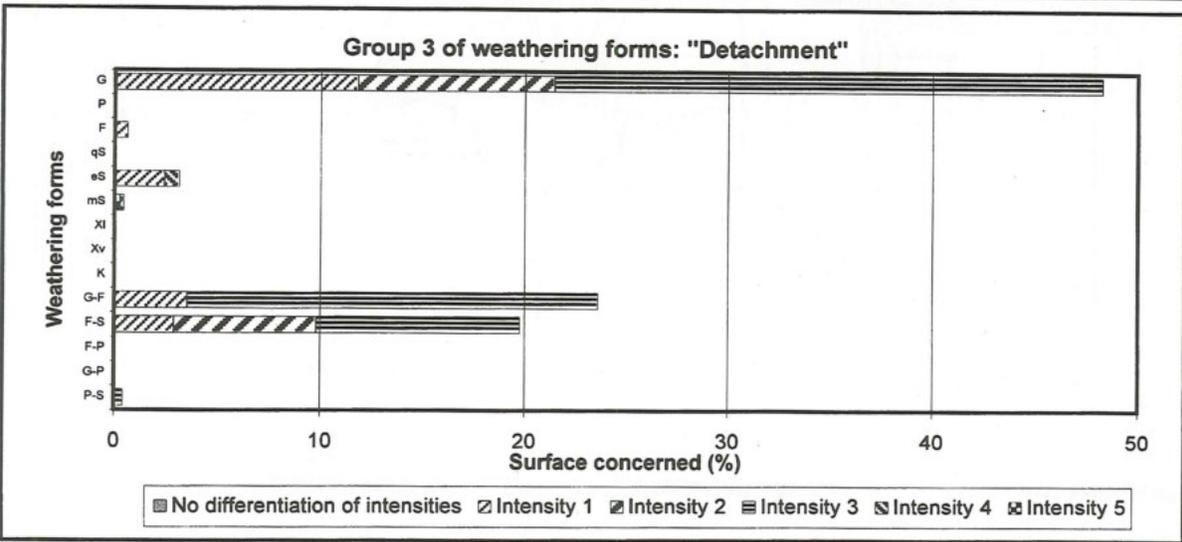
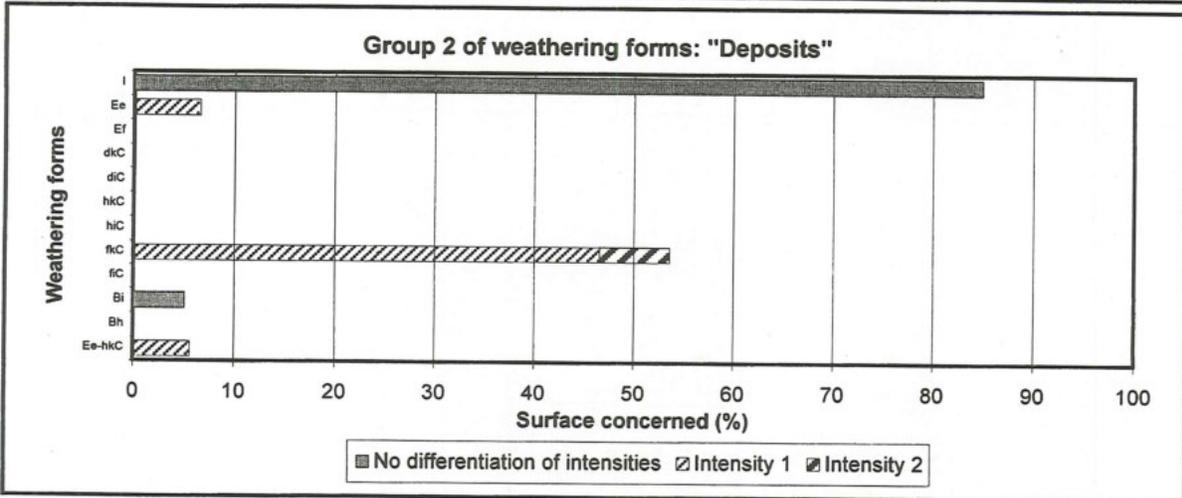
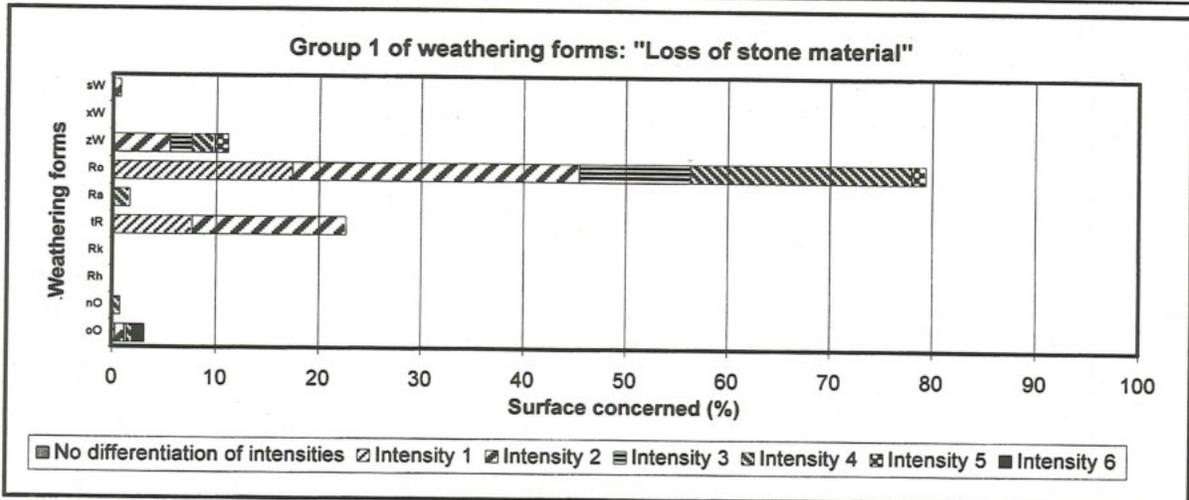
3. Tomb No. 70 - east façade; mapping of weathering forms; group of weathering forms: "Deposits".



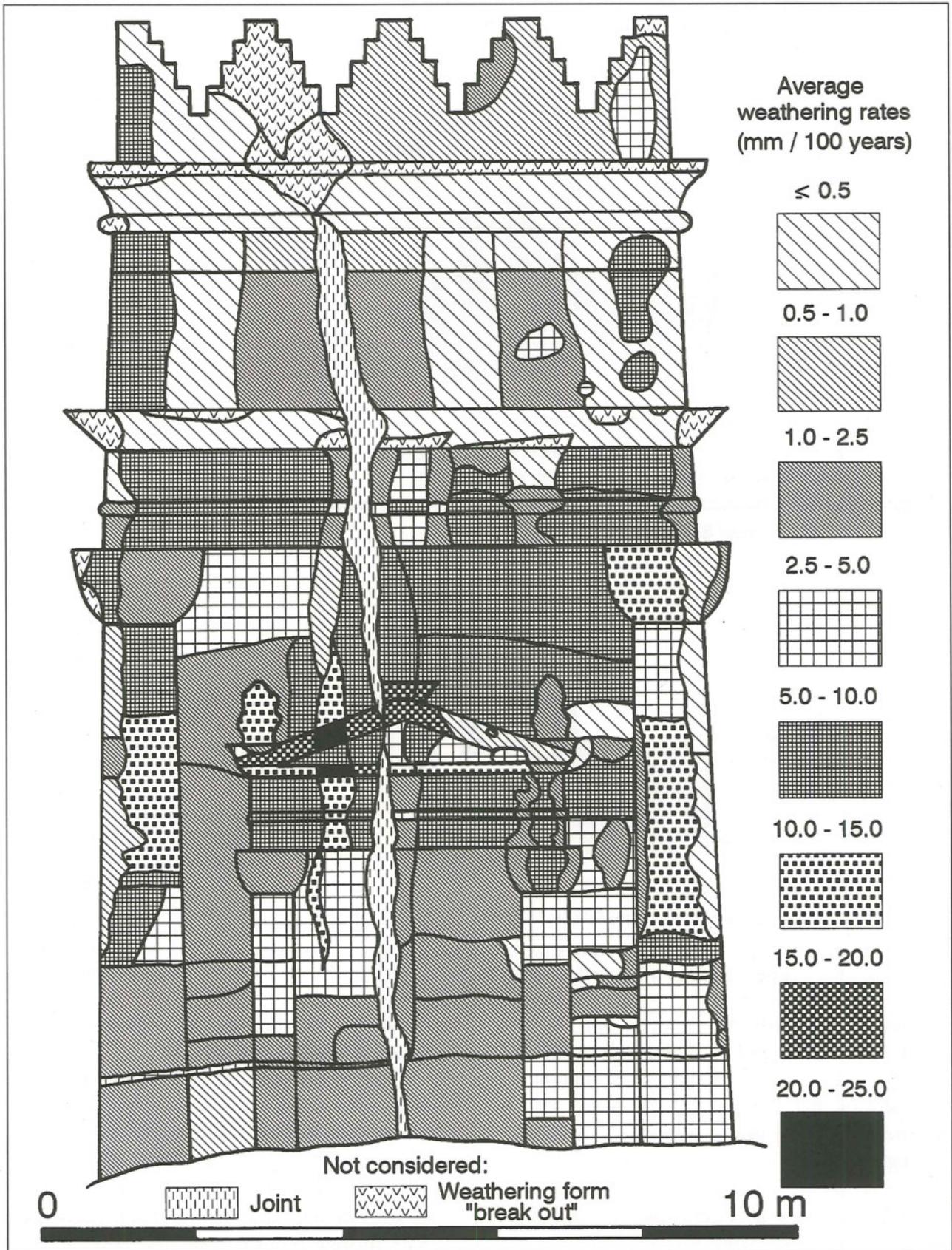
4. Tomb No. 70 - east façade; mapping of weathering forms; group of weathering forms: "Detachment".

## Tomb No. 70 (East facade) - Petra/Jordan

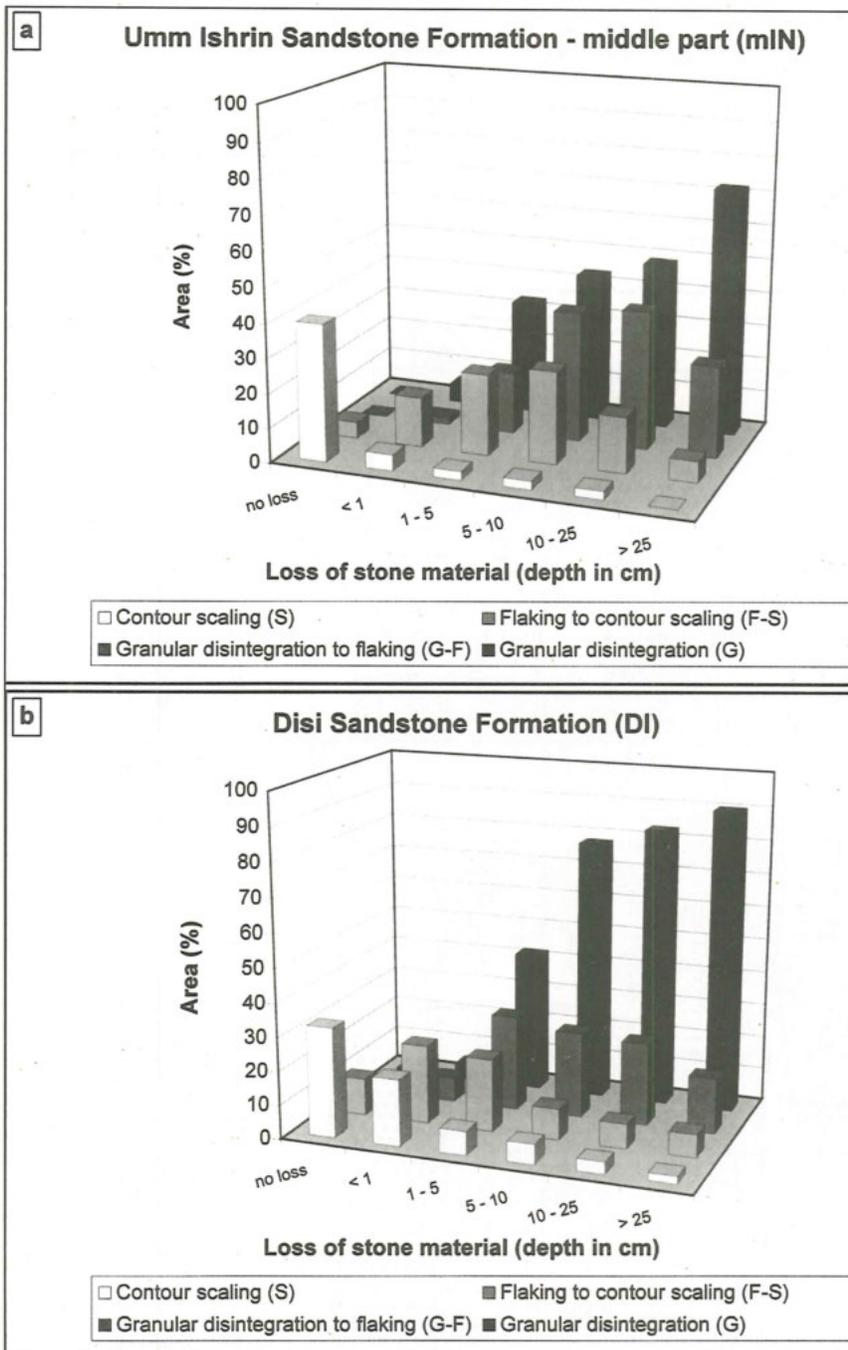
### Quantitative evaluation of weathering forms



5. Tomb No. 70 - east façade; quantitative evaluation of weathering forms.



6. Tomb No. 70 - east façade; average weathering rates.

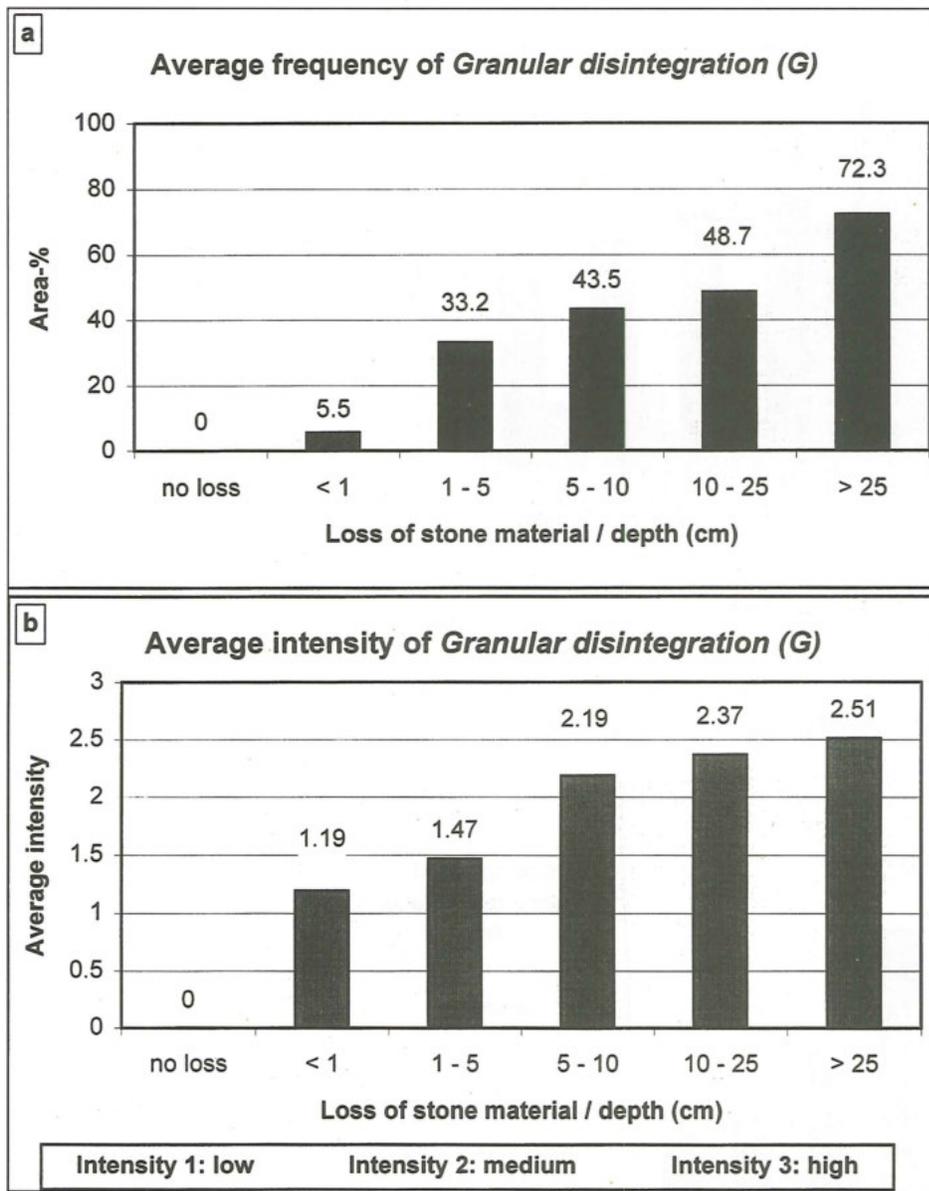


7:a,b. Relation between loss of stone material (considered weathering forms: relief/R and back weathering/W) and detachment of stone material (S, F-S, G-F, G); a - Umm Ishrin Sandstone Formation / middle part (mIN); b - ad-Disi Sandstone Formation (DI).

gration, corresponds to a decreasing frequency in soiling and to a decreasing frequency and intensity of crust formation. This shows that the velocity of stone detachment increases in the sequence: contour scaling, flaking to contour scaling, granular disintegration to flaking and final granular disintegration. As a conclusion, it can be stated that the increasing loss of stone material correlates with an increasing velocity

of stone detachment. This shows a non-linear weathering progression.

The discussed interrelations between weathering forms and assessment of weathering progression have considered entire monuments and main litho-stratigraphic units. Consideration of characteristic parts of monuments and all individual lithotypes will further promote the understanding of weathering progression. Weathering prog-



8: a,b. Relation between loss of stone material (considered weathering forms: relief / R and back weathering/W) and granular disintegration (G). Umm Ishrin Sandstone Formation/middle part (mIN); a-Average frequency; b-Average intensity.

nosis will become an important part of the "life cycle" analysis of monuments.

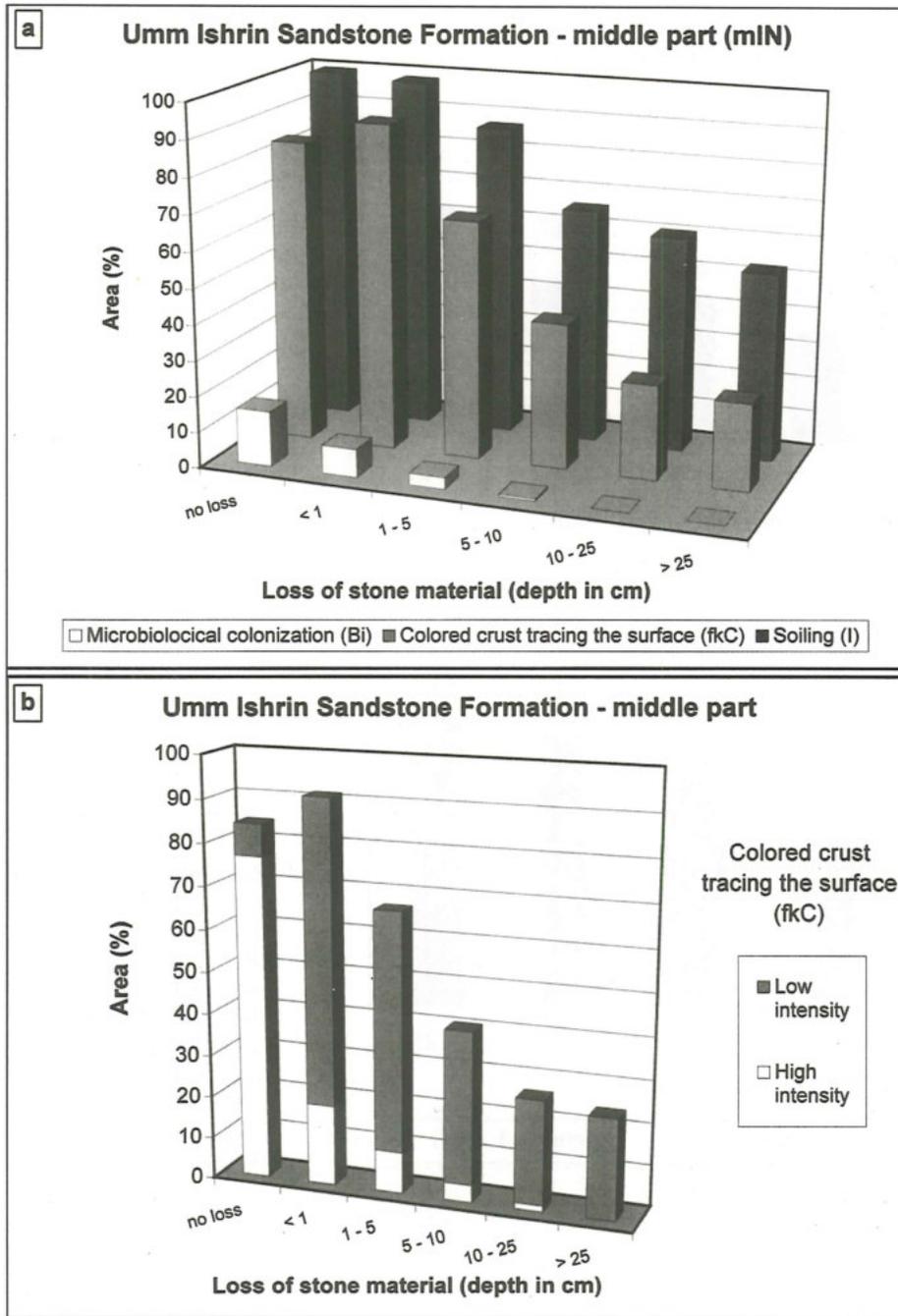
**Rating of Weathering - Damage Categories; Damage index**

Weathering forms allow precise description and mapping of the state of weathering. The rating of damages is necessary for all kinds of preservation measures and interventions. For this issue, damage categories and damage indices have been established (Fig. 10): Six damage categories have been defined:

0- no visible damages

- 1- very slight damages
- 2- slight damages
- 3- moderate damages
- 4- severe damages
- 5- very severe damages

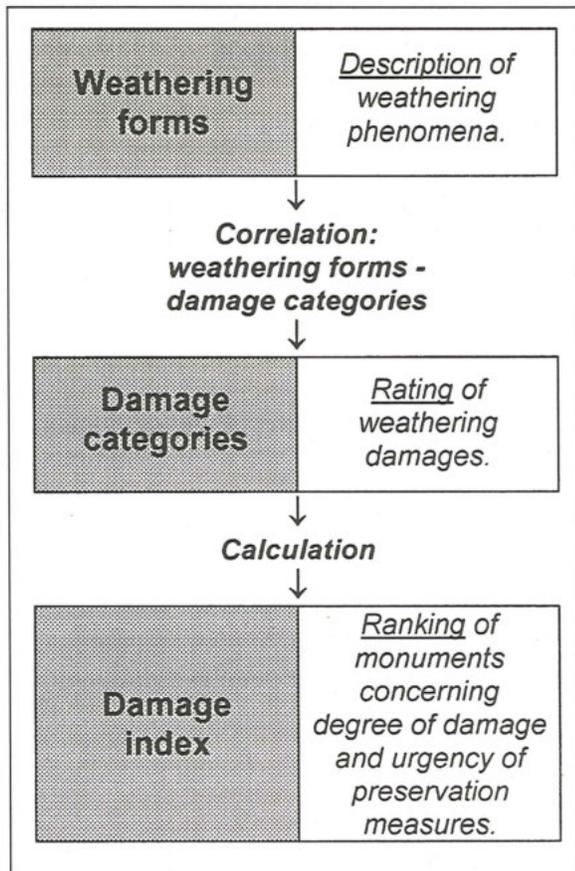
A scheme, which relates weathering forms to damage categories has been defined for the Petra rock monuments considering all intensities of the weathering forms (Table 3). All weathering forms included within the groups, "loss of stone material" and "detachment", have been taken into account. All weathering forms are transformed into damage categories. Dam-



9:a,b. Relation between loss of stone material (considered weathering forms: relief/R and back weathering/W) and deposits. Umm Ishrin Sandstone Formation / middle part (mIN); a - Deposits: Bi, fkC, I; b - Deposit: fkC.

age categories are derived separately for “loss of stone material” and “detachment”. The highest damage categories for “loss of stone material” and “detachment” are jointly considered for determining the final damage category (Fig. 11). Table 4 shows an information list with the number of areas delimited at a monument surface, weathering forms describing “loss of stone material” and “detachment”, damage categories

for “loss of stone material” and “detachment” and determination of the final damage categories. Damage categories can be illustrated in maps and can be evaluated quantitatively. In Figures 12-17, examples are presented for Tombs No. 70, No. 239 (Roman Soldier Tomb), No. 649 (Tomb with the Armour), No. 770 (Silk Tomb), No. 765 (Palace Tomb) and No. 462 (Monastery). The same evaluations are available



10. Weathering forms, damage categories and damage index.

for other monuments. Damage categories do not only serve as a comparative rating of damages. Locations of susceptible parts of monument surfaces are lined out, and the influence of monument characteristics like orientation and geometry can be quantified. Other influences may be inferred such as uncontrolled water run-off, rising humidity in combination with salt load or mechanical stress as a consequence of monument statics. This means that damage categories provide categories an important contribution for risk estimation and for well-targeted risk management. Thus, the urgency of intervention for monument preservation is indicated by damage categories.

Based on the quantitative evaluation of damage categories, linear damage index and progressive damage index can be calculated (Table 5). The linear damage index corresponds to the average damage category,

whereas the progressive index emphasizes the proportion of higher damage categories (Table 6). Linear and progressive damage indices should always be considered in combination. Both damage indices range from 0 to 5.0. The following relation is deduced: progressive damage index  $\geq$  linear damage index.

Damage indices have been calculated for the conclusive rating of the damage state considering each monument as a whole. The comparison of monuments by means of damage indices allows ranking of monuments according to:

- state of damage
- susceptibility to deterioration
- urgency of intervention

For monuments with more than one façade, damage indices have been calculated individually for each façade. This facilitates the rating of a monument's exposure and rating the environmental impacts on façade orientation like insolation, wind, wetting/drying and salt crystallization.

Figure 18 (a-d) shows a quantitative evaluation of damage categories for the four façades of Tomb No. 9. Significant differences can be recognized in the distribution of damage categories. Linear and progressive damage indices have been calculated for the different façades (Fig. 19 a). The damage indices reveal a significant influence of façade orientation on the susceptibility to deterioration. Comparable results have been derived for the two façades of Tomb No. 70 located in the Outer as-Siq (Fig. 19 b). In Table 7, a quantitative evaluation of damage categories as well as linear and progressive damage indices are presented for the Petra rock monuments. A ranking of the monuments is presented based on linear damage index (Fig. 20 a) and progressive damage index (Fig. 20 b). A significant range of damage indices can be recognized. An increase of damage indices corresponds to an increasing urgency for intervention.

Table 3. Weathering forms related to damage categories.

**Intensities of weathering forms**  **Damage categories**

**GROUP OF WEATHERING FORMS: LOSS OF STONE MATERIAL**

**Back weathering (W)**

Back weathering due to loss of scales (sW)  
 Back weathering due to loss of stone elements dependent on stone structure (xW)  
 Back weathering due to loss of undefinable stone elements (zW)

<i>depth (cm)</i>					
<1	1-5	5-10	10-25	>25	
1	2	3	4	5	
1	2	3	4	5	
1	2	3	4	5	

**Relief (R)**

Rounding / notching (Ro)  
 Alveolar weathering (Ra)  
 Relief dependent on stone structure (tR)  
 Weathering out of stone components (Rk)  
 Clearing out of stone components (Rh)

<i>depth (cm)</i>					
<1	1-5	5-10	10-25	>25	
1	2	3	4	5	
1	2	3	4	5	
1	2	3	4	5	
1	2	3	4	5	

**Break out (O)**

Break out due to natural cause (nO)  
 Break out due to non-recognizable cause (oO)

<i>volume (dm<sup>3</sup>)</i>					
<1	1-5	5-10	10-50	50-100	>100
2	3	4	5	5	5
2	3	4	5	5	5

**GROUP OF WEATHERING FORMS: DETACHMENT**

**Granular disintegration (G)**

<i>low</i>	<i>medium</i>	<i>high</i>
1	2	3

**Crumbling (P)**

<i>low</i>	<i>medium</i>	<i>high</i>
1	2	3

**Flaking (F)**

<i>low</i>	<i>medium</i>	<i>high</i>
1	2	3

**Contour scaling (S)**

Scale due to tooling of stone surface (qS)

<i>no differentiation</i>
1

Single scale (eS)

Multiple scales (mS)

<i>thickness (cm)</i>				
<0.5	0.5-1	1-2	2-5	>5
1	1	2	2	3
1	1	2	2	3

**Detachment of stone elements dependent on stone structure (X)**

Exfoliation (Xl)

Splitting up (Xv)

<i>low</i>	<i>high</i>
2	3
2	3

**Detachment of crusts with stone material (K)**

<i>low</i>	<i>high</i>
1	2

Granular disintegration to flaking (G-F)

Flaking to contour scaling (F-S)

Flaking to crumbling (F-P)

Granular disintegr. to crumbling (G-P)

Crumbling to contour scaling (P-S)

<i>low</i>	<i>medium</i>	<i>high</i>
1	2	3
1	2	3
1	2	3
1	2	3
2	3	4

Damage categories referring to „detachment“	5	5	5	5	5	5	5
	4	4	4	4	5	5	5
	3	3	3	3	4	5	5
	2	2	2	2	3	4	5
	1	1	1	2	3	4	5
	0	0	1	2	3	4	5
	0	1	2	3	4	5	
Damage categories referring to „loss of stone material“							
<div style="display: flex; align-items: center; justify-content: center;"> <div style="width: 15px; height: 10px; background-color: #cccccc; margin-right: 5px;"></div> <span>Final damage category</span> </div>							

11. Determination of final damage categories.

### Conclusions

A comprehensive damage diagnosis is required as a basis for effective and economic monument preservation. Monument mapping has been established internationally as a scientific method contributing essentially to reliable damage diagnosis of stone monuments. The method has been applied successfully on numerous monuments worldwide. Within the framework of a research project 1996-1999, monument mapping has been executed at many rock monuments in Petra/Jordan. For the mapping of weathering forms, a detailed classification scheme has been developed with definitions of the weathering forms and intensity classification that essentially serves for the Petra rock monuments. Weathering forms serve for an objective and reproducible registration of weathering phenomena at monument surfaces. The evaluation of weathering forms improves scientific knowledge in stone weathering, contributing to an assessment of weathering progression as well as to deriving key factors of weathering. While weathering forms are of a descriptive character, damage categories have been established for the subsequent rating of damages. Damage categories facilitate risk estimation and risk management. Furthermore, they can reveal the intensity of environmental impacts on monument chara-

Table 4. Derivation of final damage categories - examples.

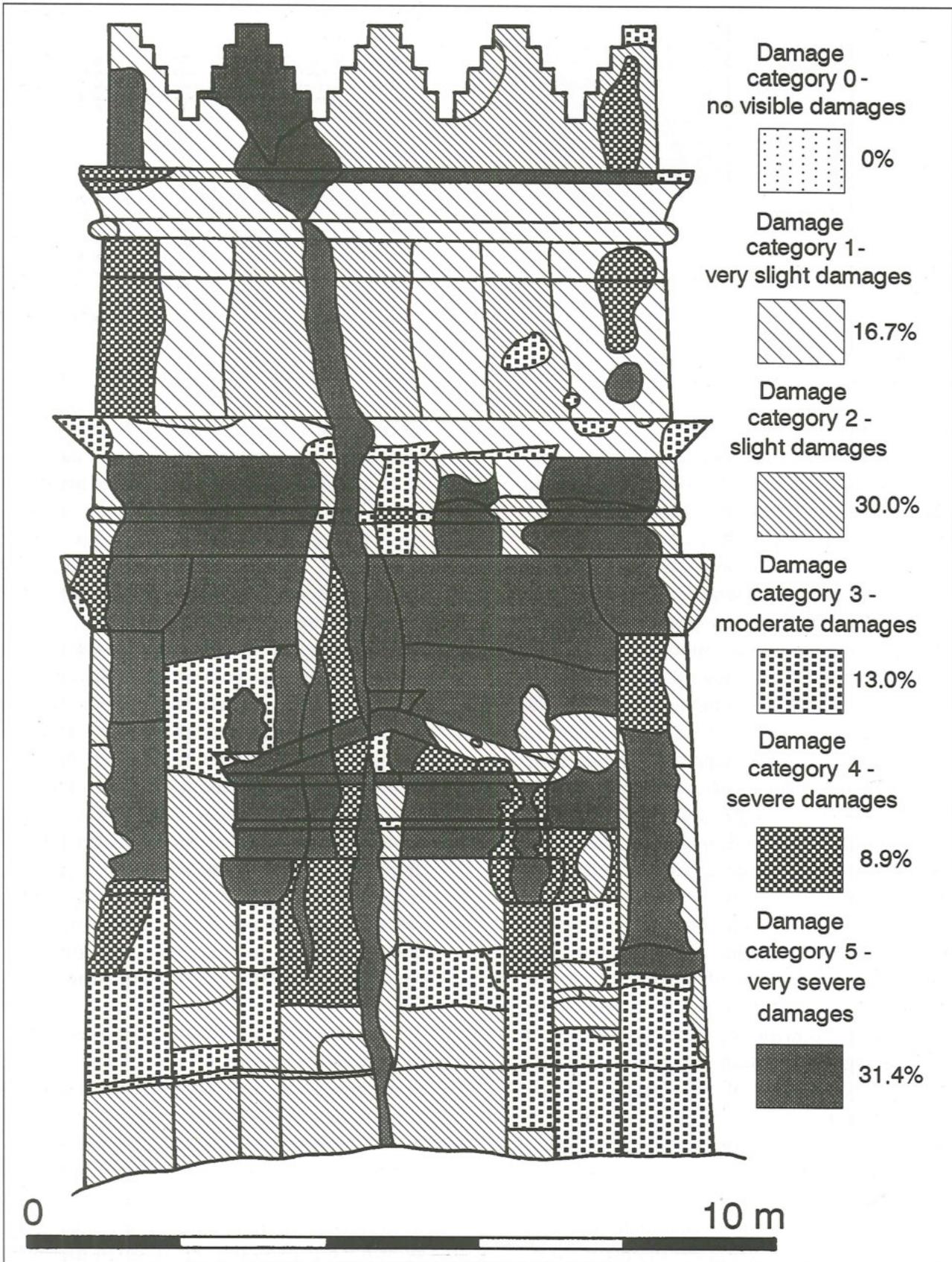
Monument surface - numbers of partial areas	Weathering forms - „loss of stone material“	Weathering forms - „detachment of stone material“	Damage categories - „loss of stone material“ (DCL)	Damage categories - „detachment of stone material, (DCD)	Final damage category
200	sW2	F-S2	<b>DCL2*</b>	<b>DCD2*</b>	2
201	Ro2	F-S2	<b>DCL2</b>	<b>DCD2</b>	2
202	zW2 tR1	G1 eS3	<b>DCL2 DCL1</b>	<b>DCD1 DCD2</b>	2
203	Ro1	eS4 G1	<b>DCL1</b>	<b>DCD2 DCD1</b>	2
204	Ro3	G-F2	<b>DCL3</b>	<b>DCD2</b>	3
205	Ro2	F-S2	<b>DCL2</b>	<b>DCD2</b>	2
206	Ro2 tR1	G1 F-S2	<b>DCL2 DCL1</b>	<b>DCD1 DCD2</b>	2
207	Ro5	G3 G-F1	<b>DCL5</b>	<b>DCD3 DCD1</b>	5
208	Ra4	G3 G-F2	<b>DCL4</b>	<b>DCD3 DCD2</b>	5
209	Ro3 tR2	G2 F-S1	<b>DCL3 DCL2</b>	<b>DCD2 DCD1</b>	3
210	Ro3	G1 G-F3	<b>DCL3</b>	<b>DCD1 DCD3</b>	4
.	.	.	.	.	.
.	.	.	.	.	.

\* (damage categories marked with bold letters/numbers) – relevant for derivation of final damage categories.

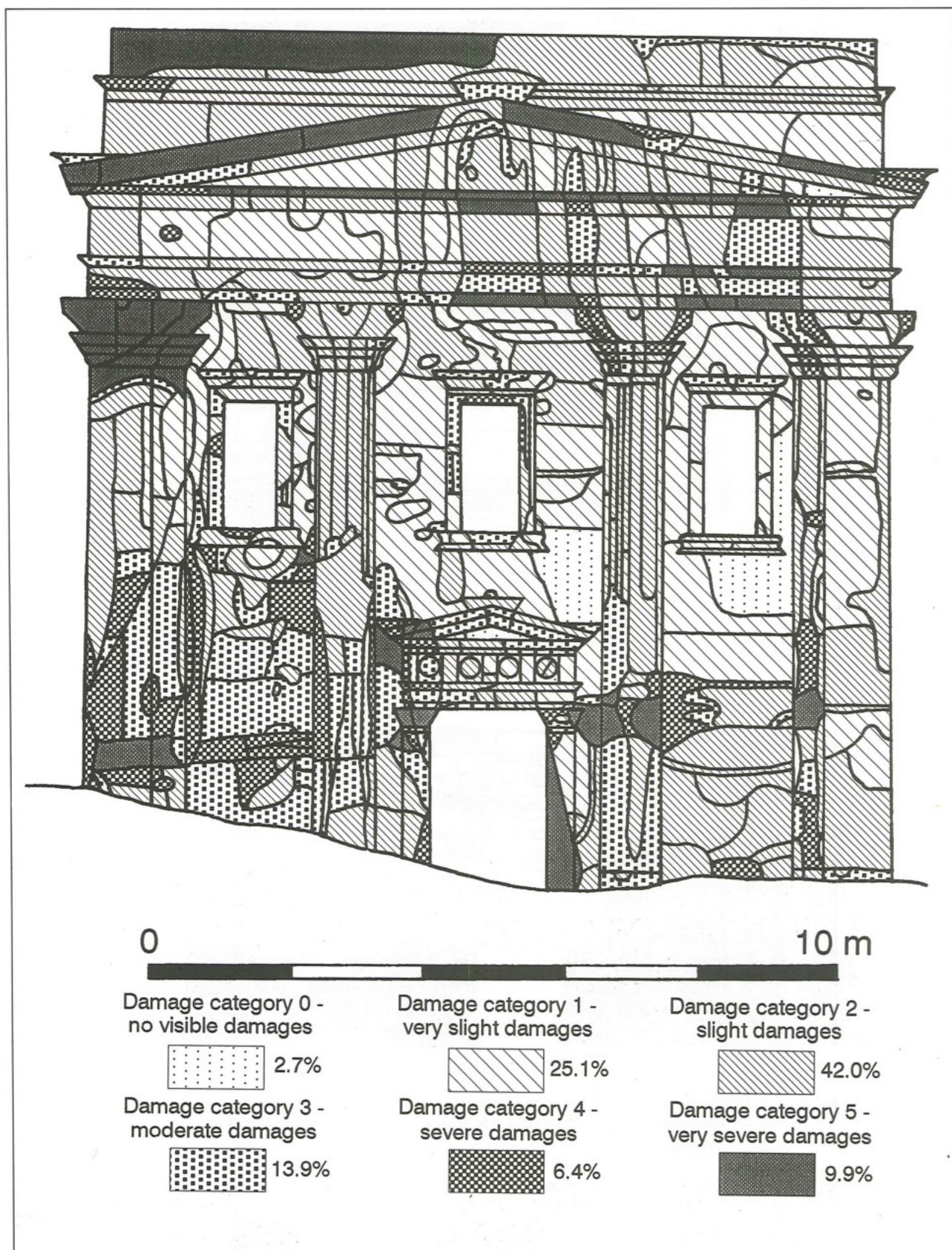
cteristics such as location, geometry or orientation. The damage index can be calculated from the proportion of damage categories for a conclusive rating of the state of damage, taking into consideration the entire monument. Comparing damage indices for different monuments, provides the possibility of ranking these monuments.

With respect to monument preservation activities, damage indices show the urgency of intervention, considering a monument as a whole. Damage categories also indicate the urgency of intervention, since they locate those parts of a monument on which intervention has to focus. Weathering forms have to be considered for the deduction of appropriate types of preservation measures. Information obtained from mapping represents an ideal basis for optimal long-term observation of monuments and for well-founded certification of preservation measures.

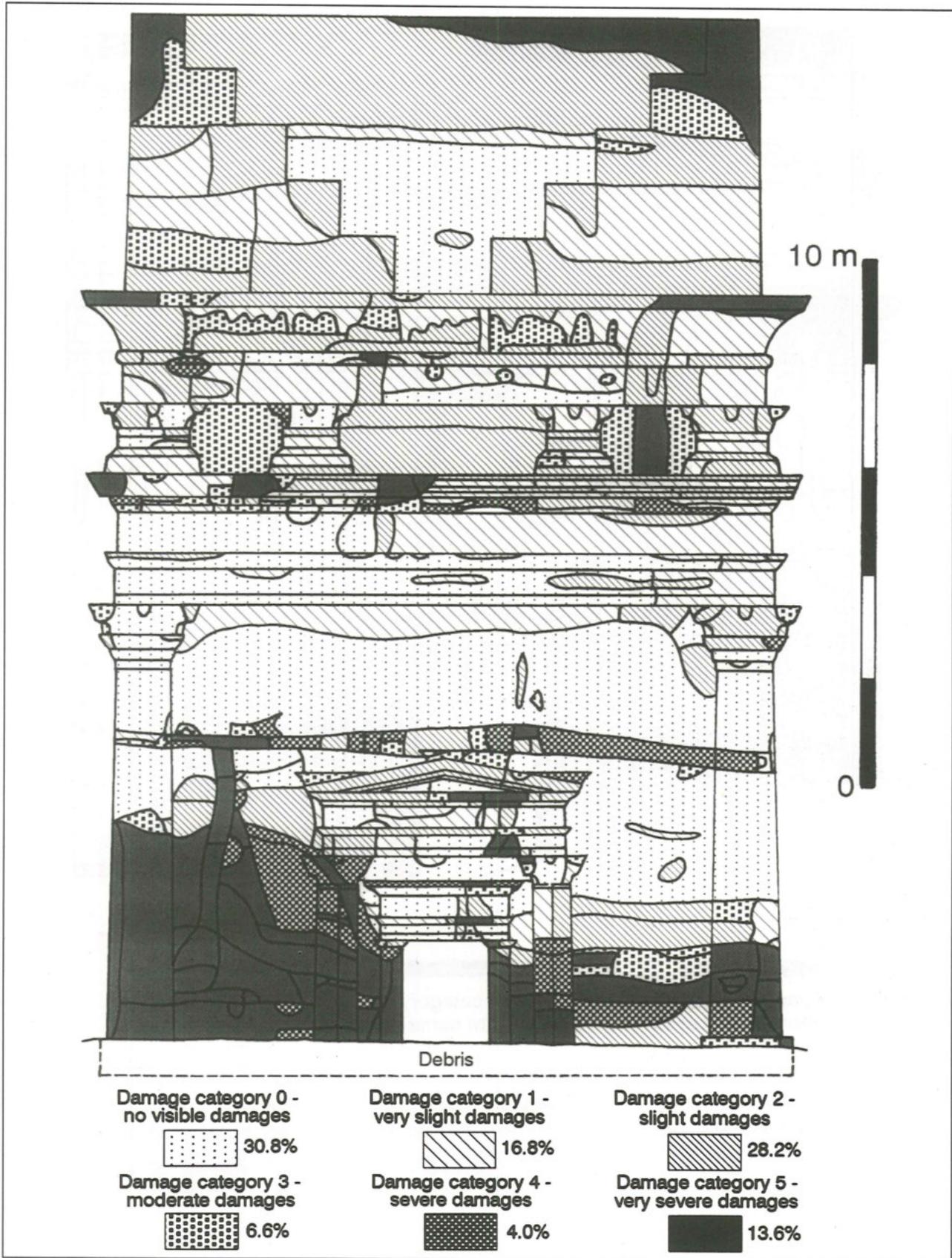
Presentation of results obtained from monument mapping of the Petra rock-cut monuments, as well as from additional in situ studies and laboratory analyses within the framework of the research project “Systematic registration and evaluation of weathering damages at monuments in Petra” will be continued in upcoming publications, considering the exploitation of scientific findings for practical monument preservation.



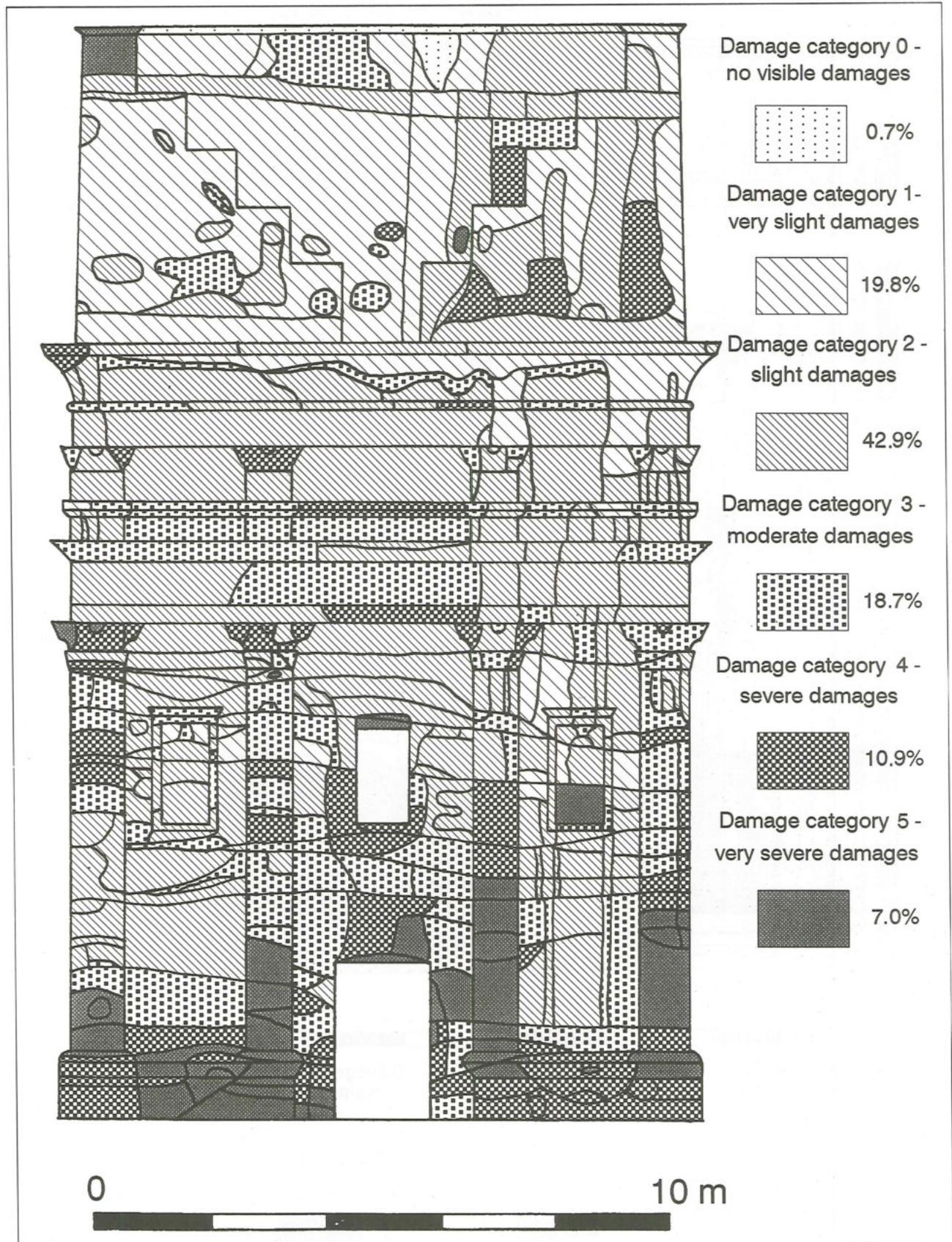
12. Tomb No. 70 - east façade; damage categories.



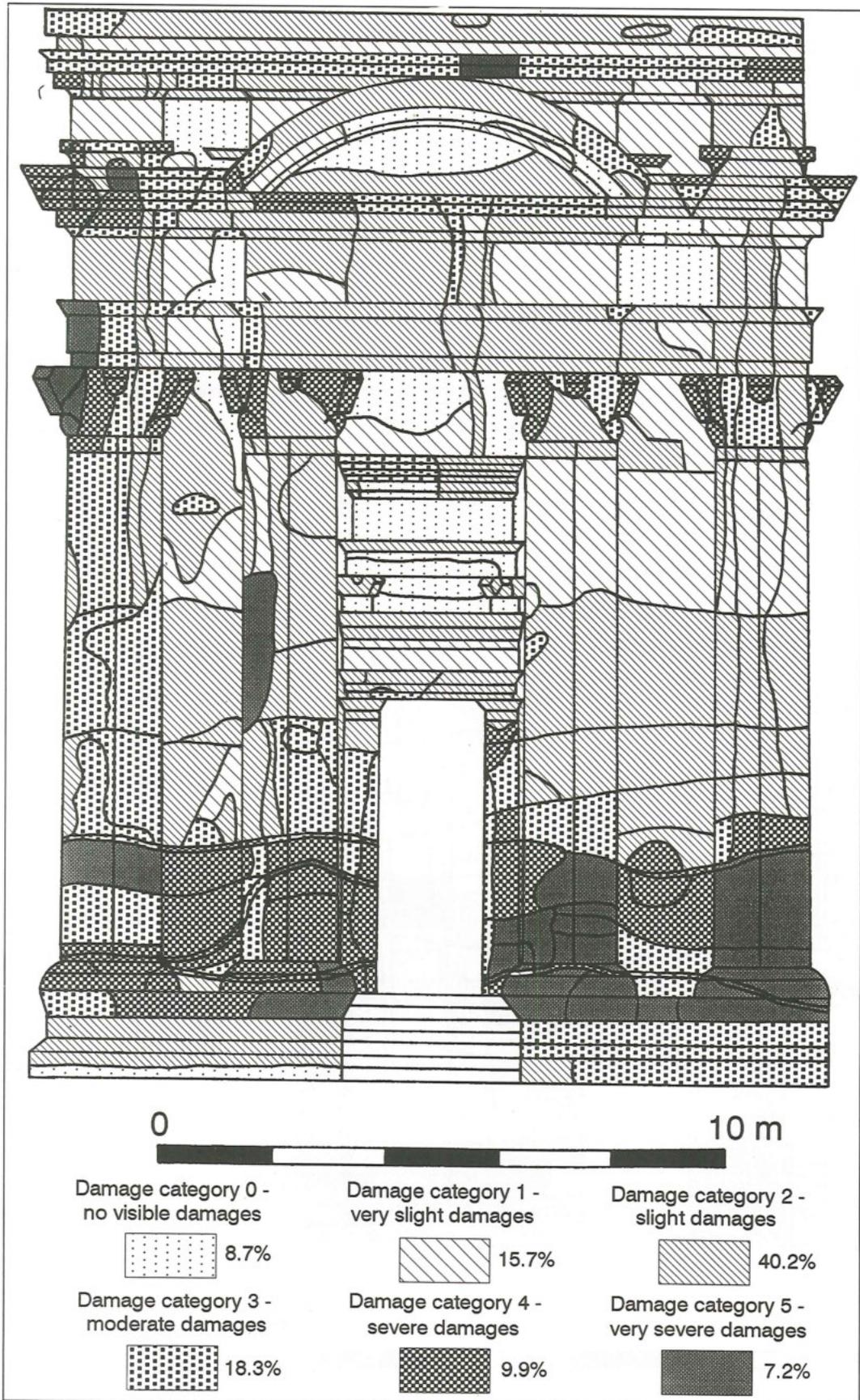
13. Tomb of the Roman Soldier (No. 239); damage categories.



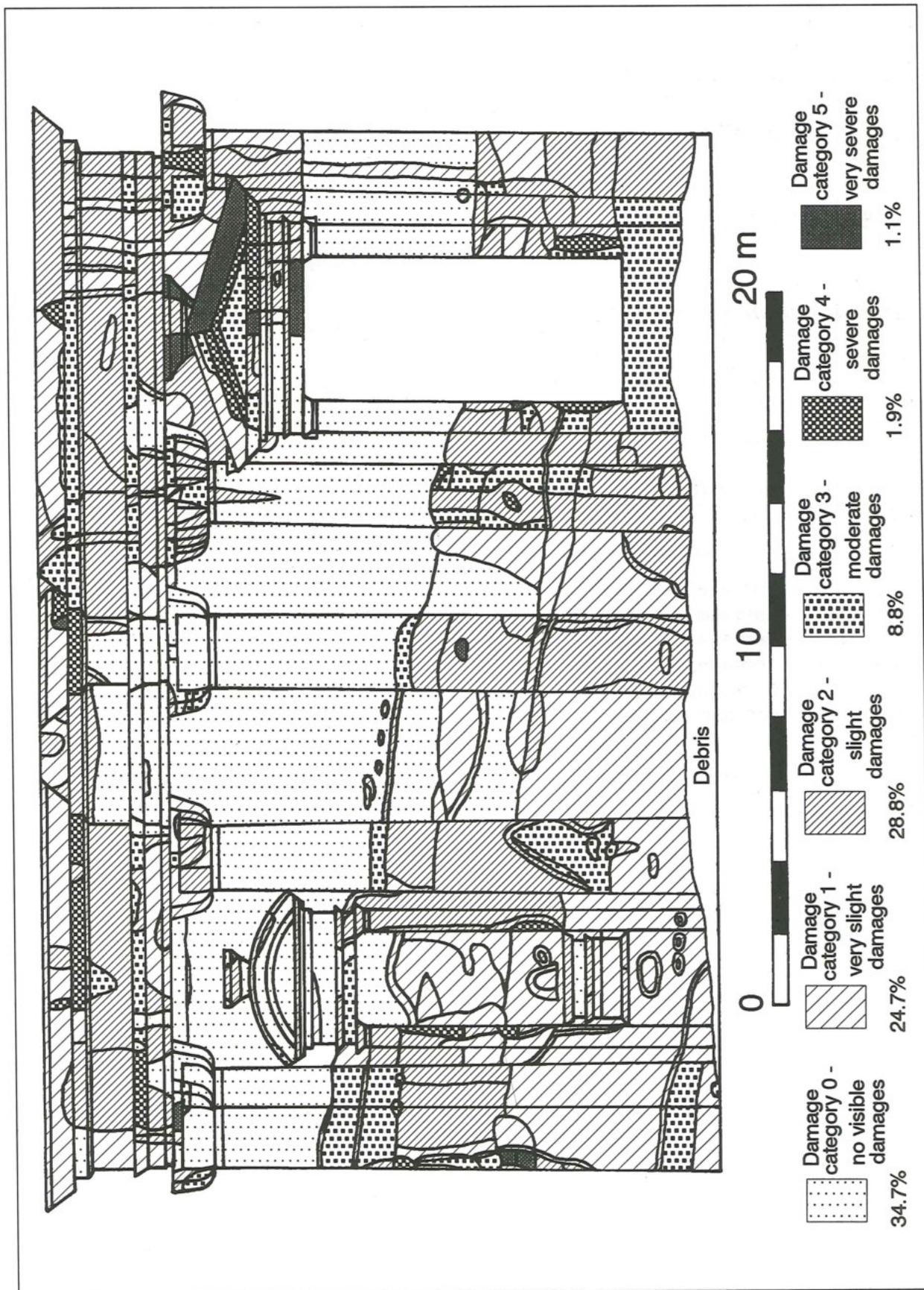
14. Tomb with the Armour (No. 649); damage categories.



15. Silk Tomb (No. 770); damage categories.



16. Palace Tomb (No. 765) - lower left part (A); damage categories.



17. Monastery (No. 462) - lower left part (A); damage categories.

**Table 5.** Linear and progressive damage index.

<p><b>Linear damage index <math>DI_{lin}</math>:</b></p> $\frac{(A \cdot 0) + (B \cdot 1) + (C \cdot 2) + (D \cdot 3) + (E \cdot 4) + (F \cdot 5)}{100}$ <p style="text-align: center;">↓</p> $\frac{B + (C \cdot 2) + (D \cdot 3) + (E \cdot 4) + (F \cdot 5)}{100}$
<p><b>Progressive damage index <math>DI_{prog}</math>:</b></p> $\sqrt{\frac{(A \cdot 0^2) + (B \cdot 1^2) + (C \cdot 2^2) + (D \cdot 3^2) + (E \cdot 4^2) + (F \cdot 5^2)}{100}}$ <p style="text-align: center;">↓</p> $\sqrt{\frac{B + (C \cdot 4) + (D \cdot 9) + (E \cdot 16) + (F \cdot 25)}{100}}$
<p>A = area (%) - damage category 0                  B = area (%) - damage category 1                  C = area (%) - damage category 2                  D = area (%) - damage category 3                  E = area (%) - damage category 4                  F = area (%) - damage category 5</p> <p style="text-align: center;"><math>\sum_A^F = 100</math></p>

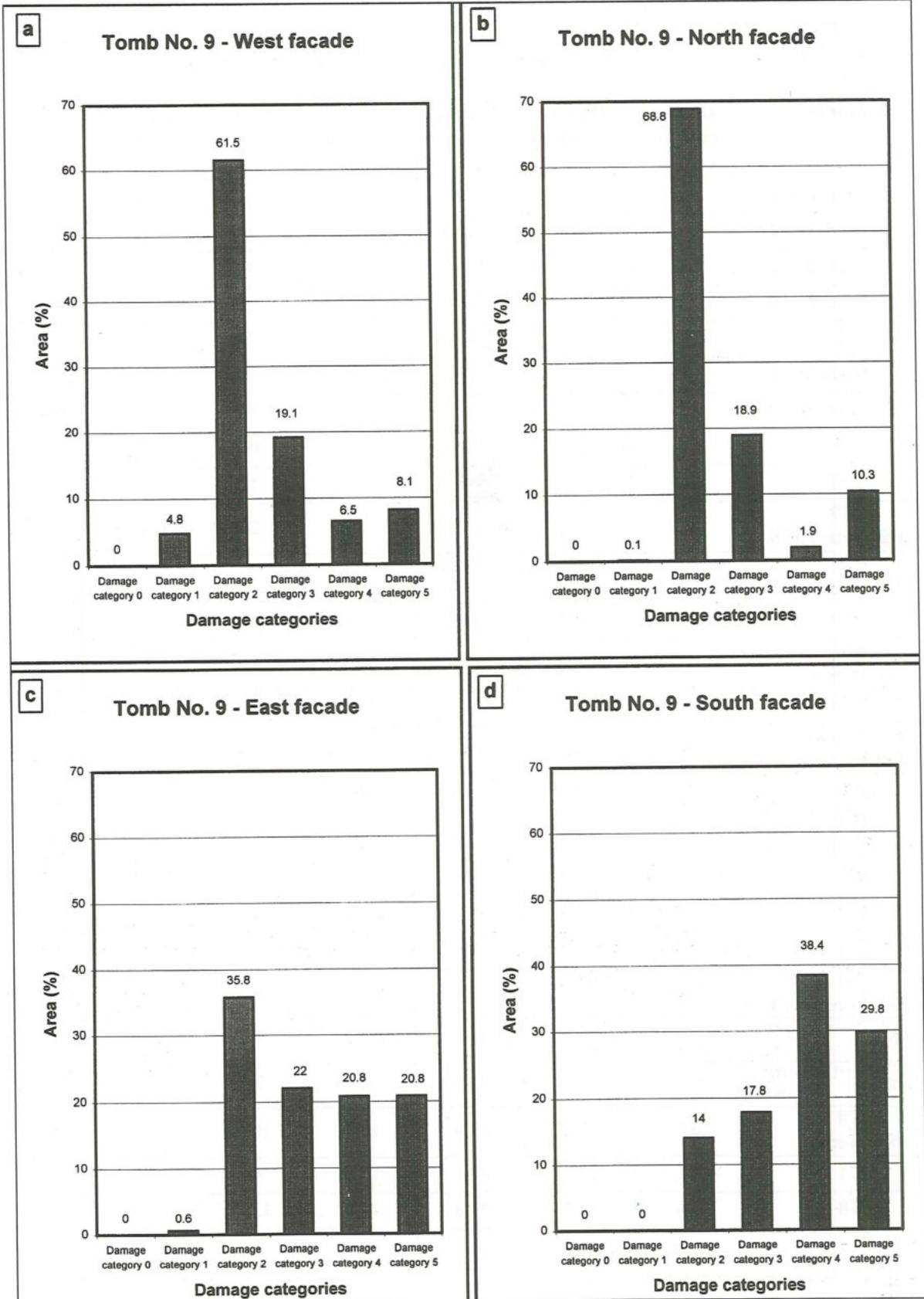
**Table 6.** Linear and progressive damage index for different cases of damage category distribution.

Case	Damage categories (% of monument surface)						$DI_{lin}$	$DI_{prog}$
	0	1	2	3	4	5		
I	-	-	-	100 %	-	-	3.00	3.00
II	-	-	50 %	-	50 %	-	3.00	3.16
III	-	50 %	-	-	-	50 %	3.00	3.61
IV	40 %	-	-	-	-	60 %	3.00	3.87

**Acknowledgements**

The authors would like to express their gratitude to then, Director-General of the Department of Antiquities, Dr Ghazi Bishah, to the representative of the Department of Antiquities in Petra, Mr Suleiman Farajat and to the former Director-General of the Petra Regional Council, Dr Kamel Mahadin, for his cooperation, discussion and advise, and for logistical support during the field campaigns. We give our thanks to DFG - Deutsche Forschungsgemeinschaft for funding the project.

Kurt Heinrichs  
 Bernd Fitzner  
 Aachen University of Technology  
 Geological Institute  
 Wuellnerstraße 2  
 D-52062 Aachen  
 Germany

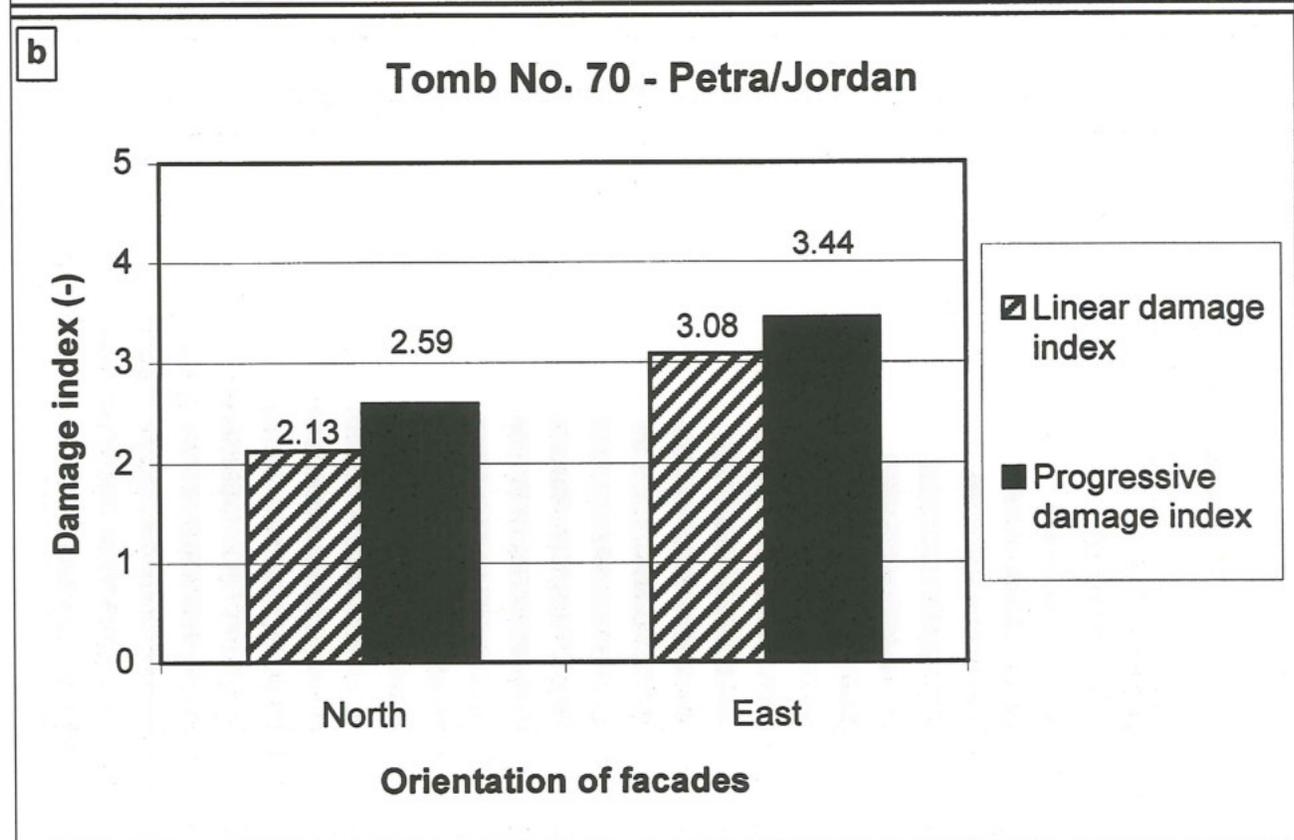
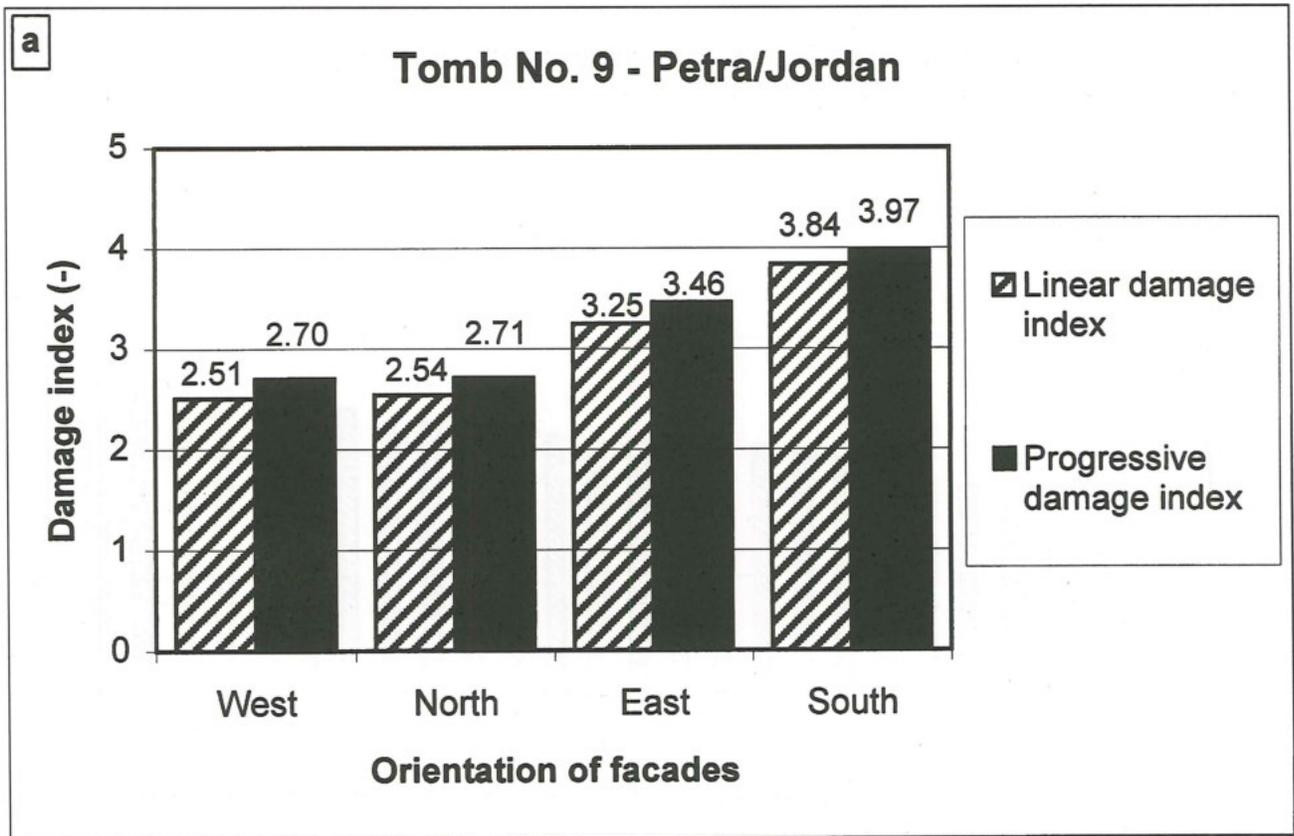


18 a-d. Tomb No. 9. Quantitative evaluation of damage categories for the four façades.

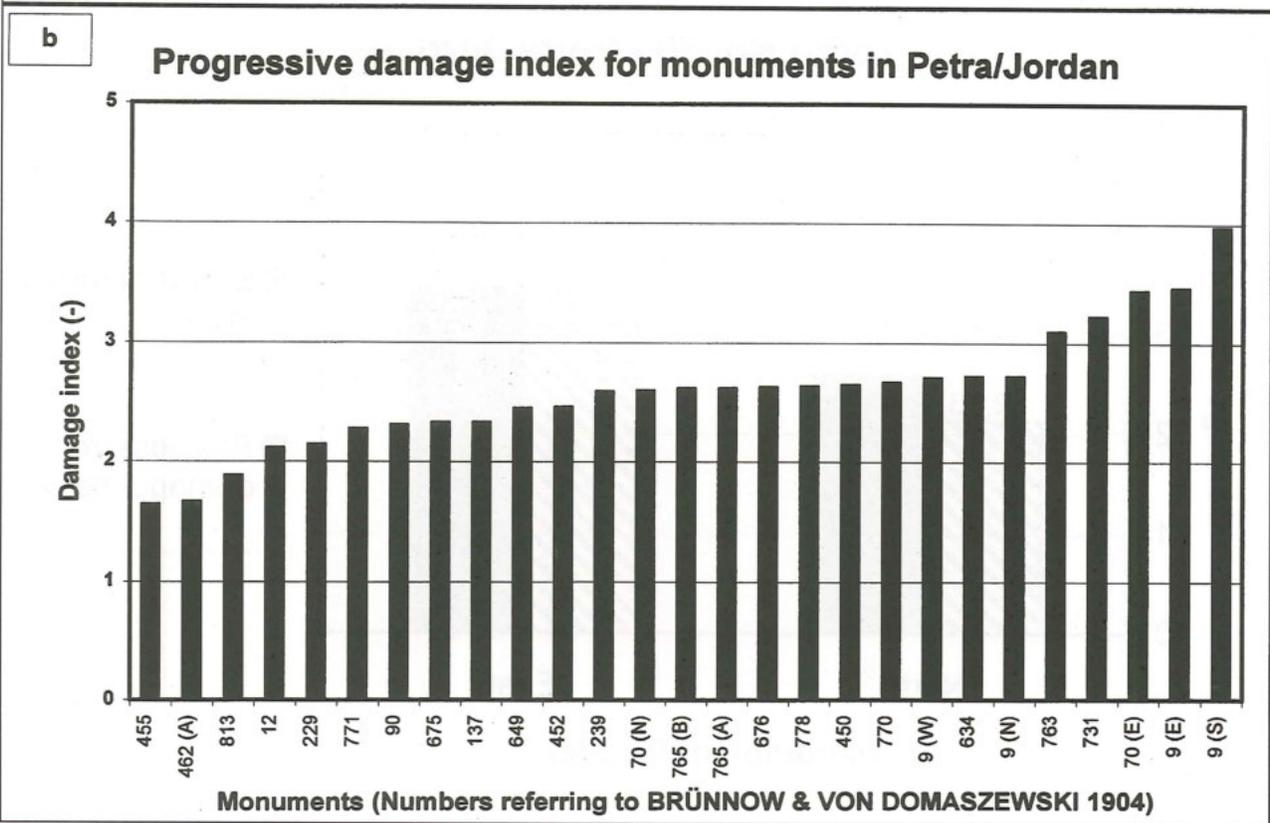
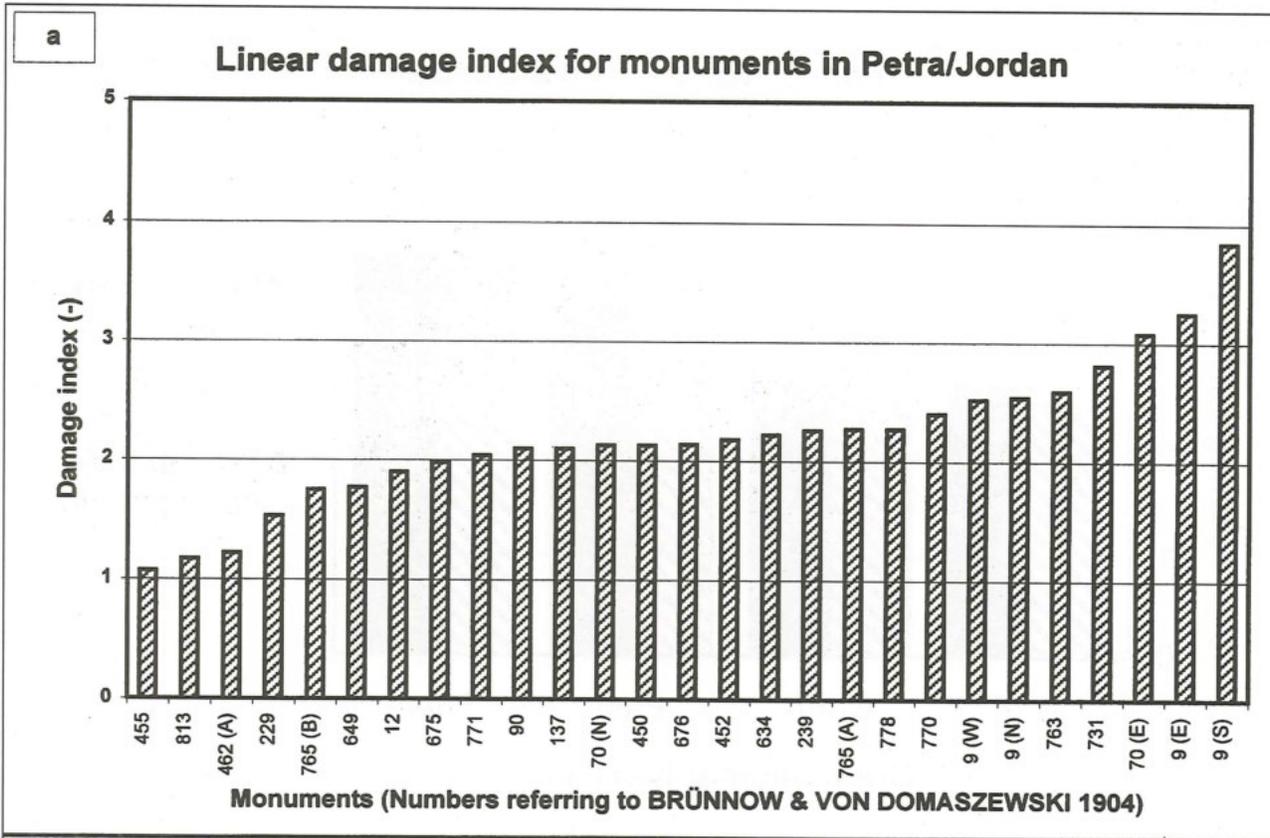
Table 7. Quantitative evaluation of damage categories, linear damage index (DI<sub>lin</sub>) and progressive damage index (DI<sub>prog</sub>) for rock monuments in Petra.

Monument*		Quantitative evaluation of damage categories (%)						Damage index (-)	
		Damage category 0	Damage category 1	Damage category 2	Damage category 3	Damage category 4	Damage category 5	DI <sub>lin</sub>	DI <sub>prog</sub>
9	West facade	0	4.8	61.5	19.1	6.5	8.1	2.52	2.70
	North facade	0	0.1	68.8	18.9	1.9	10.3	2.54	2.71
	East facade	0	0.6	35.8	22.0	20.8	20.8	3.25	3.46
	South facade	0	0	14.0	17.8	38.4	29.8	3.84	3.97
12		3.4	29.9	46.2	15.3	4.3	0.9	1.90	2.11
70	North facade	9.3	32.7	25.6	10.1	12.3	10.0	2.13	2.59
	East facade	0	16.7	30.0	13.0	8.9	31.4	3.08	3.44
90		0	22.6	59.6	5.1	10.4	2.3	2.10	2.30
137		0.9	26.8	46.3	17.3	5.0	3.7	2.10	2.32
229 Renaissance Tomb		27.4	33.3	19.8	7.4	2.4	9.7	1.53	2.14
239 Soldier Tomb		2.7	25.1	42.0	13.9	6.4	9.9	2.26	2.58
450		18.4	16.9	31.9	6.3	18.8	7.7	2.13	2.64
452 Lion Triclinium		5.9	20.6	36.6	27.5	5.2	4.2	2.18	2.45
455		49.3	14.1	21.3	11.0	4.0	0.3	1.07	1.64
462 – Monastery Lower left part (A)		34.7	24.7	28.8	8.8	1.9	1.1	1.22	1.66
634		13.6	19.7	34.9	9.7	7.1	15.0	2.22	2.71
649 Tomb with the armour		30.8	16.8	28.2	6.6	4.0	13.6	1.77	2.44
675		0.5	42.4	36.7	6.4	6.7	7.3	1.98	2.32
676		5.8	40.9	22.5	9.9	6.5	14.4	2.14	2.62
731		6.1	17.2	29.1	5.2	22.4	20.0	2.81	3.22
763 Sextius Florentinus T.		11.6	15.6	30.3	10.0	9.7	22.8	2.59	3.09
765 Palace Tomb	Lower left part (A)	8.7	15.7	40.2	18.3	9.9	7.2	2.27	2.61
	Lower right part (B)	42.7	13.6	12.7	4.7	9.2	17.1	1.75	2.61
770 Silk Tomb		0.7	19.8	42.9	18.7	10.9	7.0	2.40	2.66
771		0.1	33.3	40.1	17.2	7.5	1.8	2.04	2.27
778		6.4	26.5	27.8	19.2	13.5	6.6	2.27	2.63
813 Unaishu Tomb		46.7	19.8	19.5	4.3	3.0	6.7	1.17	1.88

\* Numbers referring to BRÜNNOW & VON DOMASZEWSKI (1904).



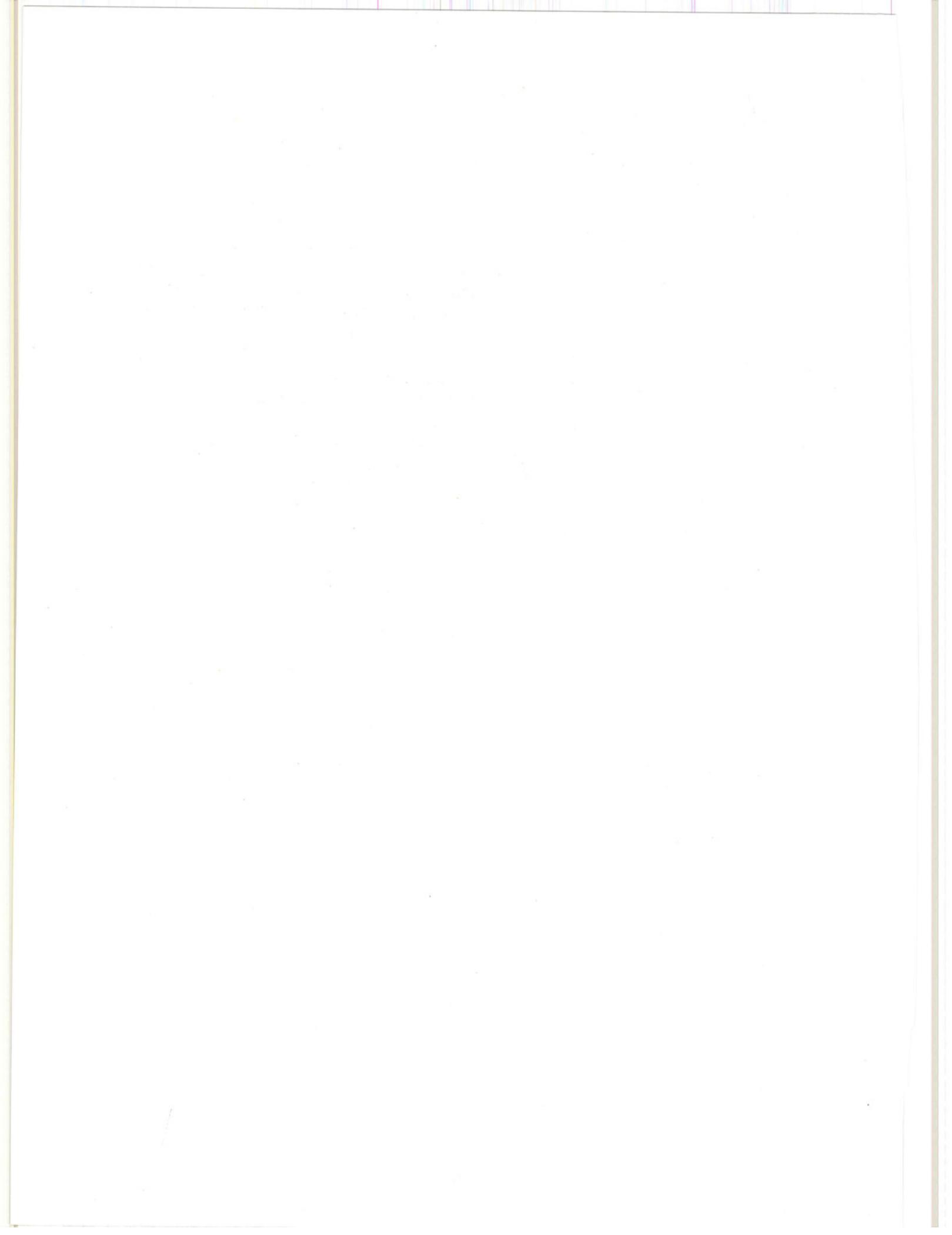
19:a,b. Linear and progressive damage index of façades with different orientation; a - Tomb No. 9; b - Tomb No. 70.



20: a,b. Damage index for rock monuments in Petra; a -linear damage index; b- progressive damage index.

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# ANALYSIS OF SANDSTONE WEATHERING OF THE ROMAN THEATER IN PETRA, JORDAN

by

Thomas R. Paradise

## **Abstract**

From ongoing research examining weathering influences and rates in the sandstone architecture of Petra, Jordan, a number of environmental variables have been identified. From a carved Theater built under Vitruvian standards during the first century AD, a two-meter sampling scheme was used to measure the presently weathered surfaces from the original stonemason dressed surfaces. 526 surface recession measurements were made on the Theater's vertical and horizontal surfaces and correlated to intrinsic variables as sandstone lithology, matrix-to-clast ratios, density, and matrix chemistry (Si, Ca, Fe, Al concentrations) and to extrinsic variables like annual solar flux (amount of total insolation).

A number of important factors were found to influence the deterioration of the sandstone surfaces. When iron concentrations in the rock matrix exceeded 2%, an abrupt decrease in overall weatherability is indicated until weathering is found to have decreased below measurable limits at 4%. It is speculated that matrix iron acts as a sandstone clast binding agent, reducing clast disaggregation. In sandstone strata with matrix calcium concentrations exceeding 11%, weathering was accelerated when annual sunlight levels exceeded 5,000 megajoules/m<sup>2</sup> (an amount typical of unobscured southern faces). It is speculated that the increased heating is responsible for irregular calcite micro-crystal expansion and contraction causing micro-fracturing, increased clast disaggregation, and subsequent weathering.

This research is also producing important information on the rates of surface

recession-sandstone decay. Mean recession rates ranged from 13-66mm/millennium on horizontal surfaces and from 7-18mm/millennium on vertical surfaces. Gross differences in recession rates were attributed to the extrinsic influences of moisture availability (slope) and insolation (aspect), while minor differences were attributed to intrinsic characteristics of matrix chemistry (iron, calcium, silica, alumina), sandstone density, and clast-to-matrix ratios.

*Key words:* sandstone, weathering, erosion, Petra, Jordan

## **Introduction**

As natural processes continue to work and tourism continues to grow, important architectural and archaeological sites like Petra, may be deteriorating faster than conservation efforts are able to decrease this decay. So, theoretical and applied weathering studies are vital to the preservation and conservation of Petra's unique architecture and history. However, there exists a great paucity in previous research that examines these environmental influences affecting sandstone weathering and erosion in arid climates like southern Jordan (Saunders and Young 1983), the direction of this study.

Weathering and erosion rate studies for sandstone in arid climates are rare. Early investigations of the processes responsible for sandstone weathering in the American Southwest were documented by Bryan (1922, 1928) and Blackwelder (1929). Similar research in arid region sandstone weathering mechanisms later established the importance of the relationship of weathering to mass wasting (i.e. Schumm and Chorley 1966), lichen overgrowth (i.e. Jackson and Keller 1970; Jones *et al.* 1980), case hard-

ening (Conca and Rossman 1982), tafoni development (i.e. Mustoe 1983), salt (i.e. Smith and McGreevy 1988; Young 1987), and insolation (i.e. Blackwelder 1933; Sancho and Benito 1990; Robinson and Williams 1992). Schmidt (1985, 1989) examined scarp retreat and mass wasting to quantify weathering rates, while Meierding (1993) investigated sandstone carving legibility as a function of weathering mechanisms. In addition, recent research has identified a number of weathering thresholds as being responsible for rock decay in Petra (Paradise 1995). This indicates that sandstone weathering may be operating in episodic fluctuations, and not in a linear manner, as previously believed.

In the weathering-limited arid landscape of Southern Jordan, the rate of erosion is limited by the rate of weathering. This is clearly the case in the Valley of Petra where minimal amounts of sand derived from sandstone weathering can be observed on the bare sandstone, but instead may be observed in recesses or as accumulated masses in the Valley. Therefore, by examining how the hewn surface of dressed sandstone Theater has changed since its construction approximately 2000 years ago, weathering influences and rates may be assessed. The primary focus of this investigation was to examine the various mechanisms and rates responsible for sandstone weathering in an arid climate by controlling lithology, time and the initial surface condition.

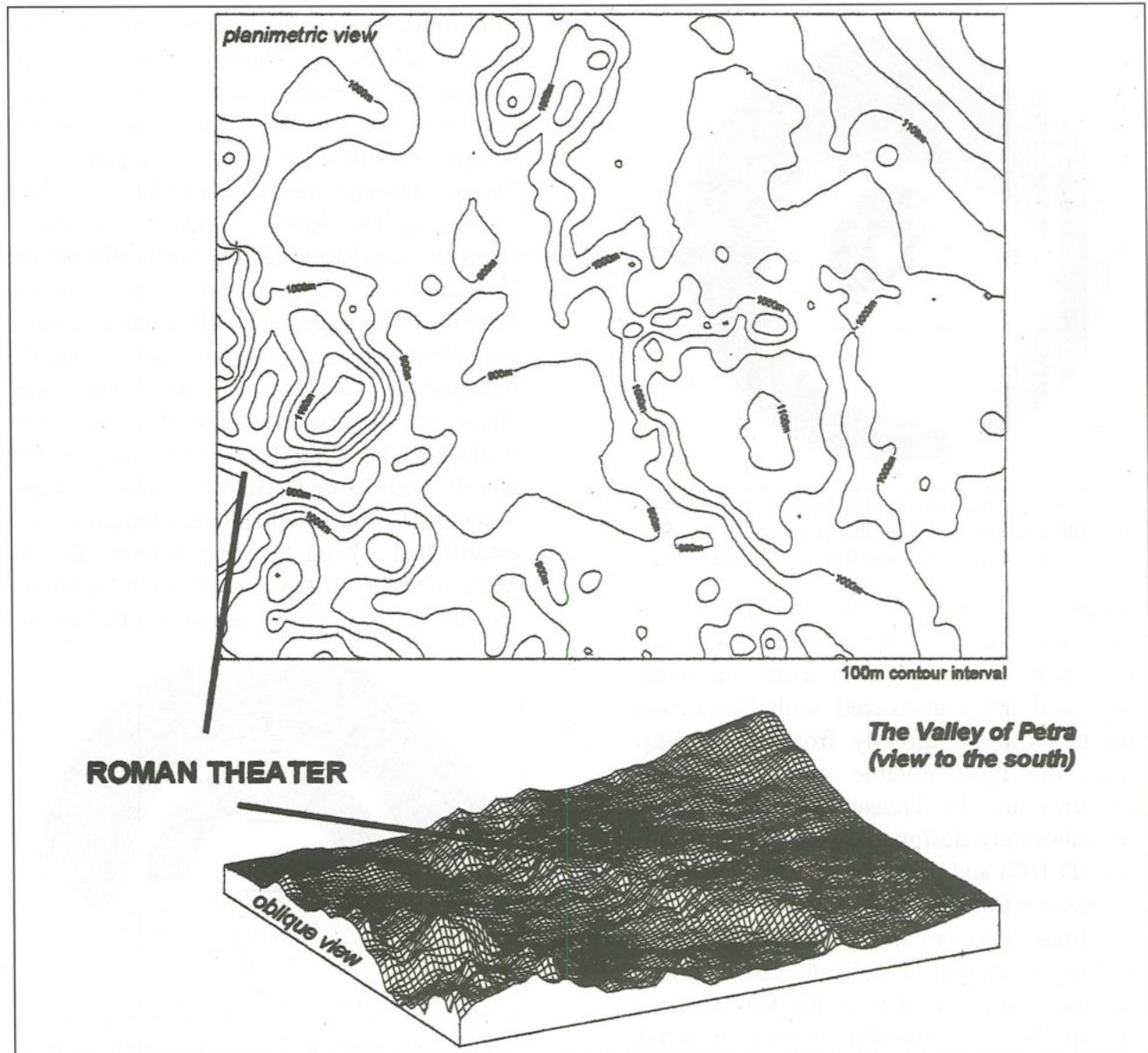
### Study Site

The Valley of Petra is a striking terrain that evolved through the incision of Paleozoic sandstones and extrusive igneous rocks, after the removal of capping Cretaceous limestones. The extensive weathering and erosion that produced the steeply-walled valleys in this region has been linked to a lowered base-level from the genesis and seismic activity of the Dead Sea Rift since the Cretaceous Period (ca.125 my)(Osborn 1985).

The ruined City of Petra lies in a valley that drains the Jordanian limestone highlands into the Wādī 'Arabah—the border between Jordan and Israel. Situated at approximately 900 m asl, Petra lies in a crescent-shaped valley (30°19'N 35°20'E) and is surrounded by vertical sandstone cliffs (mostly from *Umm Ishrin* Formation) that rise 100m above the valley floor (Fig. 1).

The arid climate of this region is typified by mild, relatively rainy winters, and hot, dry summers. Only periodically affected by Mediterranean cyclonic cells moved by the mid-latitude westerlies, local rainfall occurs when winter low barometric cells pass through northern Israel and Jordan with annual means of approximately 130 mm of rain (Jordan Meteorological Division 1971). Occasionally, however, fronts move north from Africa and bring torrential downpours and flooding from a combination of cyclonic flow, orographic lifting, and convective propagation. These infrequent floods and not the local winds may be the dominant means responsible for the removal of the weathering-produced sands. During the summer months (May-August) 1990-1998, the orientation of the Theater along the as-Siq wall was observed to shield the sand veneer in the Theater from the strong katabatic winds (>20m/s) often observed in the valley, and recorded in nearby Wādī Mūsā (Jordanian Meteorological Division 1971). Most precipitation is recorded as rainfall since subzero temperatures are relatively rare and when they do occur quickly rise during winter daylight hours. Minor amounts of snow fall annually but are fairly insignificant contributors to total precipitation. In Wādī Mūsā, recorded January mean temperatures range from 6° to 12°C, and August temperatures vary from 15° to 32°C (Jordanian Meteorological Division 1971) (Figs. 2 and 3).

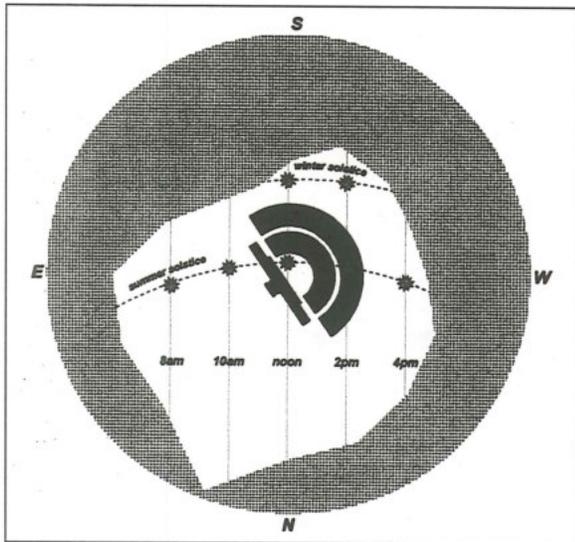
It is Petra's setting, however, that has made this site an ideal laboratory for the study of architectural deterioration and



1. The ruined City of Petra lies in an obscured and defensible valley that has assured the relatively original condition of its monuments.

weathering. Unknown to the Western world until its discovery in 1812 by the Swiss explorer J.L. Burckhardt, Petra was the site of extensive Edomite, Nabataean, Roman, Byzantine, Umayyad, and Crusader occupation (700 BC - AD 1300) (Negev 1986) and a significant crossroads for Asian trade with the Mediterranean and for Indian Ocean trade with the Black Sea. The Valley of Petra was easily defended because of its surrounding, towering cliffs and its restricted entry. Only two small routes enabled entry into the Valley - a steep and nearly im-

passible wadi (Wādī aṣ-Ṣiyyagh) connecting Petra to the Wādī 'Arabah, and a narrow defile (as-Sīq) joining Petra with the biblical Spring of Moses ('Ayn Mūsā) in nearby Wādī Mūsā. Of great interest to archaeologists, architects, geomorphologists and tourists are the numerous Nabataean and Roman tombs, buildings, and structures constructed and hewn from the local Paleozoic sandstones. Completed from early Nabataean development (ca. 200 BC) through Roman annexation (ca. AD 150), several tombs, enclosures, buildings, and

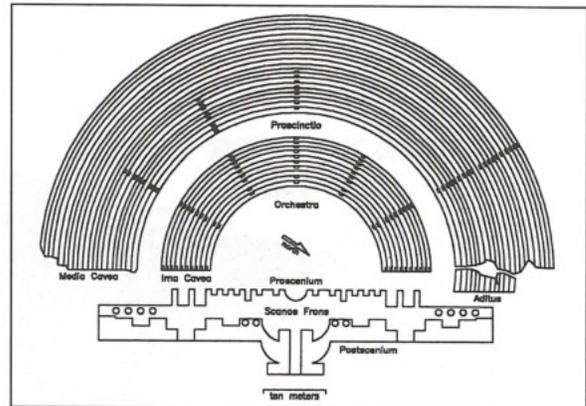


2. The horizon diagram of the Theater and the surrounding cliffs illustrate the passage of the Sun across the Outer as-Siq and Roman Theater.

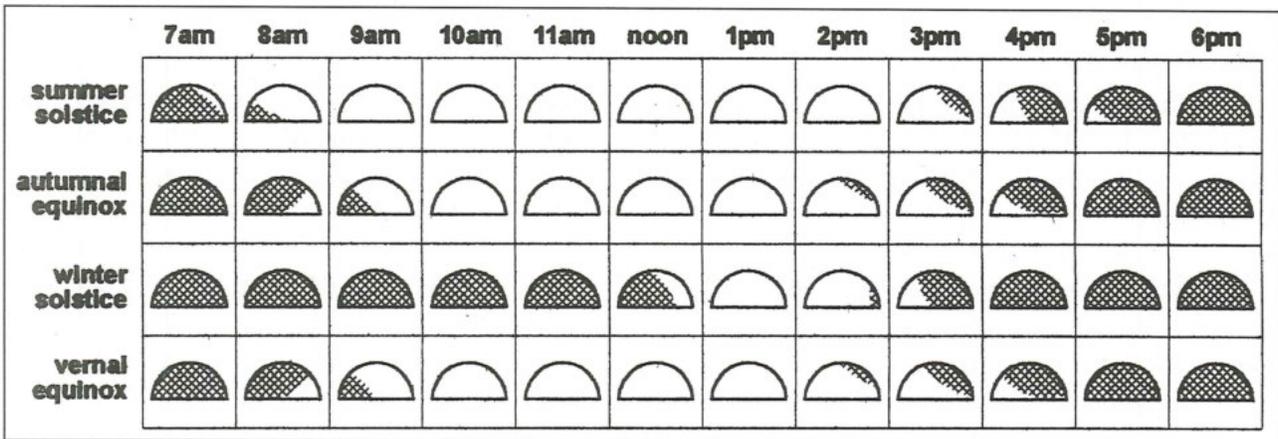
theaters were built from the relatively friable sandstone. Many of these structures, however, were uniquely hewn from the sandstone and not constructed with block and mortar. Carved directly from the as-Siq walls, the most notable of these carved structures are the Treasury or al-Khaznah, the elaborately designed and executed tomb (ca. AD 100) and the Theater, the large open air theater examined in this study.

Petra was never captured by Roman forces, but developed a delicate client status with the eastern reaches of the Roman Empire: *Arabia Felix* (Glueck 1965, Hammond 1965). It was during this period of con-

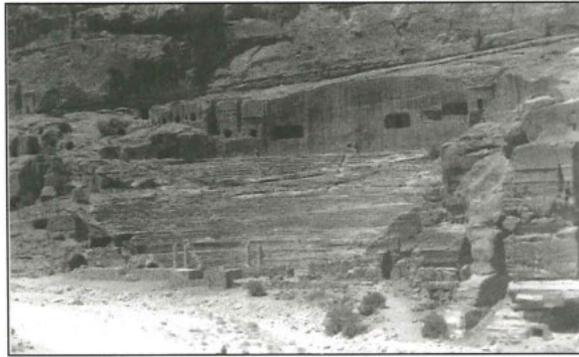
dominium, that many of Petra's hewn structures, such as the Theater, were built displaying both high construction standards (i.e. meticulous stone surface dressing) and unique Nabataean engineering features (i.e. bypass drainage to accommodate torrential flooding). The Roman Theater was hewn from the sandstone as-Siq walls during the first century AD and seated an estimated 6,000 to 8,000 spectators (Hammond 1965). Its enormity is made more remarkable by the exceptional exactness of its semicircular shape, the precisely executed vertical seat-backs and horizontal seat tops, and its relatively undisturbed original condition (Figs. 4 and 5). Roman engineering standards were established during the first century BC by Marcus Pollio Vitruvius, a Roman legion architect and engineer. For Roman theater de-



4. The semi-circular plan of Petra's Roman Theater was characteristic of Vitruvian design from the 50 BC to AD100 (ima cavea, media cavea only).



3. The shadow diagram of the Theater illustrates the advancing sunlight and shadows across the Theater throughout the year.



5. The Theater is carved directly from the Paleozoic Umm Ishrin Formation sandstone and is situated below towering cliffs in the Outer as-Siq.

sign, Vitruvian canon prescribed vertical walls and horizontal surfaces oriented at specific angles for acoustical rectitude ( $\pm 5^\circ$ ), simple accessibility, and overall aesthetics (Vitruvius BC 50). The engineering criteria recommended by Vitruvius were so definite that it has enabled historians to identify the structures of his design, of his building authority, or contemporary to his works (Blake 1947). The strict adherence to the Vitruvian prescribed angles, proportions, and design were implemented by the architects and workers that completed the Theater in Petra.

The Theater in Petra was chosen for this analysis of sandstone weathering for a number of reasons: the hewn nature of the theater ensures that it has not been moved or rebuilt since its construction; the time of its construction is recorded; the semi-circular shape affords over  $180^\circ$  of aspect; the bench seat arrangement provides nearly vertical ( $\pm 5^\circ$ ) and horizontal ( $\pm 5^\circ$ ) slopes; the limited accessibility of Petra has assured its relatively minimal contact with humans until recent years (i.e. foot-tread, automobile exhaust), and that the Theater is Vitruvian in design and construction standards (Blake 1947; Hammond 1965). This original adherence to strict construction standards is the key to this research design.

### Methodology

It was the Vitruvian canon with its engineering exactitude that permitted the hypo-

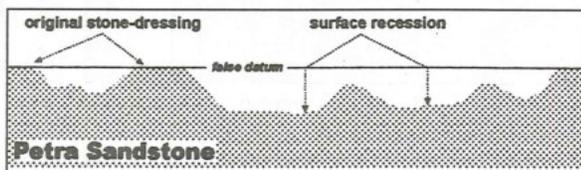
thetical reconstruction of the original pre-weathered surfaces from the present state of the sandstone Theater. Since numerous original stone dressing tool marks are visible across the Roman Theater's seatbacks, seat tops and walkways (*itinerata*), a false datum was established by using Brunton® *Pocket Transits*, Abney and laser levels and leveling cords to determine the pre-weathered dressed sandstone surface. This allowed the determination of the amount of sandstone weathered and eroded since the Theater's construction approximately 2,000 years ago. For the surface measurements, only the lower portions (*ima and media cavea*) of the Theater were used (Figs. 2, 4 and 6). These two sections (*cavea*) were used since the upper portion (*summa cavea*) was restricted to plebeian and proleterian usage and was typically constructed to less precise standards (Vitruvius BC 50) and therefore more difficult to estimate its pre-weathered condition and level. The original stone dressing marks (parallel grooves ranging up to 5 mm in depth) were located on every other seating row, and the false datum was then established - through conventional plane leveling. Starting above the *aditus*, at the Theater's stage-left side, and at intervals of 2 m, millimeter measurements were taken (using an Ultratest® pin micrometer) from



6. The recessed surfaces were measured from the *ima cavea* and *media cavea* of the Theater. The enclosed nature of the Roman Theater in the Outer as-Siq of Petra permits the seasonal balance between a weathering-limited (winter) and erosion-limited (summer) environments.

the false datum to the present sandstone surface at the seat bench back (vertical slope) and the seat top midpoints (horizontal slope). This sampling scheme was used since the differing arc lengths of the Theater's stepped conical form, in tandem with the spaced sampling sites ensured a quasi-random sampling strategy across the Theater. The examination of Roman stone dressing tools and recently dressed sandstone at the University of Rome demonstrated that the originally dressed surface displayed undulations ranging from 5 mm. Accordingly, in addition to the micrometer's minimal error of 1mm (Ultratest® manual), an accumulated measurement error envelope of  $\pm 6$  mm was established (Fig. 7).

Although previous research indicated that only minor lithological variability was present in the *Umm Ishrin* Formation sandstone of Petra (Barjous 1989), field observation indicated that these minor variations affected localized weathering in the Theater. Therefore, 62 microscopic lithological samples were collected from the *ima* and *media cavea* to examine the variability in sandstone composition. Since the prior research and preliminary field observations indicated that there was little variability in the *Umm Ishrin* sandstone clast size, orientation, and form, it was the variability of sandstone matrix chemistry that was used in the study as having the greatest effect on weathering. Conventional petrological, backscatter scanning electron microscopy, and wavelength dispersive electron microprobe analysis (JEOL model JXA-8600) were used to determine various lithological matrix variables. One main sandstone bed (#1-2) and



7. This diagram represents the false datum line stretched from the remaining stone-dressing grooves.

seven smaller lenses were identified (#A-G) from field observation and lab analysis (See Fig. 3 and Table 2). Sandstone density was determined through conventional Jolly Balance methods (Hurlbut 1971) and ranged from 1.93 to 4.06 grams/cm<sup>3</sup>. While clast-to-matrix ratios were determined through the use of CAD software and ranged from 15.7 to 53.9%. The SEM micrographs of the various lithological sub-units were digitized into *autoCAD v.13* which enabled the instantaneous estimation of clast-matrix ratios (Fig. 8).

Finally, solar flux was calculated on the various slopes and aspects of the Roman Theater in the hopes of identifying a relationship between weathering and insolation. Using conventional formulae for longitude/latitude, elevation and slope (Sellers 1965), the annual accumulated solar flux was estimated in annual megajoules per square meter for each slope and aspect. For the Roman Theater in Petra, the total annual megajoules/m<sup>2</sup> ranged from 176 on vertical, obscured northern aspects to 5410 for horizontal, exposed southern aspects.

The study variables follow:

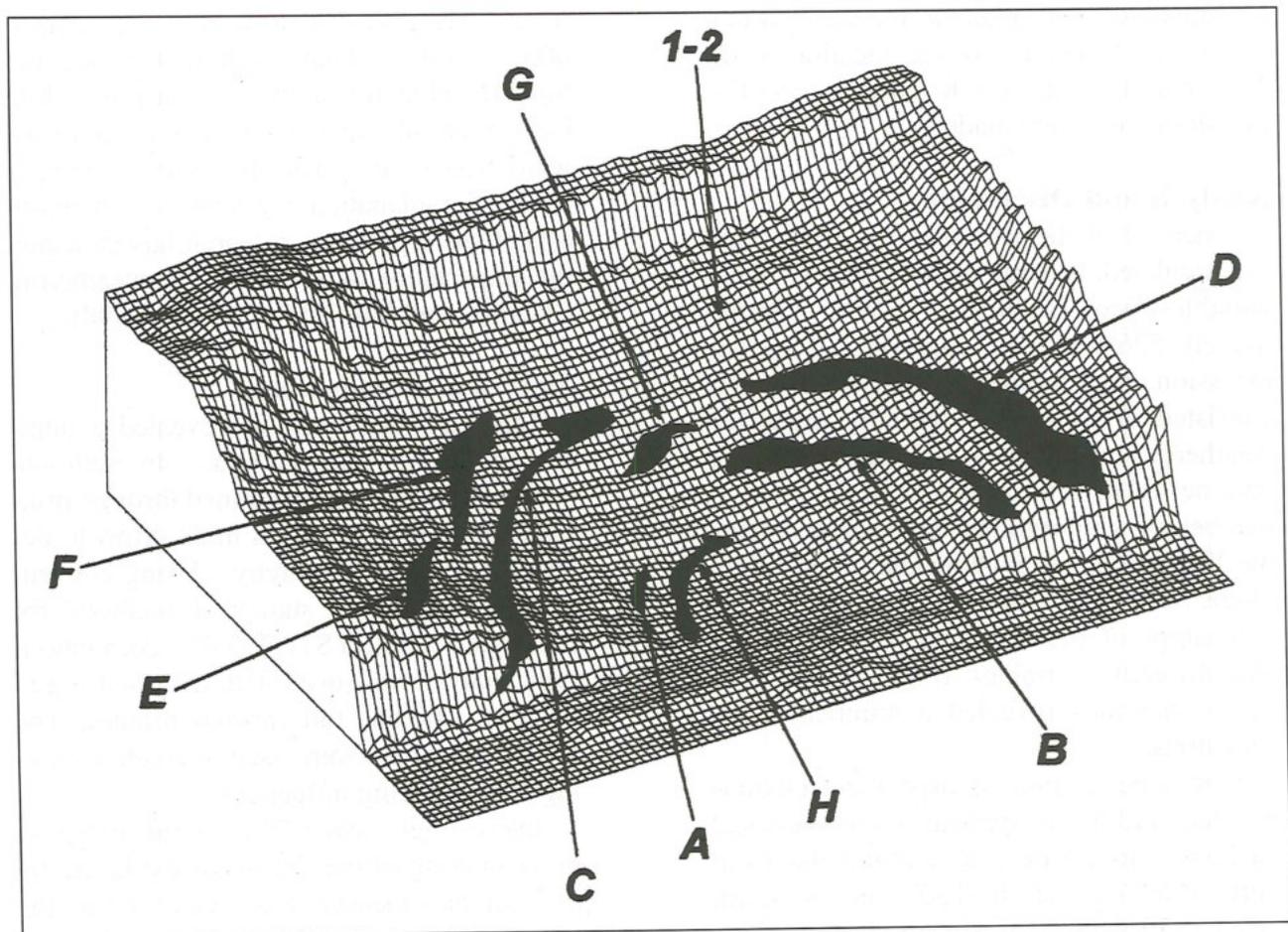
**dependent variable:**

surface recession measurements (mm)

**independent variables:**

- aspect (000°N)
- slope (0°, 90°)
- annual solar flux (megajoules/m<sup>2</sup>)
- sandstone density (gm/cm<sup>3</sup>)
- sandstone clast-to-matrix ratios (%)
- principal matrix constituents (%Al, %Si, %Fe, %Ca)

Before the study was undertaken, however, a number of assumptions had to be made. First, that the processes affecting the weathering and erosion today are of similar rates since the Theater's construction and that the climate has not varied greatly. Since the Theater's construction, although minor climatic oscillations have occurred in Southern Jordan (Danin 1983; Zohary and



8. This diagram of Petra's Roman Theater exhibits the various sandstone strata (1,2,A-G). Strata D and F contained high concentrations of matrix calcium.

Hopf 1988), it is assumed that these fluctuations have been averaged over the last two millennia and that the weathering mechanisms and rates are valid for the long term. Second, the surface recession has not been enlarged by abrasive erosion, thus implying the removal of weathered by-products by overland flow. No evidence of surface abrasion from fluvial bedload, eolian abrasion, or livestock herds was observed in the Theater. Though these forces must be at work in the Theater, it is well protected from overland flow by Nabataean diversion channels, from wind-blown particles due to its sheltered location in the as-Siq, and from grazing due to its complete lack of vegetation. Also, although current tourist levels are very high, in the early 1990s when these measurements were made, tourist numbers were

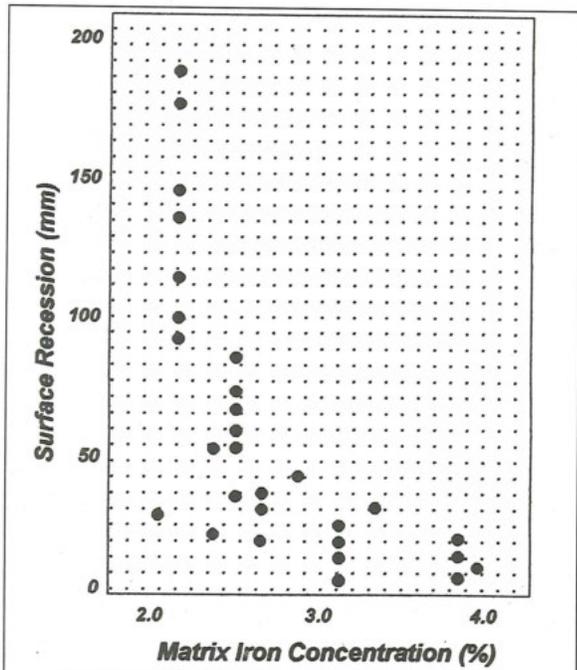
dramatically less. Third, the moisture content was not determined in the sandstone of the Theater because it varies seasonally depending upon the wetting event (i.e. snow, dew, ponding). Distribution of moisture retention is important in the study of weathering (Robinson and Williams 1989; Matsukura and Matsuoka 1991), and since sandstone weatherability is probably correlated with lithological variability, its effects on spatial weathering patterns are difficult to separate from lithology. Fourth, it can be concluded that the sandstone samples were representative of the different strata in the Theater. The samples were chosen to characterize the mean qualities of the varied strata. Fifth, of greatest importance is the primary assumption that the Theater adhered to original Vitruvian standards. Initial build-

ing standards were made to the dictated definitions of Vitruvius for the location of the false datum from which surface recession measurements were made.

**Analysis and Discussion**

Once all of the variables were measured or calculated, a large data matrix of these variables was established. With approximately 526 horizontal and vertical surface recession measurements, the data matrix consisted of over 3000 spatially organized weathering-related data, the most extensive data net of its kind at this scale known. A number of scattergrams were created from the Theater data as a whole and for each lithologic bed in order to reveal the relationships of the sandstone surface depths and different variables (Figs. 9 and 10). These diagrams revealed a number of associations.

One modification to aspect correlations was required for its applications to statistical analysis. Since aspects ascend in value from north (000°) to south (180°) and to north again (359°), the values from 181° to 359°



9. This scattergram shows the relationship of weathering surface measurements to the percentage of matrix iron concentration.

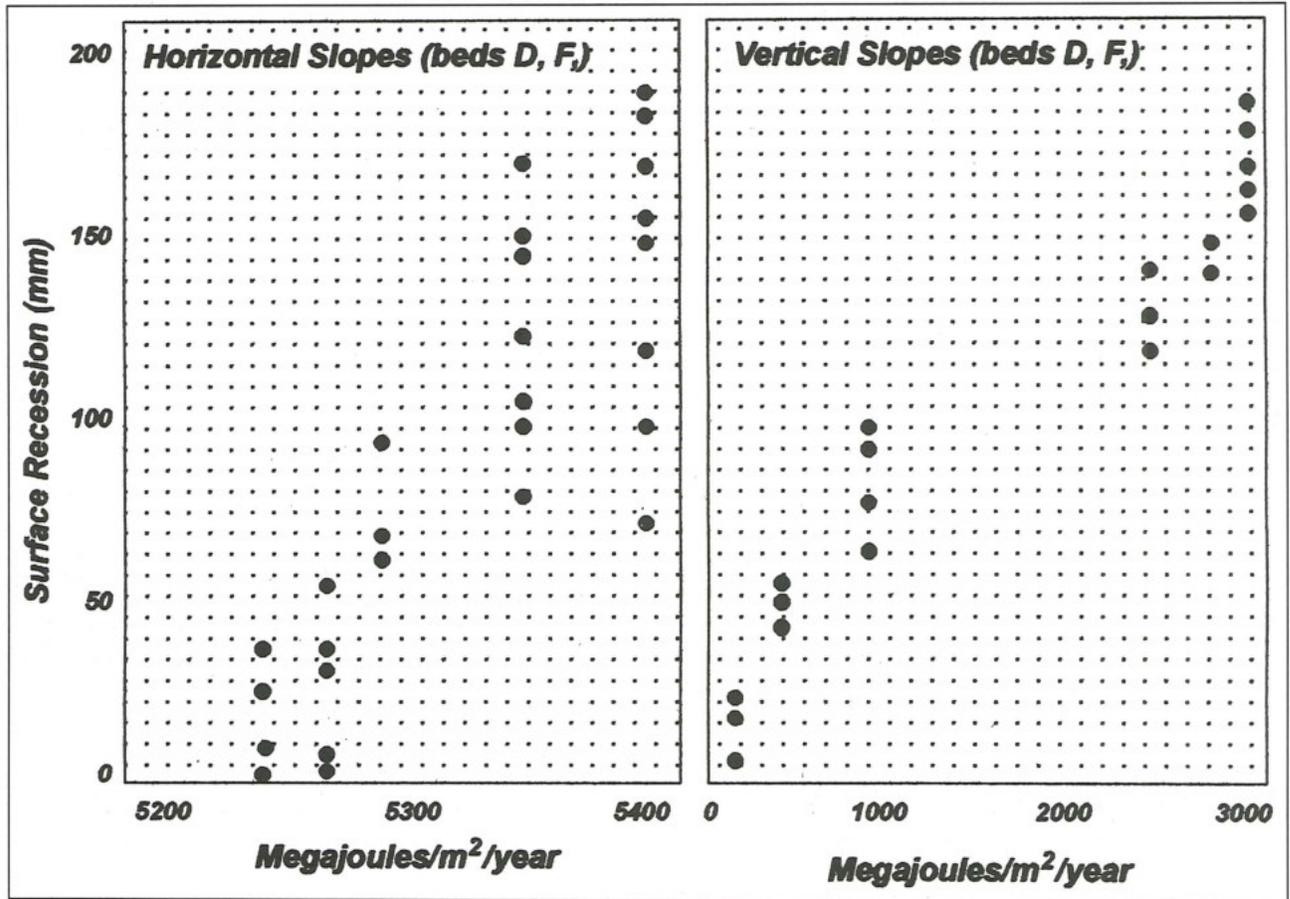
were converted to mirror the values from 000° to 180°. True south represented the highest value for statistical analysis, while both bilateral aspectual values descend toward true north. This permitted a greater level of explanation for analysis involving aspect since previous research has indicated the importance of solar flux to weathering (Paradise and Yin 1993; Paradise 1998).

*Statistical Examination*

Statistical scattergrams revealed a number of strong relationships. In addition, study variables were examined through principle component analysis in an effort to determine a causal hierarchy. Using conventionally prescribed statistical methods for factor analysis (SYSTAT 5.02), correlation-type analysis was used with a chosen Eigen value of 1.00 and full varimax rotation. The following results were used to create a ranking of weathering influences.

Interestingly, over 75% of the variation in weathering of the Theater is explained by the variables measured, as evidenced by the accumulated total. When the variables of the greatest loading values are explained, they can be assembled into groups of general influence: intrinsic (lithology) and extrinsic (insolation). The first column that has a 25% explanation level, can be grouped as lithology since the variables all represent matrix attributes or constituents. Also, the inverse character of insolation affecting horizontal vs. vertical surfaces implies the vary nature of solar flux influencing the measured horizontal surface depths, and having a reverse (non-effect) effect on vertical surfaces where annual solar angles are oblique rather than direct.

Principle component analysis permitted the ranking of the variable groupings according to their percentage of total variance explained. This enabled the development of a causal hierarchy explaining 75% of the explained variation in the measured sandstone recess depths.



10. This scattergram shows the relationship of weathering surface measurements to accumulated annual insolation.

Table 1: Principle Component Analysis of the Petra Theater Values.

	<i>horizontal surfaces</i>				<i>vertical surfaces</i>			
<b>aspect (0-180°N)</b>				0.75 3				-0.707
<b>solar flux (magejoules/m²)</b>				0.84 2				-0.802
<b>density (gram/cm³)</b>			0.850				0.921	
<b>matrix/clast ratio</b>	-0.240							
<b>alumina concentration (Al<sub>2</sub>O<sub>3</sub>)</b>	-0.915				-0.860			
<b>silica concentration (SiO<sub>2</sub>)</b>	-0.704				-0.936			
<b>calcium concentration</b>		0.637				0.634		
<b>iron concentration</b>	-0.402		0.847		-0.367		0.921	

The values represent the rotated loadings

<b>explained variance by percent</b>	25%	20%	17%	12%	27%	19%	15%	13%
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primary influence: general lithology  
 secondary influence: rock density (a function of iron concentration)  
 tertiary influence: solar flux

This weathering influence hierarchy is valuable in that it establishes the contributory importance of the influences and/or groups of effects to weathering – a previously unrecognized concept in architectural weathering studies.

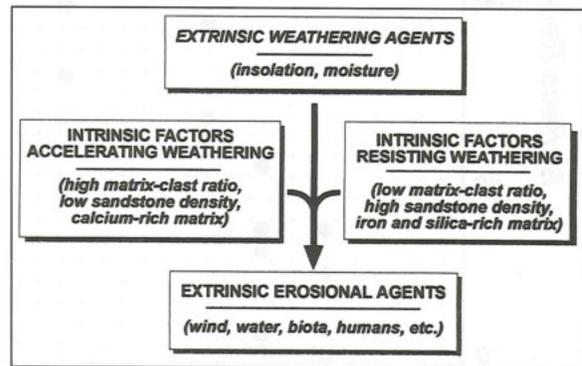
**Weathering Rates**

This study also determined a number of weathering rates for the minor variations in sandstone lithology. Since the sandstone of the *Umm Ishrin* Formation shows little variation in clast size or composition, it was revealed that minute variations in matrix constituents greatly affected surface recession. Fluctuations in matrix alumina, silica, iron, and calcium were found to be important intrinsic agents that affected the speed at

which the sandstone surfaces receded. Recession rates ranged from 7 mm per millennium on iron-rich, calcium-poor vertical surfaces (bed #B) to 66 mm per millennium on relatively iron-poor and alumina-poor horizontal surfaces (bed #E) (Fig. 11).

**Matrix Constituents**

The relationships of surface recession to lithology were first examined. The predominant matrix constituents of Si, Ca, Al,

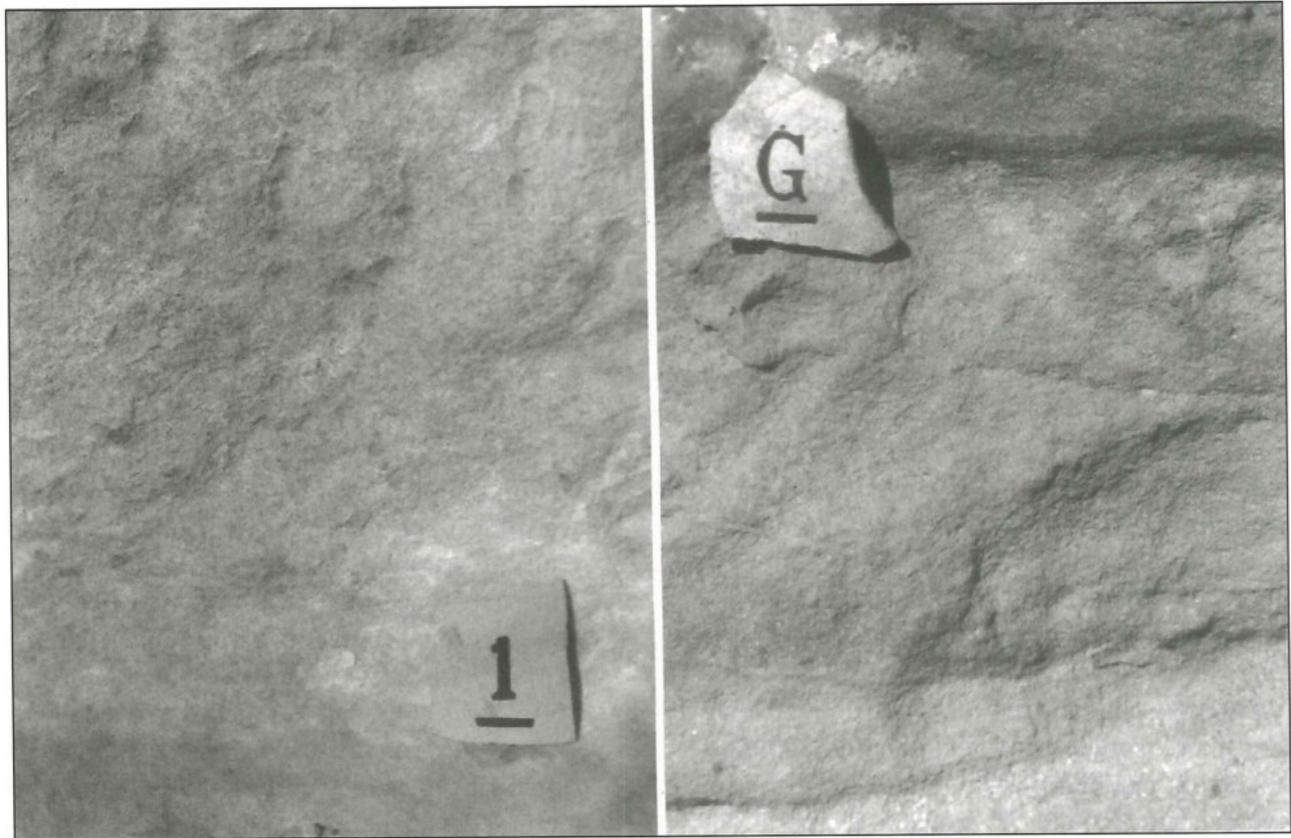


11. Basic weathering (deterioration) and erosion (removal) model for the sandstone of Petra’s Roman Theater.

Table 2: Petra Sandstone Lithological Data and Weathering Rates.

Stratum code	%Al <sub>2</sub> O <sub>3</sub>	%SiO <sub>2</sub>	%FeO	%CaO	gm/cm <sup>3</sup>	Munsell	Density %Matrix	Weathering Rate /Millennium
1	7.6	11.1	4.1	2.1	2.38	10YR 8/2	35.3%	horizontal/vertical 23mm/5mm
2	5.5	15.8	0.6	1.4	2.61	10R 8/2	24.4%	17mm/10mm
A	20.7	21.7	3.7	0.1	2.91	5R 4/2	15.7%	15mm/8mm
B	25.3	26.5	12.2	0.2	1.98	N4	37.5%	44mm/7mm
C	26.1	33.8	2.7	0.9	2.31	10YR 8/2	18.5%	13mm/9mm
D	12.3	11.0	11.5	11.2	2.43	5R 2/2	35.6%	26mm/18mm
E	11.9	22.1	5.3	0.0	4.06	5YR 2/1	17.3%	66mm/18mm
F	7.1	8.5	0.3	11.3	2.05	5YR 3/4	16.3%	27mm/14mm
G	18.7	21.7	1.6	5.2	3.09	5YR 6/1	16.7%	44mm/16mm

These constituent data represent the mean values for each lithological stratum determined through conventional petrological laboratory measurement and microprobe analysis. The mean weathering rates represent the level of recession since the Theater’s construction during the first Century AD.



12. The two beds that exhibited extreme surface recession rates were strata 1-2 and stratum G.

and Fe were all compared to the surface measurements, although only the influence of iron and calcium concentrations to weathering displayed a significant correlation (see Figs. 7 and 12). Strata 1-2 displayed mean recession rates of 23 mm per millennia (horizontal surfaces) to 5 mm/millennia (vertical surfaces), compared to stratum G which displayed mean recession from 44 m/millennia (horizontal surfaces) to 16 mm/millennia (vertical surfaces). Differences in surface recession can be attributed to iron and calcium concentrations, where it was found in this study that matrix iron decreases weathering and surface recession, while matrix calcium accelerated it.

It was found that as iron concentrations approached 2%, the mean surface recessions quickly decreased, and weathering decreased to immeasurable limits when matrix concentrations exceeded 4% - an important principle in the understanding of surface recession of sandstone. As matrix concentra-

tions of iron increase, surface recession decreases (weathering). Field observations corroborated the fact that the Theater's femic beds (blackish, dense) displayed a nearly unweathered/uneroded nature, showing numerous original tool dressing marks. This indicates that iron concentrations act as matrix integrating and indurating agents that lessens the overall sandstone weatherability. Since sandstone density is a function of matrix iron concentrations, it follows that there was a negative relationship for sandstone density and recession measurements. When the overall sandstone density exceeds  $\sim 2.2$  grams/cm<sup>3</sup>, the rate of weathering also decreases abruptly until no surface recession is measurable.

Various study influences may also act to counter-affect each other. For instance, an iron and calcium-rich matrix may exhibit weathering rates the same as those sandstone matrices containing no iron and calcium, since this study found iron constituents to

decrease weathering while calcium components increased deterioration - a balanced pair of matrix constituents. In a similar manner that various lithological components can counteract each other's effects, some constituents may reinforce each other, possibly synergistically influencing the weathering rates.

### *Insolation Threshold*

Since sunlight has had a questionable influence on weathering since the early works of Walter (1891), Schaffer (1932), and Blackwelder (1933), it has continued to perplex geomorphologists as to its direct and indirect influences on weathering. Griggs (1936) found that temperature fluctuations did not influence weathering until moisture was introduced. This landmark study discussed the greater consequence of moisture on weathering than insolation-induced heating. Greater levels of insolation were found to decrease weathering through the elevated evaporation and removal of moisture. Since Griggs' work, numerous studies have investigated the role of moisture in accelerating weathering processes such as wetting and drying cycles, slaking, and hydration expansion in accelerating weathering (i.e. Dragovich 1967; Winkler 1975; Mottershead 1988).

This research, however, suggests a strong relationship between solar flux and sandstone weathering in strata containing relatively greater percentages of matrix calcium. Where calcium levels were determined to be greater than 11% (strata D, E), scattergrams indicate that weathering drastically increased when an accumulated annual solar flux exceeded approximately 5300 megajoules/m<sup>2</sup> (an amount that represents an exposed southern aspect). The reason for this increased weathering in calcium-rich sandstone strata may be explained by recent petroleum petrology research. Somerton's (1992) findings indicate that when calcite (CaCO<sub>3</sub>) is raised in temperature from 50° to 100°C, it expands 1.9% normal

to the C-axis and contracts 0.4% parallel to the C-axis. This irregular effect is contrary to quartz crystals which expand 1.4% and 0.8% respectively - an important concept since the primary matrix constituent of the *Umm Ishrin* sandstone is silica (chalcedony). This differential expansion and contraction between the calcium and silica minerals disrupts the interface between the matrix and the clasts, leading to clast-matrix separation and particle disaggregation, a commonly attributed influence on sandstone weathering (Kerr *et al.* 1984; McGreevy 1985). This finding implies that sustained summertime warming may be all that is needed to cause matrix disruption, subsequent disaggregation and sandstone deterioration. It was found that the maximum sandstone surface temperatures of the Theater to range from 30° to 56°C (26°- 44°C air temperature) by using Omega<sup>®</sup> thermistors. This is hot enough to support Somerton's findings (1992) that the increased weatherability and related threshold of the calcium-rich matrices may be caused or influenced by the heat-induced expansion and contraction of calcite and the expansion of quartz. These are meaningful findings since the importance of thermally-induced weathering of architecture (for exposure and/or aspect) has been relatively discarded in recent years (Price 1996).

### **Summary**

During this study, it was found that sandstone weathering in Petra's Roman Theater is due to variations in rock matrix chemistry (i.e. iron, calcium, silica, alumina), and, aspect and its related annual solar flux (i.e. southern, exposed faces vs. protected northern faces). It was found that with sandstone densities greater than 2.2 gram/cm<sup>3</sup> (from matrix iron concentrations), the rate of weathering diminished to levels too low to measure. This was also found for matrix iron concentrations exceeding 2% whereby the weathering rate was found to abruptly decrease until levels of weatherability were too

small to measure beyond a 4% matrix iron constituency. Field observations in Petra confirmed this finding because local sandstone strata containing matrix iron concentrations (exhibiting a darker reddish-brown color) exceeding this level exhibited numerous original and nearly unchanged stone-mason marks dressed two thousand years ago – the most remarkably preserved stratum surfaces of the Theater. However, the rate of weathering in sandstone beds with densities less than the 2.2 grams/cm<sup>3</sup> displayed increasingly weathered surfaces as the matrix iron concentrations neared zero (see Table 2).

It was also found that insolation not only had an accelerating effect on sandstone weatherability, but also required a minimal level of accumulated annual insolation receipt to be an effective weathering agent. When annual insolation exceeded approximately 5200 megajoules/m<sup>2</sup> (representative of an exposed, southern aspect) on sandstone strata containing at least 11% matrix calcium, then there is a positive relationship between insolation and surface recession. This may be due to the fact that calcite exhibits irregular crystalline expansion and contraction when exposed to high temperatures (>50°C, similar to sandstone surface temperatures in Petra). This causes clast-to-matrix micro-fracturing, disruption, subsequent disaggregation and surface recession. In addition, below this extrinsic threshold of 5200 megajoules/m<sup>2</sup> little correlation was found between insolation and weathering, whereas above this amount, weathering was found to increase in association with solar flux. Statistical analyses using principal component analysis confirmed that the most influential factors in sandstone deterioration are lithology (matrix iron, calcium and silica) and aspect (annual solar flux amounts), on both horizontal and ver-

tical surfaces (see Table 1).

Weathering influence and rate studies, such as this one in Petra are important for a number of reasons. Current conservation studies, earth sciences, weathering research, and material science are all lacking in quantified studies that have determined causes, effects, and rates of rock weathering and architectural deterioration. These studies in Petra are filling an important niche in the field. This study contributes to the applications of monument conservation and architectural preservation, in addition to the theoretical framework of landscape change, sediment supply, and rock weathering - an important direction in international and multi-disciplinary research.

### Acknowledgments

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Thomas R. Paradise  
University of Hawaii at Hilo  
Department of Geography &  
Environmental Studies  
200 West Kawili Street,  
Hilo, Hawaii 96720-4091  
USA

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# THE 1998 FINNISH JABAL HĀRŪN PROJECT A PRELIMINARY REPORT

by

Jaakko Frösén, Zbigniew T. Fiema, Mika Lavento, Katri Koistinen and Richard Holmgren

The Finnish Jabal Hārūn Project (FJHP) focuses on Jabal an-Nabi Hārūn (the Mountain of the Prophet Aaron) located ca. 5 kms to the southwest of Petra. According to the Jewish, Christian and Muslim tradition, the mountain is the place of burial of Moses' brother Aaron. Currently, the peak of the mountain is occupied by the Muslim shrine (*welī*)<sup>1</sup> which contains a sarcophagus (cenotaph) built in the place believed to be Aaron's burial site. Ca. 70 m below and ca. 150 m to the west of the peak there is an extensive but ruined architectural complex located on a wide plateau of the mountain, at ca. 1250 m above sea level. This architectural complex, thought to have been a Byzantine monastery, is the focal point of the Finnish investigation. Previous explorations and descriptions of the mountain and its antiquities are few, and all are summarized in the recent article (Peterman and Schick 1996). More historical information comes from the Petra Papyri discovered in 1993. The bilingual Greek-Latin document Papyrus Petra inv. 6 (Papyrus Petra Daniel C. and Nancy E. Gamber), now dated to June 15, AD 513, mentions "the House (Lat. *domus*, Gr. *oikos*) of our Lord the Saint High-Priest Aaron" outside of the city of Petra. The combination of specific terminology used in this papyrus implies that the papyrus almost certainly refers to a monastic complex or church of Saint Aaron headed by the Most Holy Presbyter and Superior (Gr. *hegoumenos*) Cyricus, son of Petrus. As such, the religious tradition associated with Jabal Hārūn and the existence of an architectural complex on the high pla-

teau of the mountain would strongly suggest that the complex could indeed be identified as the monastic complex of Saint Aaron. While the exact date of the abandonment of the mountain by the Christians cannot be determined, it must have happened not later than the mid-14th century when the Muslim *welī* was constructed at the peak.

The research goals of the Finnish Jabal Hārūn Project designed as a multi-season, multidisciplinary scholarly investigation, include the following:

- 1) the study of the variations in spatial and temporal human occupation in the area of Jabal Hārūn throughout the ages, with special emphasis on the extent and nature of occupation at the site located on the high plateau, and tentatively recognized as a Byzantine monastery.
- 2) the investigations of the patterns of human adaptation in the area, i.e., the technoeconomic aspects of land-utilization, including studies on ancient agriculture and resource exploitation.
- 3) the significance of the Jabal Hārūn area in a larger historical perspective. That especially includes the relationship of the site with Petra during the Nabataean through the Islamic periods.

To meet these objectives the project utilizes archaeological excavations, survey, cartographical fieldwork and research, architectural studies, geoenvironmental exploration, and ethnoarchaeological research. Furthermore, the project will undertake the preservation, protection and presentation of the explored architectural complex situated on the plateau of Jabal Hārūn.

1. Palestinian grid coordinates of the shrine: 188.64E x 969.667N; UTM coordinates 731200E x 3356470N. The architectural remains located di-

rectly under the *welī* are not the subject of the FJHP activities.

## THE 1998 SEASON

The first fieldwork season of the FJHP lasted between July 23 and September 3, 1998. The project is directed by Prof. Jaakko Frösén, University of Helsinki. The archaeological fieldwork is supervised by Dr Zbigniew T. Fiema, Dumbarton Oaks Center, with Dr Mika Lavento, University of Helsinki, being in charge of the survey part of the project. In total, 4 archaeologists, 2 architects, and 10 students from the University of Helsinki, and 6 cartographers from the Helsinki University of Technology and Espoo-Vantaa Institute of Technology, as well as Richard Holmgren, archaeologist and draftsman from Sweden, have actively participated in the fieldwork. Additionally, Professor Ari Siiriäinen, professor of archaeology at the University of Helsinki, and Prof. Henrik Haggrén, cartographer from the Helsinki University of Technology, have participated as senior staff members during a part of the season. Dr Fawzi Zayadine and Mr Hani Falahat were the representatives of the Department of Antiquities.

The goals of the 1998 season followed the propositions which emerged from the reconnaissance conducted in 1997, and were tailored to provide data essential for the planning of the following seasons, and for developing a comprehensive methodology applicable to the entire project. The following specific objectives have been identified:

- 1) Determination of the depth, nature, and the temporal parameters of the occupation at Site 1 (the monastic complex), through limited test excavations in several areas of the site, which appeared to be most promising in terms of achieving this objective.
- 2) Determination of the state of preservation of some structures/rooms of particular interest at Site 1 and the preparation of the comprehensive top plan of the monastic complex through the intensive clearance of the surface material at Site 1, and

through the use of appropriate cartographic techniques.

- 3) Intensive survey and documentation of a selected irrigation agricultural zone located to the west of the Jabal Hārūn mountain.

**Site Documentation** (H. Haggrén, K. Koistinen, J. Latikka, V. Putkonen, R. Karjalainen, J. Mononen, J. Heikkinen, P. Honkanen and P. Pöntinen)

The goals and objectives defined for the 1998 cartographic work were as follows:

- 1) the establishment of the control point networks for mapping of the monastic complex and the survey area. Networks are also used for photogrammetric measurements in both areas. The establishment of the networks has been done using tachymeter and GPS.
- 2) the continuation of producing video sequences and digital stills to complete the photogrammetric documentation which began during the 1997 reconnaissance.
- 3) the daily recording of spatial information data produced by the excavations and survey, and the editing of this information in the form of the project's database.
- 4) the improvement of the 3D computerized image of the mountain and its environs.

The equipment used during the work included 2 electronic tachymeters (Geodimeter), 3 GPS-receivers (Ashtech), 1 digital camera (Olympus C1400-L) and 2 video-cameras (Sony Handycam) in addition to the other equipment.

### GPS-Survey

GPS-measurements were done so that the local coordinate systems (monastic complex and survey) can be transformed into a global coordinate system (UTM). The same measurements were used to transform the surface model made by using aerial images to the same coordinate system. In total eight points were measured using GPS. Two of the points are located on the top of the mountain and the rest are around the survey

area. The monastic complex control point network was tied into GPS-points by measuring the angles and distances from the monastic complex control points 103 and 105.

### **Tachymetry**

Tachymetric measurements were carried out in the monastic complex area and in the survey area. In addition to laying out the trenches, the 3D measurements of all loci (matrix deposits, features/installations), and significant objects were taken. The tachymeter measurements produced XYZ coordinates in local coordinate system. In addition to the coordinate data, extra information (like object code, etc.) relating to every point was saved to the data collecting unit of the tachymeter. The number of measurements varied from dozens to hundreds of points. The mapping project also included the surface modelling of the monastic complex, which resulted in over 2000 measured points. The data was later processed using computers. The measurements of the survey area were almost solely mapping measurements. The barrage and terrace constructions of the main and secondary wadis were measured so that their shape and relative height were recorded. The bottom of the wadi was also measured, so that the relation between the constructions and the ground shape could be informatively visualized.

### **Photogrammetric Recordings**

Photogrammetric recordings were done by using a videocamera and digital still camera. The videocamera was used mainly in the monastic complex area while the digital camera was used both at the monastic complex and in the survey area. The videocamera was mainly used to take cocentric and linear videosequences from Trenches A, B and C. Styrofoam balls were placed in the corners of every trench as control points for measurements. Plane coordinates of the points have been measured with a tachymeter and the heights of the center of the styrofoam balls

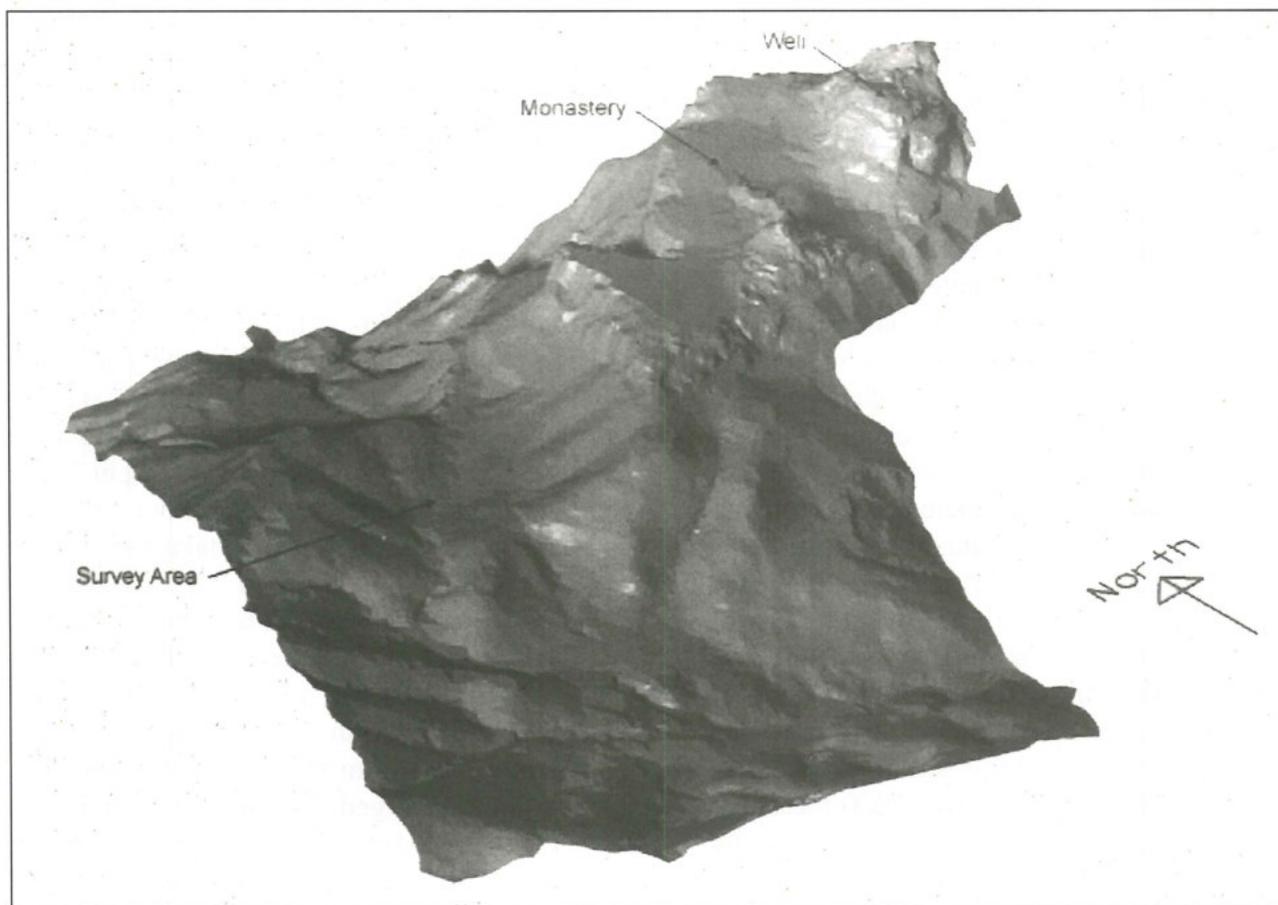
with a measuring tape. Recordings were made using the wide angle position of the zoom. In addition to the wide angle, the zooming was used in Trenches A, B and C to get a better resolution of some details.

The digital camera was mainly used for taking stereo-images from trenches in the monastic complex area and the barrages and other installations at the survey area. Digital images are used for photogrammetric measurements and modelling of entities such as trenches and their components. Images were taken from about 1.6 to 1.8 m height above the ground and from ladders about 2.0 to 2.5 m high. Some images were taken so that the imaging axis was almost vertical. An orthoimagemosaic has been made from the floor of the Trench B, based on those images.

Additionally, the 3-D terrain model of the top of Jabal Hārūn covering approximately an area of 0.7 km x 0.6 km created in 1997, was now enlarged. The terrain model (Fig. 1) based on aerial images covers after the enlargement an area of approximately 1.2 km x 1.5 km. The 1998 mapped areas are located to west and south of the top of Jabal Hārūn. The tachymeter was also used in the survey area to get more detailed information on irrigation systems, to be added to the terrain model based on aerial images.

### **FJHP Database**

The archaeological database of the project was developed with the idea of combining the textual information (site description), digital imagery and spatial data into one interrelated system which would also be compatible with the GIS information and 3-D modelling requirements. As such, the database permits a conduction of visual and statistical analysis and a preparation of a comprehensive report. For the relational database, the "Microsoft Access 97" proved to be both convenient and reliable, while "Microstation 95" by Bentley became the project's all-in-one 3-D modelling, GIS and mapping tool. The latter has also an essential



1. Digital terrain model of the Jabal Hārūn area, 1998 (seen from SW).

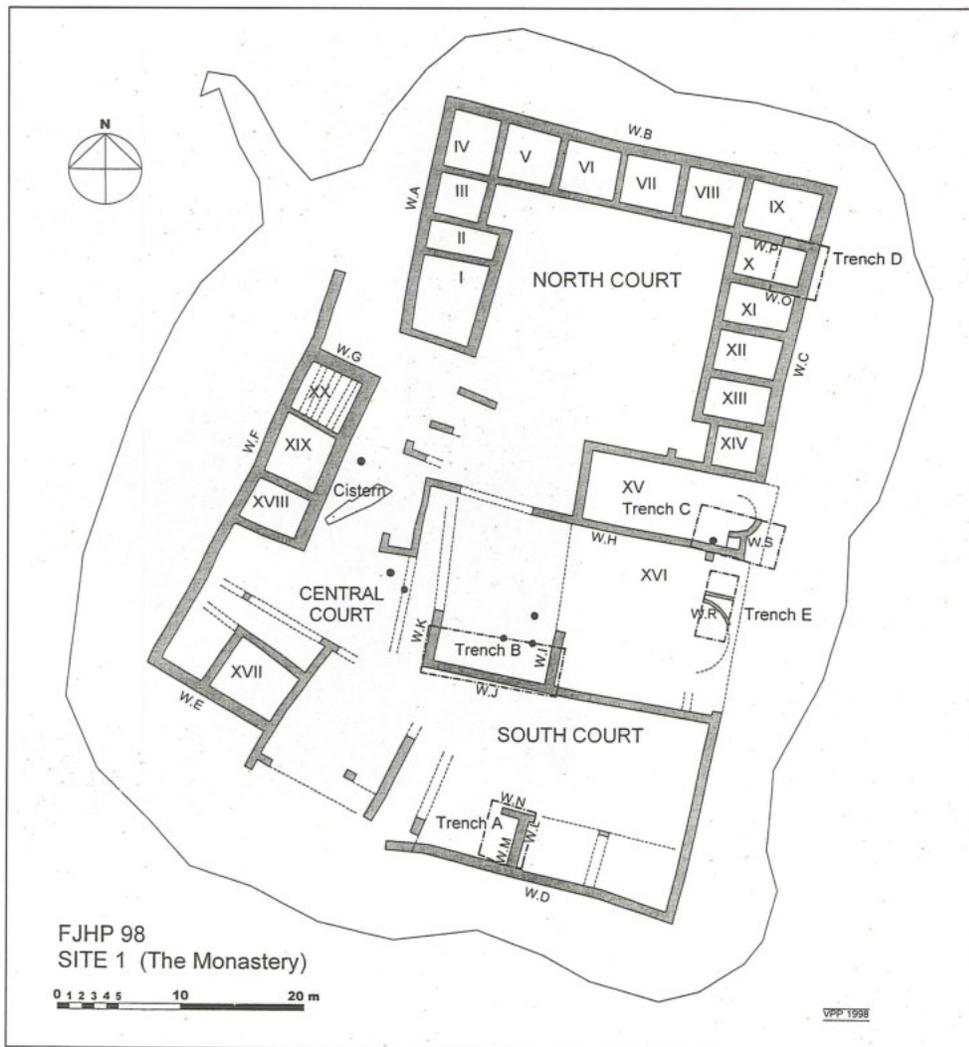
tachymeter data processing module (Ter-survey). For the textual information gathered in the field, traditional forms (locus, artifact, tract, site) were developed. Upon the completion of a form, the information was transferred to a laptop computer using pull-down menus for recurring entries. As such, each paper form has its faithful equivalent in a database form. Linking the form records to the measured points in 3-D space is being currently done in order to show the spatial relationships between different categories of data. Data collection and transmission procedures will be further streamlined and simplified.

#### ARCHAEOLOGICAL EXCAVATIONS

The limited excavations which took place within Site 1 (the monastic complex) provided basic and relatively diverse in-

formation concerning the general stratigraphy and history of the site while partially exposing some representational or significant parts of the complex. Simultaneously, an architectural survey was conducted at the site, which involved electronic recording of all extant walls visible on the surface. This survey produced a new, preliminary plan of the complex (Fig. 2), which should be regarded as a considerable improvement over the idealized plan previously published.

The excavation work was conducted in three trenches (A, B, C) which were fully excavated down to the lowermost stratum. A preliminary phasing of the occupation detected in these trenches is provided below. Two other trenches (D and E) were cleared on the surface, and the excavations there did not proceed beyond ca. 20-40 cms below the surface. The purpose of these latter trenches



2. The 1998 Preliminary Plan of Site 1 (the monastic complex).

was to test hypotheses which emerged during the 1998 excavations, and the work in these trenches will be continued at a later date. A brief description of the progress of work in these trenches is provided below. The recording of strata, features and finds in every trench was based upon the 3D readings and mapping provided by tachymeters, as well as the descriptions included in notebooks and special locus and artifact forms specifically developed for the Project's computerized database.

**Trench A** (J. Vihonen, K. Tuori, A. La-helma, R. Ylönen and K. Lorentz)<sup>2</sup>

Trench A was laid out roughly halfway

along the well-pronounced tumble ridge which marks the course of the southern outer wall (D) of the complex. The trench's size was 7m (N-S) by 4m (E-W), the southern part being about one meter outside the building. Originally set up to clarify the course, construction and dating of Wall D as well as to obtain dating material from its foundation trench, Trench A proved somewhat a disappointment in the latter goal since the structures were built directly on the bedrock. Other objectives were to clarify the function of the complex around South Court, and to find out the function and extent of enigmatic stone circles faintly visible on surface. The latter were proved to be accidental

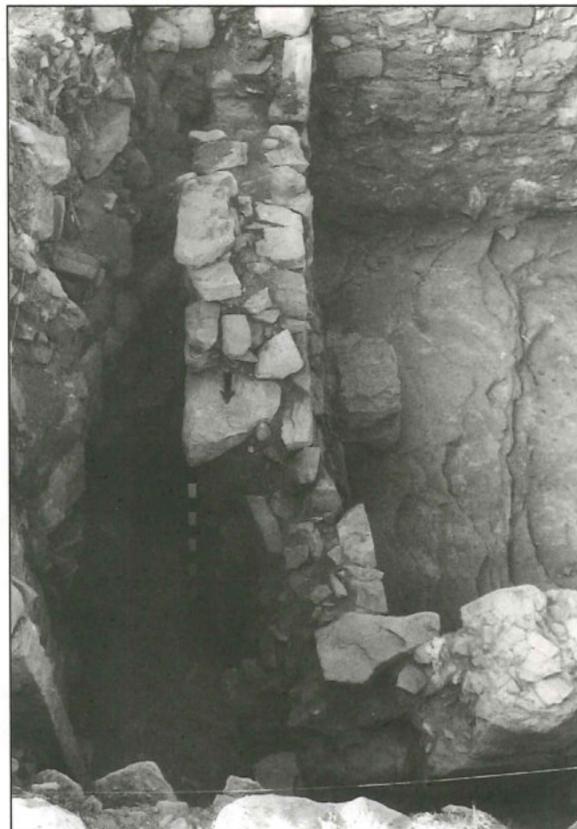
2. For the sake of clarity and space, all levels given on the plans and sections omit the first two digits,

12. As such, the level of 44.43 is, in fact, 1244.43 m above sea level.

patterns, whereas the function of this part of the complex still remain unclear.

*Phase 1: Construction.* During the first phase parallel Walls D (locus 4) and N (loci 15 and 23) were built directly on the bedrock (locus 25). Wall D is ca. 0.9 m thick and preserved up to the height of ca. 2.05 m. Its southern (exterior) face features well carved ashlar set in rows but the northern face, which was obviously plastered, is made of less regular and much weathered stones. Wall N is 2.9 long, ca. 0.6-0.8 m wide and rises above the bedrock to ca. 0.95 m. There is a gap in Wall N in the north-eastern corner of the trench, which marked the original entry from South Court to the space defined by Walls D and N. The finely built east doorjamb section of this entry is well visible in the eastern balk of Trench A. Apparently, there was a floor pertaining to this phase, although no trace of it remains. An empty space below the doorjamb (locus 28), indicates the location of a later removed wooden/stone (?) threshold.

*Phase 2: The Remodelling.* The second phase was marked by the construction of Wall L (loci 8 and 12) which runs in N-S direction perpendicular to and connecting Walls D and N (Fig. 3). With the appearance of this wall, the space within Trench A was now divided into the western and eastern parts. Wall L was constructed of rough sandstone cobbles and rubble without mortar, but reinforced by mortar at a later date. Presently, Wall L is ca. 4.0 m long, 0.6-0.7 m wide, and with the height ranging from 0.85 to 1.45 m. Since this wall was also built directly on the bedrock, the floor of Phase 1 was apparently removed, at least in the wall's area. A new doorway was pierced through in the western part of Wall N (locus 15). This doorway was a simple opening in the wall without doorjambs, the threshold of which being ca. 0.8 x 0.9 m, and 2 courses high (locus 22). Whether the eastern door-



3. Trench A (eastern half, seen from N). Wall L in the center, Wall D (upper right), Wall N (lower right).

way in Wall N remained still in use is debatable (*infra*). No deliberate blocking or other marks of discontinued use of the first doorway were found, other than the awkward position of this doorway in relation to Wall L.

Remains of floor paving under the threshold (locus 22) consist of mortar and stone pavers (locus 27). Apparently, these are the only remains of a floor which consisted of stone slabs (in the west) and of exposed bedrock (in the east). The stone floor served to level the occupational surface, otherwise very uneven because of the eastward-sloping bedrock. An enigmatic stone structure (locus 24) connected to Wall L and built directly on the bedrock also belongs to this phase. It is ca. 0.68 m long, 0.43 m wide and ca. 0.46 m high. Its purpose is unknown, although its benchlike appearance may indicate its function.

*Phase 3: The Damage.* This phase is characterized by the damage inflicted upon Wall L, caused by an earthquake or other mechanical forces. The central part of Wall L is pushed in eastwards, while the lowermost courses form a straight line. The damage is most severe where locus 8 bonds with locus 12, ca. 1 m from Wall N. There, Wall L continues abruptly at a line ca. 20 cm eastwards from the original straight line formed by and still preserved by the lowest courses. The northeastern end of Wall L - the east side of locus 12 - was entirely destroyed. Therefore it remains unclear how far the eastern side of the wall extended. Whether or not the first doorway was in use during Phase 2, could only be determined with Wall L preserved intact. If the wall was originally straight the first doorway could still have been in use before the wall was damaged. This is supported by the fact that the wall is of uniform width, ca. 60 cm, and the lowest courses of Wall L which were the least likely to have shifted during an earthquake, are in a straight line. This would indicate that the central part of the wall shifted to the east, perhaps due to the pressure resulting from an earthquake (collapsing of the roof or adjacent walls). On the other hand, the edges of the wall, which were firmly linked with the bedrock or Walls D and N survived the seismic damage. However, the wall might also have been of varying width at its top and bottom, even before the damage in Phase 3. This possibility is suggested by the straightness of the upper line of the eastern face of the wall, which is not parallel to the western bottom line of the wall. In this case the wall, when built in Phase 2, would have blocked the first doorway. While the evidence is inconclusive, the eastern doorway might have been in use before the damage, but definitely not after it.

*Phase 4: The Courtyard.* The space continued to be occupied but apparently in a different function. The floor of Phase 2, prob-

ably damaged at the same time as Wall L, was removed during this phase. A new occupational surface included sandy yellowish deposit (loci 20, 26), probably brought in from outside. That fill covered the entire room except for small areas in the northeastern and southeastern corners where bedrock was visible. Remains of a probable fireplace (locus 21) were uncovered above the sandy floor. This may or may not indicate that the room now probably had no roof, which had perhaps fallen down during the previous phase. Wall N (locus 15) was found to be preserved at an almost uniform height of ca. 1 meter above the bedrock level. This levelling down might have been intentional. Furthermore, the top of the wall displays a thick layer of mud mortar. It may be that the room was turned into an open courtyard, probably immediately after Phase 3 when Wall L was damaged and perhaps could no longer support a roof.

*Phase 5: The Dumping.* This phase appears to represent a partial abandonment of the room, during which a relatively thick, brownish layer of wind-blown sand (loci 17A, 17B, 18 [partly] and 19) accumulated, thicker along the walls than in the center of the room. The finds - such as commonware, charcoal (particularly in loci 17 A and B), quantities of bones and marble fragments - indicate that the area had not been entirely abandoned. It may have been used for casual squatter-like occupation (although without clear occupational surfaces) or, alternatively, as a dump for the other, still functioning parts of the complex. In particular, locus 17 located by the southern face of Wall N, could be easily recognized because of the high contents of ash in its matrix. This locus, which appears to have been a debris midden is ca. 2.35 m (E-W) and 1.0 m (N-S). The sublocus 17A contained most of the loose ashy deposit, charcoal bits, burnt and unburnt bones (including fishbones), glass and commonware (often with charring marks on

the outside). The sublocus 17B, was more compact and it contained fewer finds than 17A, probably being its spill area.

*Phase 6: The Destruction.* This phase represents at least one, but most probably a whole series of earthquakes, natural decay and other damage which created a stone tumble which was deep, extensive and difficult to separate. The subdivision during the excavation was thus largely arbitrary. The western section features several layers which are more separable, and thus the phase can tentatively be divided into at least four sub-phases. Undoubtedly, the stones deposited through earthquakes and natural decay of the ruins formed layers of loose rubble through which wind- and water-borne sand, pottery sherds, coins and the like could easily have filtered, creating a rather confused, secondary stratigraphy of the finds, especially pottery of all periods (Russell 1980: 57; 1985: 52, note 12, for these processes in Petra). The following is a rough approximation of what may have happened:

- 6a: The first major stone tumble (parts of loci 16 and 18) caused by an earthquake was deposited on top of the sand of Phase 5.
- 6b: The earthquake was apparently followed by a relatively brief period of natural deposition of sand (parts of loci 11 and 16; loci 13 and 10 outside the Wall L may also be counted here), mixed with some large boulders falling from the ruined walls. A number of finds of a similar type as in Phase 5 indicate some form of continued use - either as a dump or for squatting occupation.
- 6c: A second major earthquake further ruined the still standing structures, and created a new, distinguishable stone tumble (loci 6, 9, and parts of 11).

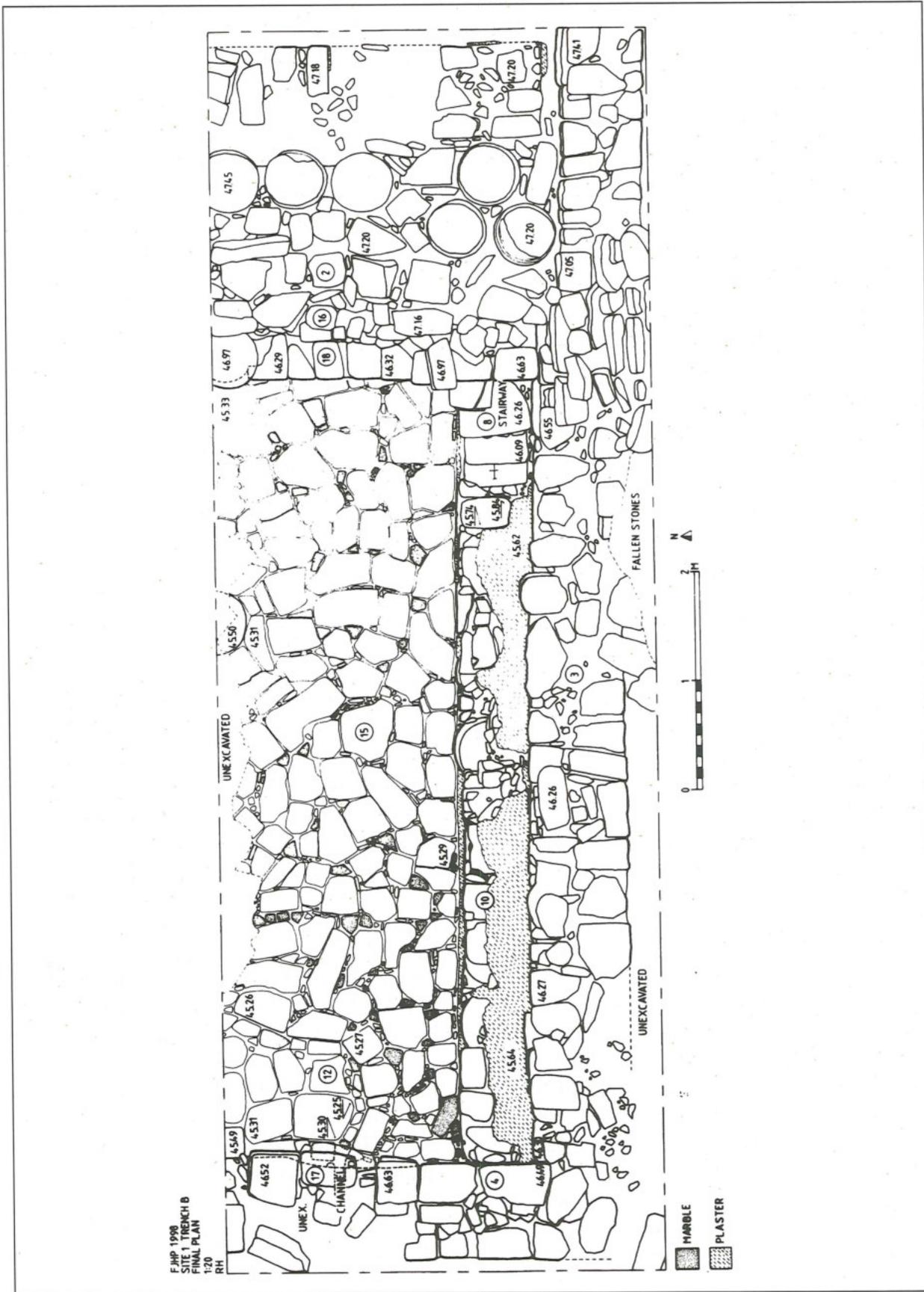
*Phase 7: Natural Deposition and Latest*

*Activities.* The incessant accumulation of wind-blown sand, remains of pastoral-type occupation and a very limited stone deposition resulting from the natural decay of walls, can be associated with the latest phase in Trench A. This phase includes not only loci 1, 2 and 3, but probably also the stone structure (loci 7, 12 = Wall M) on top of Wall L (locus 8). This structure appears to have been a sort of a temporary enclosure or windbreaker, integrated with the uppermost preserved parts of Walls L and D, of the type still being used by the transhumant population of this area. Locus 10 consists of the sand fill inside this enclosure, which provided only a few finds.

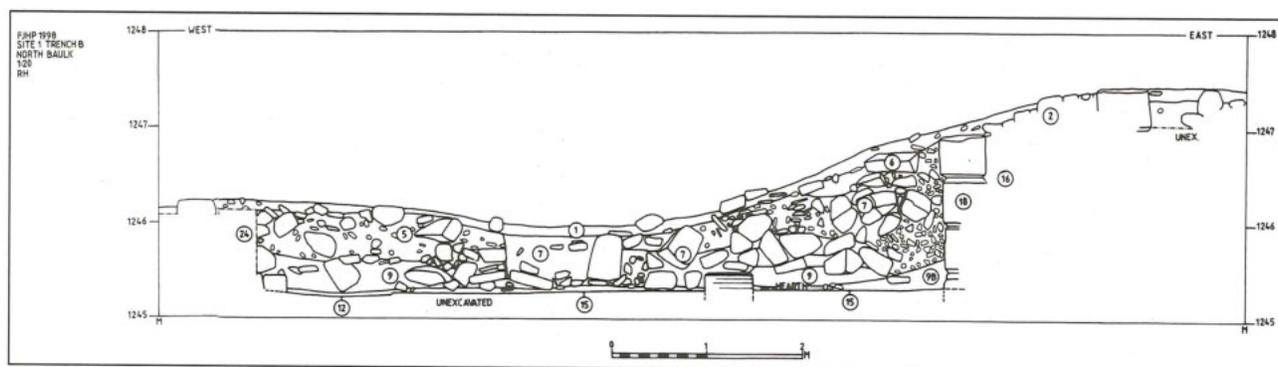
Since the excavation outside Wall D was not completed, the stratigraphic sequence there remains incomplete and thus does not permit a full integration with the phasing of the interior. Below the surface and locus 1, the loci (5, 14, 29, 30) in this area were uniform in composition: mostly sand, small pebbles and a few fallen boulders. Locus 29 was a lense of ashy sand, perhaps the remains of a campfire started outside Wall L which provided a shelter for it.

**Trench B** (R. Holmgren, A. Lahelma and R. Ylönen)

This trench (11.4 x 4 m) has been opened in front of Room XVI, the largest architectural entity within the complex, in the eastern part of the Central Court. The excavation revealed a paved area enclosed by Walls J and K, the former associated with a long bench set against it and the latter having a blocked door (Fig. 4). Furthermore, a series of column drums appeared visible in the northern balk of the trench, set as if in a W-E pattern (Fig. 5). The whole design resembled a long colonnaded hall, not unlike an aisle of a large church, the west wall having an entrance door. The close examination of the surface of Room XVI, the evaluation of the spatial arrangements of Room XVI and the area of Central Court, and finally the



4. Trench B - Top plan.



5. Trench B - North Balk.

opening of Trench E where the central apse of the so-defined church would have been (*infra*), have all confirmed this hypothesis. As such, the remains uncovered in Trench B most probably represent the southwestern part of the southern aisle of a church. Following is a short description of architectural phases detected in Trench B which, however, will not deal with the earliest, pre-church phases at the site. The considerable amount of the Nabataean pottery recovered from all different strata, and the reuse of several column drums inside the structure of the bench strongly suggest that there must have been a structure(s) in the area of Trench B, as well as generally at Site 1, which should pre-date the Byzantine period.

*Phase 1: Early Church.* Walls J and K, most probably built in this phase, are the main south and west walls of the church, respectively, which continued their existence in the following phases. The stone bench (locus 10) was built against Wall J, apparently contemporary with it. The bench is ca. 65 cm wide and ca. 50 cm high, although the extant (later) pavement was laid out against the bench at the level of only 34 cm below its top. Thick plaster on the top of the bench is moulded to form raised supports on both ends and in the central part. In order to detect the early floor, three soundings (loci 13, 14 and 20) were opened in the extant pavement. All three soundings yielded quantities of scattered tesserae, which suggest that the early floor in the aisle, nave or another

building at Site 1 was decorated with mosaics. The sounding, locus 13, featured the plaster covering the side of the bench, which continued down below the level of the extant pavement. The remains of the early floor were ambiguous there, due to the small size of the exposure. The sounding, locus 14, displayed a better preserved floor (locus 19) under the extant pavement. It featured a row of flat stones set against the lower part of the bench, flanked by what appears to be a well-made thick plaster surface. This must be regarded as the early church floor. The plaster applied to the side of the bench lips out on the row of flat stones. The drums of the columns, visible in the north balk also belong to Phase 1 as they stand on this floor. The distance from the drums to the bench (ca 2.9 m) would be the approximate width of the south aisle of the church.

Wall K had a door opening, ca. 1.2 m wide, which was later blocked. The early threshold of this door, made of two large stone slabs, is slightly higher than the extant pavement which abuts it. It means that this threshold was significantly higher than the level of the early church floor.

*Phase 2: Later Church.* In this phase, a new floor (locus 15) was laid out in the aisle. The fill between both floors contained quantities of tesserae and also charcoal fragments, which may or may not suggest a calamity which ended Phase 1. On the other hand, the fill could have been carted in from somewhere else. The floor is made of ir-

regularly shaped but flat flagstones with numerous small marble pieces wedged into the crevices between the flagstones. This floor abuts Wall K, the bench and the early threshold. Also in this phase, the original northern door-jamb section of the door in Wall K had been dismantled and reinstated in the same place. A new threshold was set upon the early one, which raised the threshold level ca. 25 cm above the new floor. It is unknown whether this reconstituting of the northern door-jamb was in response to a destruction. However, the new threshold was now fully integrated with the northern door-jamb, but not with the southern one which was obviously not disturbed since its construction in Phase 1. In the northwestern corner of the trench, just against Wall K, the pavement forms an oval, slightly depressed area (locus 12). A small, very shallow channel leads from this area toward the early threshold which has a deep groove chiseled in to drain the liquid (?) outside the aisle.

*Phase 3: The Division of the Aisle.* It is not certain whether the church was still in use during this phase, but obviously the westernmost part of the southern aisle was now completely separated from the rest of the aisle by the construction of the massive Wall I (combined loci 2, 16 and 18). While this needs to be fully tested by excavations, it appears that this wall continues farther north until the junction with Wall H, thus fully separating the entire western part of the church from its eastern counterpart. Wall I consists of the outer wall made of ashlar (locus 18), the fill of smaller stones in more or less regular courses (locus 16), and the uppermost preserved two courses of ashlar (locus 2) directly upon locus 18. Significantly, this uppermost coursing also contains several reused column drums. The function of Wall I - as a "blocking wall," or a construction within a building (no longer a basilica) - cannot be safely determined yet. It should, however, be related to the stairway

(locus 8) which runs up against Wall J starting from the level of the top of the bench. As such, Wall I may have been intended to form a sort of a flat surface-platform, since the stairway seems to be running up to this feature, either straight eastward, or making a 90 degree turn to reach the platform. The stairway consists of three well-defined steps and the probable fourth. Each step is ca. 15-20 cm high, and the entire stairway ca. 70 cm high. The lowermost step is integrated with the top of the bench by a thick layer of plaster (with small stones inside) which gradually rises up from the bench's level. The surface of the second step from the bottom contains a shallow relief of a cross with its arms, ca. 13 and 7 cm long crossing in their centers. Additionally, during this or the following phases the door in Wall K had been blocked using roughly hewn ashlar.

*Phase 4: Casual Occupation.* It is possible that Phase 4 may in fact be temporally combined with the previous one. However, the occupation during this phase appears to be casual, almost squatter-like. Remains of a hearth partially in the eastern part of the north baulk have been exposed. Bones of fish and chicken were found atop the hearth, and mixed with the ashy deposit around the hearth. Similar fish bones were found directly east of the hearth and against the façade of Wall I. The abundance of fish and chicken bones should indicate a specific, non-monastic occupation in this phase. For example, the Judaeen Desert monks abstained from meat and probably fish, these being reserved only for ailing monks (Hirschfeld 1992: 88). When the cooking fire was made on the pavement, sand had already begun to accumulate against Wall I.

*Phase 5: Levelling (?).* This phase is difficult to define, but it seems to be represented by locus 9 which is on a level with the top of the bench, locus 10. Locus 9 consists of numerous sharp-edged stones in a

sandy matrix - it may be an intentional fill. In the west, plaster fallen from the wall appears lying on the top of these stones.

*Phase 6: Collapse and Disuse.* This phase represents a disuse of the space and the collapse of stones from the walls around. It is nearly impossible to differentiate between the layers of collapsed stones, also due to the relative shallow depth of the deposition covering 3/4 of Square B. Only locus 7 appears distinctively as a result of a major destruction, probably an earthquake. The uppermost deposit within the trench is a wind-blown, waterborne sand.

### **Trench C** (E. Mikkola, N. Heiska and J. Sipilä)

The trench has been laid out in the area against the main eastern wall (C) of the complex, where the outline of a small apse, believed to belong to a chapel, could be discerned on the surface. The trench covered the southern half of the apse. The trench size was approximately 3.7 m (N-S) and 7 m (E-W). Given the material found at this site, it is highly probable that the earliest construction phase discussed here was preceded by largely unknown pre-Byzantine phases. Reused column drums, marble fragments, roof tiles found in the foundations of the early-phase floor, as well as the Nabataean pottery are safe indicators of that earlier occupation. However, the limited exposure of the lowermost deposits as well as the fact that the whole complex seems to have been constructed directly on the bedrock prevents detailed comments on this matter.

*Phase 1: Construction and Early Use.* The walls of the room were constructed, including the apse's wall (Wall S). The southern wall of the room (Wall H) is the massive wall of the structure directly to the south, which turned out to be a church (*infra*). It appears that the chapel is either contemporary with the church, or was added lat-

er on, although the evidence for either proposition is inconclusive as shown below. Although the outer line of the eastern wall of the room was not definable within the trench limits, it is most probable that the apse is fully incised, with the outer line of its back wall probably somewhat projecting eastward from the line of Wall C. Together with the apse, a closet or cupboard with three shelves was constructed in the southeastern corner of the room. The shelves are sandstone slabs (0.84 x 0.93 x 0.8 m) which were inserted into horizontal grooves in Wall H - the northern wall of the cupboard. Although the apse wall abuts Wall H, the shelves are fully integrated and thus would seemingly support the notion of contemporaneity of the chapel and the church. The cupboard displays close similarity to that found in the atrium wall of the mosaic-decorated church in Petra, recently excavated (Fiema, forthcoming)

The bedrock inside the apse was levelled by using stones and sand to serve as the main bedding for a floor (loci 24d and e). The actual mortar-bedding (locus 24c) of the floor was found flush with the fine stucco-plaster which covered the wall of the apse. Whether the floor in this phase was made of marble slabs is not confirmed, but the abundance of fragments found (e.g., in the foundations of the earlier floor -locus 24d) indicates that marble was available, possibly from earlier structures. In the nave, the floor was probably on the same level as within the apse, but the details were unclear.

A column (locus 13) made of six surviving drums (diameter ca. 57 cm) and located against Wall H was obviously modified to serve as a pilaster for an arch spanning the room by connecting the column to the wall with stones, to serve as an arch-springer. This is supported by the partial chiselling out of the drums' curvature facing the wall, and filling the space with chinking stones. Probably the entire column was coated with a thick layer of plaster to achieve a visual integration with Wall H.

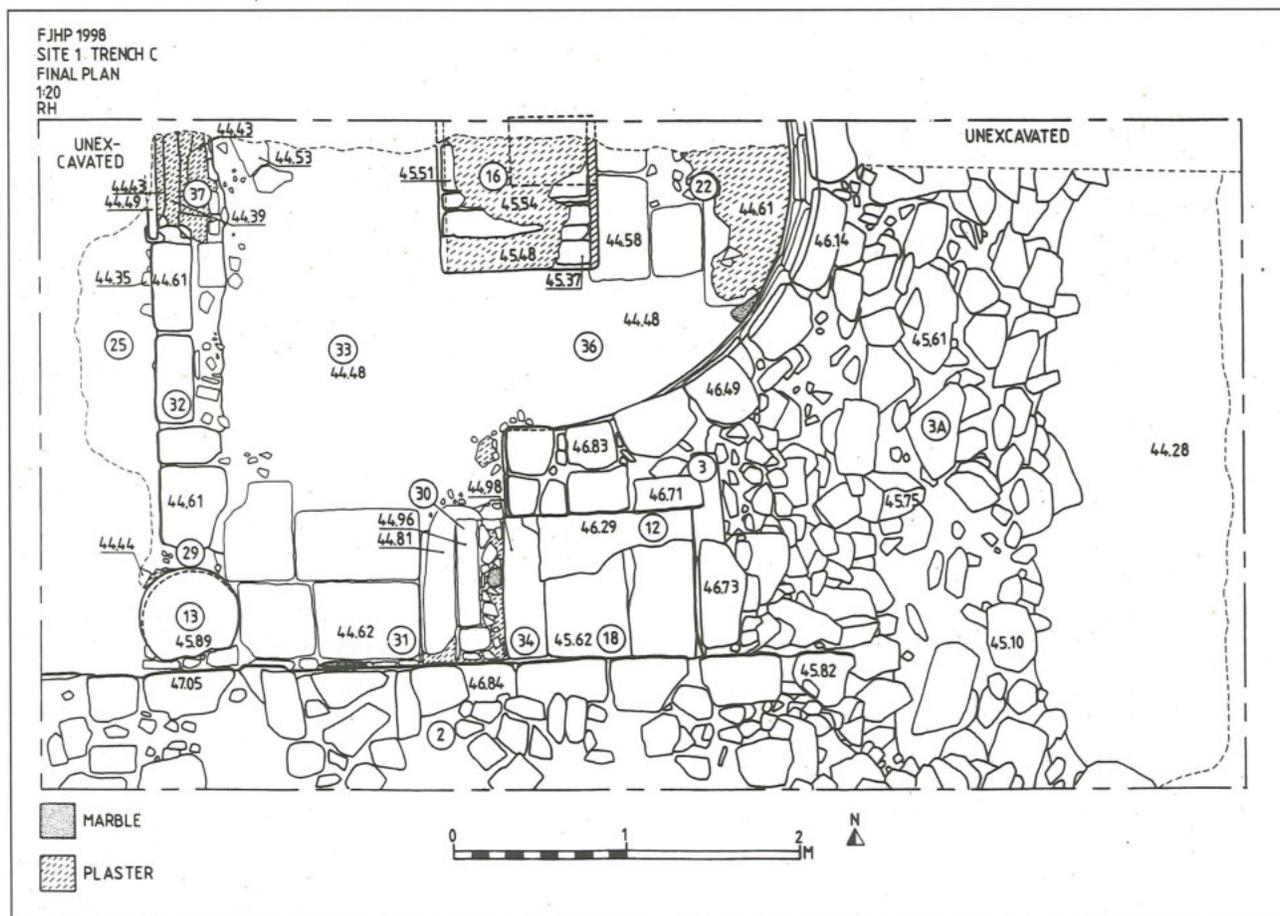
The width of the room is ca. 6-7 m, the span of the arch thereby being a little less. The arch probably supported wooden roof beams of which no remains were found. Since very few roof tiles were found in the fill of the room it is probable that the wooden roof superstructure was covered by a coat of mortar, a practice also known in the Byzantine Negev (Colt 1962: 11). Large chunks of such thick mortar coating were recovered in Trench C. Nine of the collapsed voussoirs of the arch were found within locus 8.

*Phase 2: Remodelling.* This phase indicates a remodelling of the space or a rebuilding following a small-scale destruction. The latter, however, does not find full reflection in the archaeological data. The occupational level inside the apse was raised and a kind of bema was constructed directly in front of the apse and on the level with its

new floor (Figs. 6 and 7). This process involved the deposition of a layer of red homogeneous sand (locus 24b), a layer of mortar (locus 33) and then placing floor flagstones on top of it (loci 24a, 22, 31). This combined apse/bema floor appears to have featured zones of sandstone, limestone and marble pavers (the two latter zones later



6. Trench C. The chapel (seen from W). The apse, bema, and the "cupboard." The masonry altar base seen in upper left.



7. Trench C - Top Plan.

removed). A small broken marble slab was found *in situ* against the wall of the apse. The fine stucco-plaster of the previous phase appears to have been broken off and dismantled just above the level of the new floor, but the application of new coat of plaster on the apse's wall is less evident. Small marble pieces were also used as a filling in the crevice between the new bema floor (locus 31) and Wall H. A chancel-screen and a threshold structure (locus 35) to the bema was built. The former is known only from grooves at the edge of the bema while the latter is very poorly preserved. The step-like structure (locus 30) was built in front of the shelves; the upper step being a re-used limestone cornice of an intricate moulding. The nave floor was integrated with the bema and with the column with plaster, as indicated by locus 29. Whether or not the nave floor or its foundations were newly constructed during this period remains uncertain.

In the center of the apse's chord an enigmatic masonry structure (locus 16) had been built on flagstones of which only the eastern sandstone ones (locus 22) are still *in situ*. On top of these flagstones were remains of plaster or mortar, perhaps indicating some construction, contemporary or later. Since the other half of the structure is still within the northern balk, thus its dimensions (length 0.88 m, width ca.1.40 m, height ca. 0.78-0.97 m) are approximate. The structure is hollow inside, having a small compartment (0.54 x 0.45 x 0.65 m) with the opening towards the apse (Fig. 8). Cream-yellow plaster covered the structure on the exterior while white plaster coated the interior. The marble fragment of the inscription, which reads APΩN, found in front of the structure is most likely related to this phase. The fragment could have belonged to a marble balustrade (see the description *infra*, under Small Finds). The structure, which looks like a large box or pedestal, most probably served as an altar base.



8. Trench C. The entrance to the compartment inside the masonry altar base (seen from E).

*Phase 3: Robbing-out (?)*. This phase must represent a period of decline during which the chapel may or may not have remained in use. Most of the limestone and marble flagstones were then removed from the central zone of the apse/bema, including the flagstones from under the western side of the altar box. The wall plaster deterioration began, exemplified by numerous flakes and fragments collapsed on the robbed-out floor space. The threshold of the bema (locus 35) was replaced by a makeshift construction, a vertically positioned, poor-quality flagstone. Some marble fragments, small pavers and a great quantity of stone floor tesserae were stacked up on the lowest shelf of the cupboard. The origins of these objects, especially the tesserae, are unknown.

*Phase 4: First Destruction (?) and Abandonment*. This phase should remain in a close relationship with the previous one, perhaps even combined with it. At any rate, the chapel was definitely abandoned at this time. The abandonment may have been caused by a destruction (earthquake?) which perhaps had affected the area of the chapel which is not yet excavated. But if destruction indeed took place at this point of time, its traces are primarily notable in the apse area. The altar box was tilted towards the west, because the flagstones were removed from under it in the previous phase,

and due to the pressure of the newly collapsed stone rubble. The latter included only fragments suggesting that the intact ashlar or unbroken stones might have been collected and carted away before the final destruction. The thin layers of disintegrated wall plaster which covers this rubble indicates the continuous decay, perhaps reinforced by the destruction. It appears, however, that an intentional depositing of stone and other construction material in front of the shelves (loci 3b, 14) took place during this phase. This deposit, while affected by the later destruction, still preserved a certain degree of regularity. The abundance of limestone tesserae, and marble and mortar/plaster fragments within this pile is striking. It all suggests that the area in front of the cupboard may have been used as a dump for material cleared from the other parts of the chapel or the church.

*Phase 5: Major Destruction.* The final destruction as documented in Trench C was most likely caused by earthquake(s). The direction of the collapse as indicated by the layers of stones and ashy mortar was probably E-W or SE-NW (loci 3b, 7, 9). The arch collapsed on top of the layers (loci 14, 20) which contained large quantities of mortar and plaster fragments. This material originated either from the disintegrated dump-pile mentioned above, from which the fragments in due time before and during the destruction slid down towards the nave, or it came from above during the destruction. The latter proposition is supported by the abundance of the thick mortar fragments, which might have been used for roofing instead of roof tiles (*supra*).

*Phase 6: Latest Natural Deposition.* The later phenomena which affected the site up to modern times basically include natural deposition of wind-blown and waterborn sand, the decay and collapse of material from eroded construction elements, and pos-

sible human activities like camping, collecting stones for building material, and the like (loci 1, 4, 5).

#### **Trench D** (R. Ylönen, N. Heiska)

Trench D was situated in the northeastern part of the complex, in the area where the wall lines of several smaller rooms around the North Court were visible on the ground. The trench, 3.3 x 4.5 m, was laid out across Wall C and between two walls running perpendicular to that Wall. It was hoped that the trench would provide information on the nature and date of occupation in this part of the complex. Unfortunately, the work in this trench did not progress beyond the removal of the uppermost strata, due to the unavailability of the staff members stricken by illness.

The surface of the trench substantially sloped down to the east. Upon the removal of the topsoil and the uppermost, unpatterned stone tumble (locus 1), Walls O and P (loci 4 and 6 respectively) which run E-W, and parallel to each other, became well defined. These walls are the southern and northern limits of a room which is ca. 3 m wide (N-S) and the eastern limit of which is Wall C (locus 5). The first tumble layer of the interior (locus 2), ca. 0.45-0.6 m thick, was removed, exposing another stone tumble (locus 9) which was left unexcavated. In the exterior, a layer of reddish brown sand and some cobbles and boulders (locus 3) was exposed, the stone deposit being particularly dense along Wall C. Generally, the walls in this area were made of rough ash-lars with rubble inside, clearly inferior in construction to the walls in Trenches A, B and C. Two inward projecting long stones, ca. 0.4 x 0.2 m, visible in the southern face of Wall P (locus 6), might be the remains of an arch springer. However, no parallel installation of this kind was encountered in the northern face of the opposite wall (locus 4). The width of Wall C, the main east wall of the complex, is difficult to estimate because

the eastern edge of the wall was difficult to distinguish from the eastern stone tumble (locus 7). Furthermore, there is an irregular row of rough ashlar (locus 8), set against the western side of Wall C. It appears that this row is the upper part of a support or reinforcement built against the wall. The finds included pottery and some scattered fragments of glass and bones but no wall plaster.

**Trench E** (A. Lahelma and K. Tuori)

Trench E was specifically opened to test a hypothesis which emerged during the excavation of Trench B. In particular, it was postulated that Walls J and K, the bench set against it and the associated two floor levels (*supra*) could be probably interpreted as the southwestern part of the south aisle of a large tripartite church.<sup>3</sup> This hypothesis also appeared attractive because of the presence of several column drums which protrude through the surface in the area east and northeast of Trench B, and which appear to be arranged in two, E-W rows. To test this hypothesis, the approximate position of the central apse of such a church was estimated, and Trench E was laid out where the apse's northern half should be located, i.e., along the eastern outer wall of the complex (Wall C), and several meters south of Trench C (the chapel). The hypothesis proved to be correct and the trench well-placed. The uppermost remains of a large apse and walls that supported it were exposed and cleared (Fig. 9). Upon the completion of these activities, the work in the trench was stopped until the next season.

The surface of Trench E, being 5.5 m (N-S) and 2.5 m (E-W), did not display any indication of the remains below. The uppermost deposit (locus 1) featured a notably higher density of stones in the northern part of the trench vs. its southern part. About 20-30 cm below the surface, the outline of half



9. Trench E. The central apse of the church (seen from W.)

of a large apse appeared, roughly in the middle of the trench, dividing it into the southern part, being the sandy interior of the apse (locus 3), and the northern part, being the stony exterior of the apse (locus 2). Large numbers of stone tesserae and mosaic fragments especially (but not exclusively) in the SW corner of the trench were recovered in loci 1 and 3, in addition to marble fragments. The tesserae are all large and made of limestone of two colours: light bluish-grey and a creamy white hue. In addition to thick fine mortar bedding to which many tesserae are still attached, a grey mortar also appears on top of some loose tesserae or mosaic fragments, which may indicate that the mosaic from which the fragments originate had been paved over. Following the removal of locus 2 - a stone tumble ca. 0.3 m thick - the curved wall of the apse became more pronounced as well as a straight wall which runs W-E, directly behind the curvature and supporting it (locus 4 =Wall R). The northern face of the apse's back wall was covered with plaster preserved in the western part. Roughly in the middle of the wall there was an arch springer (locus 6) consisting of two ashlar one upon the other and projecting from the Wall. A coat of plaster was still adhering to the lower ashlar.

Assuming that half of the apse chord, as exposed during the excavations, well ex-

3. Warmest thanks are offered to Prof. Yoram Tsafrir, Hebrew University, and Dr Uzi Dahari, Israel An-

tiquity Authority, for their help in formulating this hypothesis.

ceeds 2.5m, the complete length at the chord would be approximately 5.5 m. So far, the church appears to be a tripartite, mono-apsidal basilica with lateral pastophoria. If so, the apse's back wall running E-W, may also mark the southern limit of a rectangular pastophorion, with a collapsed ceiling once supported by a single arch. It is also possible that the pastophorion may have been later transformed into a small side apse, but except for a very vague curve of stones inside the pastophorion no further indication of this was detected.

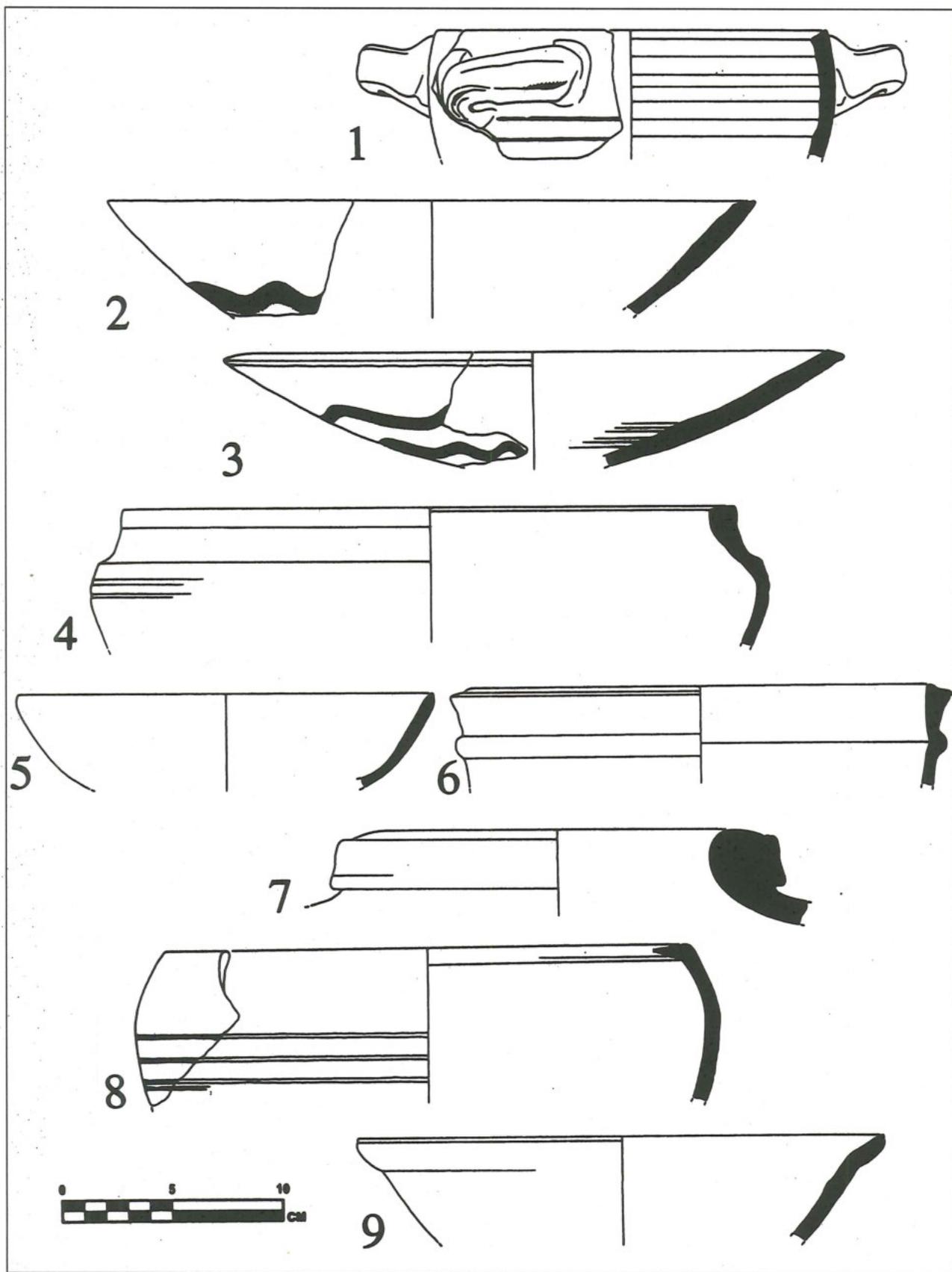
### Pottery from Site 1

Although the pottery finds at Site 1 were abundant, the achieved ceramic sequences are still inadequate for the overall and precise dating of the discrete phases of occupation at the site. Stephan Schmid and Yvonne Gerber, the ceramic experts of the Swiss *az-Zanṭūr* excavations at Petra, have conducted preliminary studies of the ceramic material recovered at Site 1. While the results of their studies partially complement each other in conclusions, the differences in dating, especially in case of the commonware, are also notable. Therefore, instead of integrating these studies into one text, it appeared more instructive to publish these separately and under each author's name (Stephan Schmid and Yvonne Gerber). This experimental way of presentation has the advantage of outlining the variations and difficulties in dating of pottery from Petra and southern Jordan in general. Furthermore, it is hoped that this presentation which well reflects the still inadequate understanding of the Byzantine - Early Islamic ceramics in southern Jordan will open and further stimulate a discussion on this subject among the experts. The preliminary studies of the ceramic lamps were conducted by A. Karivieri.

### General Comments

In general terms, most of the ceramic material found at Site 1 appears to date between

the sixth to the mid - eighth century AD, but the ceramic deposits found in particular strata were generally heterogeneous and Nabataean sherds were commonly found in layers which also yielded much later ceramics. This mix of Nabataean through Early Islamic material in a single stratum is not uncommon in southern Jordan, and was, for example, observed in most strata inside Byzantine churches excavated at al-Ḥumayma (Schick 1995: 326-7). Thus the precise dating of particular phases in trenches at Site 1 is not feasible at this point of time, although the future seasons should provide comparable sequences which will allow for establishing a basic ceramic chronology at the site. As such, only the most representative samples of (non-Nabataean) ceramics from Jabal Hārūn will be presented here with a short commentary. Cooking pots found at Site 1 are numerous, and the closest parallels appear to come from the late fourth and early fifth centuries AD (and possibly later) contexts from *az-Zanṭūr* (Fellmann Brogli 1996: 242ff. Fig. 730-741). Rather common in later antiquity in the Petra area is the so-called casserole, which also appears at Jabal Hārūn (Fig. 10:1). At *az-Zanṭūr* this form was found in the levels dated from the second half of the fourth century AD and later (Fellmann Brogli 1996: 257 Fig. 772-777). The *az-Zanṭūr* casseroles appear to be finer examples of that type than the ones from Jabal Hārūn but the latter has good parallels at Mādabā (Harrison 1994: 434; Fig. 3, 1. 2. 5. 6. 8; sixth/seventh centuries AD) and at 'Aqaba (Melkawi, 'Amr and Whitcomb 1994: 458, Fig. 9 b-f; seventh century AD). The same is true for the flat bowls or, in most cases, lids (Fig. 10: 2, 3), being integral parts of the casseroles. The green-glazed sherds from Trench C may be the latest ceramics occurring at Jabal Hārūn, indicating a date in the 12th century AD. However, these are few and, in general terms, the pottery from Jabal Hārūn shows little in



10. FJHP 98 - selected ceramic material.

common with what has been published as the 12th century forms from the Crusader castle at al-Wu'ayra (Brown 1987).

(S. Schmid)

In general, the pottery from Site 1 dates, with the exception of the Nabataean ceramics, Islamic glazed pottery and the Abbasid lamps, to the fourth - sixth centuries AD, and the early seventh century AD at the very latest. Comparative material from other sites in Jordan may indeed suggest a slightly later date for types similar to these found at Jabal Hārūn. However, this later date does not seem to be applicable to the material from Jabal Hārūn, as argued below.

(Y. Gerber)

#### *Trench A*

Loci 1-3 appear to contain very coarse and probably relatively late ceramics. There are also some poorly made roof tiles. Further down, however, some loci may easily represent earlier phases of use of this space. The most evident is the material from locus 20, with two rim sherds that are much finer and better fired than most of the pottery from this trench. For one of these (Fig. 10:4) a fairly good parallel can be found in Fellmann Brogli (1996: 239, 259; Fig. 783) which belongs to the phase dated between AD 363 and 419 (and later), considered a local form typical of the Petra area.

(S. Schmid)

Phases 2-4 (loci 20-21, 24, 26) have yielded the fourth - fifth centuries AD ceramics. Among the types comparable to the az Zantūr material are a crater (Fig. 10:4) published by Fellmann Brogli (1996: 258, Fig. 782) and lids (Fellmann Brogli 1996: 269, Figs. 841-842). A jar's rim, similar to one published by MacDonald (1992: 222 Pl. 24,4) is common at Jabal Hārūn but otherwise not well attested in the pottery assemblages from Petra. Phase 5 (loci 17A-B, 18-19) is represented by a relatively poor se-

quence. In particular, loci 17A and B yielded the fourth century AD material (e.g., Fig. 10:3, lid); locus 18: fourth - fifth centuries AD (Fig. 10:2, lid); locus 19: very late fourth - fifth centuries AD (with a possible extension into the sixth century). Rim forms from cooking pots (loci 18 and 19) are similar to those from az-Zantūr (Fellmann Brogli 1996: 242f. Figs. 730-732), however, the rib on the rim is not rounded but angular, a feature which is typical for cooking pots from the fifth century AD, and probably later. Phases 6 and 7 are represented by the late fourth - fifth century AD (possibly the sixth century) types.

(Y. Gerber)

#### *Trench B*

The uppermost stratum and the surface are represented by very homogeneous material which consists of coarse ware, probably late in date. However, in locus 2 there is already a considerable amount of earlier (Nabataean) pottery. Locus 7 contained predominantly Nabataean pottery of the first century AD, and one sherd dated to the late first century BC. This phenomenon may be partially related to the shallowness of the trench and the intrusive nature of wind and waterborn deposits. Besides locus 7 all the units down to locus 14 respond to the general stratigraphic picture of the monastic complex area, by yielding predominantly Late Byzantine ceramics. Exclusively earlier pottery is provided again by loci 16 and 20 although only to a limited extent. Neither will help in overall dating as locus 20 is a fill below the extant pavement while locus 16 is a fill of Wall I. Most probably, these deposits were brought in from somewhere else.

(S. Schmid)

Loci 13,14,20 of Phase 1 yielded little pottery; few sherds from there seem to date to the fourth - fifth centuries AD. Pottery from loci 2 and 16 (Phase 3) may, in fact, originate from the interior fill of the massive

Wall I. Phase 5 (locus 9) is represented by the abundance of the Nabataean fineware pottery from the first century AD, and the commonware from the fourth - fifth centuries AD. A rim sherd of a strainer decorated with the incised wavy lines on the exterior should be dated to the fifth, possibly sixth century AD. Phase 6 (locus 7) features Nabataean fineware from the first - early second centuries AD; commonware sherds, almost exclusively body sherds, are from the fourth - fifth centuries AD (with the possible extension into the sixth century AD).

(Y. Gerber)

### *Trench C*

Although most of the material from this trench dates to the mid-sixth - mid-eighth centuries AD, there are some exceptions worth further attention. Trench C was the only area that provided green-glazed pottery. There are mainly two types, an open bowl (Fig. 10:5) and a pot with a characteristic rim. All sherds appear to represent the same production center, with a rather dark glaze on the exterior and a yellowish one on the interior of the vessel. Glazed sherds were yielded by locus 3 (2 sherds), 3a (3 sherds), and 6, 10, 15, one sherd each respectively. Undoubtedly, this pottery indicates a late date for these deposits, and this conclusion fits the the non-ceramic evidence from Trench C, which suggests a long-term occupation, including dumping and possibly squatter-like activities. Preliminary parallels to the glazed ware will include Whitcomb (1988: 212, 219, Fig. 7) and Brown (1987: 279, 284, 286, Fig. 10, 28). According to Brown, this type of glazed ware does not occur before the 12th century. On the other hand, some loci from the same trench yielded clearly earlier pottery than the other loci. These are loci 24b, c, d and e, all representing the soundings in the extant floor level of the apse/bema. Loci 24b-e produced Nabataean material from the first century AD, and the earliest sherd was found in 24e

- a small fragment dated to the later Phase 2b at az-Zanṭūr, i.e. towards the very end of the first century BC. From 24d comes also a fragmentary orange-red, well-fired roof tile, notably of better quality than its typical Byzantine counterparts. While the material from the soundings primarily represents the build-up fill, the ceramics could either be brought together with the fill or may, at least partially, belong to an unknown demolished Nabataean structure which could have preceded the Byzantine chapel in this area.

(S. Schmid)

As for Phase 1, locus 24e, together with locus 24d, consists of 8 Nabataean fineware sherds dated to the first century BC and AD, and commonware body sherds dated to the second - fourth centuries AD. All sherds from locus 24d (28 Nabataean fineware, 7 commonware), except one, date to the first century AD. The exception is the rim of a small bowl which is dated to the fourth century AD. The large fragment of a roof tile, being of a clearly different fabric (orange to light red) than other tiles at Site 1, belongs to the roof tile found in locus 25, dated to the fourth - early fifth centuries AD. Locus 24c, being the actual mortar bedding, yielded mainly Nabataean fineware sherds (first - early second centuries AD), and only a few commonware sherds (second - fourth/fifth centuries AD). Phase 2 (locus 24a-b, 29, 33) is poorly represented by only a few sherds dated to the first - early fifth centuries AD. Loci 3b,14,20 which represent Phase 4, yielded the fourth - sixth centuries AD sherds. Types comparable to the az-Zanṭūr material include cooking pots, cooking casseroles (Fellmann Brogli 1996: 257, Figs. 775-776), and lids (Fellmann Brogli 1996: 269, Figs. 841-842), all datable to the fourth/fifth century AD. The casserole body is usually plain or roundly ribbed on the exterior (Fig. 10:1). But almost all casseroles found at Jabal Hārūn have small but sharply drawn grooves on the exterior of the body (Fig.

10:8); a ribbing manner which is not known from the Petra pottery assemblages. Locus 14 material also seems to date into the sixth century AD, judging from the form and the fabric of a jug as well as the rim of a dolium (Fig. 10:7). Parallels come from al-Lajjūn (Parker 1987: 611, Fig. 120,211), dated there to the first half of the sixth century AD. Further, the body sherd of a jar, with the external fishbone-decoration, is paralleled by jars from the Petra Church (on display in the Petra Museum), dated to the sixth century AD. The Phase 5 loci (6-7, 9-10, 15) mainly yielded sherds dated to the late fourth - sixth centuries AD. Loci 6,10 and 15 contained a few glazed sherds which are attributed to the Islamic period.

(Y. Gerber)

#### *Trench D*

Despite the material being only from the surface or the uppermost strata, one sherd deserves special attention. Locus 1, yielded a characteristic rim sherd that is either a good imitation or an actual African Red Slip Ware of Hayes' type 3, the most characteristic form of the so-called Late Roman C Ware, dated to the second half of the fifth and the first half of the sixth centuries AD (Hayes 1972: 329-338, Fig. 67-69).

(S.Schmid)

#### *Trench E*

Locus 1 yielded sherds dated to the fourth - fifth centuries AD. The pottery from the northern part from the apse (locus 2) yielded Nabataean fineware from the first century AD. However, the pottery from the southern part of the apse (locus 3) should be dated to the fourth - early fifth centuries AD.

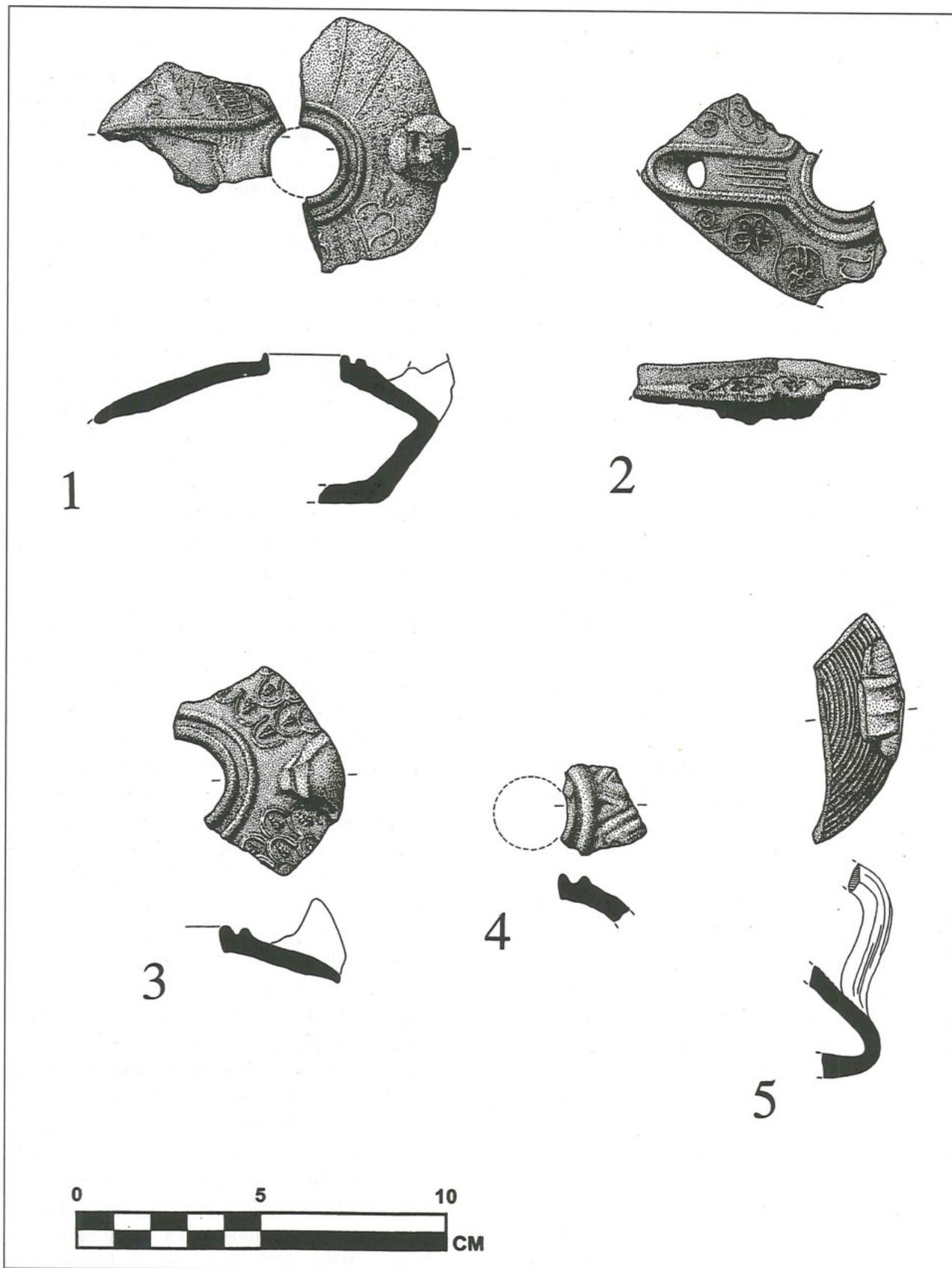
(Y. Gerber)

#### **Ceramic Lamps from Site 1** (A. Karivieri)

These objects found at Site 1 represent the sixth-eighth century types. The three lamps from Trench B belong to the Abbasid period. Reg. No. 10 (locus 9, pail 11) can

probably be dated to the beginning of the second half of the eighth century, or slightly later (Fig. 11:1). A good parallel from Jarash includes Scholl's subgroup V lamps (Scholl 1986: 165, Fig. 1, no. 8). The lamp Reg. No. 16 (locus 1, pail 16) with a vine-scroll on the shoulder can definitely be dated to the second half of the eighth century or even to the ninth century (Fig. 11:2). The Jarash parallel is Scholl's subgroup VI: 2 (Scholl 1986: 165, Fig. 1, no. 11; also T. Scholl in M. Gawlikowski 1986: 120, pl. XIV B). The same date can also be suggested for the second lamp from locus 1 (pail 16, Reg. No. 17; Fig. 11:3). Again, the close parallel from Jarash includes Scholl's subgroup VI: 2; the type is the same but the Jabal Hārūn piece has different shoulder decoration. To this main type also belong the so-called Jarash lamps, dated to the second half of the sixth-second half of the eighth centuries (Lapp 1995: 437-8, Figs. 1,2, and 440, Fig. 7, 1-4) and pear-shaped types with a channel between the filling hole and the nozzle (Schick and Suleiman 1991: 334, Pl. V2), dated to the early Abbasid period.

The two lamp fragments from Trench C are earlier in date. The fragment from locus 14, pail 42, with a large filling hole and zig-zag decoration on the shoulder can plausibly be dated to the second half of the seventh century (Fig. 11:4). The parallel example from Jarash includes Scholl's subgroup IV: 2 (Scholl 1986: 163, 165, Fig. 1, no. 5; see also Schaefer 1986: 373, no. 20, pl. V). The fragment from the same locus but pail 48 (Fig. 11:5) is a slipped wheel-made lamp with an applied vertical band-handle. The parallel examples from Egypt were dated to ca. AD 550-650 (Bailey 1988: 232, 274-275, nos. Q 2270-2274, Pl. 56). It needs to be mentioned for the type from pail 48, that several lamps of the same type were found at az-Zanṭūr in sealed deposits dated to AD 363-419 (for parallels and bibliography, see Zaroni 1996: 327-330). Therefore, this type seems to appear in southern Jordan as early



11. FJHP 98 - ceramic lamps.

as the late fourth century and it continues onward.

### **Petra and the Jabal Hārūn Pottery - Preliminary Observations** (Y. Gerber)

The following comparative commentary attempts to specifically relate the 98 Jabal Hārūn ceramics to the material recovered in the previous excavations in Petra. Specifically, the following projects are taken into consideration:

- the Swiss az-Zanṭūr excavations of the habitation quarter (material dated to the fourth century - first half of the fifth century AD; Fellmann Brogli 1996: 219-281);
- the Brown University Southern Temple Project (material dated to the fourth - fifth centuries AD);
- The ACOR Roman Street in Petra Project - RSP (material from the shops, dated to the fourth - sixth/early seventh centuries AD, unpublished study by Y. Gerber).

As the forms of vessels for the daily food preparation and storage appear, during the Byzantine period, to have been in use over a long period of time, and their rim forms were only slightly changed during that time, the fabric of a vessel may be a particularly useful dating indicator. A good example is provided by the rim form of a jar, already mentioned above, which was dated to the late Byzantine period in the Wādī al-Ḥasa Survey (MacDonald 1992: 222, Pl. 24,4). This type is quite common at Jabal Hārūn but was found there together with rim and body sherds which securely date to the fourth century AD, and later. Also the fabric (light red clay and a brownish slip) of those rims certainly does not restrict the date to the Late Byzantine period. In addition, the majority of the cooking casseroles from Jabal Hārūn have sharply drawn grooves on their exterior. Their fabric is identical to that of the above mentioned rims. Except for the fabric which is comparable, there are no parallels for this particular jar rim form and the grooves on the casseroles' exterior to be

found in the fourth/fifth century material in Petra. Therefore, one wonders whether these two features should be interpreted as an evidence for dating of the Jabal Hārūn pottery into the Late Byzantine period, i.e., later than the fourth/fifth century AD. However, such a late dating would be inconsistent with the fabric and the thickness of the vessels' bodies at Jabal Hārūn. For example, the Jabal Hārūn samples considerably differ from the pottery found in Shop XXVI excavated by the RSP, which can be dated to the sixth/early seventh century AD. The clay of the Shop XXVI samples is grayish to greenish in color, coarser and badly burnt, and with a dirty slip on the surface.

A possibility that the Jabal Hārūn pottery was produced in another, yet unknown ceramic center in the area, will also hardly support a proposition for the Late Byzantine date for the majority of the ceramic material from Site 1, as further objections to this date may be put forward. The form of the cooking casseroles is well known all over in Jordan. It appears already in the third century AD, and is well attested until the eighth century AD, displaying some development during these centuries. Late Byzantine casseroles, such as these from Mā'in (Piccirillo 1976: 63, Fig. 3,2b; mid-sixth century AD), Mādabā (Piccirillo 1981: Pl. 82, 33, second half of the sixth century AD), Jarash (Uscatescu 1996: 343, Fig. 73,381-383,385,388, Late Byzantine; Uscatescu 1996: 371, Fig. 101, 695-696, transitional Byzantine-Umayyad period), and Petra (Petra Church Project, on display in the Petra Museum; sixth/early seventh century AD), tend to feature horizontal handle(s) originating out of the rim, and pulled upwards. On the contrary, all the casserole handles of the Jabal Hārūn samples are attached to the body below the rim (see, Fig. 10:1).

Furthermore, except for the Islamic glazed pottery, there is no real indication that the Byzantine pottery from Jabal Hārūn should be dated later than the sixth century

AD. The only somewhat comparable vessel forms (such as cooking casseroles, *dolium*), as known in the ceramic studies, are precisely those which were produced for a specific function and were used, with only slight developmental changes, for more than 300-500 years. As such, these are not appropriate for precise dating. Except for those, no other vessel form can be easily compared with the forms from Jabal Hārūn. Therefore, the application of pottery dating as developed, for example, at 'Aqaba, Dhibān, or Mādabā, to the ceramics from Petra or Jabal Hārūn is debatable and of dubious value. While the dating of pottery from the 'Aqaba kilns (seventh century AD) may be correct, some forms known from there were already in production during earlier times, e.g., basins, cooking casseroles, 'Aqaba amphorae (Melkawi, 'Amr, and Whitcomb 1994: 457 Fig. 8p [fabric appears to be different]; 458, Fig. 9,a-e; 459, Fig. 10e). All these forms were already present in the stratigraphic context of "Spättrömisches II" at az-Zanṭūr, Petra (Fellmann Brogli 1996: 222).

This phenomenon of the longevity of certain ceramic types needs to be specifically addressed. For example, the Jabal Hārūn *dolium* rim (Fig. 10:7) is dated at al-Lajjūn to the first half of the sixth century AD. Prototypes of this rim already appear in the late third/early fourth - fifth centuries AD. (Magness 1993: 232, Fig. 3), or Late Roman period (Abū Dayyah *et al.* 1991: 375, Fig. 6,16; from Amman). All that, calls for the establishment of a standard ceramic chronology scheme specifically and exclusively based upon the well-stratified Byzantine pottery assemblages from Petra, recently recovered.

The presence of the Abbasid period dated lamps at Site 1, but not of the contemporary Abbasid pottery, is puzzling. Two lamps dated to the late sixth - eighth, and late eighth - ninth centuries AD, were found in locus 1 of Trench B, associated there with

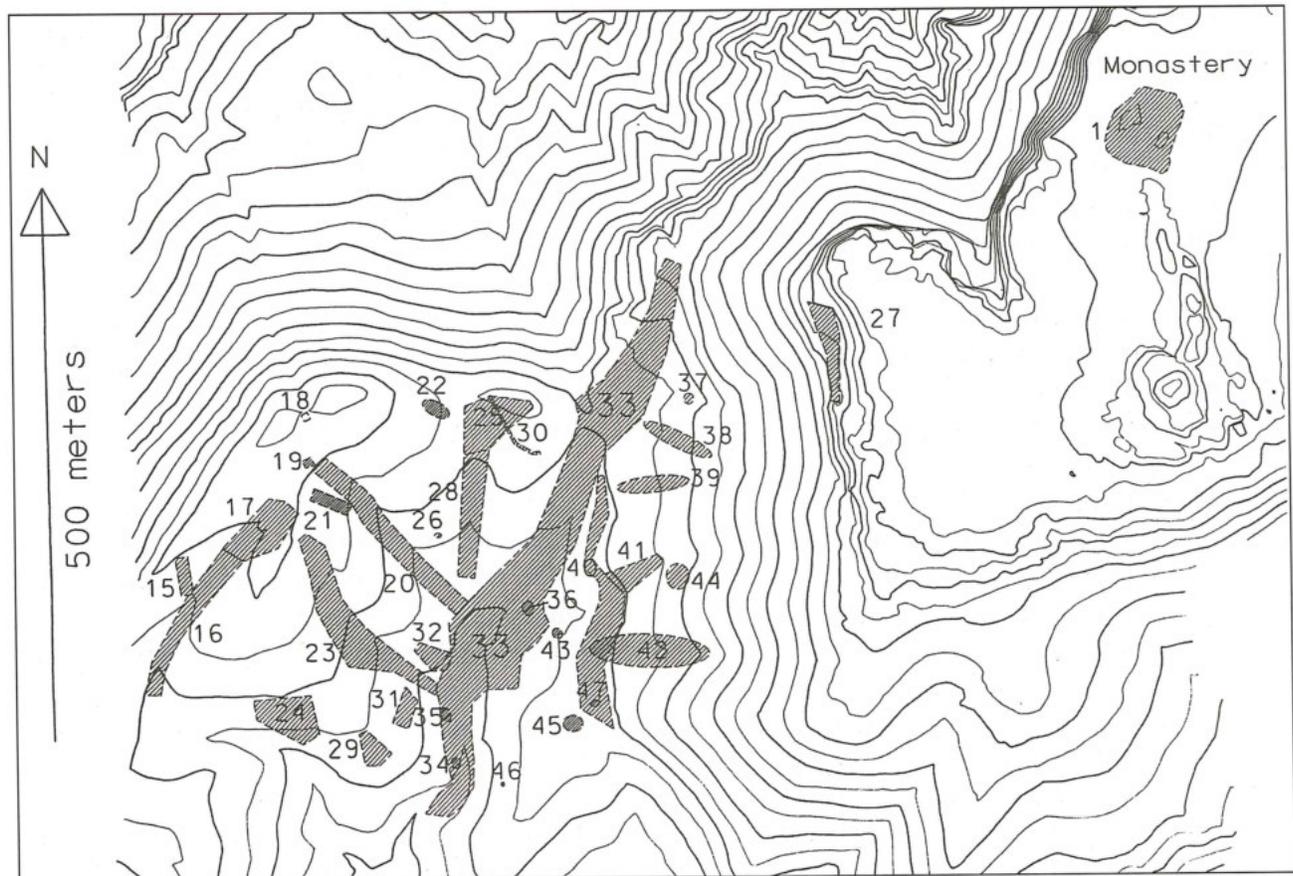
the sherds dated to the fourth - fifth/sixth centuries AD.

Another Abbasid lamp (second half of the eighth century - ninth century AD) was found in Locus 9 of the same trench. The ceramic material from that locus is not homogeneous, and its latest components would probably not date later than the sixth century. The redating of the contents of these loci to the Abbasid period on the basis of 3 lamp fragments does not appear reasonable as it would require a revision of the already established basic chronological framework of the Byzantine commonware at Petra.

**Archaeological Survey** (A. Siiriäinen, M. Lavento, M. Huotari, H. Jansson, S.-L. Schildt, S. Silvonen and S. Schmid)

Concurrently with the excavations conducted at the Site 1 (the monastic complex), intensive archaeological survey was conducted in the area west of the mountain, in the environs of the northern part of Wādī ar-Rubā'ī (Fig. 12). With the information provided by the 1997 reconnaissance, the following objectives were defined for the 1998 survey:

- 1) study of the geomorphology and sedimentation evolution history in the area in order to generate a model of the erosion patterns (including human influence) for the area. The study was also concerned with the general configuration of terrain and the location of major water catchment and watershed areas.
- 2) location, mapping and description of archaeological sites within the survey area and the establishment of site typology. As the 1997 reconnaissance results suggested the existence of a large-scale farming-related, interdependent water management regime in the environs of Jabal Hārūn, the emphasis was placed on the topographical description and functional analysis of installations in the area in order to fully visualize and understand the dynamics of the system.



12. The 1998 Survey Area.

- 3) collection of surface finds (both artifacts and ecofacts) for the purpose of study and the establishment of a geological chronology and the historical sequence of human occupation in the area.

The survey was conducted by walking the tracts or transects (normally, ca. 60 x 1200 m in size, with ca. 10 m intervals between the surveyors) marked on the map. Each tract was closely monitored for possible traces of human activities, and subjected to a thorough surface collection of finds. All finds were separately counted and recorded on the tract form, then subjected to further analysis. Clearly defined concentrations of artifacts, or clusters of installations/features were recognized as archaeological sites. Elements instrumental in recognition of a concentration of artifacts or a cluster of installations as a site, included: the number and nature of the surface finds, geomorphological factors or constraints (e.g.,

the location in relation to a wadi or water channel, etc.), interrelationships among the installations or structures, general archaeological context, and estimated boundaries of the site. Once a site was defined, the most important structures were described (using specifically designed forms), drawn, photographed and mapped using a tachymeter. A general site plan was made with the MicroStation program. In some cases, augerings and test pits were used to discern the stratigraphy. Surface clearance was also carried out at some sites, in order to delineate the extent of structures or installations. In total, ca. 200,000 square meters of the survey area were covered by 34 tracts, and several major sites were recorded, including ca. 130 barrages (in clusters of several barrages per each site). The following have been reported: 12 barrage and terrace wall complexes, 2 water reservoirs, 1 water channel, 4 dwelling sites, 8 house re-

mains, 1 graveyard, 1 rock shelter, 1 lime kiln, 1 watchtower, 1 storage cave, and 1 non-natural stoneheap.

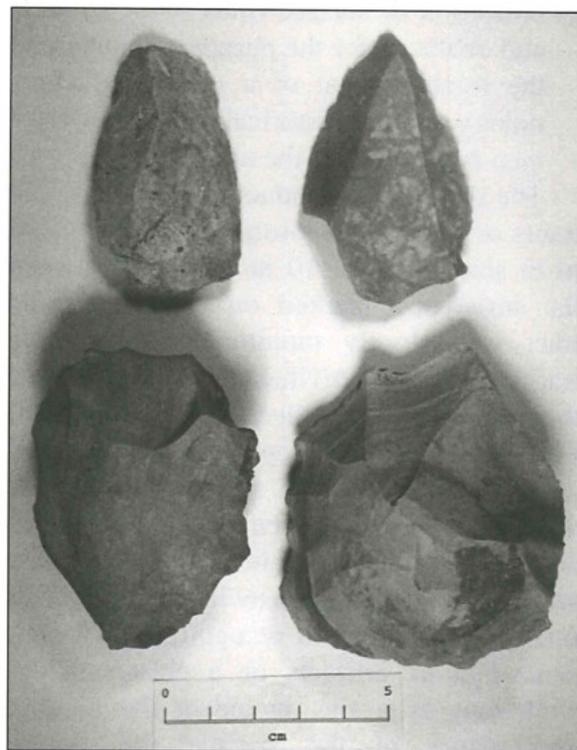
Altogether, nearly 14,000 sherds were collected, of which 5700 were considered diagnostic and were saved. Significant is the great homogeneity of the ceramic material from the survey. All sites and tracts are so strongly dominated by the Nabataean material that the other sherds - a few Roman, Byzantine and Ottoman - do not play any role in statistical analysis. According to the terminology and dating developed at az-Zanṭūr, Petra (Schmid 1996: 151-218), all of the saved Nabataean pottery from the survey belong to Phase 3, lasting from ca. AD 20 to the beginning of the second century AD, (more precisely, phase 3a and 3b). Even in the few cases of pottery of phase 3a, these seem to date rather to the later part of that sub-phase and therefore into the third quarter of the first century AD, while the second quarter of that century is not represented. As such, the overwhelming majority of the pottery from the survey belongs to the third and fourth quarter of the first century AD with a few earlier and later exceptions.

A total of 1296 lithic artifacts were found. Although isolated artifacts were quite numerous, only one certain and two possible sites were recorded on the basis of the spatial distribution of the lithics. Most of the material found is surface scatter, which has been exposed and moved horizontally by erosion and weathering. It seems that at the eastern limits (=western slopes of Jabal Hārūn) of the surveyed area, lithic material is more scarce than at the western limits. The southwestern part of the surveyed area was also generally lacking in lithic material, site 17 (*infra*) being an exception. The raw material for the lithic implements is only partially of local origin. Many artifacts are made of chert and flint that are abundant all over the survey area but other lithics were of almost black or greyish flint, which must come from some unknown location outside

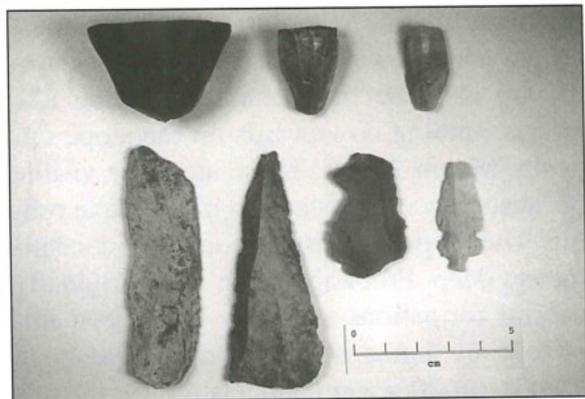
the survey area. The typological studies of the material are still in a preliminary phase, but some observations can be made. The oldest artifacts belong to the Middle Palaeolithic Levallois industry types, exemplified by the very frequent Levallois blade-flake (Fig. 13). Closely parallel material has been found at several sites in Jordan, i.e. Ṭor Şabiḥa, Rās an Nyasi and 'Ayn Difla (Henry 1988: 12- 13; Schyle and Uerpmann 1988: 42; Clark *et al.* 1997: 85). Lithic artifacts dating to the Early Neolithic or possibly later, are also present. A small survey conducted around the monastic complex at Jabal Hārūn yielded a fragmentary microblade core and an arrowhead. Similar Khiamian type arrowheads have been found in Bayḍa and Şabra and can be dated to the early Pre-Pottery Neolithic period (Fig. 14) (Müller- Karpe 1968: 101; Gebel 1988: 78-80).

### Topography and Geomorphology of the Wādī ar-Rubā'ī

The following remarks help to understand



13. Levallois flakes and cores.



14. Upper row: Microblade cores. Lower row: Khiamian arrowhead, notched piece, blades.

the nature of the human land exploitation of the area. It needs to be stressed that the average rainfall in the Petra area, including the environs of Jabal Hārūn, is only about 150 mm/year (SWC 1966: 53). The sedimentation is episodic, occurring only for a short time during the rainy season. Heavy thunderstorms and highly erosive rainfall have a catastrophic effect on soil surfaces and sedimentation structures since soil formation requires stable conditions during centuries or even millennia. Generally, the average rainfall, the nature of the bedrock, the rate of alluviation, the grain size of the surface deposits, and even local vegetation influence the soil formation (Gladfelter 1992: 178-180). The soils in the survey area are Yellow Soils, which occur in the environment where average rainfall varies between 100 and 200 mm. The absence of well-developed soil profiles indicates that the rate of pedogenesis is surpassed by the rate of sedimentation; erosion and accumulation are quicker than soil formation. The permeability of the soil is weak, which means that it retains only a small amount of runoff water (SWC 1966: 5). The soil also contains only a small amount of organic matter.

The Wādī 'Arabah-Jordan Graben belongs to the very long fault system stretching from East Africa to northern Syria (Bender 1974: 25). Local tectonics make the bedrock very variable and the contacts between different sedimentary units are very

deep. The bedrock of the area surveyed during the 1998 season can be divided into four separate lithological sections, two of them representing Ram Sandstones, two others belonging to Limestones and Volcanic rocks. The bedrock of the upper plateau of Jabal Hārūn is the red Umm 'Ishrin Sandstone of Ordovician-Cambrian Era. The lower terraces and the eastern slope of the Wādī ar-Rubā'i, including the steep slope of Jabal Hārūn, are the Abū Khushayba Sandstone of Cambrian Era date, which is stratigraphically older than the Umm 'Ishrin Sandstone (GS 1992: lithological map). The sandstone is formed of fine or coarse sand that contains a considerable number of roundish concretions which make the sandstone fragile and easily weathered. The bedrock displays parallel or nonparallel structures, cross-bedding, etc. (GS 1992: 7; Reineck and Singh 1980: 22-130). In the northernmost corner and the southeastern part of the area, there are red volcanic rocks which belong to the Bayḍa' Quartz-Feldspar Porphyrites dated to the Late Proterozoic Era, thus representing the earliest stratigraphical sedimentary unit in the area (GS 1992: 5).

Limestone in the survey area is yellowish brown or brownish yellow, with only a few exceptions. The predominant limestone type in the area is the Wādī as-Sir Limestone, which was deposited during the Late Cretaceous Era (GS 1992: lithological map). The limestone area contains some three of four small hills (ca. 15 x 15 x 2 m in size) indicating a different kind of sedimentary environment. These formations represent the Wādī Umm al-Ghudrān Limestone, which is stratigraphically more recent than the Wādī as-Sir Limestone (GS 1992: lithological map). The Fuhaus/Hummas/Shu'ays Limestone on the northern side of the survey area is also stratigraphically older. The separation between the Wādī as-Sir Limestone and the Umm 'Ishrin Sandstone is very sharp and easy to discern in the field. The nature and workability of these rocks also differs con-

siderably, which is easy to see in the size and structure of the water installations. The larger and higher installations have been built of sandstone blocks, the smaller ones of limestone. Volcanic rocks have not been used in construction. Flint and chert nodules also occur in the local bedrock in limestone. High-quality black flint or obsidian does not seem to appear in the survey area, but low-quality chert is available almost everywhere in the limestone bedrock.

The amount of alluvial deposits in the 1998 survey area is small for two reasons. The topography in the valley is relatively steep and does not favor the deposition of alluvial sediments. More importantly, the nature of water movement during the rainy season is chaotic but violent. Water washes fine particles away, leaving only coarse sediments to be deposited. Alluvial sediments occur only sporadically in the valley of Wādī ar-Rubā'ī and can be almost exclusively found in connection with human-made barrages or terrace walls. This fact illustrates the significance of the large-scale construction of water installations: without these systems it would have been impossible to carry out cultivation in the valley.

Mount Aaron rises to the northeast and east of the valley. On the valley bottom, below the mountain slope, there is a talus formation consisting of large boulders, stones, gravel and sand. The sandstone bedrock at the foot of the slope is rapidly eroding, producing new alluvium, which, however, is soon washed away by seasonal floods. It is striking that the grain size of the material in the sandstone bedrock is much coarser than in the gently sloping limestone bedrock on the western side of the valley. This is a result of the hardness of sandstone in comparison with the limestone bedrock. The sandstone cleaves in form of large blocks from the cliff creating a steep slope below the topmost vertical cliff. Four alluvial fans run into the valley of Wādī ar-Rubā'ī, all filled with large boulders. Because of the steep

gradient, all fine material, including almost all gravel, had washed downwards. Of interest are also the light features looking like stripes running downwards on the slope opposite Mount Aaron. These are quite visible because they do not contain much stone rubble. The stripes are usually only a few centimeters deep. Probably, these were originally natural formations that may have been improved by humans. They may have been used as runoff water channels. As for the micro-morphology of the soil surface, there are small geomorphological structures which are partly erosion structures, that have been caused partly by animals, e.g., resulting from the trampling effect of sheep and goats (Homès-Fredericq *et al.* 1995: 62). A closer look reveals micro terrace walls, about 20-40 cm wide and about 5-10 cm high. This micro-terracing can be explained by the activity of sheep and goats moving around in search of vegetation for food, and creating a great number of paths and tracks. They can also be caused by material sliding downwards together with rainwater.

### Water Management Sites

The majority of the structures and installations located and recorded included barrages, or wall-like "steps" built across the main wadi and its tributaries (e.g., Fig. 15). These served to slow down the rapid runoff water, allowed for the deposition of fertile silt in farming plots between two neighboring barrages, and helped to redistribute excess water into the neighboring fields located on the lower slopes of the wadi. Since the barrages hardly exist as single installations, these were defined and recorded here as barrage sites (complexes) being purposeful clusters of interrelated walls built across a wadi or its tributary. The size and structure of barrages vary according to their place in the water management system. Barrages are smallest in the uppermost tributaries and the largest in the lower part of the main wadi since the water strength is the



15. Tract 24, Site 33.  
Barrages built  
across the wadi.

greatest there. The latter are solidly built and can be as large as 20 m long and 5 m thick. Water channels are often found in association with barrages, which lead water into smaller tributaries, water reservoirs, or irrigated fields nearby. At the foot of the northeastern most fan, several massive barrages have been built, one of which ends at a circular cistern carefully manufactured of large blocks (Site 36). Over 130 barrage walls and approximately 30 terrace walls connected to the water installations were recorded during the survey, although many, being in a poor state of preservation, are difficult to define or can be easily confused with naturally deposited heaps of stone. At any rate, they all form a carefully planned and uniform system, which might have been utilized during several different periods. Most probably the system was built during the Nabataean period and then continued throughout the Byzantine period. In the Middle East and Africa these rainwater management systems directly related to irrigation farming were extensively used in both the past and the present times (Stevens 1941; Kedar 1957:179-189; Mayerson 1962: 231-246; Zohary 1954:20-21).

Small-scale test pits and surface clearance were utilized in some places to obtain details concerning the function of the water

guiding and controlling systems as a whole. For example, a clearance was conducted at the eastern end of a barrage situated in the middle of site 33e. A step-like installation (ca. 3.15 x 2.92 x 1.92 m), which runs perpendicularly right through the barrage, was skillfully built of unworked slabs. Two phases of construction and use could be distinguished. The actual steps, heavily eroded by water, must be contemporary with the barrage and were clearly constructed as part of it. Probably, the steps functioned as a water channel, slowing down and controlling the flow of the water over the barrage, perhaps in addition to being a kind of maintenance stairway. At the same end of the barrage as the steps, there is a higher barrier wall, running perpendicular to the main barrage. Because the barrier wall prevented water from running down to the wadi on that side, some kind of water channel to evacuate an excess of water was probably built there. At the second phase, a wall was constructed on the lowest step, probably to plug the lower end of the water outlet. Later, the construction was filled with rubble, intentionally or as a result of erosion. Site 42 also contains a similar, but smaller, step-like construction. It is also situated at the end of a barrage bonding to a higher and perpendicular barrier wall. These type of struc-

tures have also been documented in the Negev (Evenari *et al* 1971: 104-109).

At the southern part of site 33e, a barrage had been cut in two by the heavy erosion in the area. The eastern part of the barrage contains a construction made of horizontally placed slabs. In the western part of the barrage, three steps could be observed. The construction could have functioned as a water channel, guiding the water over the barrage in a controlled way. This hypothesis was supported by the fact that the construction clearly slopes in the direction of the current during the rainy season. Some constructional details were observed in the section that was formed when the middle part of the barrage had eroded away. Apparently, two parallel walls were constructed first and then the space in between was filled up with coarse rubble, making the entire construction ca. 5 m thick. When the section was cleared for documentation, a Nabataean potsherd was found in the filling, dated to the later first century AD. Since the steps clearly continued into the alluvium along the lower side of the barrage, a profile was excavated in order to study the sedimentation of the alluvial deposits and collect macrofossil samples. Furthermore, eight steps were uncovered integrated in the western (downstream) face of the barrage wall (Fig. 16). The steps are narrow, extending for only about 30-40 cm from the wall into which they are bonded. Upon reaching the lowest step and the bottom line of the barrage, it was observed that the lowest step had been constructed on a hard clay surface. The barrage is located at the lower end of a large intersection area, which is probably the center of the whole agricultural area of the valley. Just upstream of it, several tributaries join the main wadi. The barrage with the stairs is situated exactly where the intersection area narrows down and where a great amount of water and energy would have concentrated. Therefore, this place could possibly have functioned as a water-



16. Tract 33, Site 33. The barrage wall with the associated flight of steps.

collecting place, with the steps leading down to the water table, and the water channel. The position of the channel at the top of the barrage, forming a kind of threshold for the water, helped to filter at least the largest particles from the water running over the barrage. Approximately 10 m below the barrage with the steps and channel, there is another, equally massive barrage. This may indicate the existence of some kind of an open water reservoir between the two barrages.

### Other Sites

To provide a good sample of the infrastructure located in the valley, some representative sites are briefly described here. Site 17 is located in the northern corner of tract 4 on the western side of the survey area, more specifically, on a plateau between two ridges. Site 17 is one of the few places in the survey area suitable for a dwelling site, and the finds indicate that there have been at least two periods of use. The site is 63 m long and 15 m wide in the western part, but it widens up to 51 m in the east. The extant surface artifacts indicate that it was a domestic occupation site, with a dense concentration of ceramics and flint and chert implements and flakes, as well as remains of hearths. A total of 184 lithics were collected within quite a small area, most of these being blade-flakes probably of Middle, Upper and Epipalaeolithic date (Henry 1988: 12-13; Schyle and Uerpmann 1988: 42), and

perhaps a few Neolithic artifacts, too. More than 1700 sherds were recovered, mostly Nabataean fine and common ware dated to ca. AD 20- 70/80. Site 17 also contains two small stone cairns that may be burials. The first is 2.3 m long (SW-NE) and 1.2 m wide (W-E), and the second cairn is 1.7 m long (S-N) and 0.8 m wide (E-W). However, the nature and function of these structures can be fully determined only by excavations. The stone cairns may also relate to a Bedouin camp or other temporarily dwelling activities, although the stones do not seem to be burned and no ash or charcoal was found. Hand augerings were carried out in the middle of the plateau where Site 17 is situated, indicating a soil layer of ca. 0.25 m. No clear cultural layers were observed and the stratigraphic disposition cannot be determined without excavations.

Site 29 is situated in the southeastern corner of tract 18. The main structure is a stone rectangle, ca. 18.5 m by 11 m. It is constructed of carefully laid large stones and boulders without mortar, forming a low wall around a platform. No paving could be detected on the surface of the platform. The upper part of this structure contains the remains of a small hut, approximately 3 m by 3.5 m in size. There are three natural formations in the bedrock, which could have been used to guide water towards the structure. A few lithics and a number of pottery sherds, mainly Nabataean common and fine ware, were found at the site. An interpretation of this site, whether a reservoir, a threshing floor, or an enclosure for animals (the latter probably being a secondary function) is not easily forthcoming.

Site 32 is situated on tract 21 by the main wadi, and it contains two structures. An oval structure formed by a partially collapsed wall, is made of piled stones and is 21 m long and 8 m wide. There are also remains of a small, collapsed building or hut, made of stone slabs. The finds include some lithics, and over 500 ceramic sherds, mostly

Nabataean coarse and fine ware (ca. AD 20-100), and probably Ottoman. The site was probably an animal enclosure with a small shepherd's hut, as the walls are quite high and there seems to be an opening or a doorway. However, that function may be secondary.

Site 24 is situated on tract 14, on the southwestern slope of the border wadi of the 1998 survey area. It contains a well-built circular structure, ca. 5.2 m in diameter and at least 1.2 m deep. The structure is most probably a lime kiln. Inside the structure on the western side, there is a small stone installation with one large block resting on top of two slightly smaller ones. This installation could have been an integral part of the kiln, through which air was blown into the kiln to maximize heat, but it also could be a later addition of unknown purpose. There are signs of possible secondary use: an additional structure has been built on the southern side of the circular structure. The finds from the site were quite scarce but they included late Ottoman commonware.

Site 37 is situated on tract 28 on the northeastern side of the survey area, at the foot of the northernmost tributary running down from Jabal Hārūn. The main structure at the site is a round stone structure, most probably a cistern, made of large ashlar laid in regular rows. The cistern is about 1.5 m in diameter, with an undetermined depth. Stones with slightly concave sides were used in the mouth of the cistern. There is a semi-circular stone construction around the mouth of the cistern and fully integrated with it, which includes a two-stepped bench. The tributary near the cistern contains two ruined barrages made of exceptionally large blocks of stone. The site might have had a special purpose, and its association with water would not exclude a cultic character. Only a few indistinguishable pottery sherds were found there.

Site 27 is situated in the northeastern part of the survey area, on the northwestern side

of Jabal Hārūn, approximately 15 m above the steep slope strewn with the stone blocks which eroded away from the bedrock. It consists of a series of terraces, ca. 120 m long and ca. 2 - 20 m wide, which are situated under the steepest part of the cliff. There are several rock shelters running N-S on the terraces along the side of the mountain. The site has been divided into 5 sectors (a- e) according to the natural borders of the terraces. Surface collection included pottery and lithics, with sector c being the most abundant in finds. Therefore, the exploration concentrated on this sector, especially in the main rockshelter there. The maximum depth of the sediment in the southern part of the rockshelter was about 1 m. The sediment there consists of silt eroded from the roof of the rock shelter. A test pit of 0.4 x 0.4 m was dug about 1 m from the wall, which, however, yielded only a few finds. At a depth of 10 cm, there was a layer of goat droppings, about 5-7 cm thick, which indicates that the place has been used as a shelter for animals in recent times. At the depth of 45 cm, two potsherds were found, probably dating as late as the 16th to 19th century. Only one chert flake was found at the depth of 50 cm. Since the lithics cannot be definitely dated, the two sherds may indicate that at least the later occupation of the rockshelter may be relatively recent. It is known that lithic artifacts were produced and used by pastoralists in the Petra area even in recent centuries (Simms and Russell 1997: 470). The finds from the outer edge of the terraces, especially the Byzantine potsherds, could have washed down from the top of the mountain.

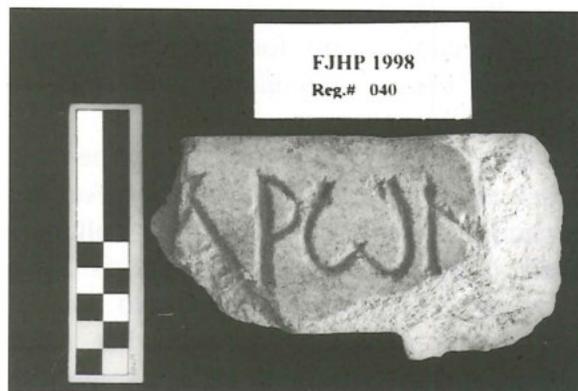
#### Small Finds (J. Frösén and J. Lindblom)

In addition to the aforementioned activities, the archaeological team has collected all marble fragments from the area around Site 1, and deposited these in the lapidarium inside the site. All architectural stones (door-jambs, column drums, etc.) which were recovered through the excavations,

were marked and deposited in the lapidaria inside Site 1. The project took care that all excavated debris (soil, rubble, ashlar) were orderly and properly deposited in two areas outside the monastic site.

The most interesting find of the 1998 season was a corner fragment of the rightmost piece of a white marble orthostat (Reg. No. 40), which preserves the end of a Greek inscription (Fig. 17). The fragment was found in Trench C (*supra*). The fragment measures 15.5 x 8.5 x 7.7 cm. The height of the letters is ca. 4-4.5 cm. The height of the horizontal part of the corner is 7 cm, while the width of the preserved vertical part on the right is 6 cm. On the right upper edge, there is a carved hole which appears to be made for joining with a connecting marble piece. Thus, the last visible letter of the fragment is probably also the last letter of the whole inscription. The letters are well cut in sharp grooves, based on traditional forms, with sherifs, featuring alpha with dropped bar, oblongated rho, and cursive omega, all paleographically datable most probably to the sixth century. The text reads ...]APΩN, most probably 'A]αράων, the name of Aaron (in genitive?).

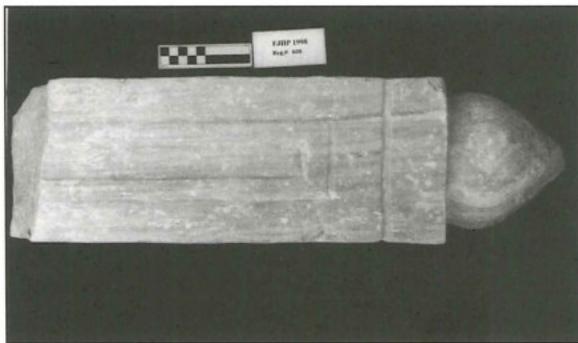
Floor mosaic stone tesserae were found in Trenches A and B but the majority of tesserae came from Trench C. There, several loci contained clusters of tesserae, but generally, almost half of all stone tesserae found at the site in 1998 came from the lowermost shelf of the cupboard located directly south of the



17. The ...]APΩN inscription.

chapel's apse. The average tessera was usually cubic, ca. 2.5 - 3 cm on each side. Two small gold-plated glass tesserae were found on the surface of Site 1, and five glass or small coloured stone tesserae came from by the excavations in Trench B. Only a small number of metal objects, mostly unidentified fragments, were found. Some iron nails were found in Trenches A to C, and copper alloy nails in Trench C. The bone material from the site, primarily from Trench B, was predominantly fish and chicken. A considerable amount of painted plaster was recovered from Trench C, especially in the area of the apse.

As for the stone objects, marble was abundant and included broken fragments of paving slabs, tables (altar?) and stone vessels. An outstanding find was a marble post which must have supported a chancel screen (Fig. 18). The post is ca. 60.5 x 17.5 x 13 cm; the bottom part of the shaft was broken off. The post was recovered from the western baulk of Trench C, in an upper tumble layer. The post belongs to a very well known type of a square or rectangular horizontal section, vertical grooves, and crowned by a bulbous pointed finial. Examples are numerous from Byzantine churches in Palestine, e.g., from Shivta/Sobata (Segal 1988: 252, 255). A post of the same type was also recovered from the mosaic-decorated church in Petra, where it was dated to the early sixth century (Fiema, forthcoming). Furthermore, during the clear-



18. The chancel screen post uncovered in Trench C (the chapel).

ance of wall tops in the area directly north of Trench C, two fragmentary sandstone relief panels were discovered just under the surface. The material was very fragile and flakes of the sandstone easily peeled off. One panel, ca. 51 x 53 x 4 cm (in four fragments) features a peacock in profile, executed in a shallow relief. The other panel, ca. 60 x 30 x 6 cm (in two fragments) most probably features the lower part of an eagle (wingtips and claws) in a frontal position. The peacock is a well-known symbol in Christian iconography, symbolizing spring-time renewal, paradise, and redemption as well as being used to represent the many-eyed wings of Seraphim, Cherubim and Archangels (Weyl Carr 1991: 1611-12). A lintel with a peacock relief was found in the mosaic-decorated Church in Petra, recently excavated (Fiema, forthcoming). The panels at Jabal Hārūn might have been decorative orthostats or screens in the church or the chapel, which later were apparently reused to reinforce the walls.

Of all glass fragments recovered during the 1998 campaign, over 2/3s came from Trench C. Among the registered objects (Reg. No. 29, locus C.19 and Reg. No. 036, locus C.6) are two fragments of the same glass vessel with pinched diamond-shaped ribs as a surface design, which seems to be typical of the second to the fourth centuries AD (von Saldern 1980: 20-21 and Pl. 4.; Weinberg and Goldstein 1988: 80-81 and Pl. 4-15). The third registered glass object is a solid, blue-beaded stem (Reg. No. 28, locus C.19) belonging either to a goblet or a glass lamp, known as Jarash B.1 type (Crowfoot and Harden 1931: 198 and Pl. XXIX; von Saldern 1980: 59 and Pl. 12.). Among non-registered fragments there is a rim of a small "pillar-moulded" bowl, possibly from the first century AD (von Saldern 1980: 12 and Pl. 2; Stern 1977: 25-30 and Pl. 3; Barkóczy 1996: 26, 117, and Pl. B, II, XXIV, XXXVII, LXXIII). Among other distinctive pieces are some five fragments of a mould

blown vessel with a string of concentric circles in shallow relief. This design is probably related to the Byzantine products dated to the seventh-eighth centuries AD, but could also be earlier. Nearly ten fragments belong to a vessel with engravings. The closest parallel at this time appears to be a fragment from the excavations at Saraçhane in Istanbul, where it is identified as 16th century Austrian glass (Hayes 1992: 344, 412 [No.11] and Pl. 52h). All the fragments mentioned here were found in Trench C. Some fragments of window panes were also found in the same trench; not only transparent but also at least one dark green window glass and some yellow pieces. Four stems of glass lamps (one solid with a knob and three hollow) of a type often used in polycandela and many possible rims and handles of such type were also recovered, mainly in Trench C, but also some in Trenches A and B.

### Conclusions

The 1998 fieldwork of the FJHP has produced important results which will be instrumental in designing the excavation and survey strategy in future seasons. Important is the discovery of a large tripartite basilican church at Site 1, the remains of which were detected in Trenches B and E. The church's size is approx. 24.2 m x 14.2 m, with a single central apse measuring ca. 5.6 m at the chord, and lateral rooms, probably pastophoria. The later insertion of side apses is not impossible either but cannot be ascertained without further excavations. Compared with the size of the mosaic-decorated church in Petra recently excavated and dated to the later fifth century AD, which is internally ca. 23.21 m long and ca. 15.35 m wide (Fiema, forthcoming), the Jabal Hārūn church is of similar dimensions, thus the ratio of the inner length to inner width, being exactly 3 : 2 in case of the Petra church, will not be much different in case of the Jabal Hārūn church. Incidentally, this length to

width ratio is quite typical of earlier churches in Palestine (fourth-fifth century) characterized by long and relatively narrow aisles (Crowfoot 1941: 54, 61; Smith and Day 1989: 84). It is also usually accepted that basilicas with an inscribed central apse and quadrangular lateral pastophoria are relatively early, and, for example, generally dated to the fifth century in Syria (Butler 1929: 48-82). One should also examine the comparable monoapsidal churches at Humayma (Schick 1995), which, in addition to the Petra church in its earliest phase, may be the closest spatial and temporal parallels. Examining the plan of the site, it is possible to discern traces of a structure to the west of the church which might have been a narthex, probably associated with a portico (judging from the traces of a "stylobate" and extant column drums there). The entire area farther west (Central Court) might have been an irregular atrium with the rock-cut cistern (see Fig. 2). Again, such an arrangement would have been similar in components to the appearance of the Petra church in its earliest phase. However, while the fifth century date for the Jabal Hārūn church is not improbable, it should be considered only as a working hypothesis until further excavations provide a firm date.

Of interest is also the chapel, directly north of the church, which may be contemporary with the church or added later. Arguments can be produced for either of these hypotheses, so the answer will be provided only through future excavations. The small compartment inside the masonry pedestal uncovered in the chapel might have served as a depository for reliquaries. If the pedestal was indeed a base for an altar table, the location of a reliquary below the altar would make it accessible and would allow for its display on various occasions. This would be generally consistent with the practices observed in *Palaestina I, II and III* and *Arabia* during the Byzantine period (Donceel-Voute 1995: 198-200; 1996: 328). Al-

though in this particular case the reliquary would not be located in a shaft or fosse under the structure of the altar on the bema (e.g. at Umm ar-Rāṣaṣ, see Alliata 1994: 312-14 and Michel 1994: 117, 119, note 15), but rather under the altar table. The reason for that may be a relatively high level of the bed-rock under the chapel and a shallow buildup for the floors of the bema and the apse's floors. The construction of a solid masonry altar structure only in Phase 2 of the chapel's existence may also well correspond with the chronological observations concerning portable vs. fixed altar installations. Recent studies indicate that the fixed altar installation appears relatively late in the sixth century, and only at the end of that century special panels or mosaic arrangements clearly marked the emplacement of the fixed altar's supports (Duval 1994: 170, 203).

The discovery of a large church with an associated chapel at the architectural complex below the summit of Jabal Hārūn may also be significant with regard to the overall function of the complex and the nature of occupation there.<sup>4</sup> Basilican churches are very rare in the monasteries of the Judaeen Desert (Hirschfeld 1990: 63-65, Site 57; 1992: 130). Furthermore, it may be relevant that the rooms around the northern court of the complex appear to be relatively large in size; almost twice the size in comparison with known cells in some Judaeen Desert *coenobia* (Hirschfeld 1992: 176-7). Perhaps, these could be interpreted as pilgrim hostel rooms rather than monks' cells. While the monastic complex hypothesis is certainly still upheld here, it is possible that the complex represents a pilgrimage center related to the veneration of St. Aaron and most probably associated with the monastic presence. Again, this proposition remains highly hypothetical at this stage of the archaeological

exploration of Site 1. In fact, the Jabal Hārūn complex may resemble a monastic complex type (always a *coenobium*) usually erected next to a memorial church which generally served the needs of pilgrims coming to the holy places. The *coenobium* type, being reminiscent of late Roman agricultural estates, was a self-sufficient complex (Hirschfeld 1992: 33, 55-58), which appears to hold also in case of the Jabal Hārūn complex. Probably, monks could also have lived in caves nearby, or in smaller structures located on the plateau or in the valley below.

Undoubtedly, the lack of literary evidence specifically mentioning pilgrimages to the Mountain of Aaron, either performed by Christian Arabs (Shahid 1998: 375-7) or foreigners is disturbing, while the neighboring Negev certainly benefited from the pilgrim traffic to Sinai (Figueras 1995). But since one of the three main itineraries to Mt. Sinai would lead from Syria, first to Ayla (Maraval 1995: 295), possibly on or following a general course or some sections of the *Via Nova Traiana*, detours to Jabal Hārūn could have been made. It is imperative that the main goal of future seasons at Jabal Hārūn is to determine the nature of occupation from the archaeological standpoint.

As for the survey results, it is significant that the collected ceramic material extensive agricultural installations in the valley (a task which will be continued in the following seasons) revealed that the irrigational agriculture was particularly prominent in the area between ca. AD 50 and the beginning of the second century AD. This would fit well the previously made suggestion that the irrigational systems for terrace-type agriculture in the neighboring Negev particularly increased in use during the reign of Rabbel II (Bowersock 1983: 73). As no later pottery than that dated to the very early second century AD was found, this could lead

4. The remains under the *weli*, whether or not of a Byzantine church, cannot enter the discussion

here, as no detailed archaeological exploration is possible there.

to a preliminary conclusion that following the annexation of the Nabataean Kingdom by Rome, the agricultural production in the Jabal Hārūn area had, for unknown reasons, (temporarily?) dwindled. It is also not without significance that the predominantly Nabataean ceramic material yielded by Site 1, exactly fits the ceramic pattern obtained in the survey, i.e., the ceramics in both areas cover the same time span.

It is definitely too early to propose any chronological assessment of the history in the excavated and surveyed areas. However, the Byzantine period apparently witnessed a revival or continuation of the intensive farming in the valley, and obviously a major expansion on the mountain's plateau, exemplified by Site 1: the church, the chapel, and the associated structures. Significantly, two major phases of occupation in the church (Trench B) and the chapel (Trench C) could be easily distinguished. However, it is not feasible at this time to propose a firm date for the construction of the architectural complex and its components, nor for their abandonment or destruction. Further refinement of the Byzantine period pottery from the Petra area, as discussed above, and new ceramic sequences at the site will be needed to conclusively address these issues. Thus, while there seem to be little doubt that the intensive occupation at Site 1 took place during the fourth-sixth centuries AD, a more substantial and firmly dated evidence for the post-sixth century occupation remains to be discovered. Judging from the presence of the glazed ware and Abbasid lamps, as well as indicated by the extant written sources, the occupation would have continued in some form in the following centuries, possibly until the Islamic *welī* was constructed at the top of the mountain's summit. However, the nature, intensity, and duration of the post

sixth century occupation at Jabal Hārūn cannot be fully ascertained at this moment. In any case, this situation holds great promise for the investigation of the transitional Late Byzantine - Early Islamic period in the Petra area in the forthcoming campaigns at Jabal Hārūn. Furthermore, the project will be able to explore a unique opportunity to test historically derived postulates against the archaeological reality at Site 1.

### Acknowledgements

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J. Frösén  
Z. T. Fiema  
M. Lavento  
K. Koistinen  
R. Holmgren

CATALOG OF ILLUSTRATED CERAMICS

- 1) Trench A, locus 1, pail 3  
casserole  
ware: 7.5YR pink 7/4  
inner surface: 7.5YR pink 7/4  
outer surface: 7.5YR pink 7/4  
parallels: Harrison (1994: 432ff., fig. 3, 2. 5. 6; sixth/seventh century AD); Abu Dayyah *et al.* (1991: 378ff., fig. 7, 31; late Byzantine); Melkawi, 'Amr, Whitcomb (1994: 458, fig. 9, b-f).
- 2) Trench A, locus 18, pail 22  
lid with incised wavy lines decoration  
ware: 2.5YR light red(dish brown) 6/5, coarse with many white grits  
inner surface: 2.5YR light red(dish brown) 6/5  
outer surface: 10YR white 8/2 (slip)  
parallels: see Pottery from Site 1 above
- 3) Trench A, locus 17A, pail 18  
lid with incised wavy lines decoration  
ware: 2.5YR light red 6/8, quite fine, lamella-shaped structure  
inner surface: 2.5YR light red 6/8  
outer surface: 10YR light red 6/6  
parallels: see Pottery from Site 1 above
- 4) Trench A, locus 20, pail 24  
ware: 2.5YR light red 6/7, fine and well fired  
inner surface: 2.5YR light red 6/7  
outer surface: 10YR light brownish gray 6/2  
parallels: Fellmann Brogli 1996: 258, fig. 782
- 5) Trench C, locus 3a, pail 29  
glazed bowl  
ware: 5YR pink 7/4  
inner surface: glazed with dark green (upper part) and 5Y yellow 8/6 (lower part)  
outer surface: glazed in dark green, splintered off  
parallels: see Pottery from Site 1 above
- 6) Trench B, locus 9, pail 11  
neck fragment of a steamer  
ware: 2.5Y very dark gray 3/ , with small white grits  
inner surface: 2.5Y very dark gray 3/  
outer surface: 2.5Y very dark gray 3/  
parallels: Oleson *et al.* (1995: 339, fig. 19, 3; 352 no. 3 (second half of the seventh century AD)); Melkawi, 'Amr and Whitcomb (1994: 459, fig. 10b, c; seventh century AD)
- 7) Trench C, locus 9, pail 21 (joining fragment found in C.10.24)  
rim from a large storage vessel

ware: 10YR very pale brown 7/4, quite fine, some bubbles and grits  
inner surface: 7.5YR reddish yellow 7/6  
outer surface: 7.5YR reddish yellow 7/6  
parallels: Parker 1987: 611, fig. 120,211; Abu Dayyah *et. al.* (1991: 378f, figs. 7, 23; late Byzantine)

- 8) Trench C, locus 14, pail 42  
deep bowl  
ware: 5YR pink 7/4, quite fine  
inner surface: 5YR light reddish brown 6/4  
outer surface: 5YR light reddish brown 6/4  
parallel: Harrison (1994: 431, fig. 1, 16; sixth/seventh century AD).

- 9) Trench B, locus 5, pail 7  
flat bowl  
ware: 2.5YR light red 6/6  
inner surface: 2.5YR light red 6/6  
outer surface: 2.5YR light red 6/6

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# PRELIMINARY REPORT OF THE AL-ḤUMAYMA EXCAVATION PROJECT, 1995, 1996, 1998

by

John Peter Oleson, Khairieh 'Amr, Rebecca Foote, Judy Logan,  
M. Barbara Reeves and Robert Schick

## Introduction

Large-scale excavation continued at al-Ḥumayma, ancient Ḥawar or Ḥawara, in 1995, 1996, and 1998.<sup>1</sup> In keeping with the rich and continuous history of the small caravan stop and agricultural centre, founded in the 80s BC by the Nabataean King Aretas III, a wide variety of structures from every cultural period was probed or excavated (Fig. 1). Since commencing excavation in the habitation centre in 1991, we have tried to recover information that will allow a well-rounded reconstruction of the settlement's social, economic, and political history. This strategy is now producing remarkable results. Ḥawar, located in a large basin of light, sandy, but arable loess 80 km north of 'Aqaba, on or near an ancient route linking the Red Sea with northern Transjordan, was the only significant settlement in the Ḥisma.

Surrounded by the ash-Sharā escarpment, dramatic mountain ranges and colourful sandstone *jibāl*, Ḥawar evolved through the processes of Nabataean sedentarization, administration by Roman frontier forces, Christianization and extensive church construction in the Byzantine period, and watchful occupation by Abbasid revolutionaries. Although brevity is essential, given the mass of material, we present here the basic results of three fruitful seasons of excavation, organized roughly by culture and chronology.<sup>2</sup>

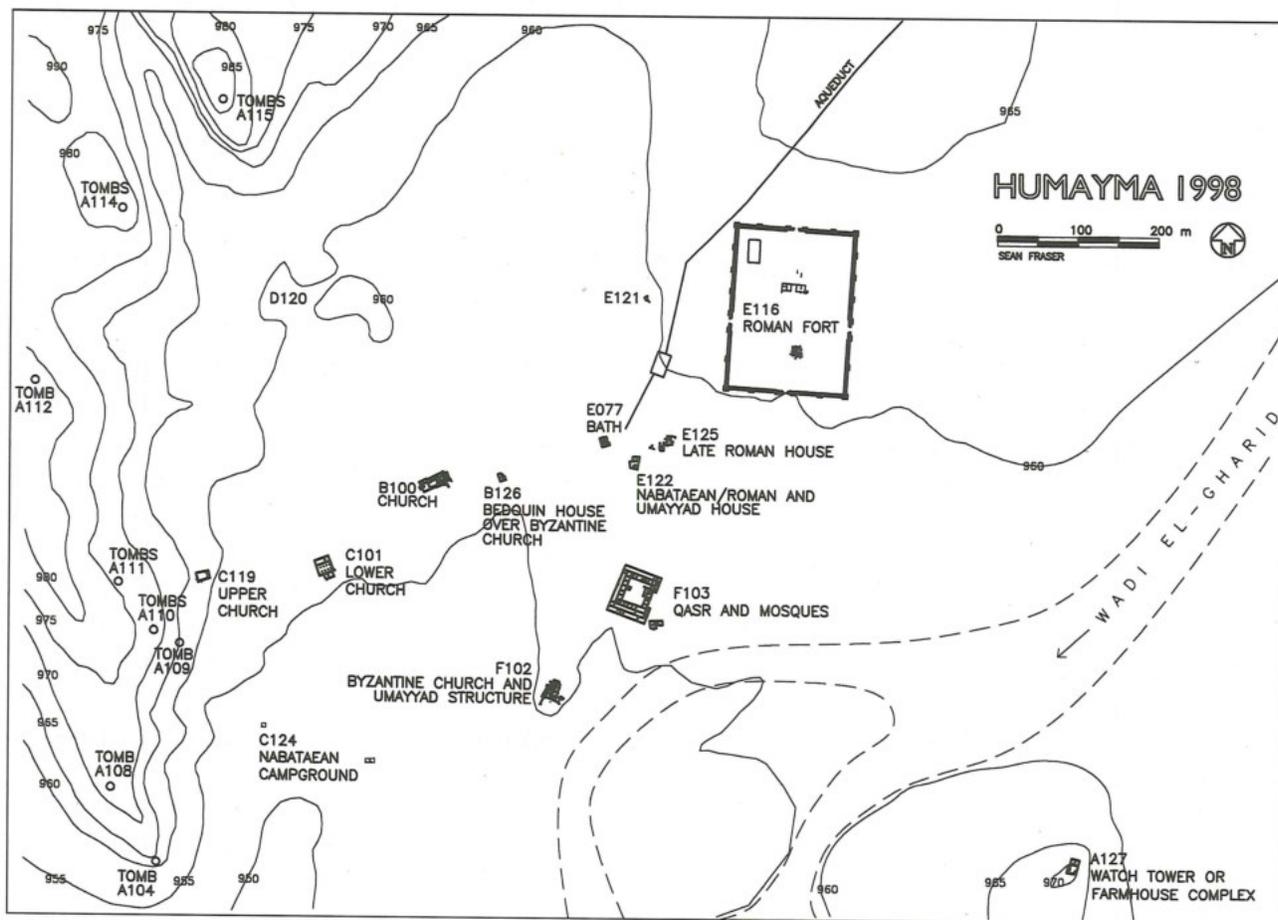
## Field C124: Nabataean Campground (J.P. Oleson)

There are many archaeological indications of the Nabataean foundation and occupation of Ḥawar, also reported by the Byzantine historian Uranius (Oleson 1997: 157; Forthcoming). Typical Nabataean fine-

1. The fourth, fifth, and sixth seasons of the al-Ḥumayma Excavation Project took place in June and July of 1995, 1996, and 1998. This preliminary report has been delayed by the press of other projects on several of the individuals involved, although we have presented the results in other forms: see Foote and Oleson 1996, Oleson 1997, Oleson *et al.* 1998, Foote 1999. Preparation of the final report volumes, however, is well in hand. The project was funded principally by the Social Sciences and Humanities Research Council of Canada. A special grant was awarded by the Taggart Foundation to help pay for the costs of artifact conservation and building consolidation, and the van Berchem Foundation of Geneva provided grants to support excavation of the Abbasid manor house in all three seasons. ASOR, ACOR, and the Endowment for Biblical Research provided several small grants to support special technical services or student travel. We are very grateful for all this funding. The Project Director is Prof. John P. Oleson of the Department of Greek and Roman Studies, University of Victoria; Co-Directors were Dr Khairieh 'Amr of the Department of Antiquities of Jordan, Dr Rebecca Foote of Harvard

University, and Dr Robert Schick of the Albright Institute. M. Barbara Reeves of SUNY Buffalo served as Assistant Director in 1998. The Conservator is Judy Logan of the Canadian Conservation Institute. The Architect is Sean Fraser. The al-Ḥumayma Excavation Project is accredited by the American Schools of Oriental Research and licensed by the Department of Antiquities of Jordan. The Project Director and Co-Directors are very grateful to Dr Ghazi Bisheh, then Director - General of the Department of Antiquities, for his assistance with the project, to Dr Pierre Bikai, Director of ACOR, and to Dr Patricia Bikai, Senior ACOR Administrator, for their enormous help with the practical arrangements necessary for carrying out our work.

2. Oleson supervised the excavation of Fields A127, C124, and E116, Foote the excavation of F103, 'Amr the excavation of E122, E125, and F102 in 1995-96, Schick the excavation of B126, C101, and Reeves E125 in 1998. The relevant sections of the following report were written by these supervisors on the basis of notebooks and field reports prepared by the excavators.



1. Plan of the site of al-Ḥumayma.

wares, dating from the first century BC through the third or fourth century AD are common in the surface scatter and throughout the strata of later phases. The water-supply system, which was fundamental to the settlement's survival, is securely dated to the Nabataean era (Oleson 1988; 1995), and there are many rock-cut Nabataean tombs in the necropoleis. Despite intensive efforts, however, we have been unable to locate campgrounds or domestic architecture of the period of the Nabataean kingdom in the main habitation area, which is overlaid by the thick deposits of later occupation periods. In 1996, however, a Nabataean habitation area was found in Field C124, at the very southern edge of the settlement, and a small house of Nabataean/Roman origin in Field E122, on the eastern edge (Fig. 1).

Field C124 was selected for excavation because ploughing in the open field had ex-

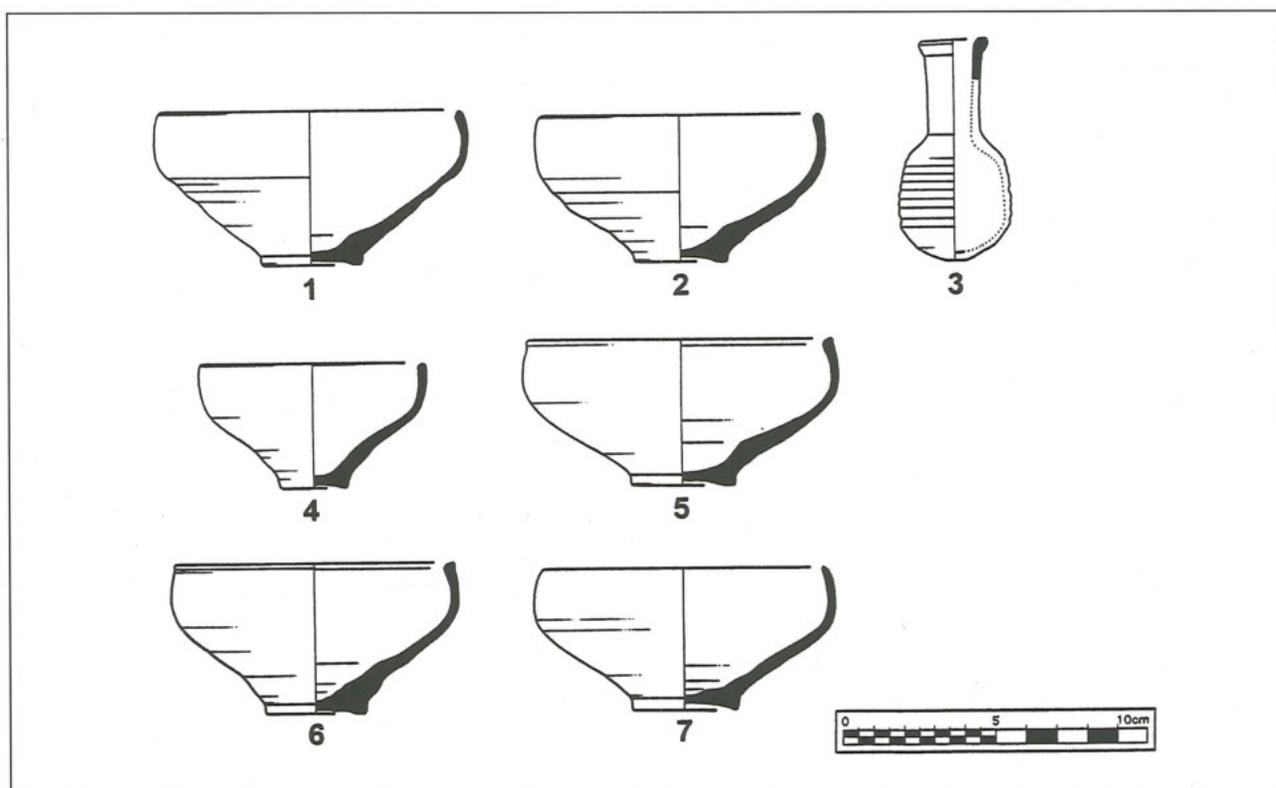
posed enormous quantities of Nabataean ceramics from strata just below the modern surface, particularly drinking bowls, intact or nearly complete, sometimes apparently stacked. Furthermore, the site was adjacent to the large, round Nabataean-type Cistern no. 54, the only round, private cistern in the immediate settlement area which is not associated with massive remains of domestic structures.

Square 01 (5 m x 5 m) was laid out 20 m east of Cistern 54, in an area of very fine, hard loessial soil only superficially affected by ploughing. The surface ceramics and spoil from a small robber pit were removed, allowing excavation of the undisturbed strata in the northern 2 m of the square. The surface sherds were predominantly coarse ware bowls, of Middle Nabataean date. Although there was very little definable stratigraphy, several loci were numbered and excavated,

all containing significant amounts of similar ceramic material, with a few fragments of glass. An intact MN drinking bowl was recovered from Locus 04, with a slightly incurving rim and a string-cut base (Fig. 2:1). Locus 05 contained a coin of Rabbel II and Gamilat, dating to AD 101-2 (96.0007.01; Meshorer 1975: 111, Type 163A). Several other coins of this period were discovered on the surface near Square 01. The various soil loci contained a very high concentration

of Nabataean ceramics, including numerous intact or restorable vessels, mainly small bowls with string-cut bases, along with part of a lamp, and a small piriform unguentarium (Fig. 2:3).

The more than 1500 sherds from Loci 06 and 08 all derive from Middle Nabataean (first century BC to first century AD) ceramics—nearly all small coarseware drinking bowls with string-cut bases; only a few sherds from storage vessels appeared. The



2. Ceramic objects from C124 (drawing by C. Mundigler and Q. Tweissi):

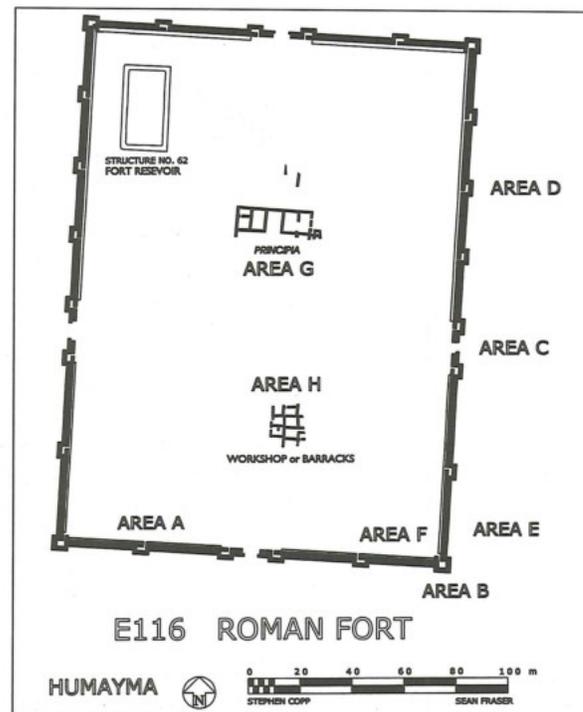
1. H96.0005.01; C124.01.04. Cup with string-cut base, complete and intact. Exterior and interior: 2.5YR 6/6 light red. Many sand and some mineral white inclusions, causing some bloating;
2. H96.0008.01; C124.01.06. Cup with string-cut base, complete and intact. Exterior: 2.5YR 6/5 light reddish brown/ light red with patches of 10YR 5/2 greyish brown and 10YR 6/4 light yellowish brown at body, 2.5YR 5/4 reddish brown at base; interior: 2.5YR 6/5 light reddish brown/ light red. Numerous sand and few mineral white inclusions;
3. H96.0008.02; C124.01.06. Unguentarium with trimmed string-cut base, complete and intact. Exterior: 2.5YR 6/8 light red. Some sand and many mineral white inclusions;
4. H96.0010.01; C124.01.08. Cup with string-cut base, complete. Ware, exterior and interior: 2.5YR 6/8 light red. Many sand and mineral white inclusions;
5. H96.0010.02; C124.01.08. Cup with string-cut base, part of rim missing. Ware, exterior and interior: 2.5YR 6/8 light red, medium core: N5/0 grey. Few sand and mineral white inclusions;
6. H96.0010.03; C124.01.08. Cup with string-cut base, complete and intact. Ware: 2.5YR 5/6 red; exterior: 2.5YR 5/6 red with patches of 2.5Y 6/3 light brownish grey/light yellowish brown; interior: 2.5YR 5/6 red with striations of 2.5YR 5/2 weak red. Numerous sand and few mineral white inclusions;
7. H96.0011.01; C124.01.09. Cup with string-cut base, part of rim missing. Ware: 2.5YR 5/4 reddish brown, wide core: N4/0 dark grey; exterior: 2.5YR 5/4 reddish brown with patches of 2.5YR 4/2 weak red and 2.5Y 7/4 pale yellow; interior: 2.5YR 5/4 reddish brown with striations of 2.5YR 5/2 weak red. Some sand and many mineral white inclusions, causing some bloating.

more complete bowls were often recovered in approximate stacks, indicating that they were associated with some intentional activity at this spot, and not simply dumped. The deepest locus (Locus 13), a compact, greyish soil level above sterile sand, contained very little ceramic material, but all was Middle Nabataean in date. A bronze coin of Rabbel II and Hagru, dating to around AD 106, (Meshorer 1975: 111, type 164) was recovered from the bottom of this locus. Subsequent excavation of the southern portion of the square revealed that it contained a different blend of ceramic fabrics and types. Middle Nabataean finewares predominated, with a large number of painted bowls, along with a larger number of fragments from storage vessels than seen elsewhere in the square.

No architectural remains, stone blocks or slabs, or mudbricks were associated with these loci, and very few blocks or slabs are to be seen even in the deeply ploughed portion of the field. The only possible installation recovered in association with the ceramic concentration of Loci 06 and 08 was a rough semi-circle of stones that partially encircled the ceramics. The absence of architecture other than a cistern, the deposition of the undisturbed ceramics, and the apparent spatial sorting by types suggest that Field C124 is a Nabataean campground (cf. Rosen 1993; Finkelstein 1995: 23-30). It is not surprising, given the flexible character of Nabataean urbanism, that tents should still be in use alongside well-constructed houses (Finkelstein 1995: 37-50; Bignasca *et al.* 1996: 14-17). It is possible that Cistern 54 was constructed to serve a family or related group of families who pitched their tents nearby when staying in town to harvest crops or join in market activities. Unlike the other five similar cisterns in the habitation centre, Cistern 54 never attracted the construction of a house. The economic or social structure of the family may have required a greater degree of nomadism than commitment to a house would have allowed.

### Field E116: Roman Fort (J.P. Oleson)

The large Roman fort at the very north edge of al-Ḥumayma is one of the most prominent archaeological features at the site (Fig. 1). It has the typical rectangular plan of Roman forts (206.32 x 148.30 m, or 700 x 500 Roman feet), with a gate in each of the four walls, and virtually all the dimensions can be expressed in rational numbers of Roman feet. The entire plan is rectilinear and carefully laid out, but skewed nine degrees east of magnetic north (Fig. 3). Prior to our first campaign in 1993, the only feature clearly visible was a large reservoir in the northwest corner (29.40 x 14.20 x 3.05 m, or 100 x 50 x 10 Roman feet), fed by the Nabataean aqueduct via a branch line. Probes were carried out around the reservoir in 1987, but could only verify a period of Byzantine occupation (Oleson 1990: 160-62). The location of Ḥawar (also called Auara or Havarra in the Roman period) on the *Via Nova Traiana* and its isolation in the Ḥisma, suggested that the fort might date early in the history of the *Provincia Arabia*. Excavation in 1993 was designed to provide in-



3. E116: overall plan of fort.

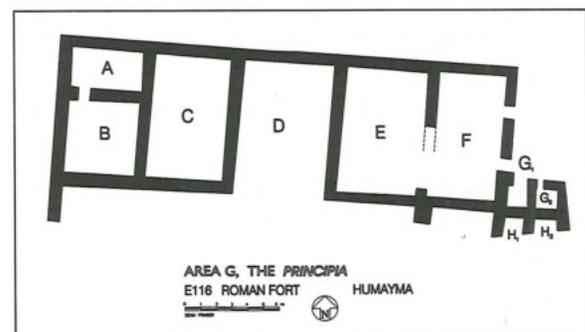
formation on the chronology of the fort's construction and development, and its design (Oleson *et al.* 1995: 321-30). We determined the design and dimensions of the curtain walls, the four corner towers and 20 intermediate towers, and of the east gate. The stratified ceramics and coins found in 1993 revealed that the fort was built no later than the mid-second century, and that the major period of occupation extended only through the fourth century. The fort therefore dates to the original garrisoning of *Provincia Arabia* and not to Diocletian's reorganization of the frontier system.

Excavation in 1995-96 was designed to cast light on the layout and design of major structures in the interior of the fort. Rectangular buildings—barracks blocks, workshops, or stables—are clear in the aerial balloon photographs taken in 1991 (Oleson *et al.* 1995: 322), and a particularly prominent structure in the southeast quadrant of the fort was picked out for excavation. A small robber pit in this area had deposited a large amount of well preserved cooking ware on the surface. This area, presumably a barracks, was termed Area H. The aerial photographs show that the east and west gates are not located in the centre of their respective walls, but are shifted to the south. The east wall extends 119 m north of the center-point of the east gate, and 87 m south of it (400 and 300 Roman feet respectively). It seemed likely that this arrangement indicated the presence of a large headquarters building (*Principia*) in the northern half of the fort, encompassing a rectangular parade ground that could be seen in the aerial photographs fronting the east/west road. This area was termed Area G. Intensive excavation was carried out in both areas in 1995 and 1996, exposing the plan of the *Principia* building in Area G, barracks and workshop rooms in Area H, and confirming a foundation date for the fort in the first quarter of the second century (Phase I). Coins of Trajan, Antoninus Pius, Claudius Gothicus, Aurelian

(?), Probus, Numerian, and Carinus have been found in various loci in the fort, but none of Diocletian, suggesting that the garrison was withdrawn during Diocletian's reworking of the frontier forts of Arabia. The appearance of numerous coins of Constantine and the House of Constantine mark a second phase of occupation. Phase II was accompanied by the addition or alteration of rooms in the *Principia* and barracks, and the dumping of earlier refuse in abandoned rooms. Since no coins later than the house of Constantine have been found in the fort so far, it seems likely that final abandonment took place in the mid-fourth century.

#### Area G: The *Principia*

In Phase I, the *Principia* consisted of a row of rooms 29.42 m (100 Roman feet) long defining the north end of a rectangular courtyard (not yet excavated) (Fig. 4). The east and west side walls of the *Principia* continue south to frame the courtyard, probably serving as the back walls of two north/south colonnades. Many column drums (averaging 0.54 m diam.) cut from the local white sandstone are found reused in Phase II constructions in the *Principia* and elsewhere around the fort, and the parade ground is an obvious possible source. This colonnade probably passed in front the *Principia* façade, then turned to the south on line with the first crosswall in from either end of the main building, resulting in a courtyard 17.70 m (60 Roman feet) wide (measured from the column axes). A parade ground twice as



4. E116: plan of Area G, the *Principia*.

long (35.4 m; 120 Roman feet) as it is wide would reach almost exactly to the projected north edge of the road connecting the east and west gates (the *Via principalis*). A probe along the centre line of the courtyard did not uncover any paving, but did find indications of a very pebbly, tamped surface.

The main building and the walls framing the courtyard were carefully built of relatively large pieces of un-trimmed and partly-trimmed rubble and occasional re-used Nabataean blocks, facing a narrow core of cobbles set in a slightly limey mud mortar. The walls, which all bond with each other, appear regular, but vary in thickness from 0.60 to 0.70 m, most often measuring 0.68 m thick. Many of them survive to a height of 2 m. Crosswalls mark off six rooms, the central one (Room D, probably the *Aedes*, or shrine for the unit's military standards) is 0.74 m (2.5 Roman feet) wider than the others. An east/west crosswall with door subdivides the westernmost space into a small room at the northwest corner of the building, Room A, (inside dimensions 2.70 x 5.01 m), fronted by Room B (4.90 m x 4.98 m). The architect may have been aiming at room units measuring (from mid-walls) 20 Roman feet wide by 30 long, the *Aedes* 22.5 by 30. Room C, immediately west of Room D, measures 8.13 x 5.01 m. The two rooms east of Room D, Room E (4.90 x 8.10 m) and Room F (4.75 m x 8.10) appear to be slightly narrower than the corresponding rooms A/B and C, but the apparent discrepancy may result from damage to the walls. There should be doors in the south walls of all five rooms, although they have not yet appeared in the excavation.

The original Phase I pavement has been exposed over part of Rooms C, D, E and F. It consisted of rectangular sandstone slabs, the long dimension laid mostly east to west, with neatly alternating short seams. The maximum length for the paving slabs in Room D was 3.78 m; the width ranges from 1.66 to 0.74 m; the thickness varied from

0.03 to 0.06 m. The pavement abuts the adjacent walls at a joint of either thin flat stones or cobbles set in a white mortar containing ground pottery. All the interior and exterior *Principia* walls seem to have been plastered with a hard, off-white sandy plaster laid on a bedding layer of soft, white mortar. Where the joint is preserved, this plaster curves onto the paving slabs. In addition to the white plaster, the upper portion of the walls of the central Room D was decorated with elaborate polychrome frescoes. Deep red borders frame designs in both rectangular and diamond-shaped panels on an off-white background, presumably reproducing the effect of expensive coloured stone revetment plaques. Two types were prevalent, one consisting of pink (5YR 7/4) with red splotches or streaks, the other consisting of brownish yellow (10YR 6/6) with similar red splotches or streaks. Sufficient fragments were recovered to reconstruct a geometric pattern consisting of a light greenish gray (5GY 7/1) right-angled triangle surrounded by a brownish yellow (10YR 6/6) border, all on an off-white background. A large number of fragments were recovered of a swirling "whirligig" pattern of interconnected rounded red triangular shapes and light greenish gray and brownish yellow lenticular shapes, all on an off-white background. Other designs include a broad red border framing intertwined stems and tendrils in pink, red, and brownish yellow on an off-white background, and a possible egg-and-dart pattern painted in red, black, and light green. One small fragment retained a fleck of gold leaf apparently applied to the painted surface.

A probe was excavated beneath the pavement at the north end of Room D, revealing three layers of clay and cobble foundation packing over sterile soil. Only a single, small fragment of a lamp was recovered, probably second century in date. Like the fortification walls (Oleson *et al.* 1995: 325-30), the walls of the *Principia* were built on

foundation trenches filled with cobbles and clay.

Significant numbers of typically Roman terracotta roof tiles were recovered from the rubble fill in the structure: large, flat pan tiles with side flanges, and curved, tapering cover tiles, often associated with great lumps of the light-weight, white mortar into which some of them were set. These tiles indicate that at least some spaces in the *Principia* were covered by gabled roofs in Phase I or II. Since the tiles were all badly broken and were found scattered throughout the fill without any apparent order and not in sufficient quantities to have roofed any of the rooms, it is possible that gabled, tiled roofs were used only in Phase I. The same layers of fill also contained large lumps of mortar and mud that were smooth on one side and carried the impression of bundles of reeds on the other. These fragments may derive from flat roofs laid on some of the rooms in Phase II, consisting of beams holding up layers of sticks and reeds mortared and plastered to shed water. Presumably any tiles used in Phase II could have been salvaged before the roofbeams or walls collapsed, but such tiles are found only infrequently elsewhere on the site.

The excavated portions of Rooms A to F were filled with a generally unstratified, rather uniform fill consisting of windblown soil, wall and ceiling rubble, plaster, iron nails and miscellaneous metal scraps, and ceramics dating to the Middle Nabataean, Roman, Late Roman, and Early Byzantine cultural periods, but with second-century material predominating. In conjunction with the material from Area H, it can be seen that the structure was cleared out at the beginning of Phase II, perhaps after damage or a period of abandonment, minor modifications were undertaken—perhaps to allow civilian habitation—then it was allowed to decay slowly at the end of Phase II. The ceramics and other artifacts suggest a period of particular activity from the very be-

ginning of the second century, with a decline or hiatus in the late third and early fourth century. Phase II, which the ceramic and coin finds date to the first half of the fourth century, left fewer cultural remains.

No evidence has been found for Phase I installations other than a large sandstone statue base or speaker's platform (0.90 x 0.76 x 0.46 m high) with a projecting lower cavetto moulding, set up on two reused blocks with Nabataean dressing. The base itself is probably a reused Nabataean column base. It was installed flush against the south façade of the *Principia*, on line with the party wall between Rooms E and F. A two-line Latin inscription in tall narrow letters (H 0.05 m) was cut in the south face. Unfortunately, the inscription was in poor condition, the first line (L 0.34m) being completely effaced by weathering or mechanical damage, and only the middle portion of the second line (the overall length of which is 0.43m) could be partly deciphered: ...]PRAESENEMP[... Other conjectures are ...]PRAESEDE...RAT[... The character of the inscription should be honorary, and, although neither conjecture makes sense on its own, it might be that *praeses*, the term for provincial governor lies hidden in the text (cf. Gatier 1986: 39 no. 13, from Amman; Sartre 1982: 131, 9060: *praes(es) provinc(iae) Arab(iae)*, from Bostra), or mention of a dedication or structure (*prae sede*). The final letter should be a verb, which would accord well with ...]RAT. The use of Latin for such a prominent monument reinforces the Roman character of the fort, and suggests Italian or western origin for its administrators, if no one else (see Oleson Forthcoming). A silver drachma of Trajan, struck at Bostra between 112-117 was found in the fill near the inscription (cf. Kindler 1983: 100-101, nos. 6-9). Although the stratigraphy is mixed, the fine condition of the coin suggests that it had not circulated for very long before being lost somewhere in the vicinity of the

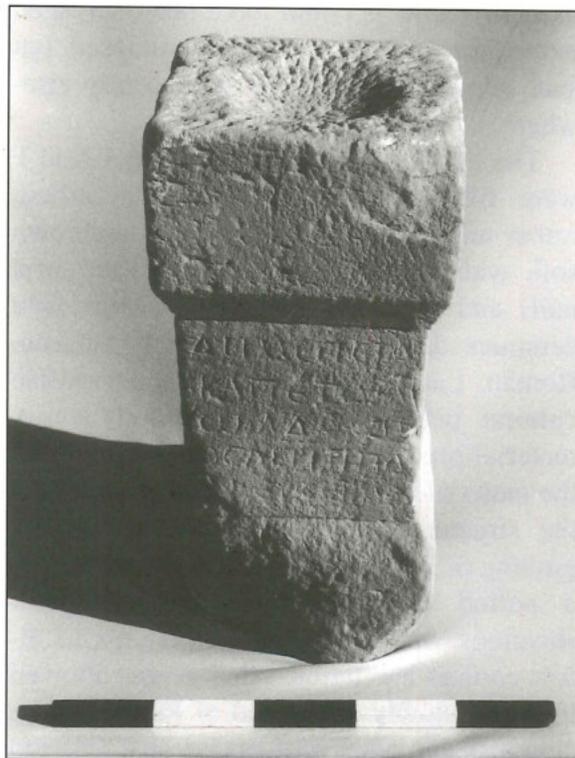
*Principia.*

Some minor modifications were carried out in Phase II. Benches (W 0.44m) composed of heavy paving slabs on earth and rubble supports were built across the north walls of Rooms E and F, along with a bin or cooking area in the northwest corner of Room F. A series of small rooms was added to the east of Room F and the east portico (Rooms G1-G2, H1-H2), and an access door provided. Further excavation is needed to determine the function of these rooms, but several basins found in Room G2, and west of Room H1 are more suggestive of agricultural occupations than of military activity. It is likely that in the fourth century the north-eastern corner of the *Principia* was turned to uses other than military administration. The structural remains, too, are much shabbier than those of Phase I. It is interesting that the sandstone pavement of Room G2 was laid over an enormous deposit of ground up ceramics (*cocciopesto*), undoubtedly prepared for use in the high quality cements and plasters used in Phase I construction. Further excavation is required to recover the plan of the colonnade, and to define the character of the reuse or renovation of the *Principia* facilities.

About 25% of the fragments of white plaster which were found close to the west wall of Room C carried graffiti drawn with carbonized reeds or twigs while the plaster was still on the wall. The subjects include the hind-quarters of a camel with human rider, an ostrich, palm trees, other trees or shrubs, angled and curving lines, and possibly ithyphallic human figures. The subjects, which resemble similar ancient graffiti pecked on rocks throughout the region (cf. Jobling 1983; 1984), may have been drawn during Phase II, or after final abandonment of the structure. Many of the plaster fragments also exhibited drip marks made by muddy water running down the wall, indicating that the roof of the structure was no longer complete at the time the building be-

gan to crumble.

Two inscribed sandstone altars or statue bases with square bodies (0.27 m sq.) flaring to a wider base and top were found in the rubble fill in Room F. One base (95.0599.01) was standing upright next to the Phase II door the east wall of the room, but it was broken and incomplete (H 0.36 m), probably indicating reuse. A Greek inscription was carved in careless letters ca. 0.02 m high: CΩTHP.../ΠΙPΩTON.../THN ANEΘHKEN... A steep-sided, shallow oval recess was carved in the upper surface, probably the base for the statue of the political or religious image mentioned in the dedication. A second altar, of identical design and dimensions, but complete (H 0.60m) was found in the rubble fill of the room (Fig. 5; 95.0596.01). A shallow oval recess was pecked into the upper surface, either for a statue base or for offerings. The inscription, which begins ΔΠ ΜΕΓΙCΤΩ / ΚΑΠΙΕΤΩ [ΑΙΝΩ]? / ΗΑ[ΙΟΠΟΛΙΤΗ]/..., may dedicate the altar to Jupiter Heliopolitanus (cf. Rey-Coquais 1967: 59-64, nos. 2728-31,



5. E116: inscribed altar from Area G.

from Baalbeck). The last line is still undeciphered. Since the rest of al-Ḥumayma is nearly devoid of inscribed material, the appearance of several Greek and Latin inscriptions in one small area of the *Principia* is a strong testimony to the Roman “epigraphic habit” (see Oleson, Forthcoming).

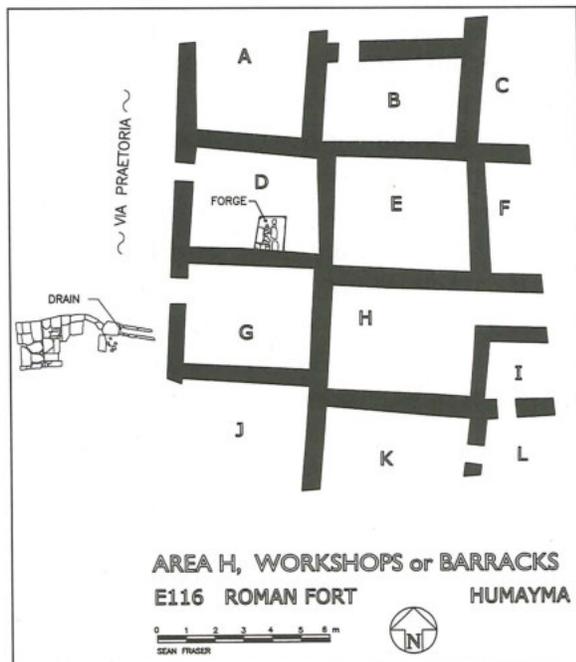
*Area H: Barracks and Workshop*

A portion of a block of barracks and workshop rooms was excavated in 1995-96 in the southeast quadrant of the fort, adjacent to the main north/south road (*Via praetoria*)(Fig. 6). Twelve rooms were identified and at least partially excavated (Rooms A to L) exposing numerous installations of both Phase I and II, and an enormous corpus of ceramics and metal artifacts. The walls were built less carefully than those of the *Principia*, using poorer qualities of stone, fewer large or carefully shaped blocks, and larger quantities of mud mortar and chinking stones. As a result, the upper sections of many of the walls have slumped or collapsed, giving the published plan a more irregular appearance than the structure actually embodies. The walls vary

from 0.56 to 0.62 m in thickness, but probably were designed to be 0.59 m (2 Roman feet) thick.

The original, Phase I design can best be seen in the better preserved Rooms D, G, and J, along the east edge of the *Via praetoria*. Measurement is difficult, but the rooms are all close to 4.50 m long and 3.5 m wide, very close to 15 x 12 Roman feet. There are doors 0.74 and 0.75 m wide (probably 2.5 Roman feet) near the northwest corner of Rooms D and G (this portion of Rooms J and A is unexcavated), opening onto the slightly raised earth and cobble sidewalk outside (W ca. 1.40 m, probably 5 Roman feet). A low step of cobbles and mortar was built on this surface just outside the door of Room D. The rooms along the street may be better preserved because they served as dumping areas during at least part of Phase II, while the rooms to the east and north were more thoroughly renovated and reused. During Phase I, rooms in Area A, like those in the *Principia*, were paved with sandstone slabs. This paving is still well preserved in Rooms D, G, and J, but elsewhere it was partially or totally removed in favour of beaten earth floors.

Room D is the most interesting in the complex. Although we expected the warren of rooms in Area H to be a military barracks, a forge had been installed in Room D, which seems incompatible with sleeping quarters. A thick layer of soft black ash (from charcoal?) covered the paved floor, incorporating small (D 0.08 m), bowl-shaped forging blooms—formed during the working of iron rather than during its refinement. The ash layer concealed hundreds of iron and copper artifacts, apparently mostly scrap metal meant for re-working or resulting from repair: buckles, three-bladed arrow heads, spear points and butts, sections of scale armour, hobnails for boots, and the cheekpiece of an iron helmet, with fragments of leather still adhering to its inside surface (Fig. 7). The presence of a bronze



6. E116: plan of Area H, the workshop or barracks.



7. E116: cheek piece of helmet, found in Area H.

coin of Constantine in the ash layer indicates that the forge was in use in Phase II. The forge table itself, however, a waist-high platform (L 0.90 m, W ca. 0.50m, H 0.82m) built of fairly well shaped blocks, bonds with the south wall of the room, possibly indicating the presence of a forge in Phase I as well. A stepped arrangement of blocks in the southeast corner of the room may have been used as a tool bench or bellows support. A thick circular disk of hard sandstone (D 0.52 m, Th 0.27 m) with several deep, round-bottomed depressions on the upper surface was found on the pavement by the north wall, possibly in secondary use as a pounding surface. A probe beneath the paving yielded Middle Nabataean and Roman wares of the early second century.

The Phase I paving was preserved over much of Room G as well, but in one place the collapse of a slab revealed the presence of a drain running under the slabs from east to west. The drain, approximately 0.15 m wide and deep, was constructed of upright stone slabs and an earth floor. It was found

to continue under the west wall of Room G and below the street, where it was accessed by a white sandstone drain cover (ca. 0.48 m square) at the edge of the sidewalk, perforated by five petal-shaped holes arranged in a rosette. The drain continued west to the very middle of the *Via praetoria* (30 Roman feet wide from building façade to building façade), where it emptied into a large north/south drain (W 0.30 m, 0.25 m deep) very solidly built of neatly cut white sandstone slabs. This main drain must have been expected to carry run-off water from most of the area of the fort safely beneath the south gate and into the adjacent fields. The road surface itself clearly had been patched from time to time and consisted of irregular slabs of sandstone, limestone, and granite. A probe into the cobble and red clay bedding for the the paving yielded a single late first century or early second century sherd. A probe beneath paving in Room G exposed Middle Nabataean and Roman period pottery, and a denarius of the deified Faustina was associated with the unpaved surface of the floor (95.0161.01; after A.D. 141; Mattingly and Sydenham 1930: no. 384).

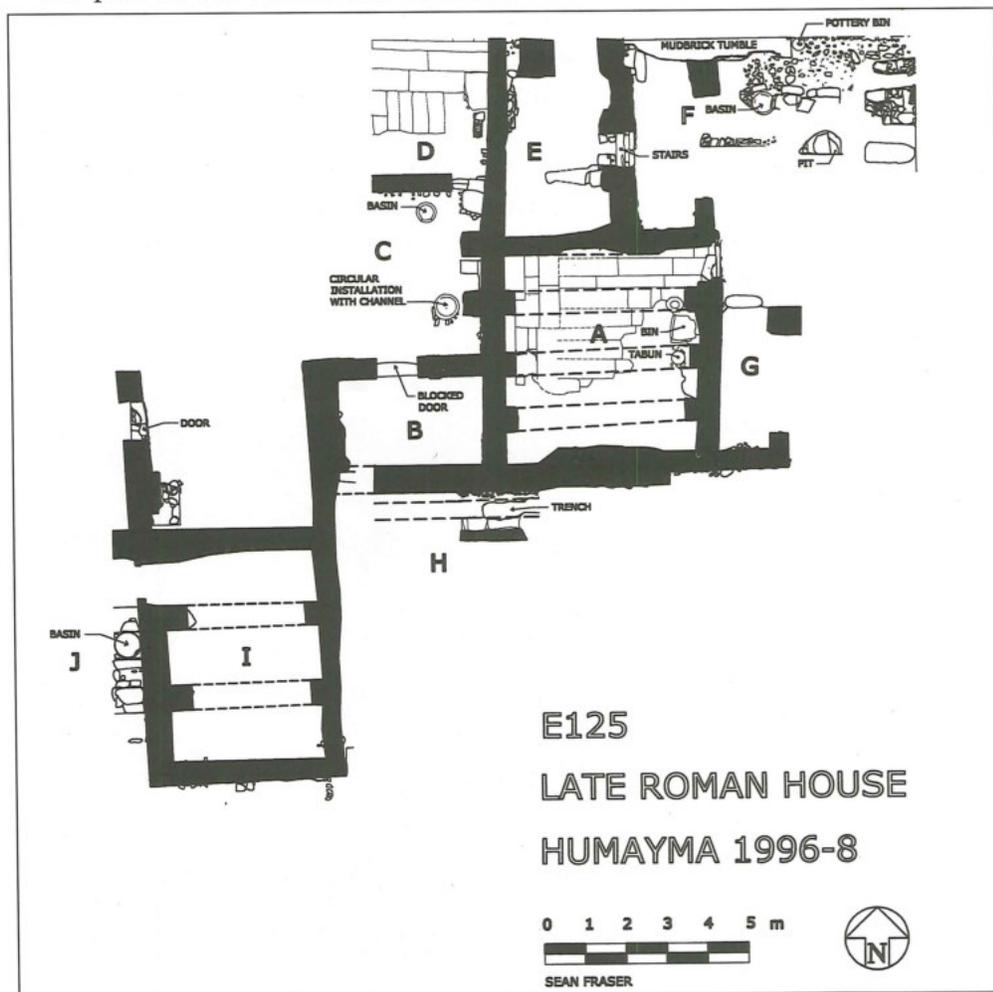
No Phase II renovations were noted in Room G, but at some point during the early fourth century the room was used as a dump for old and new rubbish. This stratum yielded hundreds of large fragments of second, third, and fourth-century ceramic vessels, mainly coarse and cooking wares, butchered animal bones, fragments of glass, and a wide variety of fragmentary metal artifacts in iron, bronze and lead. Room J was filled with a slightly less dense deposit of similar character. The bones include significant quantities of pig, chicken and fish, alongside the more usual sheep and goats. The remains of food and cookware presumably were generated by a barracks area in or near this building. Similarly, large quantities of oyster shells were found in and around the *Principia*, perhaps deriving from the officers' mess.

The remaining rooms so far excavated in Area G show a careless renovation of the original structure, involving the removal of some or all the paving slabs, the construction of bins, platforms and fire pits, and the reuse of sandstone column drums as stands or paving. The fill throughout contains a mix of second through fourth-century ceramics, along with fragments of glass vessels, and a modest amount of iron or bronze clippings. The character of the structure in Area H is not entirely clear. It may originally have served as a barracks and been transformed at least partly into a workshop in Phase II, or it may have accommodated both functions in both phases.

Roman period houses at al-Ḥumayma, in 1996 we began excavation of a low mound located 60 m east of Bath E077 (Figs.1 and 8). The mound, approximately 30 m across, was chosen for excavation because traces of wall-lines and the scarcity of vegetation suggested the presence of a buried building, while the high concentration of painted plaster fragments on the surface implied a richly decorated structure. In addition, the location of the building in the midst of structures of Nabataean (Reservoir E066; the structure under E077) and Roman origin (Bath E077, Fort E116) pointed to a pre-Byzantine construction date. It was hoped that the structure would be domestic in character and date to the period of the Nabataean kingdom, or that it might be part of the vicus associated with the fort. Two seasons of excavation (directed by K. 'Amr in

**Field E125: Late Roman House (B. Reeves)**

As part of our search for Nabataean or



8. E125: plan of Late Roman house.

1996 and by M. B. Reeves in 1998) revealed it to be a Late Roman house post-dating the construction of the Roman fort, but embodying interesting construction techniques and remarkable fresco decoration. As the excavation of this building is not yet complete, the structural analysis and phasing are preliminary.

Ten 6 m x 6 m squares were laid out over the mound, but once rooms were identified, recording and description naturally shifted to room designations. House E125 contains at least nine rooms or areas (labeled A to J) of which only two (A and I) have been fully excavated. The external walls have not yet been located. Four phases of occupation were define.

*Phase I.* During Phase I, the structure was built of neat mudbrick walls on multi-course cobble foundations. These walls rested directly on hard, sterile earth which was used as a ready-made floor in Rooms C and F. In Rooms A and D a more impressive flooring was laid down, consisting of local white sandstone flagstones overlaid by plaster.

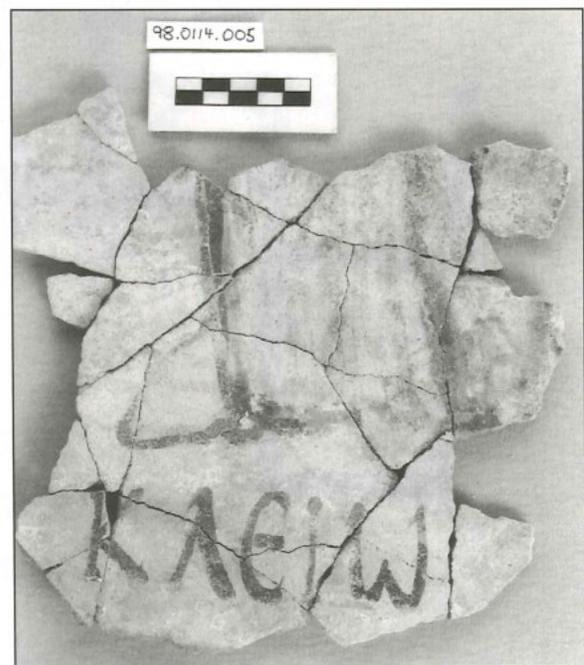
Neatly-cut sandstone blocks were also used for the doorjambs of Rooms A, D, and I, and for the arches and roofing slabs in Rooms A and I. The small spaces between the roofing voussoirs were chinked with cobbles and mortar. The pressure of these arches on the mudbrick walls was relieved here and there by means of buttressing piers or walls installed against the opposite face of some walls (e.g. in Room C, opposite the north and central arches of Room A).

The walls, arches and visible areas of the roofing slabs were coated with hard, sandy white plaster applied directly to the smooth mudbrick of the walls, to the mudplaster coating on the arch-springers, and to the mortar between the voussoirs. Most of the rooms (e.g. C, F, I) displayed either simple white plaster or a white plaster surface decorated with simple red lines and/or daubs. In marked contrast, Room A was decorated

with figured frescoes.

Analyses carried out at the Canadian Conservation Institute after the 1996 season indicated that the true fresco technique was used for the figured scenes, the pigment being applied while the final plaster surface was still wet (Corbeil *et al.* 1996). The motifs on the walls and arch voussoirs of Room A included human figures, a stemmed bowl or basin, volutes, grape clusters, and wreaths—one held in an eagle's beak. Yellow, brown, gray, red and pink borders marked out the rectangular figure panels. The motifs employed are common in Graeco-Roman art and probably originated in an artist's copybook. A neatly painted Greek inscription below one draped figure, of which only the bottom half is preserved, identifies her as Κλειώ—Kleio—the Greek Muse of history (Fig. 9). Since the Muses seldom appear alone, it is likely that at least some of the other figures in more fragmentary condition represent either some of the other eight Muses or gods who commonly accompany them, such as Apollo.

There is evidence that in its first phase of use, some sort of domestic production took



9. E125: fresco of Muse Κλειώ.

place in the structure. A circular basin of white sandstone (D 0.62 m), with a thick base and thin peripheral walls perforated by a drainage hole, was installed during this phase over a channel cut in the earth floor of Room C and lined on either side with low stone slabs. The installation was damaged and dismantled in antiquity, but three other similar sandstone basins or disks were found reused throughout the building. The function of these installations is not clear: the sandstone is too friable to have allowed their use as durable presses for olives or grapes. Moreover, the floor of the drainage channel in Room C consisted of hard-packed soil rather than stone, which would have allowed much of the fluid pouring from the basin to escape. Although the situation remains unclear, it is possible that the basins were used for dyeing or fulling woolen garments, or even for washing laundry, and the drain was meant to contain the water neatly until it could be absorbed by the soil. Unfortunately, all other installations and artifacts that might have indicated the function of the structure and its rooms were cleared out in Phase II.

It is difficult to date the phasing of the E125 building. Although still under analysis, much of the pottery from E125 is a transitional ware combining elements of both second and fourth century AD typologies (K. 'Amr; Y. Gerber, personal communication, May 1999), and many ambiguities remain concerning the chronology of the Late Roman and Byzantine ceramics of Southern Jordan (Frösén *et al* 1999). The fresco, however, seems to have been painted in the late second or early third century. This date is appropriate for the figure types, drapery style, and inscription, and for the deployment of polychrome pictures one above the other on the wall, starting at different heights, contained within solid frames of

several diverse colors, and without any architectural elements characteristic of Pompeian Second to Fourth Styles (cf. Ling 1991: 176-78). Since the fresco was painted at the time the original coat of wall plaster was applied, the building itself should date to the late second or early third century AD. Similar mudbrick architecture found in a probe under the building in F102 suggests that mudbrick construction may have been common on the site during the Nabataean and Roman periods (Oleson *et al.* 1993: 141). It is therefore possible that the Roman period house in E125 continues a local tradition of mudbrick construction with stone reinforcement and roofing. This construction method may be one reason it has been difficult to identify Nabataean and Roman houses in the archaeological record at the site.

Although constructed later than the Roman fort, the E125 house was well placed to interact with the military structures. It was located 160 m southwest of the south gate of the fort—the gate closest to the barracks—along the busy route between the fort and the garrison's bath-house.<sup>3</sup> One possible interpretation of the situation is that an entrepreneur built a structure in the vicus containing a domestic industry aimed at the military market. The owner displayed his Romanness by decorating a public (?) room with common Graeco-Roman motifs and Greek inscriptions. In view of the fact that the first forces to garrison Arabia included many Egyptian units (Speidel 1977), it is interesting that several Egyptian objects were found within the house: a faience ram's head amulet, a faience scarab, and faience beads. Although the identity of Ḥawar's garrison is not known, it is possible that E125 was built by a retired Egyptian soldier or by an Egyptian camp-follower who followed the garrison to Arabia. An Egyptian

3. Sommer (1984: 47-48) notes a consistent spatial relationship among Roman forts in Roman Britain,

their vici, and military bath buildings.

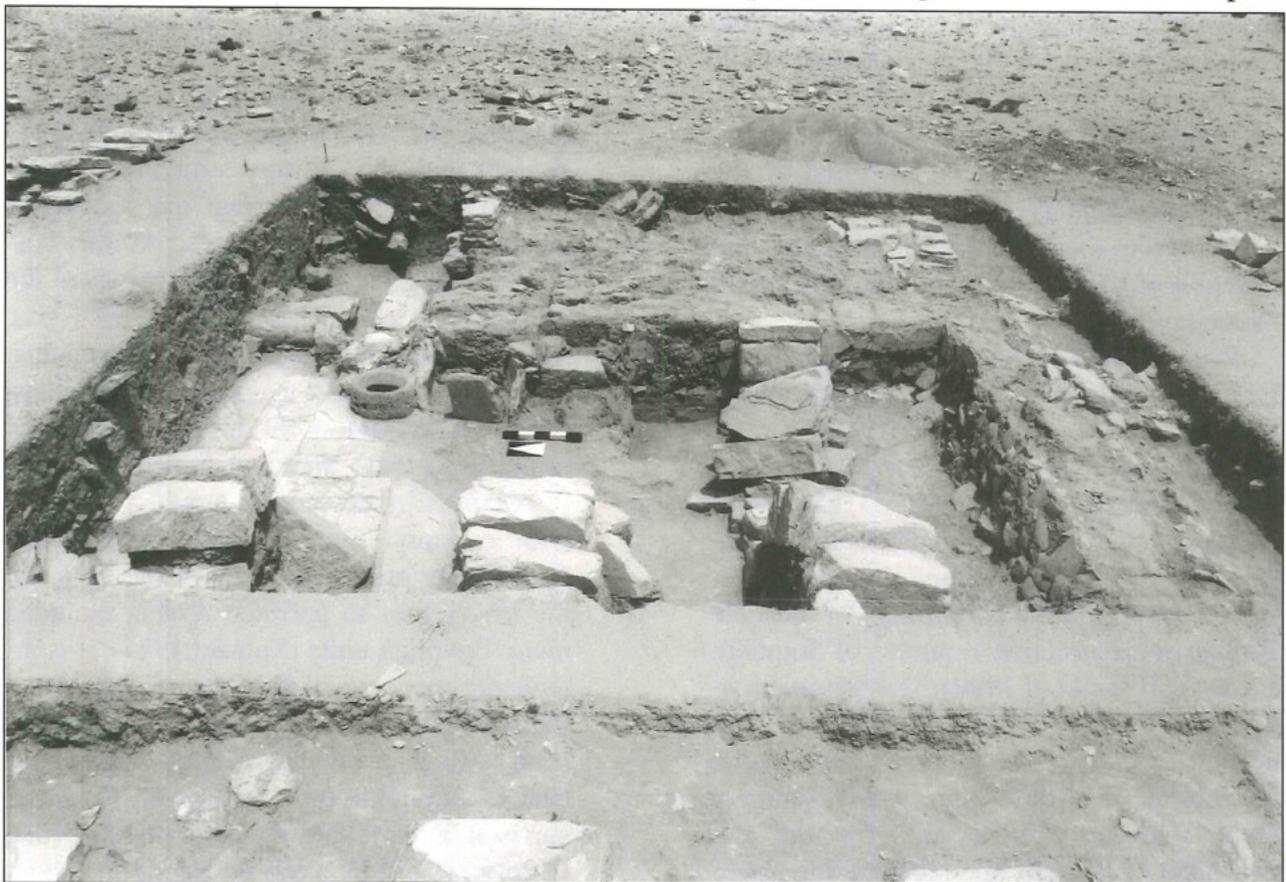
origin for the owner might also explain the mudbrick construction of the building, as opposed to traditional Nabataean construction using cut stone blocks (cf. Strabo 16.4.26).

Phase I ended with damage to the building. A dump in Room H, beneath an area where plaster was mixed for Phase II renovations, contained building debris and sandstone sling balls associated with the damage.

*Phase II.* Major renovations were made to the building during Phase II, but carelessly executed. Many of the mudbrick walls were repaired or reinforced on one or both sides with facings of pottery or cobbles held in place by mudplaster. The north face of the south wall of Room A was faced with

large potsherds set in mud (Fig. 10). Other sections of the walls (often adjacent to renovated sections) were not repaired, but the wall decoration (both figured designs and red lines/daubs) were covered with white-wash. The flagstone pavers were taken up in the southern halves of Rooms A and D.

A possible rationale for these renovations is suggested by debris thrown into Room H during Phase III, and partly sealed under a trench filled with mud-plaster which may have been used in the renovation of the building. In addition to fresco fragments, this dump contained seven sandstone balls. The stone balls vary in diameter from 0.038 to 0.047 m and average 102 g in weight. Similar balls found elsewhere have been interpreted as sling stones.<sup>4</sup> It is therefore pos-



10. E125: Room A (foreground), Room G (background), to east.

4. The spherical stone balls from the contemporary Roman fort at Buciumi (Romania) are 0.03-0.05 m in diameter (Bishop & Coulston 1993: 139). Moreover, although individual diameters/lengths vary,

the average length of lead sling-shot was 0.04 m (Griffiths 1989: 259), strikingly similar to the diameter of these balls.

sible that the building was damaged in a military engagement. E125 is located only 90 m from the southwest corner of the fort, 160 m from the south gate, well within contemporary sling-shot range (cf. Griffiths 1989: 261-63). It is tempting to link the damage to this building with Zenobia's revolt in 270-272. Graf attributes much of the contemporary destruction in Provincia Arabia, Egypt and Palestine to this revolt, including damage to the Qaṣr al-Bint at Petra (1989: 144). At present, however, the pottery suggests that the damage occurred no later than the mid-third century.

Phase II ended with the sudden collapse of the building. The arches in Rooms A and I fell, bringing down the ceilings. The wall separating Rooms A and G fell to the east, its courses still visible lying horizontal just below present ground level (Fig. 10). A heap of large flat sandstone slabs in Room C represents either roofing slabs which fell at this time or floor slabs pulled up in Phase II or III. In Room F, a similar slab fell into a pit (Locus 13). Tumbled stones beneath a bin (Locus 35) in Room F represent either stones which collapsed into a pit or which were thrown into it at this time. Complete cooking ware vessels crushed under the arches in Room A have been tentatively dated to the mid to late third century. The reason for the building's collapse is unknown. No major earthquake is known to have occurred in the area at this time (Amiran *et al.* 1994: 265). Possibly the earlier phases of damage and renovation had simply undermined the structural integrity of the building.

*Phase III.* The Phase II collapse was followed by a period of abandonment, during which deposits of soil and ash were dumped in Rooms B, C and F. Given the date of Phases II and IV, the abandonment probably only lasted 20 to 50 years.

*Phase IV.* Portions of the building were cleared out for limited reuse in Phase IV. The voussoirs of the northern and central

arches in Room A were removed from the northeast corner of the room, while the voussoirs in the northwest corner and all those of the southern arch were left where they had fallen. A kitchen area was set up in the cleared space, consisting of a *ṭābūn*, a storage bin, and a millstone. The doorway from Room A to G was also blocked at this time. Room B was reused in this phase, but with a higher floor level; the door connecting it with Room C was filled in. The southern portion of Room C was not used at this time, but a sandstone basin was set up in the northern half. Room F saw the most intense reuse in Phase IV. A new threshold was inserted into the western wall, leading to a hard-packed earth floor, with cobbled surface in the northeast quadrant of the room. A recessed bin (floored with cobbles and lined with large blocks) was built into this area and used for the storage of coarse ware and cooking ware vessels. These vessels date this phase to no later than the late third or early fourth century. Like Room A, Room F was apparently now used as a cooking area, incorporating a *ṭābūn* and a reused sandstone basin. Given the limited and un-coordinated character of these renovations, the re-use of the building in this period should be attributed to squatters.

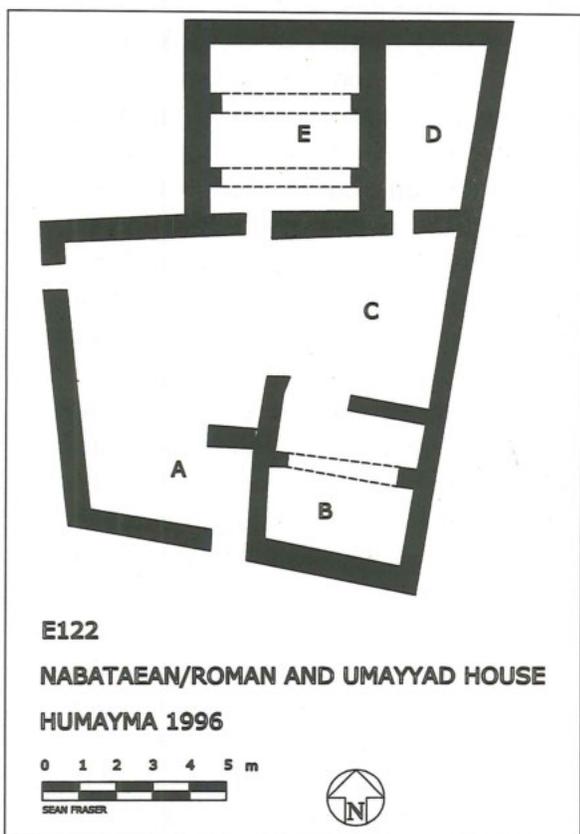
Phase IV ends with the final collapse and abandonment of the building. The mudbrick wall along the north side of Room F collapsed and crushed the pottery in the adjacent bin, marking the end of the building's occupation. This event occurred in the late third or early fourth century, before the re-occupation of the fort and the subsequent renovation of the bath-house signal the return of some prosperity to the neighborhood.

Two seasons of excavation have provided a great deal of information about this structure, which dates to one of the most important but least known phases of Ḥawar's occupation—the period between the construction of the fort in the early second century and the departure of its garrison in the

late third century. Analysis of the finds, and especially of the pottery, much of which seems to represent a new transitional ware, is still underway. One more season of excavation is planned in 2000. The goals of that campaign will be to define the extent of the building and to finalize its plan, throwing new light on domestic architecture in Roman Ḥawar. It is also planned to investigate further the loci associated with the Phase II damage, and its possible military source.

### Field E122: Nabataean/Roman and Umayyad House (K. 'Amr)

Traces of the walls of a small structure were noted on the surface of the ground 20 m southeast of the Bath (E077) in 1995 (Figs. 1 and 11), 30 m southeast of the centre of the mound later found to cover the Roman house E125. This structure, termed E122, was selected for excavation as a possible Nabataean domestic structure, based



11. E122: plan of Nabataean/Roman and Umayyad house.

on the assumption that the Nabataean structure on which the nearby Bath was built may have been adjacent to other structures of the same period. The presence of a badly weathered column base just to the east of the structure (unearthed by illicit digging) further encouraged this assumption. Complete excavation of E122 in 1995-96 revealed a small domestic building built during the later second century AD and abandoned sometime during the third century AD. Following a typically Near Eastern house plan, it was composed of a large central courtyard with rooms opening off the north and east sides. During the later seventh century AD, the eastern part of the structure was remodeled in two phases before its final abandonment and collapse, most probably in the mid-eighth century AD. Excavation revealed at least three phases of development.

*Phase I.* Walls of this phase (the initial, second-century phase of building) are oriented more or less east-west and north-south and were built of medium-sized sandstone blocks with alternating courses of flat wedging stones. The walls vary in thickness from 0.44 to 0.60 m and are only roughly finished. The plan is a courtyard house measuring overall approximately 12.5 m E/W and 16 m N/S. The only entrance is through a door 0.90 m wide in the west wall, near the northwest corner of the courtyard, an L-shaped space approximately 8.8 m E/W by 8.6 m N/S. In this phase the structure seems to have had three rooms, all accessed through the courtyard in typical Near Eastern fashion. In general, very little fill covered the structure, whose walls were preserved to a maximum height of 0.75 m. The stratigraphy consisted of a thick layer of stone tumble (Loci 01.03, 05) directly on top of a beaten earth floor (Locus 01.06) associated with the walls.

Room A was built into the southwest corner of the courtyard, but only traces of the partition walls have survived. Room B, in

the southeast corner of the courtyard (3.8 m N/S by 4.0 m E/S), was roofed by a single arch springing from imposts built against the east and west walls, which probably carried stone roofing slabs. This room was reworked in the Phase II renovations.

Room E was entered by a door 0.84 m wide in the north wall of the courtyard. It was 4.0 m square and roofed by two arches carried by imposts built into the east and west walls. A niche or closet was built into the middle of the east wall, and a bin built out from the northwest corner with carefully dressed blocks. A closet built into the west face of the west wall of this room suggests that there may originally have been another room to the west of Room E, now completely lost. A sounding below the beaten earth floor of Room E (Locus 05.13) revealed a layer of ash (Locus 05.14) which contained small sherds dating up to the later second century AD, and one fragment of a flue pipe. It seems likely that before construction of the house, this area was used for dumping rubbish from the nearby Bath building.

The house seems to have been abandoned sometime in the later third century AD. A layer of soft, sterile soil (Locus 05.12) was deposited on the floor of Room E by the wind, then covered by a layer of ash 0.37 m thick containing a large quantity of flue pipe and hypocaust tile fragments, along with ceramics of the Early Byzantine period (Locus 05.06). This layer was probably produced by the renovation of the bath.

Although smaller and simpler, the plan of this house bears a general resemblance to that of the first Nabataean house on az-Zanṭūr in Petra, where the enclosed courtyard is to the east of the rooms. The roofs of the az-Zanṭūr house, however are supported by columns and walls, not by arches as in E122 (see Bignasca *et al.* 1996: 18, 41-44).

*Phase II.* After the abandonment of the Phase I house and its use as a dumping ground for the Bath building, the eastern house wall and the east wall of Room A

were robbed out. A new wall was constructed of irregular stones of varying sizes piled up with no definite courses and oriented 10 degrees east of north, as opposed to the better construction and the cardinal orientation of the Phase I walls. The construction of this wall created Room D at the northeast corner of the building, which had a roughly rectangular shape (4.0 m N/S x 2.4-1.5 m E/W) and a door (W 0.78 m) in the south wall. No evidence for the roofing arrangement has been preserved. A platform of roughly set stones in the northwestern corner of Room D still retains some of its original compacted surface. The east end of the court may have been divided off to form Room C as well.

The dating of this phase comes from a probe below the packed earth floor (Locus 02.15) within Room D, which produced a small amount of pottery, including two Umayyad sherds.

*Phase III.* This seems to be the latest phase of use of the structure. A wall was built blocking the northern arch in Room B and separating Rooms B and C. An interesting feature in this wall is a built-in niche or closet (Locus 02.08C) which opens onto the interior of Room B. Wall 02.08B is built directly on the Phase II floor (Locus 02.12) which indicates that Phases II and III are chronologically very close to each other.

After this phase, the structure suffered from extensive destruction (perhaps due to the AD 747 earthquake, as Early Abbasid sherds were found in the upper collapse of Room B). All excavated areas showed abundant tumble and collapsed stones in the topsoil levels.

### **Field A127: Watchtower or Fortified Farm (J.P. Oleson)**

During the 1998 season of the al-Ḥumayma Excavation, wall definition work and a small sounding were conducted in structure A127, thought to be a Roman watchtower contemporary with the fort, to

determine its design and chronology.<sup>5</sup> The structure is located on the northern end of a low rise on the east bank of the Wādi Qalkha, ca. 603 m east of the Abbasid qaṣr and 630 m southeast of the Roman fort (Figs. 1 and 12). The hill is approximately 20 m higher than the surrounding landscape and provides clear views of the escarpment to the north, the al-Quwayra/Wādi Ramm region to the south, and the entire site of al-Ḥumayma. Despite the clearing and probing, the date and purpose of the structure remain unclear.

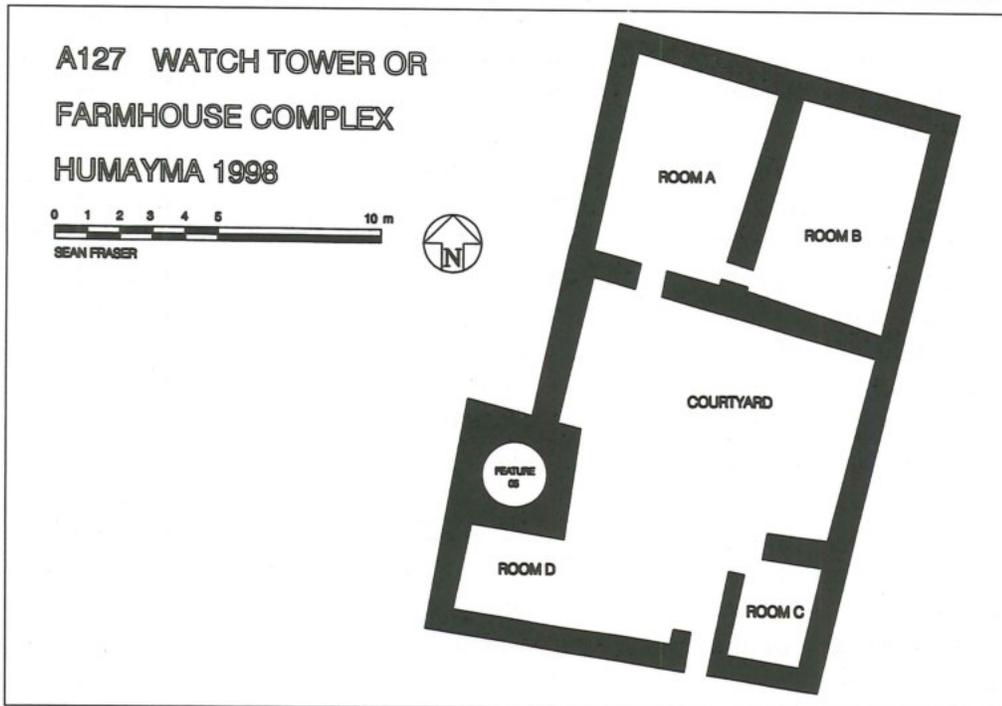
Even before clearing of the light cover of soil over the walls, A127 could be seen as a large walled enclosure roughly 16 x 12 m with a courtyard and at least two interior rooms. The walls seem to survive to only one or two courses, now mostly flush with the surface of the soil. Wall tumble was heaviest along the north and east sides, where the hill is steepest. The only clearly defined element before the wall cleaning was Feature 05, a square structure along the western edge of the complex, the interior of which had been largely cleared out by illicit excavation. Per-

haps owing in part to the large number of previous archaeologists who visited and surveyed the site (e.g. Graf 1979: 122, 125), few surface sherds were visible.

#### Wall Definition

Wall cleaning was conducted by brushing or trowelling; no work was conducted below topsoil. The walls were uniform in character, constructed of large, very roughly trimmed limestone blocks facing a core of flint-cobbles packed in mud-mortar. Several walls included dressed Nabataean limestone blocks, and three pieces of yellow marl from the Nabataean aqueduct appear in the northern wall.

A door (W 0.90 m) in the south wall (L 12.22 m) provides access to a roughly square courtyard (ca. 10 m E/W, 11 m N/S). Badly damaged walls seem to define a small room (Room C, 2.98 x 3.25 m) in the southeast corner of the court, while Feature 05, the tower or silo, straddles a jog in the west wall of the complex. There are two rooms at the north end of the courtyard: Room A at the northwest corner (4.95 x 6.45 m) and



12. A127: plan of watchtower or farmhouse complex.

5. This section is based on the field notes of J. Cook, and I have benefitted greatly from his observations and hypotheses.

Room B at the northeast corner (4.22 x 6.30 m). Their side walls abut the north wall of the court. A door (W 0.75 m) in the south wall of Room A provides access from the court, and there are possible remains of a door at the south end of the party wall, allowing access from Room A to Room B. The eastern, outside wall is 17.90 m long, and the north wall is 10.56 m long.

Feature 05 is a square structure (ca. 3.67 m square) built for the most part of regular sandstone blocks faced with mortar and framing a circular shaft ca. 2.10 m in diameter. The circular inner wall and the outer wall frame a cobble and mud-mortar packing, reinforced with occasional headers entering from the exterior. The inner face is constructed of roughly hewn stones in courses, 0.30-0.40 m thick, alternating with leveling courses of flat stones ca. 0.10 m thick. The minimum wall thickness, in the centre of each side, is ca. 0.75 m. The square retaining wall appears to be built entirely of sandstone ashlar blocks (0.65 x 0.22 x 0.20 m). The construction materials and method differentiate this feature from the rest of the walls in A127, as does its orientation, several degrees off the orientation of the rest of the structure. The other walls do not bond with it.

#### *Probe 01*

A probe (Probe 01) dug in the northeast quadrant of Feature 05, revealed 11 courses of alternating blocks and flat leveling slabs extant above the foundation, which consisted of a leveling course of hard yellow clay in a trench cut into the bedrock. There was a sterile layer of hard-packed red sand (Locus 05) at the bottom, just above limestone bedrock. It is difficult to date Feature 05. The interior was cleared out in the past, possibly several times. This is indicated both by the presence of a dump of soil, rubble, and mortar found just north and east of the feature and by modern debris found in Probe 01. As a result, the small number of Roman, Byzantine and Umayyad sherds

found in the probe can provide only a very tentative date for the chronology of construction and use. Moreover, the few Roman sherds may have come from a single African Red Slip vessel. Middle Nabataean sherds found during wall definition work may predate any construction on the hill, or they may belong to Phase I, when Feature 05 was constructed. In the latter case, however, a rich scattering of such sherds would be expected in and around the feature.

#### *Phasing and Interpretation of A127*

Analysis of the architecture allows definition of three building phases, but at present the phases cannot be dated securely.

*Phase I.* The skewed orientation of Feature 05 to the rest of A127, and its location straddling a courtyard wall that does not seem to bond with it indicate that it was built before the rest of the structure. Furthermore, the unique construction technique and materials, including mortar facing not otherwise found in A127, suggest that it belongs to a completely different chronological period. The use of neatly coursed sandstone blocks is particularly characteristic of the Nabataean period at Ḥawar, as seen in the structure below the Roman bath (Oleson 1990: 289-94), but this type of masonry also appears in the Byzantine church apse in B100 (Oleson *et al.* 1993: 492, Fig. 2). The Byzantine church apse in F102 is built of limestone and marl, but the blocks are neatly cut and are laid in alternating thick and thin courses as in Feature 05.

*Phase II.* The walls surrounding the courtyard (all 0.72 m wide) were constructed in a single phase and incorporated Feature 05. Room C may also date to this phase.

*Phase III.* The structure was extended to the north by creating Rooms A and B. The similarities in orientation, wall dimensions, and construction technique and materials suggest that Phase III dates soon after Phase II.

The function of Feature 05 is not clear. It

is obvious that it was designed very solidly, and the volume of tumble surrounding it seems to suggest that the original height was significant, perhaps two to three metres above the outside ground level. The circular design resembles that of a cistern, but no hydraulic mortar was found on its inner face or in the fill, and the interior coursing would have made it difficult to seal. In addition, given the absence of a catchment area at the top of the hill, it could only have been filled with water carried in from elsewhere in containers. Feature 05 would have functioned better as a silo, and the number of storage sherds found in and around it may support this conclusion. It is interesting to note that the field southwest of the hill is carefully tended today, probably because the slope of the long hill forms a natural water catchment. Feature 05 was a solitary structure during phase I. Although it seems unlikely that such a solid silo would be built apart from a farmhouse, it is at least conceivable that it was meant to serve tent-dwelling farmers.

The significant height of Feature 05 also suggests that it could have served as a watchtower either by itself in Phase I or along with the rest of the structure in Phases II and III. Unfortunately, it is notoriously difficult to distinguish between ancient watchtowers and fortified farmhouses (Killick 1986: 438). There is no standard shape and size for these types of structures (Kennedy and Riley 1990: 216-21), and many documented towers, such as Rujm Banī Yāsir at al-Lajjūn, were earlier structures reused as watchtowers (Bloom and Parker 1987).

In his survey of structures surrounding the Roman fort at al-Lajjūn, Parker relied on three criteria to distinguish watchtowers from other features: the topography of the site, the nature of the structure, and the pres-

ence of Late Roman/Early Byzantine sherds (Clark and Parker 1987: 170). Certainly, A127 has a good line of sight to the fort and provides views not available from the latter, but the pottery repertoire and the construction technique do not match those of the fort. In addition, there are no watchtowers on the hills just north of the fort, which provide an even more comprehensive view. The size and ground plan for both Feature 05 alone and the whole complex are atypical compared with watchtowers found elsewhere in the region.<sup>6</sup> For the moment, it seems most reasonable to explain Feature 05 as a silo constructed in the Byzantine period, which was later on, perhaps in the Umayyad period, incorporated into a farmhouse.

#### **Field B126: Byzantine Church** (R. Schick)

During his brief visit to al-Ḥumayma in 1935, Alt noticed digging activity by the local Bedouin in a three apse Byzantine church in the immediate area of the settlement. As part of his description of the site he published a photograph that shows the east end of the church (Alt 1936: 94-95, plate 3B), revealing seven courses of neatly cut blocks forming the central apse and seven courses of the north portion of the south apse curve and a doorway into a southeast room. The photograph shows that the locals had begun to clear earth out of the central and south apses and in front of the doorway to the southeast room. We had puzzled for years about the fate of this church, since the remains clearly did not correspond to those of the Byzantine churches so far identified at al-Ḥumayma (C101, C119, B100, F102), and yet the structural remains seen in 1935 seemed substantial and prominent. Finally, in 1996, the apses were recognized built

6. It may be inappropriate to presume a uniform typology of watchtowers in the *Provincia Arabia* or elsewhere. Johnson (1983: 270-79) provides a listing of known watchtowers in northern Europe which exhibit significant differences in archi-

ture even among towers constructed in the same period for similar purposes, e.g. watching river fords. One must wonder if there is a standard type of Roman watchtower in southern Jordan or if they all vary due to local circumstances.

into a modern Bedouin house in the very centre of the habitation area, concealed by darkness and dust.

The house (10.20 m N/S x 7.5 m E/W) incorporated the central apse and south wall of the church, and the walls of the southeast room, with new north and west walls and a wood and mud roof (Figs. 1 and 13). An east/west arch springing from imposts built into the back of the apse and the west wall helps support the roof. An Arabic inscription has been cut into the lintel: "There is no god but God and Muhammad is the Messenger of God," above "Muhammad 'Ali al-Hijazi." No features of the church are visible from outside the post-1935 building, although it occupies only the east end of the structure. Large heaps of earth and rubble cover whatever remains of the rest of the nave and façade. In recent years the owner has carried out illicit digging inside, lifting some of the

original church-phase pavers in the central and south aisles and cutting as deeply as 0.80 m into the fill below.

### Room 01

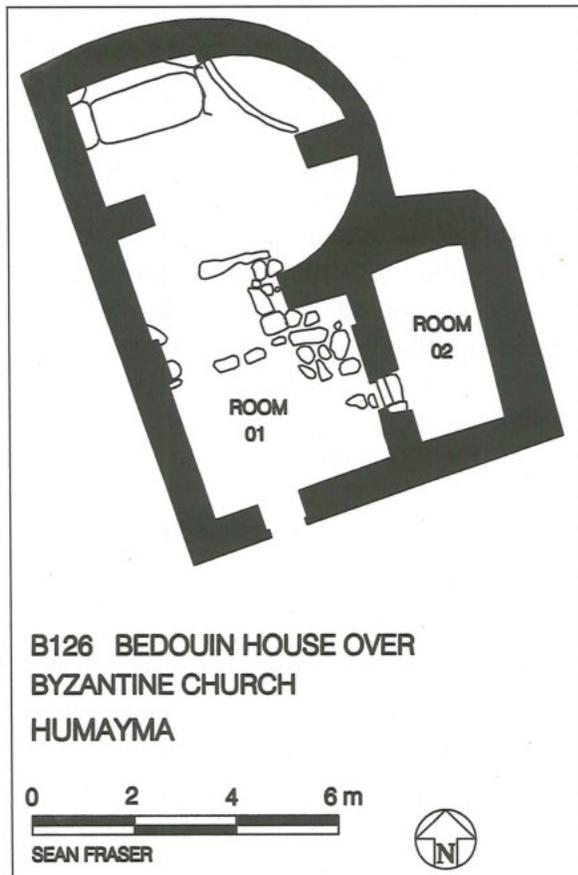
The stratigraphy in the chancel area indicates that the post-1935 builders cleared the collapse debris of the church completely down to the original pavement. In the chancel area this consists of thin, rectangular slabs of purple to white sandstone, but in the south aisle it consists of roughly dressed, irregularly laid blocks with a few chinking stones in between. The pavement of the south nave is 0.20 m lower than the apse pavement, but the location of the chancel screen mounting and step down is obscured by the recent digging. Two cupboards built into the modern west wall are framed by four large, finely dressed blocks of shelly Ma'an limestone that could originally have served as steps up to the chancel area, as in the B100 church. A fragment of a yellow marl aqueduct block found in the robber pit may have been part of the chancel screen base, as in the C101 church.

A shallow probe in the southwest corner of the house, near the modern door in the south wall quickly reached the top of a cobble layer, similar to Locus 02 in Room 02. No pieces of marble, glass, or other liturgical equipment were found.

No trace survives of the northern half of the curving south apse, which appears in the 1935 photograph; that apse has been totally dismantled, obscuring the relationship between the south apse and the southeast room (Room 02). In the photograph, it looks as if the south apse was simply built up against the flat north/south wall that now survives, with packing to fill the corner. The door to the southeast room either opened through the centre of the apse or was blocked by its construction.

### Room 02

The door and much of the wall coursing



13. B126: plan of bedouin house over Byzantine church.

in the southeast room (Room 2; 3.6 m x 2.0 m) seem to be original, although they were built up to a uniform height when the modern roof was installed. No paving stones remain in the room, but a probe along the doorsill revealed a layer of cobbles, pebbles, and silt (Locus 02) similar to the bedding layer below the intact church flagstone pavers in the central aisle. Locus 06, below Locus 02, consisted of a 0.90 m thick layer of silt with occasional random cobbles and pebbles, extending down to the bottom of the west and south walls as far as the sterile orange sand layer (Locus 07) that underlies all the ancient structures at al-Ḥumayma. The few sherds found in Locus 06 were Late Byzantine and Umayyad in date. The character of this bedding layer is radically different from the fill below the pavement in the C101 church, which produced enormous quantities of pottery in variegated layers of silt, sand and ashy silt.

### *Analysis*

Further investigation is needed to determine the dimensions of the church, to verify the presence of a north apse, of which no trace is visible, and to confirm an Umayyad construction date. The relationship of the south apse and the southeast Room 02 also requires clarification. While there are numerous examples of triple-apsed Byzantine churches in which the central apse projects farther east than the two side apses, and numerous examples of churches with rooms like Room 02 to the southeast of the central apse, the presence of a room as large as Room 02 behind the south apse is anomalous. The anomaly could be explained if the southeast Room 02 belonged to either a pre or post-church phase, but only further excavation can clarify that point. The church appears in general to be humbler than any of the other churches at al-Ḥumayma. The poor nature of the pavement in the south area of Room 01 demonstrates that point best.

The B126 church is the fifth church to be identified at al-Ḥumayma (cf. Schick 1995). The large structure just north of the modern school house (E128) may be a sixth. There were five churches at Faynān, and four churches are known at Petra. As is the case with so many other places in Jordan, this number of churches seems to be excessive. Analysis of the local and regional water resources suggests an absolute maximum population of 650 people for Ḥawar. A more realistic total would be only half that (Oleson 1997). In general, Christians of Arab background followed Orthodox belief (Shahid 1984: *passim*). It is possible, however, that the multiplication of churches at Ḥawar resulted from competition among Orthodox and heterodox believers in the settlement. It is also possible that some of the churches were built as others went out of use. The mid-seventh century construction date for the F102 church and possibly of the B126 church coincides with the abandonment of the church in C101, and the renovation of the church in B100, but that still leaves al-Ḥumayma with a significant number of churches. Negev (1991: 228) suggests that the Byzantine towns in the Negev seem over supplied with churches simply because a large portion of the population was nomadic and lived out of the town centre or in tents, which are difficult to document archaeologically. This situation certainly would fit al-Ḥumayma as well.

### **Field F102: Church and Islamic Houses (K. 'Amr)**

Extensive excavation was carried out from 1991 to 1993 in F102, a large, apparently domestic structure and associated cistern at the southeast edge of the settlement (Figs. 1 and 14; Oleson *et al.* 1993: 476-84; 1995: 337-43). The scale and complexity of the structure, however, had remained puzzling, along with the reason for the presence of several Byzantine cist graves inside the east wall. Further excavation in the south-

east portion of the structure in 1995 clarified its outlines and revealed that the core of the structure was a church with associated rooms to the north and west, rebuilt in the Abbasid, Fatimid and Ottoman periods. As the primary aim of the season's work was architectural definition, only tops of walls were cleared in Trenches 14, 15 and 17, and floor levels were reached only inside the apse in Trench 16. The phasing of most of the uncovered walls, however, can be deduced from their relationships with the walls uncovered in other trenches (Fig. 14). To avoid confusion, the same phasing is used here as in the previous reports, the numbers decreasing from early to later periods rather than increasing.

#### *Phase V*

During this phase the southern part of the structure was a single apse church with three aisles, the flagstone pavement of which was already partially uncovered in 1991 in Trenches 03 and 04. The internal dimensions of the church are approximately 19.3 m east/west by 9.4 m north/south (Fig. 15). The west façade was formed by a wall in Trenches 04 and 05 with three symmetrical doorways leading into the three aisles. Traces of the south wall found in Trench 04 included a single doorway, while the north wall in Trenches 03 and 15 included two door openings; on the south Walls 04.02, 10.04 and 12.02 with one doorway in Trench 04; on the east the apse is Wall 16.02; and on the north Walls 03.08, 03.02 and 15.02 with two doorways in Trenches 03 and 15. Although the evidence is not entirely clear, it seems most likely that the plan is not symmetrical, the north wall making a jog to accommodate the pre-existing cistern. The apse wall is the highest preserved wall in F102, while the area to the north of it is badly eroded, sloping steeply towards the cistern. The two rooms that project from the east and west ends of the south wall (in Trenches 09 and 12) constitute an-

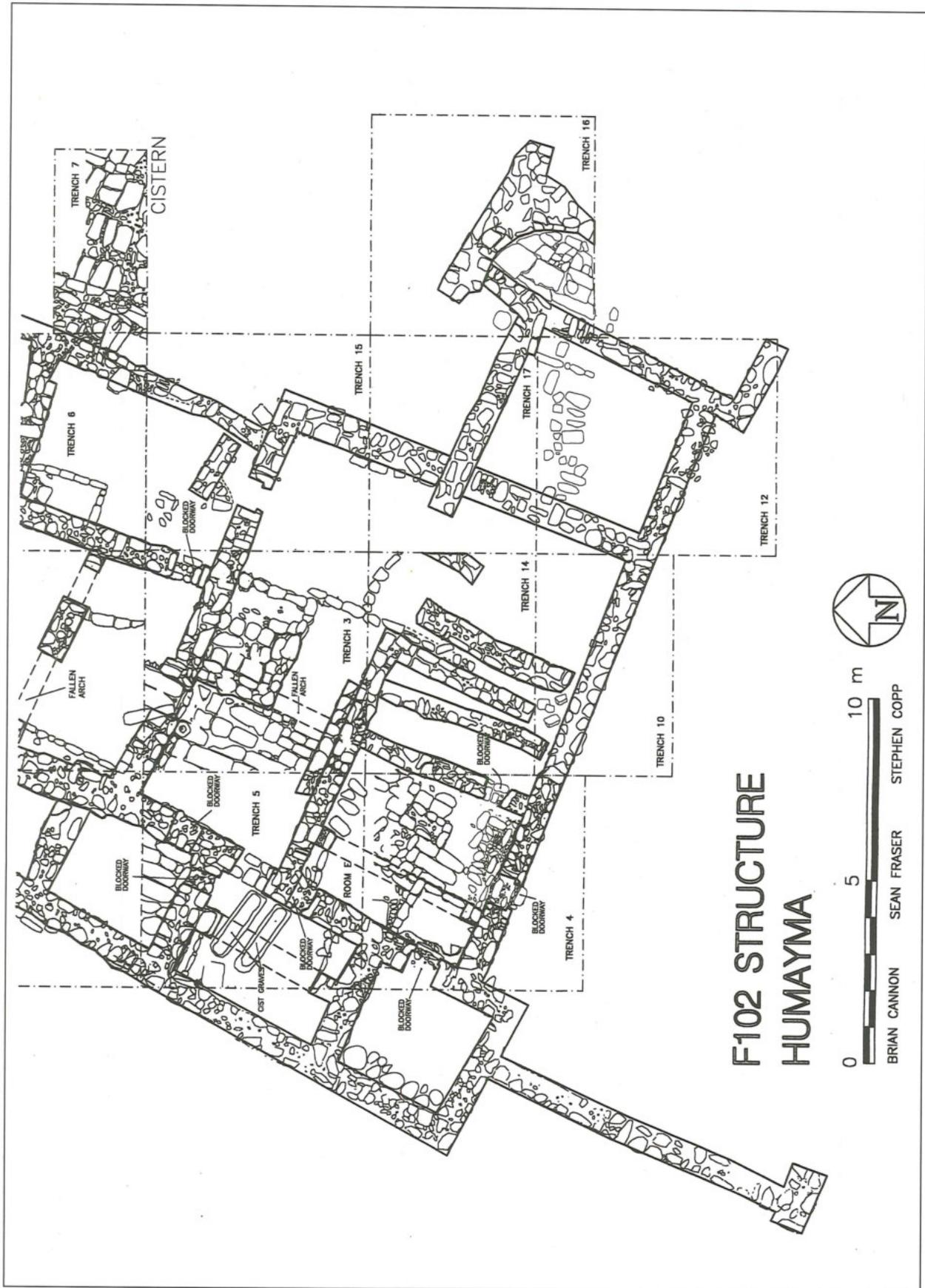
other peculiar feature of the church. They may constitute the towers that can be seen on several representations of churches on mosaics dated to the sixth century (Piccirillo 1993: 243, 289, 325, Figs. 397, 545, 677). Traces of white plaster were found on the south and north walls and on the apse.

The inner face of the apse wall is constructed almost entirely of limestone ashlar with a few marl blocks. All of the stones had been cut specifically for this purpose, as each was slightly curved to form the apse. They were laid in alternating thick and thin courses. The only Phase V floor reached in 1995 was inside the apse in Trench 16 (Locus 20), a flagstone pavement made of comparatively large sandstone blocks similar to those found in Trenches 03 and 04. Its elevation is 0.40-0.50 m higher than the pavement inside the aisles, suggesting the presence of an elevated chancel. Marl blocks were placed on this pavement at the western edge of the apse, perhaps as a base for the marble altar table or chancel screen of which many fragments were recovered from various parts of F102. At a later stage of Phase V, the pavement was covered with greyish plaster which extended over the marl blocks.

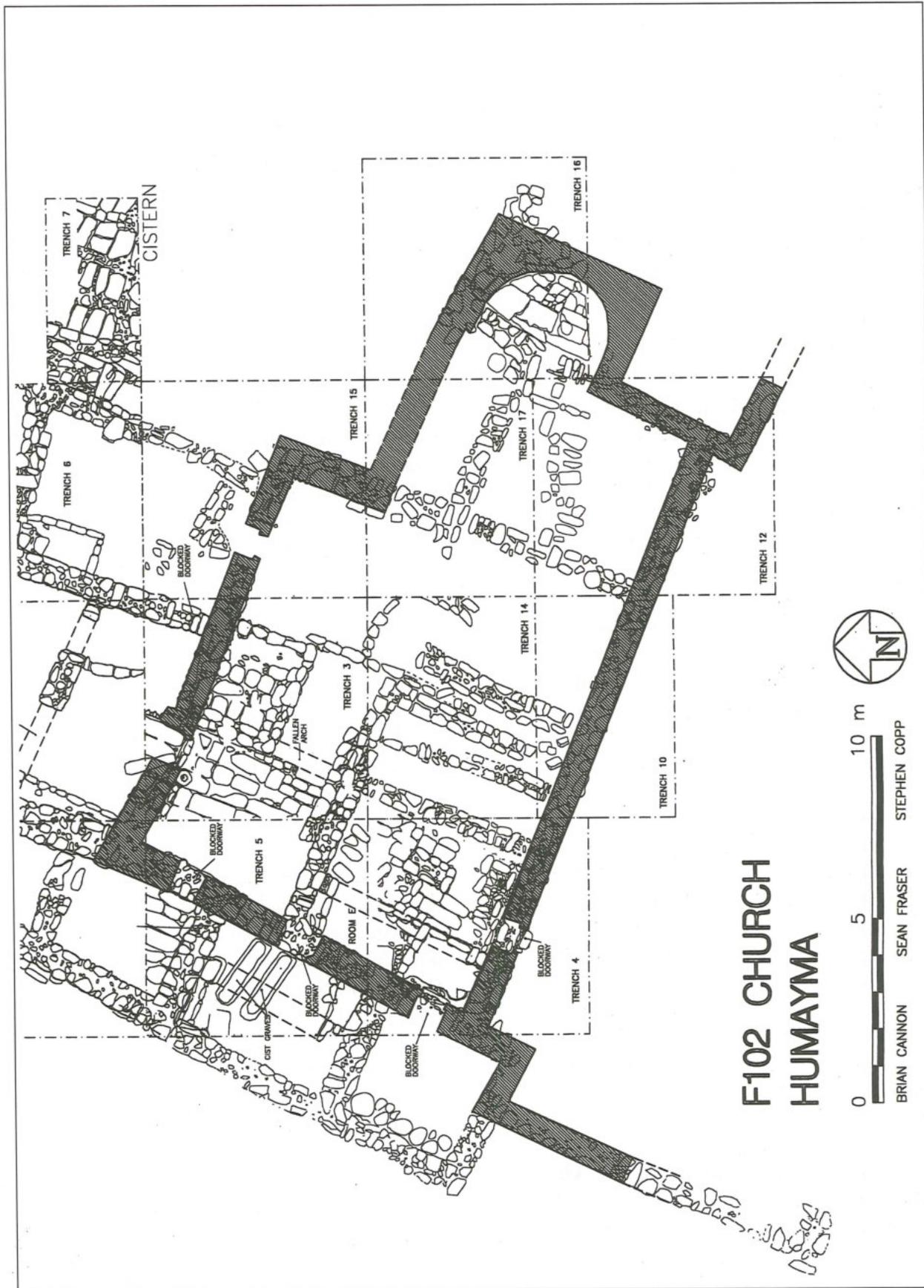
Further evidence for the Early Islamic dating of Phase V and the church came from a sounding under the apse pavement, which yielded the body sherd of an Ayla amphora of the mid-seventh century. This fill also contained many glass sherds and a fragment of the rim of a large marble bowl.

#### *Phase IV*

The main Phase IV (mid-eighth century) walls uncovered in 1995-96 were in Trench 14, the wall defining the Phase IV Room E, uncovered in Trenches 03, 05, 04 and 14. The room is 5 m wide in the west narrowing down to 4.75 m in the east, and has a maximum east/west length of 6.6 m. It re-uses the Phase V church doorways in the south and west, however four north/south span-



14. F102: plan of southern half of Islamic structure.



15. F102: plan of church.

ning arches were built during Phase IV to support its roof. The original plaster on the inner face of the southern church wall continues behind the arches.

In Trench 16, a pilaster (Wall 16.01B), was built on top of the base for the chancel screen or altar table (Wall 16.01D). A beaten earth floor was found inside the apse directly overlying the Phase V. Beaten earth floors covering flagstone pavements are typical of Phase IV as already noted in Trenches 01, 03, 04 and 05.

### *Phases I-III*

Several walls in the area of the nave could be assigned to the eighth-century Phase III. The three centuries of abandonment between Phase III and the twelfth-century Phase II are best represented in the over 0.40 m thick layers of laminated silt and sand in the apse (Loci 16.11, 15, 16). During Phase II a wall was built blocking off the apse area as a separate room with an earth floor. As in all the other trenches in F102, the Phase I Ottoman period is typified by extensive tumble in light, dry ashy soil, some of which is very orderly, denoting instantaneous collapse (e.g. Loc. 16.03).

### *Conclusions*

Discovery of the mid-seventh century F102 church adds to the astonishing list of churches at al-Ḥumayma. Whatever the reason for building this church, the major period of re-modeling at the structure seems to date to the mid-eighth century Phase IV, around the time the Abbasid family left al-Ḥumayma for al-Kufa. The F102 church site shows that very dynamic changes and adaptations were taking place at least in this corner of the site for centuries afterwards.

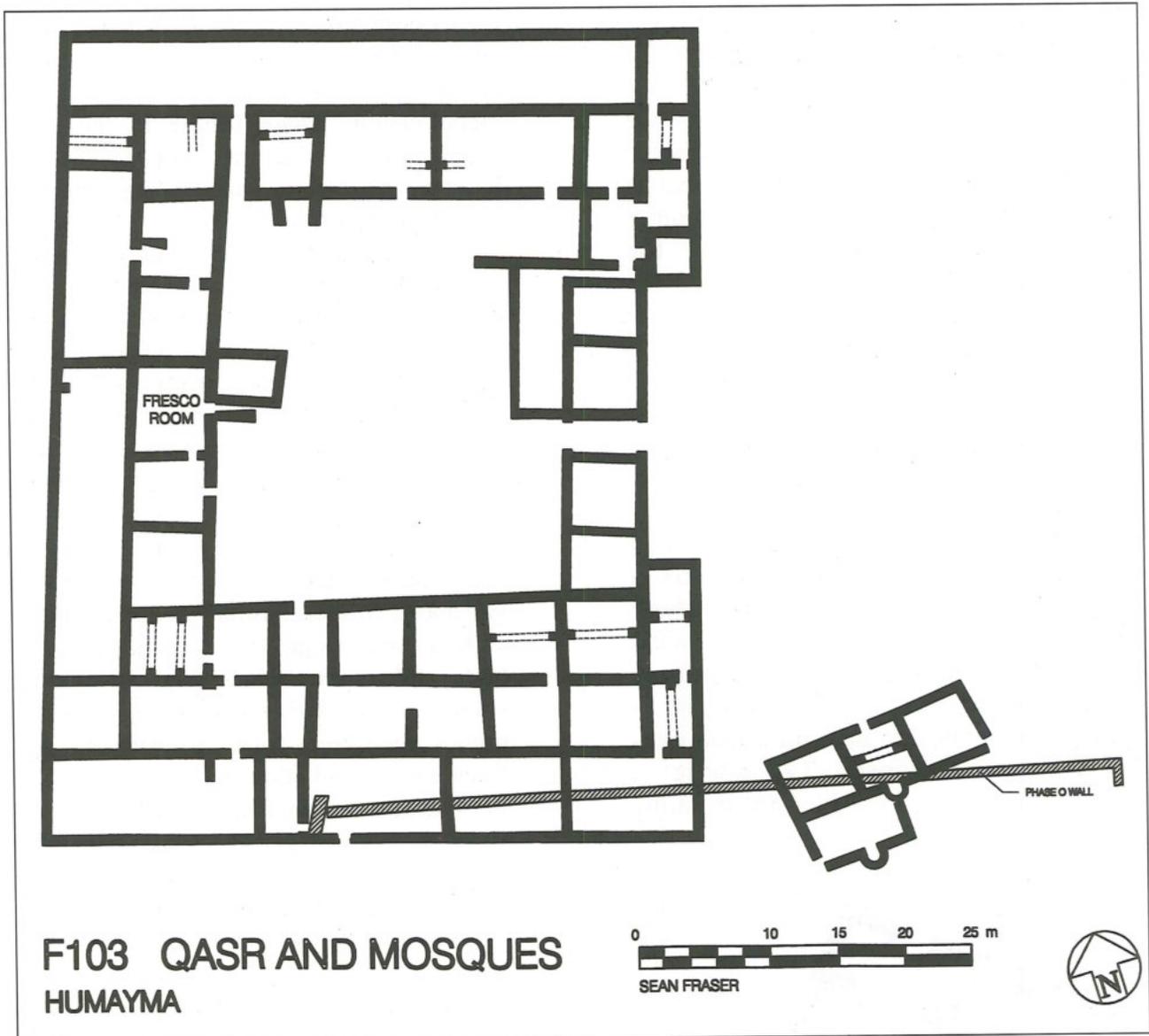
### **F103: *Qaṣr-Masjid* Complex of the Abbasid Family (R. Foote)**

The two Early Islamic structures identified at Field F103 during the 1992 and 1993 seasons were intensively excavated

during the 1995, 1996, and 1998 field campaigns (Fig. 1). At the *qaṣr*—a large, rectangular (ca. 61 x 50 m), building with central courtyard—40 new squares (5 x 5 m) were opened, two squares reopened, and work in the “Fresco” Room (Room 02, originally Probe 02) nearly completed (Fig. 16). Just southeast of the *qaṣr*, the entire area in and around the *masjid* (mosque)—a small, rhomboidal structure with projecting *miḥrāb* on its south side—was also fully explored. The results of the excavation confirm the late seventh or early eighth-century date for the complex and its identification as the Abbasid homestead at al-Ḥumayma mentioned in early Islamic historical texts. Upon purchasing al-Ḥumayma, ‘Alī ibn ‘Abd Allāh, son of ‘Abd Allāh ibn al-‘Abbās, built a *qaṣr* with a garden there, and a mosque which later figured in the conspiracy against the Umayyads (al-Duri and al-Mutallabi 1971: 107-8, 149, 154, 195; al-Tabari 1985: 84, 148-50, 158; al-Bakri 1945-51: 130; Foote and Oleson 1996). An enigmatic Byzantine-period wall was found to extend beneath the southeast quadrant of the *qaṣr* and the *masjid*, and there was evidence as well for a significant Ottoman-period phase of modification and reuse in and around both buildings. Exquisitely carved ivory panels (perhaps furniture veneer), first noted in Room 02 in 1992, continued to dominate the small finds assemblage, illuminating the Abbasid family’s material culture and wide political connections while based at al-Ḥumayma, before usurping the caliphate in AD 749/50.

### *Pre-Islamic Use of the Site*

Excavation in 1993 exposed a pre-Islamic wall (Wall 12) running under the southeast corner of the *qaṣr*, the ashy soil along its north face containing a number of mid-fourth century bronze coins. Further excavation of Wall 12 in 1998 revealed that it extended at least a remarkable 58.90 m, from the west baulk of Square 55, beneath



16. F103: plan of Qasr and Mosques.

the N/S walls of the *qasr*, beneath Mosque 01, and into a field to the east of the mosque, where it finally terminated at a short spur wall to the south. No other intersecting walls have yet been found. Excavation of a deep probe in Square 78 revealed that the remains of Wall 12 consist only of two courses of roughly shaped blocks on a footing of small flat stones. A construction date in the Byzantine period is likely, given the recovery of eight fourth-century coins, mostly of the house of Constantine, dating from 317 to 351. Although eight more coins

found in this context could not be read after cleaning, and one more coin may possibly date to the fifth century, the narrow chronology of the legible coins suggests the structure was in use a relatively short time.

Since Wall 12 was covered by a thick layer of silt deposited by runoff from the fields to the north or by overflow from the adjacent wadi, the builders of the *qasr* and mosque probably were unaware of its presence. The walls of the later structures certainly follow different orientations than Wall 12. The presence of a possible floor

surface and of coins along its north face, and the proximity of the wadi bed to the south, suggest that if Wall 12 was part of a structure, then the “interior” lay to the north. Alternatively, the great, uninterrupted length of the wall may indicate that it formed part of a barrier or corral for animals or that it served as a property boundary. The Byzantine artifacts probably washed down the natural slope from the north and west and were caught against the north face.

*Mosques*

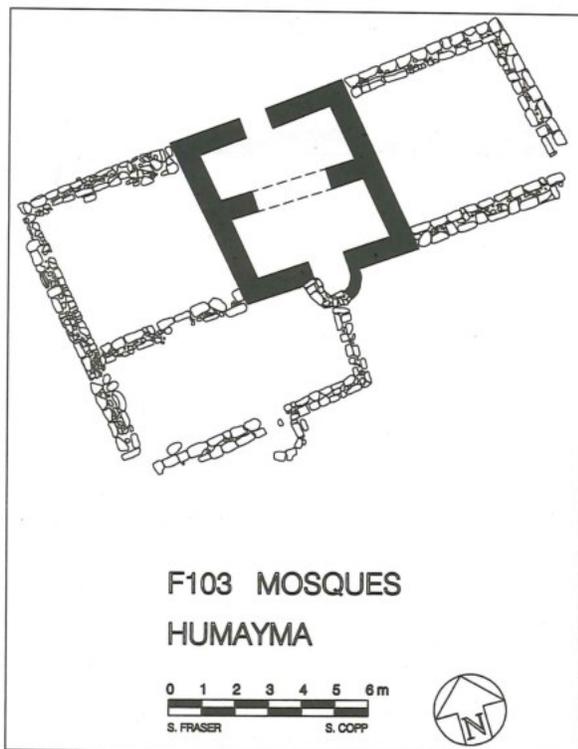
The original mosque (Mosque 01), discovered in the final days of the 1993 season, is small and rhomboidal, the walls ranging from 5.60 to 5.75 m in length, with wall thickness, as in the *qaṣr*, averaging 0.68 m (Fig. 17). The interior niche of the *mihrāb* measures 1.04 m across its opening and is 0.67 m deep. The original walls and *mihrāb* are bonded and built, again as in the *qaṣr*, of coursed stone blocks laid with a mud mortar. The original doorway (0.74 m wide) in the north wall, which was blocked up during

the modern rebuild, was still distinguishable and has been reopened. Only the three lowest wall courses belong to the original, eighth-century phase (Phase I), the upper courses and the single roofing arch were rebuilt on the ancient wall footings and arch springers after the building was cleared out to foundation level in the present century. Although the few original courses of the arch springers that survive do not bond with the foundation blocks of the adjacent walls, the construction and coursing are similar, and the springer foundations extend one course deeper than the mosque walls, suggesting that the springers belong to the initial phase. The *mihrāb*, which had collapsed and been covered with fill, was not recognized by the modern builders, and the gap above was used as the structure’s door.

Extensive excavation was carried out both inside and outside Mosque 01 over the course of the 1995 and 1998 seasons. Ceramics recovered from beneath the wall foundations and the entire area of the mosque floor, including a small amount of Byzantine, Late Byzantine and Umayyad material, confirm a date of construction in the first half of the eighth century.

Several walls built of a single course of large blocks enclose rectangular areas extending east and west of Mosque 01. When cleared, these walls were found to abut the east and west walls of the mosque, and to be bedded half a course higher, indicating they probably were added in a second, later phase (Phase II). Ceramic evidence did not allow secure dating. Since no doorways could be positively identified in these walls or in the original east and west walls of the mosque, access to the flanking areas remains uncertain. Their function also is undetermined, and we have simply labeled them “pens.”

To our surprise, the removal of earth and stone fill outside the southwest corner of Mosque 01 and south of the west pen in 1995 revealed a second mosque (hereafter



17. F103: plan of Mosques.

referred to as Mosque 02). Mosque 02 is rectangular, measuring roughly 7.50 m x 4.00 m, its north wall formed by the south walls of the west pen and of the original mosque. The other three walls survived to only one course of facing blocks and a rubble core. Although at present the remains resemble those of the open-air mosques well-attested in the Ḥisma and the Negev from the early Islamic period to the present (Finkelstein 1995: 19-21; Sharon *et al.* 1996), the wall construction seems too solid. Further examination is needed. Curiously, its east wall abuts the *miḥrāb* of the original mosque, thereby creating a convex northeast inside corner. The *miḥrāb* of Mosque 02 is 1.03 m wide, 0.75 m deep, positioned slightly west of the center of its south wall (3.40 m from the west wall and 4.43 m from the east wall). Although one block in the southwest corner was oriented perpendicular to the others, no door or doorsill could be identified. Because the walls of Mosque 02 clearly abut the original *miḥrāb* and the west “pen,” it is certainly later than both and indicates a third phase of use (Phase III). Foundation pottery for Mosque 01 was scant and inconclusive, with all sherds very small and non-diagnostic.

### **Qaṣr Plan and Date**

In 1995, the *qaṣr*'s plan was clarified and the principal entry located in a recess 21 m wide in the east perimeter wall (Fig. 16). The wide door sill of worn limestone and sandstone blocks (2.25 x 0.75 m) was discovered in the north-south Wall 03 (Squares 83 and 94), east of the courtyard's perimeter wall (Wall 05, Squares 72 and 83), but set back 4 m from the eastern, outside wall of the *qaṣr*. The threshold allowed entry to a narrow, east-west hall (W 2.50 m x L 6.00 m) which opened onto the courtyard through a doorway over 2.0 m wide in Wall 05. Foundations for arch springers flank each end of the entry hall. These springers, plus the great amount of unfired mudbrick

in the collapse of the hall, suggests that a mudbrick barrel-vault roofed the entry. The floor was of beaten earth.

An Early Islamic, post-reform, silver dirham struck in Wasit (Iraq) in 115 H (AD 733/4), was found at a depth of 0.53 m below the surface, less than 3.0 m outside the *qaṣr* gate (Fig. 18)—the first and only Islamic coin yet discovered through excavation at al-Ḥumayma. It is a standard type in common circulation, with formulaic Arabic inscriptions (Walker 1956: 197; Broome 1985: 8-11). Unfortunately, the stratigraphic context outside the *qaṣr* does not lend itself to use the coin for dating, but the coin fits in with what we know of the important connections between al-Ḥumayma and Iraq just prior to the Abbasid revolution.

The identical foundation levels and the stratigraphic connections of the inner perimeter wall and crosswalls, along with the character of the ceramics recovered in the foundation deposits, at first suggested that the *qaṣr* was erected in one phase in the first half of the eighth century. By the close of the 1998 season, however, several discoveries had begun to indicate that the original *qaṣr* consisted of only one ring of rooms surrounding a central courtyard, and that additional rings of rooms surrounding the “core” were built in two immediate sub-phases. All excavated crosswalls in the outer rings of rooms abut their perimeter walls, while all the walls of the innermost ring of



18. F103: silver dirhem found outside entrance to *qaṣr*.

rooms, surrounding the courtyard, bond. It is possible that walls laid at the same depth and which have contemporary foundation pottery, but which abut instead of bonding do not necessarily belong to sub-phases; they may simply reflect an unconventional or unsophisticated building technique. Nevertheless, there is a perceptible difference in building technique as well between the inner ring of rooms and the outer one, and a Mahesh Ware sherd was embedded in the construction fabric of the outer ring at the junction of Walls 01 and 02 (Square 98). Whitcomb considers this ware to date after AD 750, though he concedes it could have appeared as early as the second quarter of the eighth century (Whitcomb 1989 and personal communication).

Although further excavation in 2000 will focus on clarifying this question, for now we reconstruct the initial phase (Phase I), the *qaṣr* as a single ring of rooms around a courtyard, the whole complex measuring approximately 43 m north/south by 39 m east/west. The complex subsequently was enlarged by the addition of a second ring of rooms on the west and south, and on the east by two projections that flanked the entrance and thereby emphasized it (Phase II). Slightly later, another set of rooms was added along the whole north side (which still awaits excavation), including an unroofed oven room at the northwest corner (Squares 01A, 02A)(Phase III). During this phase, a third set of rooms was also added along the south wall, including another entrance to the *qaṣr* in Square 55. Phases I-III probably date to the late seventh and early eighth century. Some more subdivision of space by means of abutting walls laid at a higher elevation took place considerably later, probably in the Ottoman period, and particularly in the courtyard (Phases IV-VI).

Twenty-five rooms throughout the *qaṣr* have now been excavated fully enough to determine that most are unique in their dimensions, placement and type of supports

for superstructure, fenestration, and span and placement of doors. The use of a repeating *bayt* module (coherent apartment-like units) is not indicated. Nevertheless, the piers along the north and south walls of two rooms off the southeast corner of the courtyard (Squares 75, 80) were aligned, despite the dissimilar dimensions of the rooms themselves. Excavation of more rooms along the south edge of the courtyard may uncover more indications for the coherence of the superstructure design there. In Square 24, off the northwest corner of the courtyard, discovery of a complete arch support allowed calculation of the ceiling height at just over 4 m.

Other early eighth-century *quṣūr* in this region were built on imported Roman-Byzantine *castellum* designs—square or rectangular with a perimeter curtain wall of towers and internal arrangements based on a repeating *bayt* module, for example Jabal SAYS and aṭ-Ṭuba (Creswell 1989: 144-46). The plan of the al-Ḥumayma *qaṣr* is dissimilar in its recessed entry and the absence of both perimeter towers and *bayt* arrangement. The al-Ḥumayma *qaṣr*, located further south than any other Early Islamic *qaṣr*, may either reflect an enduring, pre-Graeco-Roman building tradition for Southern Jordan, or perhaps all of Jordan, or it may indicate building traditions of the Arabian Peninsula brought with the Abbasids during their resettlement.

### *The "Fresco Room"*

Painstaking excavation in the "Fresco Room" (Room 02, originally Probe 02) over the last three campaigns has allowed recovery of thousands of fragments of both collapsed wall fresco and ivory veneer panels, plus charred woods, iron nails and fasteners, fine glassware, carved steatite, and an ostrich eggshell vessel painted in red tendril motifs (Foote and Oleson 1996; Foote 1999). All come from the deepest deposit (Locus 13), a destruction stratum caused by fire. The

entire room, measuring 6.43 m north/south x 5.5 m east/west, has been excavated, except for the east/west baulk (W 0.75 m) (Fig. 19), which will be removed in 2000.

Many more geometric and floral motifs were identified among the new fresco fragments, along with three new colors—blue, gold and green. The basic design, however, still appears to have been amorphous rosettes and geometric patterns surrounded by beaded frames deployed in a diaper pattern (see Oleson *et al.* 1995: 346, Fig. 27; Foote 1999), and no evidence has appeared for the presence of human or animal figures. A complete set of pigment samples recovered between 1993-96 was sent for analysis at the Canadian Conservation Institute in Ottawa. We are still assembling comparative material, but one discovery is that the yellow pigment is of the lead-ellestadite group, a unique instance in Jordan (Corbeil *et al.* 1996).

In addition to the nearly complete ivory panel displaying a standing warrior (Oleson *et al.* 1995: 347, Fig. 28), three other fragmentary warrior panels have been recovered, along with a facing male (?) with bouffant hair holding some sort of cartouche, and several other animal and plant motifs: leaves, tendrils, grape clusters, birds, lions (Fig. 20; cf. Foote 1999). Varied concentrations of charred pine, ash and juniper were unearthed throughout the room (identification of the latter two was carried out at the Wiener Laboratory, Cornell). While the palm fronds and juniper were most likely part of the superstructure, the ash (*Fraxinus*) was found along with the ivory and iron handles, hinges and nails. This context and the fact that the ivory was rendered in thin sheets (0.003-0.005 m thick) with drill holes, suggests the panels were affixed as decorative veneer to a



19. F103: Fresco Room, to north.



20. F103: ivory panel found in Fresco Room.

wooden object or objects. The discovery of two iron hinges in association with the large warrior panel found in 1998 (the mirror image of the warrior panel found in 1993) suggest that the panels decorated the doors to a small cabinet. The provenance of these imported luxury objects is as yet not clear, al-

though there are stylistic affinities with Persian, Central Asian, Indian and Coptic art. The doorway threshold between the Fresco Room and *qaṣr* courtyard proved also to be highly crafted—two stone slabs plastered and inlaid with wood (charred in the fire). Nails and hinges from the door were found among its charred remains on the floor.

In view of its nearly axial relationship to the *qaṣr* entry across the courtyard, the decorative wall fresco, and the luxury furniture within it, the Fresco Room can be tentatively identified as the ceremonial audience hall of the Abbasids at al-Ḥumayma. The decorations and furnishing demonstrate the sumptuous material culture available to the Abbasid family in the decades before their revolution, and the inter-regional character of their affiliations even before they came to power. Despite al-Ḥumayma's apparently remote position today, it was located along the *Via Nova Traiana*, a route still well-traveled during the Early Islamic period, connecting the Umayyad heartlands around Damascus with the Arabian Peninsula. Furthermore, communication with points east, especially important for the Abbasids after the 730s because of their popular power bases in Khurasan (in northeast Iran) and al-Kufa (Iraq), would have been possible across the North Arabian desert along the well-established route via Dumat al-Jandal (al-Jawf).

#### *Functions of Other Rooms*

Since most early occupation deposits outside of the Fresco Room were cleared out during the Ottoman phases, there are few remaining traces of the original furnishings or installations that might indicate the functions of the *qaṣr* rooms in Phases I-III. The only room with a plastered floor—other than the Fresco Room—was located adjacent to the Fresco Room to the south (Square 29) and connected with it by a door. It contains, however, no traces of similarly elaborate ornamentation or furnishings, and

its function remains unknown. The function of a room south of the courtyard (Square 75) also remains unclear. Its southwest corner contained a small, rectangular, plaster-covered stone platform (1.60 x 0.93 m, 0.13 m H) belonging to Phase I. This platform may have been used as a stand for water vessels or some other furnishings. Finally, the function of one room is clear; a bakery with several large *ṭābūns* was installed in the northwest corner of the *qaṣr* (Squares 01A, 02A) in Phase III.

Several phases of rebuilding have been distinguished in every room except the Fresco Room, and the late Phases IV-VI, of the Ottoman period, involved extensive spatial reorganization, including subdivision of the *qaṣr*'s central courtyard. Fortunately, the Fresco Room was not affected by the Ottoman renovation and has provided us with a remarkable picture of the beginnings of Abbasid culture. The compactness and depth of the collapse locus 13 (ca. 0.30-0.50 m) apparently led the later inhabitants of the *qaṣr* to cover the deposit with a layer of sand (Locus 05) to even the surface, instead of attempting to clear the room to its original floor level.

The later installations suggest some potential functions for the Ottoman Phase rooms. Three rectangular bins were discovered within the room revealed in Square 75. Constructed along its east wall after the southeast entry to the room was blocked up, the bins were laid on top of a layer of ash 0.06 m thick which covered the original beaten earth floor. Given the size of the room and the bins, and the presence of ash, they were probably intended for animal feed. In Square 24 a semicircular bin abutted the north pier; the fill of this installation contained Ottoman ceramics but no indication of function. Two of the bronze artifacts found in Square 42—a *kohl* stick and tweezers—suggest a connection with female toiletry. Square 19 produced two Ottoman phases of use: first the blocking of the door

and construction of an upper pavement and bench (*maṣṭaba*); and later the laying of a beaten earth floor and construction of two contiguous bins against its south wall. Refinements to the ceramic chronology within the four-hundred year period of Ottoman rule would greatly enhance our ability to date these later phases more precisely. Mosque 02 is also tentatively attributed to the Ottoman period, given the widespread attention to remodeling inside the *qaṣr* at that time.

### Conservation of Small Finds (J. Logan)

Priorities for conservation in the 1995-96 and 1998 seasons were cleaning, consolidating, sorting, and packing fresco and ivory fragments from F103, and cleaning coins to the point that they could be read. Other materials that required attention included plaster with graffiti found in the Roman fort, iron and copper artifacts, some ceramic and glass items, and carbonized wood from F103.

Since the soil of al-Ḥumayma is slightly alkaline (Oleson 1997: 177-78), preservation of calcareous material such as bone, ivory, plaster, and mortar is favoured. The combination of dissolved calcium magnesium, and chloride-containing salts (e.g. sodium chloride) in the soil has resulted in a variety of states of preservation for other materials such as metals, ceramics and glass. The condition of artifacts is often an indication of micro-environments (past and present), history of use, or nature of loss or destruction. Due to the fragmentary and fragile condition of some of the artifacts, conservation began in the field with the packing of friable objects on padded supports for transport to the lab.

### Fresco

The fresco found in F103 was in extremely poor condition. During the destruction of the room in the mid-eighth century, the painted lime plaster was subjected

to smoke, heat and flames from the fire, then crushed by the collapsing roof and walls. The heat made the plaster very friable and affected the adhesion of the pigments, leaving the paint layer powdery. The heat also affected the colour of the pigments.

Although al-Ḥumayma is an arid site, freshly excavated fresco was damp and very difficult to handle. Conservation began by allowing the exposed fragments to dry completely *in situ*. They were then placed one-by-one on padded supports and secured by stretchy gauze for the trip from the site to the conservation lab. Cleaning involved blowing off the loose dirt and then gently tamping and brushing the more adherent soil using soft brushes. Once cleaned, the fragments were placed painted side up on aluminum foil and consolidated with a 12-13% aqueous solution (vol/vol) of Acrysol WS-24™. The consolidant was poured onto the foil and wicked into the plaster from the unpainted surface. Once dry, the fragments were robust enough to be sorted and packed. Samples of an unconsolidated fresco were taken for pigment identification at the Canadian Conservation Institute (Corbeil *et al.* 1996).

The same consolidant solution was applied to the surface of plaster with *graffiti* found in E116. The *graffiti* had probably been drawn using charcoal, and the quality of the plaster surface supporting the images varied from very sound to extremely friable. On many pieces, two to four thin layers of white-wash or plaster could be discerned over the hard, smooth plaster that had formed the primary finish of the wall. These layers tended to delaminate, necessitating surface consolidation. This was done by brushing dilute Acrysol directly on the image layer, taking care not to drag the solution over the design. Consolidation of the total thickness of the plaster was not necessary. The painted plaster from E116 and E125 was robust enough that consolidation was not required. The fragments were

brushed and, where necessary, lightly washed with tap water.

### *Ivory*

Thousands of burned and crushed fragments of carved ivory panels were recovered from the Fresco Room in F103. The colour of the ivory varied from tan to black, dark grey, bluish-grey, to white. The variations in colour indicate differing degrees of temperature during burning, tan being the result of lower temperatures than black, and white indicating very high temperature (Shipman *et al.* 1984). During heating, the organic component of ivory (collagen) is destroyed and the mineral component (hydroxyapatite) undergoes changes in crystal structure. This process results in variations in conditions such as porosity and fragility, as well as colour.

In order to transfer the ivory from the cultural deposit to the laboratory in some form of order, pieces found together were placed on padded Coroplast™ supports, and secured with more padding, which was tied down with stretchy gauze.

The ivory was cleaned either by brushing with a dry brush, using bristles of varied stiffness, or by brushing with water. For wet-cleaning, fragments were placed on folded paper towels and the soil and water were brushed off the surface and onto the absorbent toweling. This procedure worked particularly well for black ivory to which a film of clay adhered, but if blind cracks were present, they tended to split open, resulting in tiny and difficult repairs. Most of the grey, white, and tan pieces were very fragile and were consolidated with dilute (3%-5% wt/vol.) B72 in acetone. This was applied by brushing on the surface and allowing the ivory to absorb the solution. The black fragments would not absorb the consolidant.

Fragments from each day's excavation were sorted according to motif. When joins were found, the fragments were adhered

with UHU (polyvinyl acetate adhesive) diluted with acetone. Some curved pieces were backed with fine Japanese tissue adhered with B72 dissolved in acetone. The procedure effectively maintained the curvature and protected joined edges. For shipping and storage the pieces were placed face-up on file cards. Applicator sticks were used to form frames to keep the fragments on the cards, then each tray was padded with nylon-covered polyester quilt batting held under tension by elastic bandages.

### *Iron and Copper*

Due to the calcareous nature of the soil, copper and iron form hard, stable corrosion crusts. The presence of dissolved chloride containing salt, however, results in the slow yet continuous corrosion of both metals. The iron is particularly affected and most of the objects are heavily mineralized with very thick, cracked corrosion layers over a brittle core. The shape of the objects is retained in the corrosion, however, due to distortion, cracking, and in some cases the formation of fresh corrosion on remaining metal surfaces, metal objects can be quite fragile.

Most of the iron from the site appeared to be completely mineralized. Conservation was limited to light surface cleaning to remove loose sand and concretions. Repairs were carried out with Araldite 5-minute epoxy. In cases where further consolidation was necessary, Lepage's Regular epoxy was used.

Iron objects, mainly nails and fasteners, associated with the ivory from F103 were not cleaned. Most have wood or charcoal adhering to the corrosion, and should be radiographed prior to removal of any of the accretions. In addition, burning has had a stabilizing effect on the objects, some of which preserve relatively distinct surfaces. The high degree of mineralization of iron from al-Ḥumayma has left most of the objects in a "stable" condition, meaning that

fresh corrosion should not be a problem, since metallic iron appears to be absent (Watkinson 1983).

The nature of the corrosion layers on copper varied widely across the site, from lightly-corroded, compact surfaces to thick, calcareous layers which completely obscured detail. Mechanical removal of corrosion to a stable oxide layer is the preferred method of revealing surface detail (Jedrzejewska 1976), and this was the procedure followed for most of the objects. Coins were an exception, since the corrosion layers were usually very much harder than the underlying metal and mechanical cleaning flattens detail. Instead, a chemical method developed by Dr Pierre Bikai of ACOR (Bikai, personal communication) was used to dissolve the corrosion on silver and bronze coins with a heavy corrosion layer. All these coins were cleaned by immersion in 3% vol/vol nitric acid in distilled water followed by rinses with distilled water. They were then wrapped with aluminum foil and soaked in 2% wt/vol sodium carbonate in distilled water to neutralize any remaining acid. After soaking in distilled water, the coins were de-watered with ethanol and placed in a 3% wt/vol benzotriazole (BTA) solution in ethanol under a slight vacuum (approximately 15mm Hg). After BTA treatment, they were rinsed with ethanol, dried and lacquered with dilute (3%-5% wt/vol) B72 in acetone. Examination of al-Ḥumayma coins cleaned in this manner and stored in a hot, humid museum storeroom for four years revealed no signs of renewed corrosion.

### *Ceramics*

Ceramics were generally recovered in good condition. Many were covered by a thin layer of calcareous deposit that was removed by soaking in a dilute acetic acid solution (10% vol/vol in water). Some objects exhibited cracking apparently caused by the formation of what is probably calcium or

magnesium sulphates, salts that are not readily soluble in water and therefore are difficult to remove by washing. Very few pieces were crumbling due to the presence of readily soluble salts. These were treated by soaking in baths of tap water followed by final soaks in distilled water. To monitor the removal of salt, dissolved solid content of the wash water was measured using a conductivity metre (Hanna Instruments Dist 10P3).

#### *Glass*

The alkalinity of the soil, in conjunction with the composition of soda-lime glass, leads to generally poor preservation of glass at al-Ḥumayma. One exception was a restorable bowl found at E116. Although slightly degraded and badly stained, the glass appeared to have a sound surface and it was possible to adhere the pieces for drawing purposes. UHU was the adhesive used; the object was dismantled and the adhesive removed prior to packing it for storage.

#### *Charcoal and Basketry*

Several fragments of what appears to be basketry or a woven mat were found in association with one cluster of ivory from F103. These were saved as a sample. Charcoal and unburned wood from the same area were saved with the intention of submitting them as a sample for dendrochronology and species identification. The carbonized wood was in such fragmentary and poor condition that consolidation with synthetic resins (e.g. Acryloid B72 dissolved in ethanol or acetone) was not practical. Pieces that were saved were packed in padded boxes for shipping and storage.

#### *Materials Used*

- 1) UHU: a solvent-based polyvinyl acetate adhesive, soluble in acetone.
- 2) LePages Regular Epoxy and Araldite 5-Minute Epoxy: epoxy resin, soluble in

methylene chloride.

- 3) Acrysol WS-24: an acrylic emulsion, pH = 7.0 (approximately), the dry film is soluble in acetone. A 12-13% vol/vol aqueous solution contains approximately 4% solids. Manufacturer is Rohm & Haas ("Primal" is the Rohm & Haas trade name for their acrylic emulsions/dispersions in Europe). These are available from conservation supply companies. Water used to dilute the acrysol was tap water from the school at al-Mureighah.
- 4) Acryloid B-72: solid acrylic resin, soluble in acetone, toluene and ethanol. Manufacturer is Rohm & Haas. Available from conservation supply companies.
- 5) Coroplast: corrugated plastic board, copolymer of polyethylene and polypropylene. Available from plastic supply companies.
- 6) Stretchy gauze: "Super Crinx"; cotton/nylon bandage available from medical supply firms.
- 7) Nitric acid, acetone, ethanol, benzotriazole: available from chemical supply companies.

#### **Architectural Consolidation** (J.P. Oleson)

The problems of preserving and presenting architectural remains are among the most difficult faced by archaeologists and conservators. In order to repair damage caused by weathering of the structures at al-Ḥumayma that were excavated years ago, to stabilize and protect the structures excavated recently, and to provide a more coherent image to the growing number of visitors to the site, we have carried out a programme of architectural consolidation every season since 1995. Consolidation of the Roman Bath (E077) and the Church in C101 is now complete. Portions of the two mosques in F103 have been consolidated, and the major walls of the *Principia* building in E116.

In consolidating walls, the loose, old mortar was removed, the joints and blocks cleaned and wetted, and the mortar replaced with a mixture of lime and local sand, coloured immediately afterwards with dirt. Ancient blocks were added where necessary to repair or top walls. In contrast with Portland cement, this lime mortar does not contain sulphates and salts which can migrate to the adjacent stone, causing efflorescence and spalling. It is relatively soft, allowing easy maintenance, and it fits in well visually and physically with the ancient mortar and stones. Loose stucco was reattached to its backing wall by injecting a solution of Primal AC33™ by means of small holes drilled through the plaster, using a syringe, then edged with the lime and sand mixture. The buildings restored in this manner in 1995 and examined in 1999 have stood up well to the weather and to human and animal traffic, and there has been very little of the separation of mortar and wall materials frequently seen with Portland cement repair of ancient walls. We estimate that this sort of consolidation should last at least ten years. As part of the development of the site, we have also removed all current excavation dumps and nearly all the older dumps.

John Peter Oleson  
Dept. of Greek and Roman Studies  
University of Victoria  
Victoria B.C. V8W 3P4 Canada

Khairieh 'Amr  
Department of Antiquities  
POB 88  
Amman

Rebecca Foote  
Department of Art History  
Harvard University  
Cambridge MA 02138 U.S.A.

Judy Logan  
Canadian Conservation Institute  
1030 Innes Road  
Ottawa ON K1A 0M5 Canada

Barbara Reeves  
Department of Classics  
SUNY-Buffalo  
Buffalo NY 14260-4650

Robert Schick  
Albright Institute  
POB 19096  
Jerusalem

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# THE 1998 SEASON OF EXCAVATION AT ABILA OF THE DECAPOLIS

by

W. Harold Mare

The eleventh season of excavation at Abila of the Decapolis, Quwayliba (Fig.1), was conducted from June 13 to August 1, 1998, by W. Harold Mare, Director of the Abila Archaeological Project and the Covenant Theological Seminary, St. Louis, Missouri, as principal investigators, under the supervision of Dr Ghazi Bisheh then, Director-General of the Department of Antiquities. The American Staff of 34 persons<sup>1</sup> were accommodated in a government school at Hartha, a town close to Abila. Abila is an ancient Biblical archaeological site with an archaeological history from 3500 BC to A D 1500; it is 1.5 kilometers north-south, and 0.6 km east-west. The Abila 1998 excavation was endorsed and sponsored by the Abila Archaeological Project and Covenant Seminary. The excavation was also sponsored by Cincinnati Bible College and Seminary.

The American staff was assisted in the field by 35 workmen hired to assist in the many labor tasks. The Department of Edu-

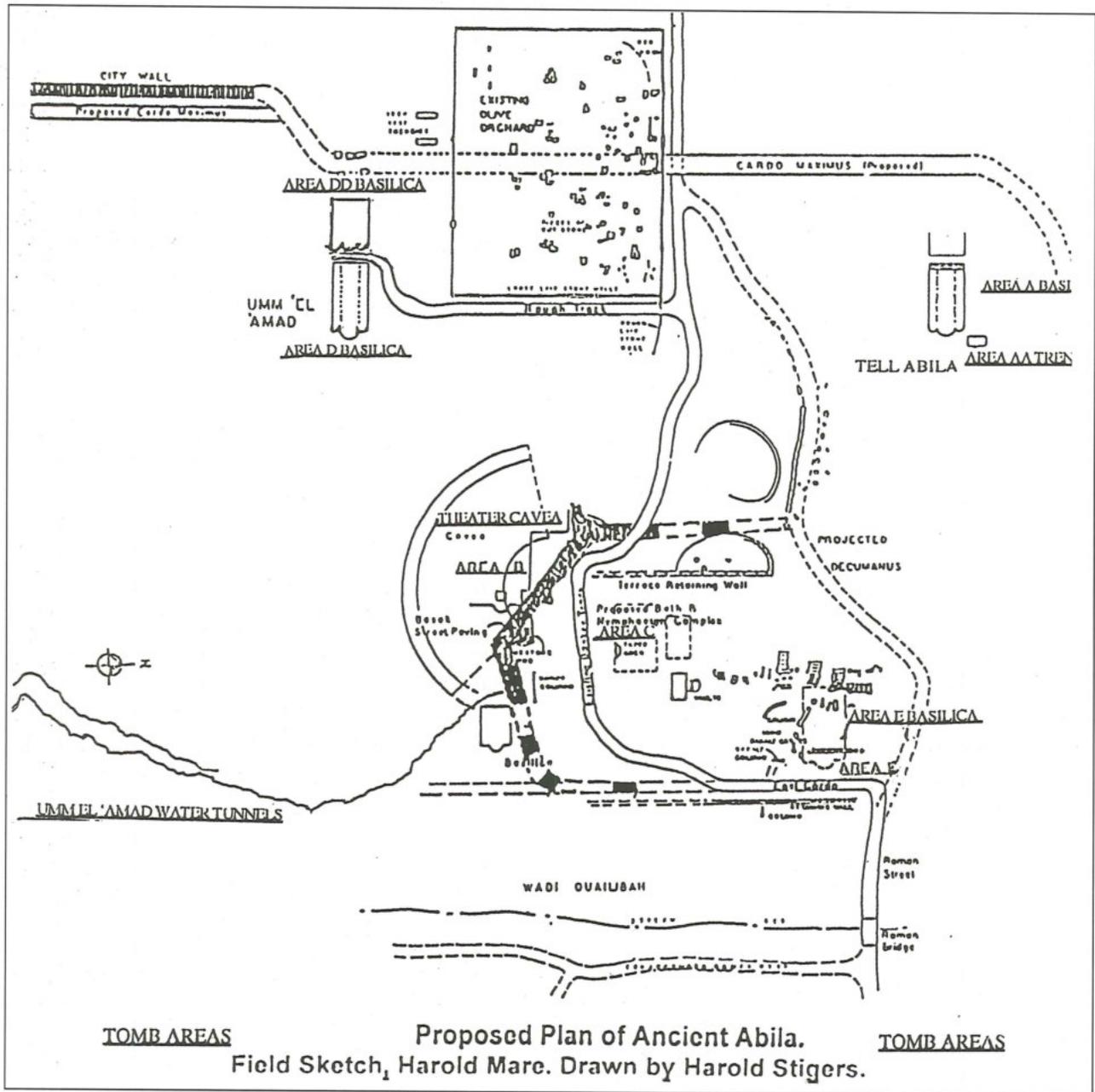
cation and Mrs. Hend Obeidat, Principal of the Girls School in Hartha, graciously allowed our American Staff to use the School, as its headquarters which was supremely adapted to the needs of our Staff.

## Objectives

The objectives set forth for the 1998 Season of excavation at Abila of the Decapolis had three major components: 1) to research into the physical materials available at the site of Abila (i.e., ceramic evidence, stratigraphic profile, architectural remains, human skeletal remains, geographical, faunal and floral evidence, numismatic specimens, inscriptional evidence, soil analysis, etc.), which would be of help in understanding the cultural history of Abila and the surrounding area; 2) to perform cultural resource management by conducting salvage archaeology, thus retrieving and preserving as much as possible of the physical remains exposed or disturbed by natural causes and by

1. The American staff included: Dr W. Harold Mare, Director, Dr John R. Lee, St. Johns Fisher College, Dr Clarence Menninga, Calvin College, Dr Robert W. Smith, Florida Christian College, Dr Susan Ellis, Heritage College, Mabton, Washington, Timothy Snow, Cincinnati Bible Seminary, George Van Voorhis, Alton, Illinois, Mary Van Voorhis, Alton, Illinois, C.S. Per Almquist, Covenant Seminary, Adam Chambers, Cincinnati Bible College and Seminary, as Senior Staff members. Staff members and their positions were as follows: Director, W. Harold Mare; Area Supervisors, Susan Ellis, Area AA; George Van Voorhis, Area B; John Lee, Area C; Mary Van Voorhis, Area D; Adam Chambers, Area DD; Clarence Menninga, Area E; Robert Smith, Tomb Area. Square Supervisors included Per Almquist, Thomas Andrea, Kent Arthur, Connie Arthur, Tina Brown, Matthew Coiner, Julia Christie, Maria Deutschmann, Heather Erickson, Mark Hansen, Judith Herzog, Paul Hill, Aaron Hill, Revkah Hill, Dr Dale Jarvis, David Kraus,

Dr Ryan Landvov, Donald Moore, Shannon Scheurer, Laurie Snow, Katherine Sunder, Dean Tlustos, George Vander Welt and Harrietann Weller. The Specialists were: Ceramicists, W. Harold Mare and Susan Ellis; Registrar, Mary Van Voorhis and Elizabeth Mare Assistant, Geoarchaeologist, Clarence Menninga, Photographer, Timothy Snow. The Support Staff included Wajeeh Karasneh, Department of Antiquities representative, George Van Voorhis, Camp Manager, the Cook and his assistant. The American Staff expresses its thanks to Dr Ghazi Bisheh, then Director-General of the Department of Antiquities Mr Wajeeh Karasneh, and all the Department of Antiquities staff for their dedicated efforts given to make the Abila 1998 season a resounding success. We also thank Dr Wesley Ulrich, M.D., and Aileen Coleman, R.N., for all of their help and kindness to the excavation, including the storing of the Abila archaeological equipment at the An-Nour Hospital in al-Mafraq, Jordan.



1. Plan of ancient Abila.

unlawful digging and looting both on the site (as in the churches, bath/nymphaeum, theater *cavea*) and in the necropolis; and 3) to conduct an intensive educational program consisting of semi-weekly instructional sessions in camp on various aspects of the history and archaeology of Jordan and the surrounding regions, and a wide-ranging touring program on week-ends to the important archaeological sites in Jordan. This educational program also included provision

for regular college or graduate school archaeological courses including a practicum in the field for which three to five hours of credit could be earned.

The 1998 Abila excavation accomplished the following results in the following areas of the site.

**Area R 5 (W. Harold Mare)**

From May 25 to June 6, in the preliminary probe in Area R 5 just east of the

Quwayliba stream, on the lower east side of Wādi Quwayliba, Professor Mare, with the aid of Wajeeh Karasneh, the Department of Antiquities representative and several workmen, completely uncovered the sculpted basalt "conch shell" shaped structure (2.95 m wide, and 2.70 m high, not counting the missing top stones which will complete the arch) located east of the Quwayliba stream which flows north in Wādi Quwayliba from 'Ayn Quwayliba. The surface remains of this structure had been detected in our work during 1997. All of the missing stones of the arch have been recovered in the debris, which, when replaced, will make the structure ca. 3.30 m high. The "conch shell" shaped structure, which faces west, is enclosed on the north and south by two earlier Hellenistic/Roman parallel walls, 3.00 m high, with courses that extend below the foundation level of the structure. Several meters west of the structure are remains of the entrance to the complex with a basalt threshold and door sockets *in situ*. In the beginning of the excavation, it was thought the structure might have been part of a mausoleum, though it does not continue down to a tomb entrance. It was also thought the structure might have been part of a nymphaeum (since there is a large cistern on the nearby hill). The fragments of Byzantine glass lamps that were found among the debris of the structure—like many such fragments which were found in the DD Byzantine church on Umm al-'Amad, and were used in polycandelae to light religious structures—suggest to us that this installation may have been a small enclosed Byzantine religious shrine.

The season of excavation began with an instruction period, followed by major excavation in the following areas: 1) on the north tall, Tall Abila, in Area A and Area AA; 2) on the south tall, Umm al-'Amad in Areas D and DD; 3) in the saddle depression in between the two tall in Areas B, C, and E; 4) and in the tomb area, on the

east side of Abila, along the east slope Wādi Quwayliba.

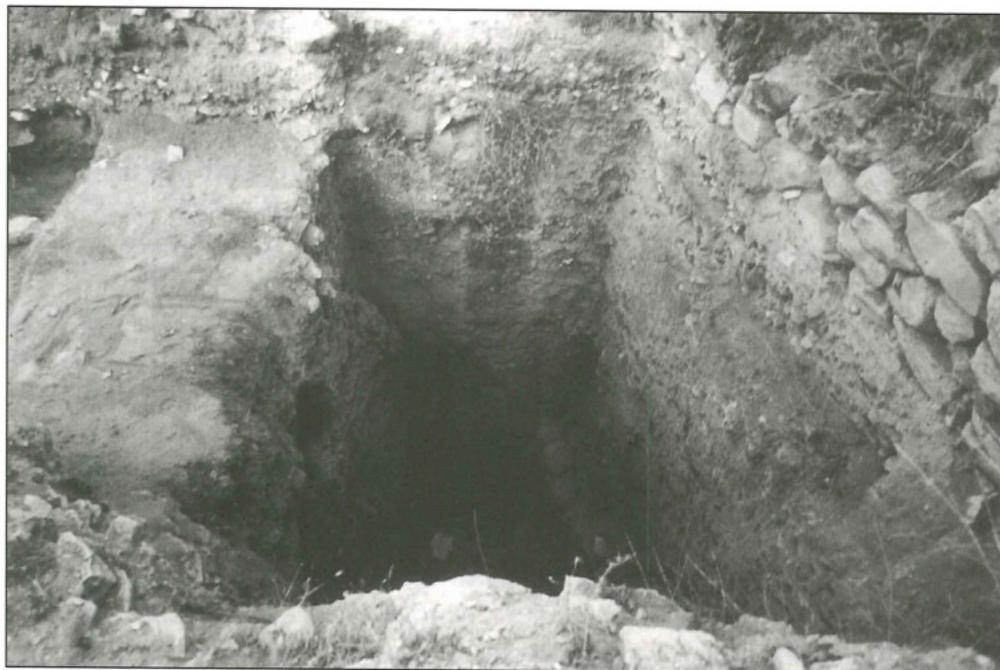
### **The Excavation on Tall Abila in the Area North of the Basilica and in the Deep Trenches to the Northeast of the Basilica, Area AA** (Susan Ellis)

On Tall Abila in Area A, the team probed farther along the north wall of the Area A basilica but did not find the two arms and head of the life-size white marble statue of Artemis, goddess of the hunt which we found in this area in 1994.

In the nearby Area AA, just to the east of the north apse of the Area A basilica, the team continued to find remains of Early Bronze, Middle Bronze, Late Bronze, Iron Age, Hellenistic, Roman, Byzantine and Umayyad walls and loci, including a Middle Bronze mud brick wall. In the deep trench of Area AA 1, an east-west Early Bronze wall was found in addition to two other stone installations located at bedrock 9.50 m below the surface of the soil (Fig. 2). Much of this Middle and Early Bronze material of squares AA 1, 5, and 15 represented domestic habitation; loom weights and part of an Asherah figurine were found. In addition, some Late Bronze and Iron Age pottery, were excavated. East of the main Bronze Age trenches in squares AA 8, 11, 25 and also in 15, the team found continued evidence of Hellenistic/Roman walls, with quantities of Hellenistic and Roman pottery. Farther to the east, the team investigated an area with two arches facing east. There was a secondary wall built against these arches at a later stage. Here, there was evidence of reuse of earlier architectural stone blocks of the Early Byzantine and Roman times, where the pottery found was basically Late Roman.

### **Tall Umm al-'Amad: Area D Basilica** (Mary Van Voorhis)

On Umm al-'Amad, the excavation team



2. Area AA, probe excavated to bedrock,

probed in three squares (D 80A, 79A and 81) located just south of the south wall of the seventh-eighth century Area D basilica. The purpose of the excavation was to uncover any further evidence of auxiliary service structures there. However, all that was found were soil layers and random rock fall. It was concluded that there are no additional service rooms on the south side of the church beyond those service areas located to the west and south of the monumental monolithic columns at the narthex of the church. Numerous tesserae were found in the squares excavated, in addition to pottery dating to Late Roman, as well as Early and Late Byzantine.

In a further effort to conserve and restore some of the Area D basilica one of the Department of Antiquities architects, with the aid of several of the Department's workers, helped reconstruct part of the Area D church and the three apses at the east end of the church by rebuilding two stone courses of the outside walls (Fig. 3: Area D restored Church).

### Tall Umm al-'Amad: Area DD Basilica (Adam Chambers)

In the fifth-sixth century Area DD basil-



3. Area D, restored church.

ica, (Fig. 4) located to the west of the seventh-eighth century Area D basilica, the excavation team sought to define further the north and south outer walls of the church, restore the main threshold area of the structure, and to try to find any narthex or atrium in the probe to the west of the main entrance of the church. In the probes at the north and south sides of the church, the team found that the church's south wall had been robbed out, the stones of which were in part evidently reused in the secondary rebuilding during the Umayyad period – there are numerous secondary walls enclosing rooms built within the basilica. A finely sculpted marble lintel also found in this sector was



4. Area DD church (foreground), Area D church (background).

with egg and dart, and, bead and reel decorations, reused in defining a secondary room within the church. In further excavating along the north wall of the basilica, the team again found that the wall had in part been robbed out for secondary building. In one of the excavated squares there, the team found an almost complete base of a sarcophagus (its design pointing to the Roman period) with lime mix residue at its bottom, indicating that it was used to mix lime mortar. In a probe west of the central threshold of the church, the team found no evidence of neither a narthex nor atrium.

#### **The Saddle Depression: Area B, The Theater Cavea** (George Van Voorhis)

At the civic center in the saddle depression, the team probed farther into the Area B theater *cavea*, uncovering at the central crest of the *cavea*, and ca. 2.00 m down, a large north-south and ca. 4.00 m wide arch (possibly an Umayyad structure connected with the Umayyad fortress/palace). Other walls or parts of walls running east-west and north-south were also uncovered. In a probe on the crest to the east of this central crest probe, the team discovered a water collection channel, but they were

not able to determine whether the large cavity exit found at the southeast edge of the *cavea* in 1997 continued around its back. In the orchestra and *scenae frons* area of the *cavea*, the deep probes, located to the north of the large mosaic plaza and a secondary east-west column drum wall, a well-constructed Greco/Roman wall was exposed. This wall extends ca. 4.00 m below the upper Byzantine/Islamic levels, down to bedrock, which is at a level of the Roman settling tank vaults of the nearby bath nymphaeum complex to the north. Besides Roman and some Umayyad and Abbasid pottery, the finds in this area included Roman-Byzantine lamps, and a number of coins, including a third century Late Roman Abila bronze coin (obverse, Emperor Elagabalus (AD 218-222); reverse, Abila temple, with inscription). It can be concluded that at this point of the excavation we have evidence which suggests that the Roman city was at a level that is considerably below the present surface of the soil fill accumulated in the civic center over the centuries.

In further excavating the Byzantine street which runs in front of the theater and then turns north just west of the bath/nymphaeum complex, it was found that the street con-

tinues to the foot of the south slope of Tall Abila and then seems to turn west, up the saddle depression to the west side of Abila, a road (the east-west Decumanus) which eventually runs under the vaulted arch which in turn supported the north-south road, the *Cardo Maximus*.

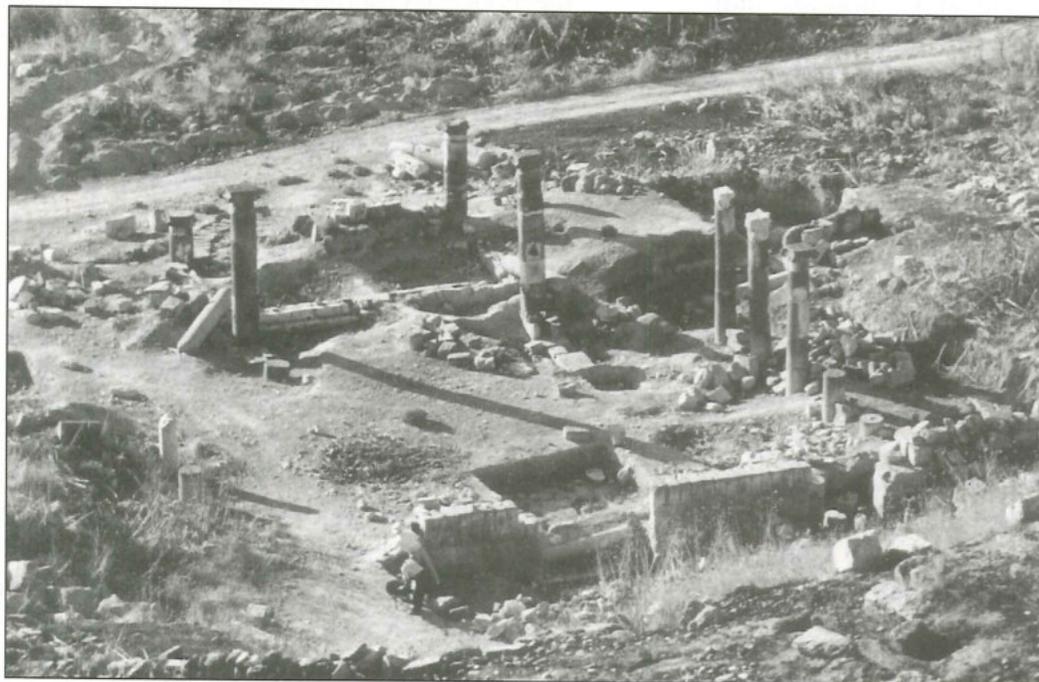
**Area C: the Bath/Nymphaeum Complex** (John R. Lee)

The ruins of the bath-nymphaeum complex lie to the north of the theater *cavea*. On the east side of the complex, the team excavated farther into the domed structure, which may well be part of the nymphaeum or another one of the structure's settling tanks. In the squares opened to the east of the domed structure, secondary column drum walls, stone floors and plastered surfaces were found, pointing to periods of habitation later than the original bath house. Excavation along the north-south retaining wall, extending north from the domed structure revealed evidence of a pool or cistern area, and a section of well-laid *opus sectile* flooring. Further excavation at these points is needed to show how these features relate to the main bath house. In the central part of

the bath house ruins (Square C 2) the team cleared away debris further exposing two columns which seem to rest on some floor of the structure.

**Area E: The Cruciform Byzantine Basilica** (Clarence Menninga)

In the ruins of the Area E Byzantine cruciform basilica (Fig. 5), near the Roman bridge, the excavation team further defined the outer north, south and west walls of the church. On the west wall of the church are five entrances to the church for each of the five aisles. These entrances are the main threshold for the nave, two thresholds for the south aisles, and two for the north aisles. The outside north and south thresholds are still blocked by stone and other debris, but excavation at the central and southern thresholds has continued to the floor level sections of the limestone pavement. Excavation has shown that the outside surface of the west wall of the church was revetted with marble facing. Along the south wall of the basilica, west of the side apse, the team found a secondary rebuild structure and a passageway in connection with part of a marble altar post with decorative carved de-



5. Area E, cruciform church.

signs. In the continued probe north of the north wall of the church and west of the side apse, the team found an additional threshold with flanking limestone columns in an auxiliary room complex. The limestone pavement extends north of the threshold ca. 8.00 m, and reaches to an east-west wall which was built on top of the pavement, indicating that the wall is a later construction. From the surface remains, it seems that this east-west wall extends ca 30 m west, to join at right angles with a massive north-south wall (ca. 5 m above the floor level of the church). This wall continues south and seems to be the retaining wall of the massive building (in ruins).

#### **Area H: Tomb Excavations along the East Ledges of Wādī Quwayliba** (Robert W. Smith)

In the Area H tomb area lying to the north and east of Tall Abila, along the east slope of Wādī Quwayliba, several installations and several Hellenistic-Roman-Byzantine tomb complexes and shaft graves were excavated. Among these, burial places included the following: a Late Hellenistic four loculi tomb complex (H 64) in which, among other late Hellenistic materials, a three-spouted Late Hellenistic lamp and two terracotta unguentaria were found; another tomb complex with six loculi (H 68), possibly Roman, which had been cleared of artifactual material at an earlier time; three shaft graves, including a Late Roman shaft grave (H 63) in which Late Roman sherds together with cooking pot sherds were found, another Late Roman shaft grave (H 66) which was sealed with stones over the lower part of the shaft (soil found in the grave suggests that the grave had been robbed), and a third Roman shaft grave (H 67), which had been closed with a stone, and evidently robbed in Mamluk times (two green-glazed sherds from a Mamluk bowl were found in the soil fill).

Among the installations, is a water col-

lection installation (H 62, possibly originally intended for grave use), a water reservoir (H 61; it was a plastered unit), and a possible animal water trough cut into the bedrock (H 70). Additionally, there is a large olive press, H 65, and what seems to be a smaller olive press unit (H 69) located only 15 m south of H 65. The subterranean olive press unit, H 65, (Fig. 6) has been cut out of the top ledge bedrock of the eastern bank of Wādī Quwayliba. It is a complex installation located among tomb and grave units, and next to modern olive groves. The underground unit is reached by a series of stairs cut into the bedrock, opening up into a large room, 7 m wide by 5 m deep and 2.50 m high. Along the side to the left of the stairway it contains a large circular cracker stone. A circular rolling stone is placed perpendicularly into the trough of the cracker stone. This circular stone was moved around the cracker stone by human manpower, or possibly by a donkey, in order to crush the whole olives into oily mash. The mash was then collected into woven baskets which were taken to an area in front, and to the right of, the stairs. There, it was placed between two stone slabs (one on the floor of the installation and another on top of the baskets) over which a 7 m long wooden beam, heavily weighted with two limestone blocks (the stones weighing almost 1000 kg) was lowered down to crush the olive mash in the baskets. The olive oil then flowed down through grooves and into a plastered cistern. Here the olive oil, possibly mixed with hot water (a small oven was found at the head of the installation's stairs), was cooled and any floating olives were skimmed off. It was then poured into pottery jars or into plastered cisterns. Along the edge of the installation's central chamber two cisterns were cut into the bedrock and plastered: one holding ca. 2600 liters, and the other, holding ca. 1200 liters. Olive oil stored in such cisterns would have kept at a cool, constant temperature, helpful for the



6. Area H, olive Press.

extended preservation of this useful commodity. Installation H 69, close to H 65, is a small olive press, with a collection pit which would hold only 21 liters.

At present, the Iron and Bronze Age cemetery, which must have been extensive at Abila – evidenced by the large quantities of pottery sherds of these periods has not yet been delimited. From the time we started our work at Abila in 1980, and until now, 94 tombs have been excavated (88 from 1982 through 1997, and 6 in 1998), as well as tomb complexes and graves (representing periods from Middle Bronze through the Late Byzantine). In addition, tomb mapping

was conducted and a number of installations in the tomb area were excavated, including a pottery kiln (H 36, Abila 1992) and the underground olive press complex (H 65) described above.

We look forward to do further excavating, conserving and restoring to Area E cruciform basilica in 1999 and to our twelfth season of the Abila of the Decapolis excavation in 2000.

W. Harold Mare  
Covenant Theological Seminary  
St. Louis, Missouri, 63141  
USA

# TOWN AND VILLAGE: SITE TRANSFORMATIONS IN SOUTH JORDAN (THE GHARANDAL ARCHAEOLOGICAL PROJECT, SECOND SEASON REPORT)\*

by

Alan Walmsley, Philip Karsgaard and Tony Grey

With Contributions by Malcolm Choat and Kim Barrett

## Project and Season Objectives

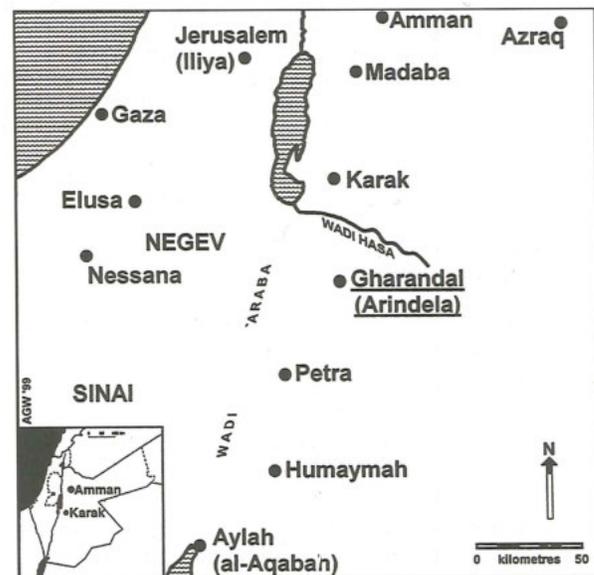
The principal aim of the Gharandal Archaeological Project is to investigate the nature and extent of human settlement in south Jordan, especially the causes, processes and degree of change in that settlement, between Classical Antiquity and the Islamic Middle Ages. The applied approach is interdisciplinary, drawing on a wide spectrum of archaeological and historical sources, and specifically features the archaeological excavation and survey of a large urban site and a reconnaissance of its immediate hinterland. The research program is set to produce new and verifiable information on urban conditions, economic activities, urban-rural relations, land use patterns, diet, settlement and population change in the transition from Antiquity to the Islamic Middle Ages. Particular focus is placed on understanding major variations to urban and rural settlement patterns over a millennium (roughly second to thirteenth centuries CE), specifically the important issues of 'town' and 'village', 'urban' and 'rural'.

The absence, until recently, of any serious work on south Jordan in Late Antiquity and the Early Islamic period is attributable to the entrenched perception that this region is geographically isolated and historically irrelevant. Now, seen as a highly erroneous nineteenth-century European view, it has been successfully challenged and essentially overturned by an increasing number of major regional surveys and site excavations.<sup>1</sup>

\* Illustrative material by Hugh Barnes and Judith Sellers

1. Note especially the important survey work of, among others, D. Graf, G. King, and B. MacDonald (e.g. Graf 1992; King 1985; MacDonald

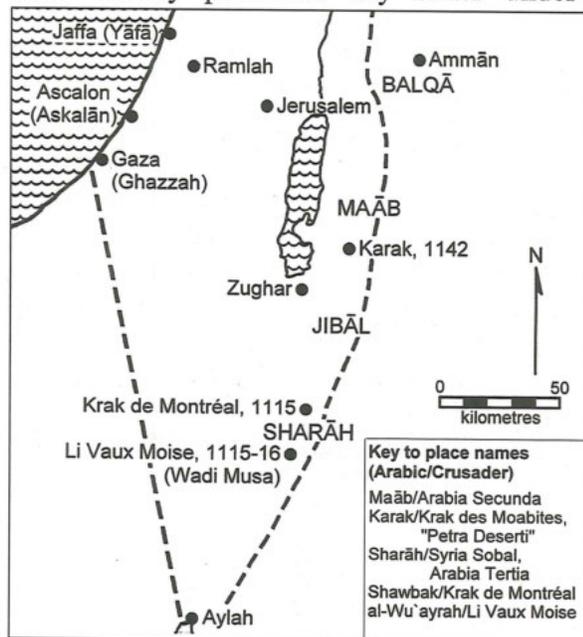
Gharandal (Byzantine Arindela, Early Islamic 'Arandal; Fig. 1) and its district of al-Jibāl rose to prominence in Late Antiquity and Early Islamic times, ranking third in the Byzantine province of *Palaestina Tertia*. The district surrendered early to the Muslim armies, after which it formed part of the extensive Province of Damascus (*Jund Dimashq*). However by the tenth century Ruwāth had replaced Gharandal as the chief centre of al-Jibāl and literary sources note the dominance of the "Arabs" (Bedouin), suggesting major developments in socio-political conditions. Al-Jibāl and the neighbouring district of ash-Sharā to the south are also conspicuous in the later Islamic and Crusader sources. For almost nine decades (ca. AD 1100-1188) both were ruled by the



1. The location of Gharandal (Arindela), at-Ṭafilah district, Jordan (Walmsley 1999).

1988; 1992), and the recent archaeological discoveries at individual sites such as al-Ḥumayma and 'Aqaba (e.g. Oleson 1997; Whitcomb 1997; 1998).

Latin Kingdom of Jerusalem, becoming part of the fiefdom of al-Karak after the construction of the castle at al-Karak (Fig. 2). The Islamic sources, for instance Ibn al-Qalanisi and al-Dimishqī, describe from the Arab viewpoint the struggle for domination over al-Jibāl and all south Jordan, and its social, economic and religious reconstruction after the expulsion of the Crusaders in 1188.<sup>2</sup> Clearly these sources collectively demonstrate the folly of older opinions that propose the virtual abandonment of settled life after the Islamic conquest. However their brevity precludes any fuller under-



2. South Jordan in the Crusader period (Walmsley 1998).

2. Critical for Jordan in the twelfth to fourteenth centuries are the journals and geographical works of Abū'l-Fidā' (1983), Dimishqī (1923), Fulcher of Chartres (1969), Ibn al-Qalanisi (1932), Ibn Jubayr (1952), William of Tyre (1941a; 1941b), to which can be added the great geographical dictionary of al-Yāqūt (*Mu'jam al-Buldan*).
3. The Gharandal Archaeological Project is a collaborative undertaking with the Department of Antiquities of Jordan, in affiliation with the Council for British Research in the Levant (in Amman: the British Institute at Amman for Archaeology and History). For the first season report see Walmsley (1998).
4. Staff for 1998 were: Dr Alan Walmsley (Project Director, Australian Research Fellow, University of Sydney), Mr Imad al-Droos (Department of An-

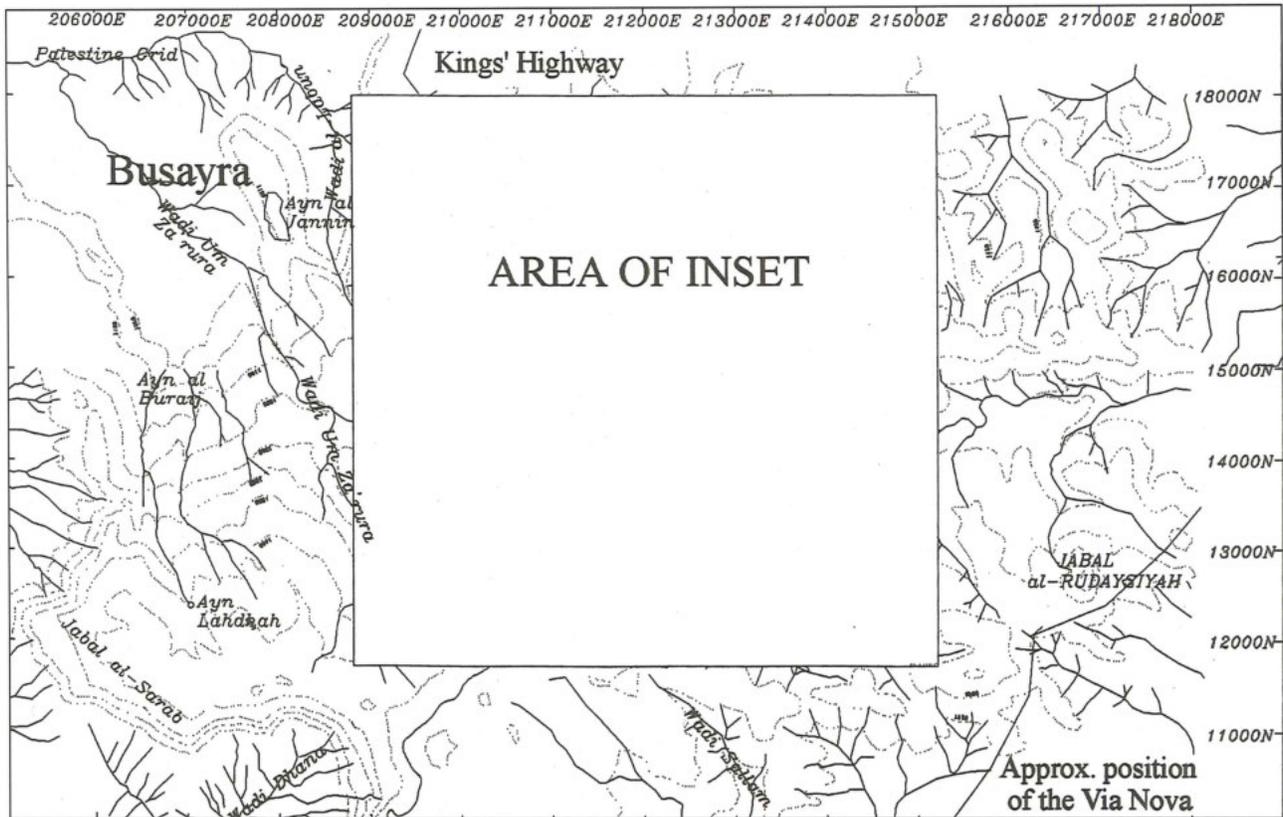
standing of social developments between Late Antiquity and the Islamic Middle Ages, and it is in this area that archaeology can make a major social historical contribution.

The archaeological site of Arindela / 'Arandal is strategically located in the upper eastern reaches of a wide valley, midway between the 'Kings Highway' and the *Via Nova* (Figs. 3 and 4). A perennial water source at the foot of the site irrigates agricultural fields that fan out in the valley below to the west. Grapes, apricots and figs are the major crops. Only about one fifth of the site is preserved, with the rest being built over in the last three decades by modern housing (Fig. 5).

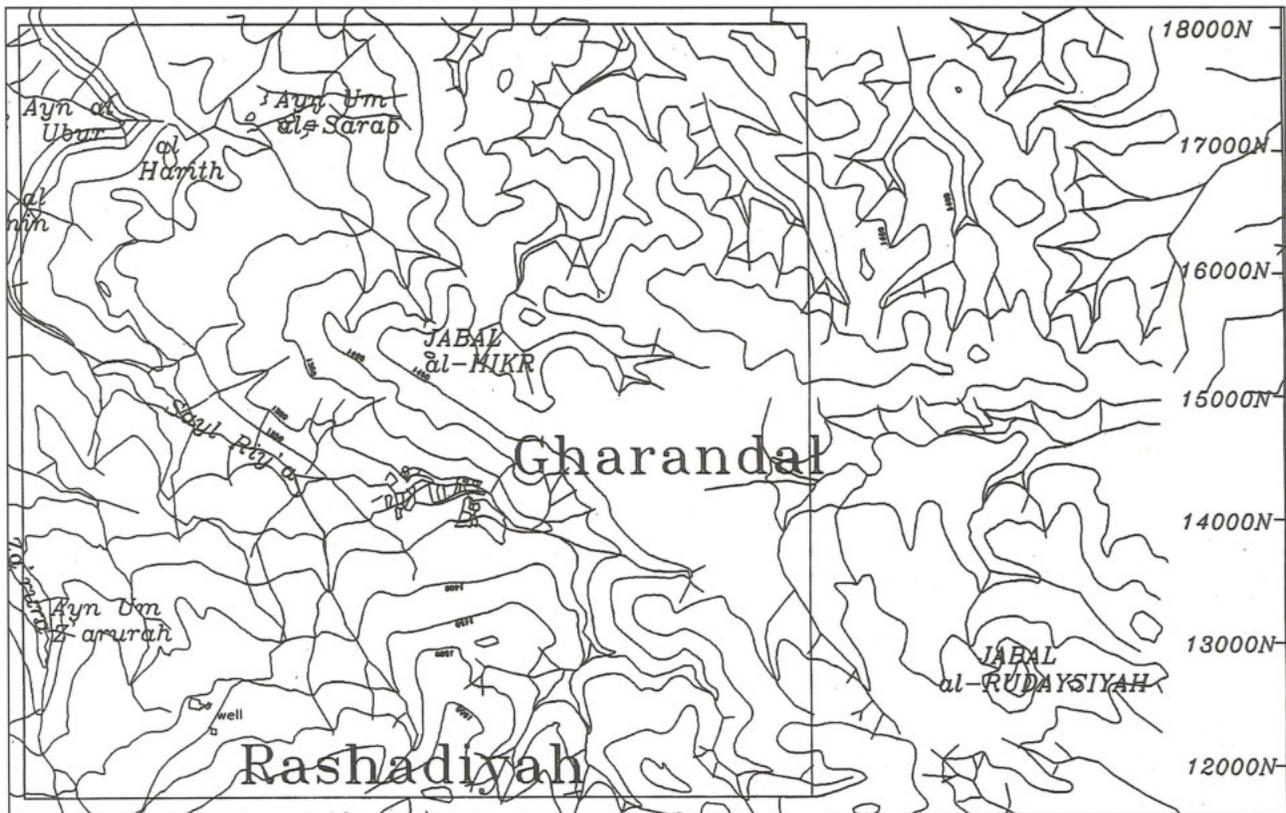
The second season of archaeological investigations at Gharandal was undertaken between 16 May and 9 July 1998.<sup>3</sup> The work comprised seven weeks of excavations in the Department of Antiquities area and survey work around Gharandal, and a subsequent week of post-excavation work in the field and the dig house. A team of twelve undertook the work.<sup>4</sup> The specific objectives of the 1998 season were as follows:

1. To continue ongoing investigations into the constructional sequence, architectural features, and post-ecclesiastical history of the Byzantine church (Area A, Fig. 6), probably the cathedral of Arindela.
2. To initiate excavations at a large double-enclosure on the summit of the site, south

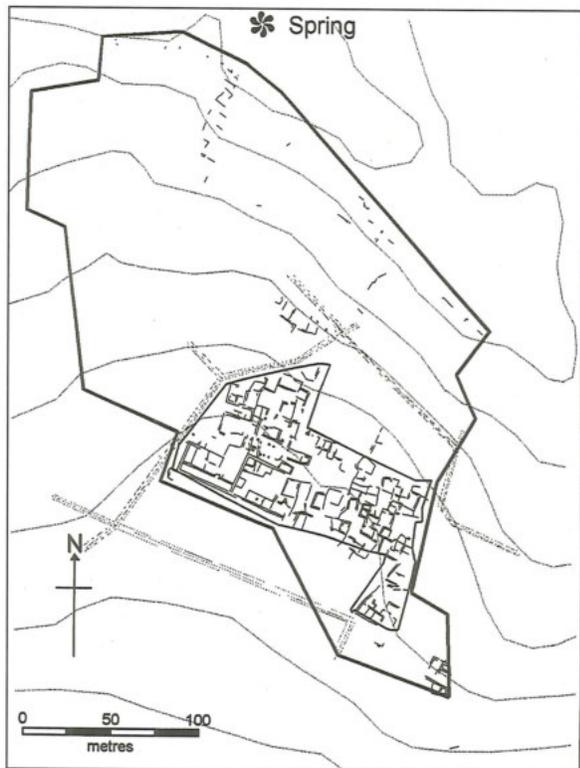
tiqities Representative), Mr Hugh Barnes (Surveyor), Ms Kim Barrett (Field Archaeologist, University of Sydney), Mr Malcolm Choat (Field Archaeologist, Macquarie University, Sydney), Ms Yara Doleh (Archaeological Assistant, British Institute at Amman), Mr Tony Grey (Ceramicist), Mr Philip Karsgaard (Head Field Archaeologist), Ms Judith Sellers (Illustrator, Australian National University, Canberra), Ms Noël Siver (Conservator and Project Administrator), Mr Barnaby Skinner (Archaeological Assistant, British Institute at Amman), Dr Rachael Sparks (Registrar, University of Sydney). The dig cook was Hassan Rahmi. A workforce of 15 was employed in the field, and was made possible by the considerable financial support of the Department of Antiquities of Jordan.



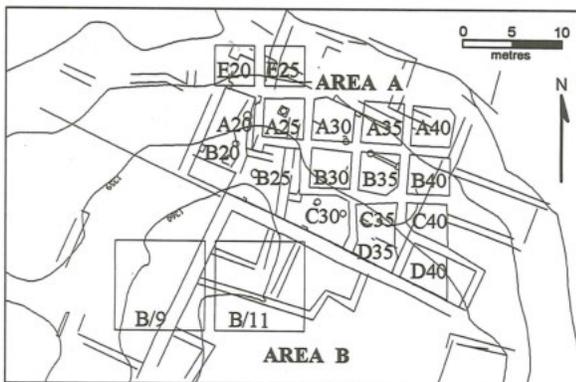
3. The Gharandal Catchment area, showing the approximate line of the *Via Nova* and the Kings' Highway (Barnes 1998).



4. Detailed map of the environs of Gharandal (Barnes 1998).



5. Contour map of Gharandal, showing original extent of site and current antiquities area (Barnes 1997-98).



6. Map of central antiquities (DOA) site showing location of excavations in Areas A and B (Barnes 1997-98).

of and earlier in date than the church (Area B). Excavation of the church revealed that it had been built against a massive stone wall, seemingly either Nabataean or early Roman in date. This wall formed part of a larger double compound measuring 65 x 25 m, the outer walls of which stand above ground to the south and west.

3. To develop a stratigraphically linked ce-

ramic sequence from the Late Roman to Islamic periods. This basic work is crucial for the accurate interpretation of regional survey data in the region. The historically questionable results from many surveys in southern Jordan reflect the absence of a reliable and fully published pottery sequence.

4. To document in plans the standing remains at nearby Ruwāth, a historically important site now seriously threatened by agricultural and building developments. The extensive ruins, all undated, feature major wall lines and two tower-like structures, possibly military/defensive in purpose.

## RESULTS

**Area A: Church** (Supervisor: Malcolm Choat, assisted by Barnaby Skinner and Yara Doleh) (Fig. 6)

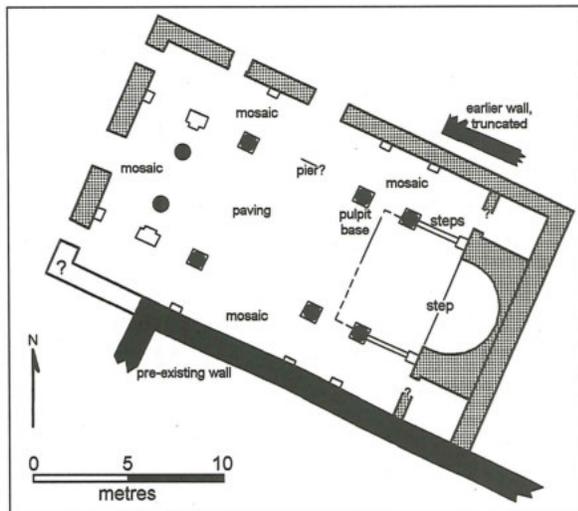
This year's work concentrated on defining and ascertaining the architectural features of the sanctuary and apse area of the church, paying special attention to periods of subsequent occupation in the area. As in last year's report, the five phases of occupation in the church are presented in Table 1 (with slight adjustments to dates), but this phasing has no relevance to occupation over the rest of the site.

*Church Level 5: Construction and Use* (Fig. 7)

*The Apse:* The Gharandal church is a mono-apsidal basilica with two rectangular rooms flanking the central apse. Internally constructed of finely dressed masonry, the apse did not protrude beyond the external face of the church's east wall, which consequently presented a plain straight façade to the east. Within the church, the apse had the unusual feature of a full step up in line with the inner face of the east wall. The raised floor of the apse thus produced was paved with flagstones, which are poorly preserved. On ei-

**Table 1.** Provisional levels and archaeological features in Area A.

	<i>Features</i>	<i>Date</i>
<b>Level 1</b>	Post-occupation collapse.	?Seventeenth–twentieth centuries
<b>Level 2</b>	Houses. Thick uncoursed two-faced stone walls, doorways, packed earth floors, tabuns.	Fourteenth–?sixteenth centuries
<b>Level 3</b>	Houses. Uncoursed stone walls.	Eleventh–thirteenth centuries.
<b>Level 4</b>	Yellow clay fill within church; dividing walls; build-up.	c. Late eighth/ninth to tenth centuries.
<b>Level 5</b>	Monoapsidal Church with nave paving and mosaics in the aisles and narthex.	c. Fifth–eighth centuries.



7. Block plan of the Gharandal Church. Solid walls were pre-existing (mod. Barnes 1998).

ther side of the apse was a substantial pier, and these served as the eastern terminus for the flat lintels of the aisle colonnades in the body of the church. Beyond the piers, on both sides, doorways led from the aisles into the two small rooms that flanked the apse.

*The Sanctuary Platform:* Extending deeply into the nave of the church is the raised sanctuary platform, which was approached by three steps from the nave to the west and two steps from the aisles to the north and south. These have been preserved on the nave side and facing the north aisle. Slots for the sanctuary screens and posts can be clearly seen in the stonework edging the sanctuary on the

north side. Extensive remains of floor mosaics are preserved along the north and west parts of the sanctuary. The mosaic is plain on the north, but presents a simple, yet appealing rectangular pattern facing the nave on the west. A disturbance in this mosaic suggests that an altar stood on the platform in front of the apse, and this is confirmed by the absence of mosaics in the platform centre adjacent to the apse step. However, this area was paved with well-cut triangular stone including marble/calcite.

At the northwest corner of the sanctuary was a large flat base that served for a major piece of church furniture was discovered. Constructed from two flat stones, the base projects deeply into the nave to a point, roughly in line with the second row of pillars west of the sanctuary. The nave paving terminates at the base, suggesting it is an original feature of the church. The base exhibits three (of probably originally four) sockets cut in a hexagonal shape, which were almost certainly intended to hold colonnettes (probably for a pulpit, like in the Petra church), especially as one still preserves the lead bonding used to securely hold the insert in place.

*Church Level 4: Dismantling of the Church*

In the sanctuary area, the dismantling of

the church resulted in an extensive demolition of the apse and sanctuary platform, including the total removal of the screens. Many screen fragments were found in earlier seasons, suggesting an intentional demolition of the church's apse. The body of the church and the steps leading into the sanctuary and apse were deliberately filled with a yellow clayey soil to create a reasonably level surface. Roof tiles were found extensively in the fill, suggesting that the church roof was removed (or repaired) at this point. Roof tiles are commonly found in levels above the fill, suggesting possible re-roofing at the time the fill was laid down.

The date of this dismantling/conversion phase is unclear. However the absence of any type of handmade wares in the fill suggests a date before the eleventh century CE, but the identification of red painted early Islamic pottery equally suggests a date not before the mid-eighth century. Thus, a roughly ninth-tenth century date for the demolition of the church can be suggested.

### *Church Level 3: Construction of Domestic Structures*

This phase typically involved the construction of stone walls for domestic occupation directly over the yellow fill and, in the sanctuary, usually directly onto the surface mosaic and apse paving. The question as to whether the yellow fill was laid immediately for the construction of these walls or served some other purpose is still unresolved. Notably, the sanctuary mosaics do not appear to have been exposed for any long period of time before being built over, suggesting that the time period between laying the yellow fill and building the walls was quite short.

The earliest surfaces associated with these walls include the first hand-made pottery. The vessels are thinly bodied and fired hard with the use of much chaff as temper, displaying red-orange to light brown faces and

black cores. No paint is attested. This type of pottery compares well with the later eleventh century CE varieties from 'Amman Citadel and Ayla/'Aqaba, and likewise probably dates to the latter part of the eleventh century.

Associated with the first handmade wares are:

1. moulded lamps including a beautifully executed "arcade" style with arches resting on double columns and with vine scrolls above;
2. wheel made wares including a jug with a tall, thin narrow neck and a long handle in a grey metallic ware (no paint or combing evident);
3. cream ware sherds with evidence of body paring ("Abbasid-Fatimid").

Later floor levels in these same houses have produced the first painted handmade wares. The paint is thick and sometimes bulgy, and bright red in colour. The decoration is linear, comprising wavy lines, dots and droplets. This pottery compares well with Robin Brown's twelfth century ash-Shawbak ware ("Crusader"), and should be of a similar date.

Shortly after, and in levels immediately above those with the linear handmade ware, the first geometric painted ware appears. However, the painted decoration is still very red in colour and applied to a similar, if thicker, fabric to the Shawbak linear ware. This pottery would appear to be a precursor to Hand Made Geometric Painted Ware (HMGPW).

### *Church Level 2: Modification of Domestic Structures*

The upper levels exhibit considerable modification to standing domestic structures and the insertion of new wall lines. The pottery associated with this occupation is "classic" HMGPW, and would appear to have a very long life. At this point earlier and later varieties cannot be distinguished, although the earlier decoration appears more "refined".

*Church Level 1: Post-occupational Collapse and Subsequent Usage*

After a long period of occupation, the Level 2/3 houses within Area A were abandoned. The absence of Ottoman pipes suggests they were deserted some time before the seventeenth century. The houses, being generally of relatively poor construction (especially those of Level 2), probably collapsed within a few decades of abandonment. A few rough walls, almost at ground level, would indicate some type of subsequent use of this area (stock herding, temporary winter shelters?), but seemingly not for prolonged village settlement.

**Area B: The Double Enclosure** Supervisors: Kim Barrett (B/9), Philip Karsgaard (B/11) (Figs. 6 and 8)

The exploration of the large double compound on the summit of Gharandal was a major initiative in 1998.

At the highest point of ancient Gharandal stands the impressive remains of a large double compound, probably of later Nabataean or early Roman date (first-second century CE), judging from the masonry. The massive constructional style of the outer and dividing walls share much in common with Khirbat adh-Dharih, Khirbat at-Tannur and, especially, the "Great South Temple" of Petra. The intention this year was to commence

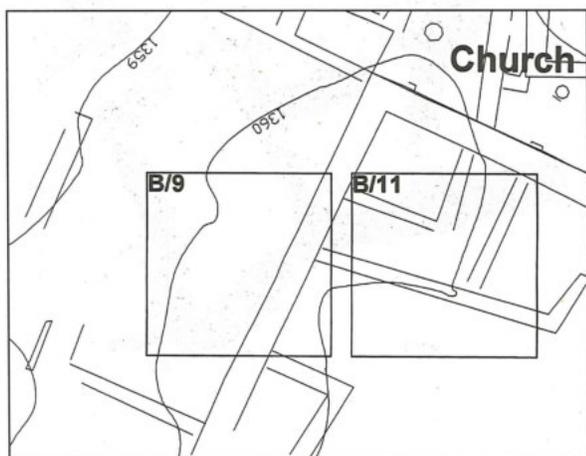
an archaeological section across the central dividing wall, thereby probing both enclosures to the east and west of this wall. Two 10x10 m adjoining squares, labelled B/9 and B/11, were laid out to span the central dividing wall (Fig. 8). The top course of this wall, still partially exposed above ground level, displayed evidence of a major rebuild. Sections of engaged and circular columns, probably recycled from this same building, were laid end on to increase the wall height. Other stonework also suggested at least one major phase of wall rebuilding.

Similarly, prior to excavation it was immediately apparent that there had been considerable later reuse of space within the building, evidenced by late internal dividing walls that mostly ignored the symmetry of the compounds.

*Square B/9*

This season was largely devoted to removing a thick deposit, over 2m deep, against the west face of the central dividing wall, of wind blown ash and dumped rubbish. Three phases can be identified, with a fourth that has just commenced.

1. Infant burials, which had been placed in shallow pits cut into a wind/dump deposit (phase 2). These can be dated to the recent past. One burial included two iron bracelets and a bead necklace made from carnelian, jasper and a red wood resin.
2. The wind/dump deposit of layered dark grey ash and a harder yellow organic material. The upper layers butted up to the rebuild of the central dividing wall, and hence they must post-date this activity. Considerable bone and pottery (especially HMGPW) was recovered from these levels.
3. The first architectural phase, represented by a frugal wall running north - south, a small round room abutting this wall, and a pit. The pottery recovered seems unchanged from phase 2.
4. A major north - south wall built roughly



8. Location of squares B/9 and B/11 in the Double Compound of Area B (Barnes 1998).

parallel to the central dividing wall. The space between the two walls was filled with numerous stone blocks - many dressed and obviously from other buildings - and bright yellow earth. The purpose of this construction is unclear at this point. Interestingly the pottery is very different from that recovered in the levels above, being mostly wheel made and sporting an orange-brown bloom. However some early handmade sherds were recovered, but no painted types. This would suggest, very provisionally (and tantalisingly), a late eleventh to twelfth century date for this major construction.

*Square B/11*<sup>5</sup>

Square B/11 lies to the south of the church and the monumental north wall of the Double Enclosure that the church abuts. It also lies to the east of the dividing wall of the Double Enclosure (Figs. 6 and 8). The square was thus positioned to catch any occupation relating to the use and reuse of a portion of the Double Enclosure.

Several wall lines were apparent on the surface of the square, and the first feature of this area of excavation was the enormous amount of stone tumble and rubble that had fallen off the surrounding walls. The first task was defining the wall lines through the removal of tumble. Once most of the walls were defined, excavation was concentrated mainly in the north-western area of the square, leaving especially the area along the southern edge of excavation as well as that along the eastern edge of the square unexcavated. From quite early on in the season, it was realised that maintaining a baulk between squares B/9 and B/11 in the northern half of the square was almost impossible. Hence, excavation was carried out right up to the main dividing wall of the Double Enclosure (wall 1), north of wall 3.

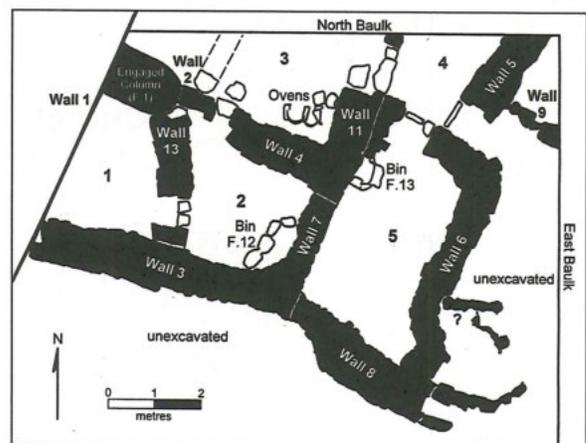
Also, almost immediately apparent was

the distinction in the use of space on either side of B/11 wall 1 (= B/9 wall 1). B/11 showed intensive architectural occupation, while B/9 seems to have remained almost as an open space in the latest phases.

The earliest features in the square, the massive wall 1 and the associated engaged column (feature 1), are very probably Nabataean/Roman in date (ca. first or second century). The most recent 'use' of the area may perhaps be characterised by a 'magical text', a modern charm deliberately buried at the site. Most of the material excavated during this season, however, appears not to reach earlier than 'Mamluk' occupation.

Some nine 'phases' may be tentatively identified, and again at this early stage only refer to the sequence in this square.

- I. Phase I is a profound abandonment phase, characterised by much tumble with windblown material and modern detritus.
- II. Phase II is somewhat more amorphous. It is represented by tumble that possibly fell onto an ill-defined level or surface, but there is no secure evidence for any substantial occupation. It may represent simply 'seasons of tumble' which appear to form horizons/surfaces, but may also slide into 'low-use' surfaces where actual oc-



9. Square B/11; principal features (mod. Karsgaard 1998).

5. The following section is an edited version of Philip Karsgaard's end of season report.

- cupation is difficult to pick up.
- III. Phase III is a solid later Islamic occupational phase spread over five rooms (Fig. 9). It is clearly represented in room 3 by two rectilinear ovens and a very compact and secure surface associated with them. This phase is further characterised by a storage bin in room 2 and, in room 5, a small storage bin and a solid mud plaster yellow surface edged with stone. However even in this period of apparently heavy occupation, the surfaces within rooms 1 and 2 remained elusive; there was not, for example, an obvious surface associated with the bin. It is assumed that these rooms, therefore, were used for storage, as the narrow doorway would also suggest.
  - IV. Phase IV is simply defined as occupation/stratigraphy dug in room 2 below the bin of phase III. Perhaps the most secure of the loci from this phase is locus 61, a putatively partially plastered floor butting wall 13, probably that wall's primary surface. Again, however, the deposits in this room remain enigmatic, so much so that no very good primary surface for wall 4 was identified on its south side.
  - V. Phase V is the main late architectural phase in the square. The precise chronological relationships between the walls are difficult to establish, especially given the lack of excavation throughout the south and east of the square. Nevertheless, it may be stated that walls 5, 8, 9 and 13 are later even within this phase. Wall 5 seems to have been built down a slope and seems quite late along with its butting wall, wall 9. Wall 8 butts wall 3 and so must be later, as does wall 13. Perhaps earlier in this phase are walls 3, 6 and 7. Walls 7 and 3 are bonded, and so should be contemporary. Wall 2 seems problematic as to its exact chronology. It is later than wall 4, but probably contemporary with wall 13. It appears to be a rebuild to form a narrow doorway with wall 4, so perhaps it is contemporary with the building of the western room up against walls 4 and 11.
  - VI. Phase VI includes the bonded walls 4 and 11, the earliest except for wall 1 of the double enclosure. Excavation to the north of the walls, and in room 5, is needed to confirm this.
  - VII. Phase VII is solely represented by locus 50, which apparently underlies wall 4, and is thus assumed to be a deposit predating all the above. Note also that wall 3 may be built upon an earlier wall. Hence, locus 50 may be associated with wall 3's predecessor.
  - VIII. Phase VIII is probably the earliest post-Nabataean phase, and is represented by feature 18, the blocking of the doorway through wall 1, and perhaps the rebuilding onto the top of wall 1.
  - IX. Phase IX is the architectural Nabataean phase represented by the massive wall 1 and feature 1, the engaged column.

### The Finds

As predominantly domestic levels were encountered this year, the ceramic finds consisted of pottery including much HMGPW, and a large range of non-ceramic objects in stone, iron, glass, copper and bone. Initial inspection of the coins has identified Nabataean (especially Aretas IV), Roman, Arab-Byzantine and Mamluk issues, but further cleaning and identification of the coins is required before a complete list can be offered. Architectural fragments were also recovered in considerable numbers.

As already noted, an important objective of the Gharandal Archaeological Project is to build up a stratigraphically and chronologically tied pottery sequence for the highlands of south Jordan, a resource desperately needed. Such ceramic "chrono-typologies"

can serve as a valuable tool in the writing of a social history, offering vital information on areas of production and lines of trade, cultural regionalism, and contributing to broader issues of social identity and change. Material culture is also, perhaps, a most useful tool to address the issue of whether transitional societies are passive or active in the response to change. Although it is still early days in the study of the Gharandal pottery, some major discoveries in the ceramics of south Jordan are worth noting at this stage.<sup>6</sup>

### The Pottery (Figs. 10-12)

Most of the pottery studied to date has been from the Church (Area A), recovered during the 1997 and 1998 seasons. All excavated pottery was retrieved with the aid of sieving, and all was retained. This has enabled tiny eggshell thin sherds to be retrieved that would otherwise not have been noted. Individual ware and form types were catalogued and the ware types quantified by sherd count for each context.<sup>7</sup>

To date, 48 ware types have been tentatively assigned, subject to confirmation by further study including petrologic analysis. A ceramic sequence for sherds found within the church has been developed, commencing with the deposits on the floor following the termination of the church as a place of worship and its subsequent incorporation into secular village structures. The dating of the end of the building's use as a church appears to be eighth century from the ceramic evidence. Residual material from the Iron Age, Nabataean and Roman periods is present in some layers. The sequence is terminated by the cessation of village settlement in the late Middle Islamic, tentatively dated pre-seventeenth century. The evidence shows an absence of Ottoman smokers' pipes.

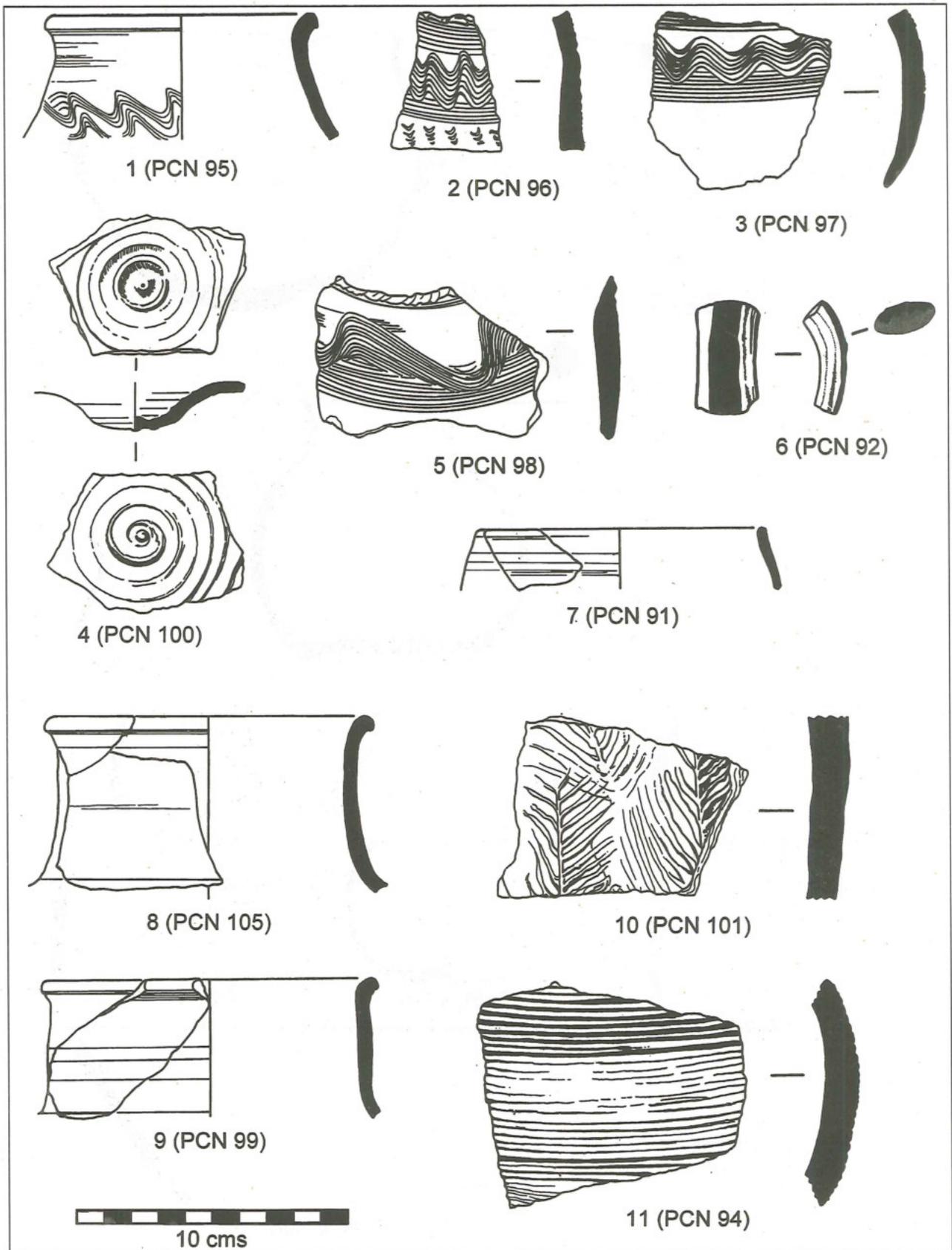
Within the church sequence, two important groups have been isolated. The first is a single-phase deposit from the yellow fill directly overlying the paving and mosaics of the church floor (Walmsley and Ricklefs 1997). The ceramics in this layer appear to form a closed group with no earlier residual and no later intrusive material. A detailed, contextual analysis of this material has identified regional styles distinctive to the south, but fortunately with datable links to the well established north-Jordan sequence. Prevalent are various jar types in a sandy fabric, with extensive body combing and fired to a mostly light colour of red, reddish yellow and very pale brown to light and pinkish grey (Fig. 10: 1-5). The prevalence of light surface blooms and combed decoration on the pottery could easily be mistaken as Byzantine, but the context is clearly early Islamic. Apart from the post-church context, Red Painted ware is also present (Fig. 10:6), dated to the eighth and ninth (plus?) centuries in north Jordan. Also present is "Fine Byzantine Ware" (Fig. 10:7), in a type common from 'Abbasid contexts further north (Walmsley 1991; 1995). Also represented are tall necked jars (Fig. 10:8,9) and handmade amphora, including a type with stamped palm decoration (Fig. 10:10,11).

The second group consists of a sequence beginning in the later tenth or early eleventh century and continuing into the thirteenth century. An important component of this sequence is the handmade wares, initially appearing in a thin-bodied variety made from a heavily chaffed fabric, but without any painted decoration (Fig. 11). However, found in the same contexts are wheel made wares, including cooking jars (Fig. 12: 1, 2), and extremely fine moulded lamps (Fig. 12:3). Based on finds from 'Aqaba and 'Amman

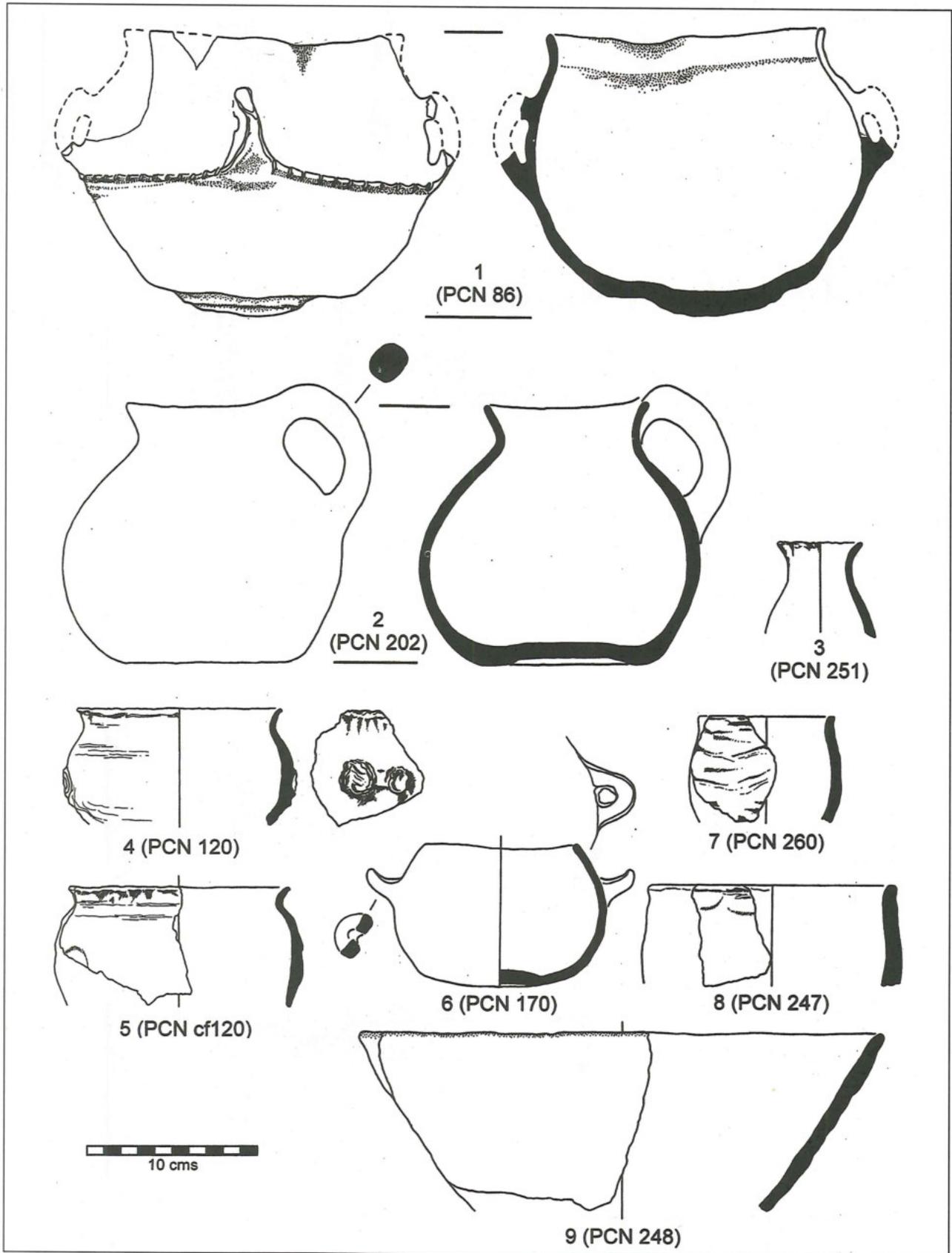
6. This pottery report includes material drawn from a more detailed article being prepared for the journal *Levant* by the Project ceramicist Tony Grey.

7. Data were entered into catalogue and layer proforma sheets designed by the Project registrar Ra-

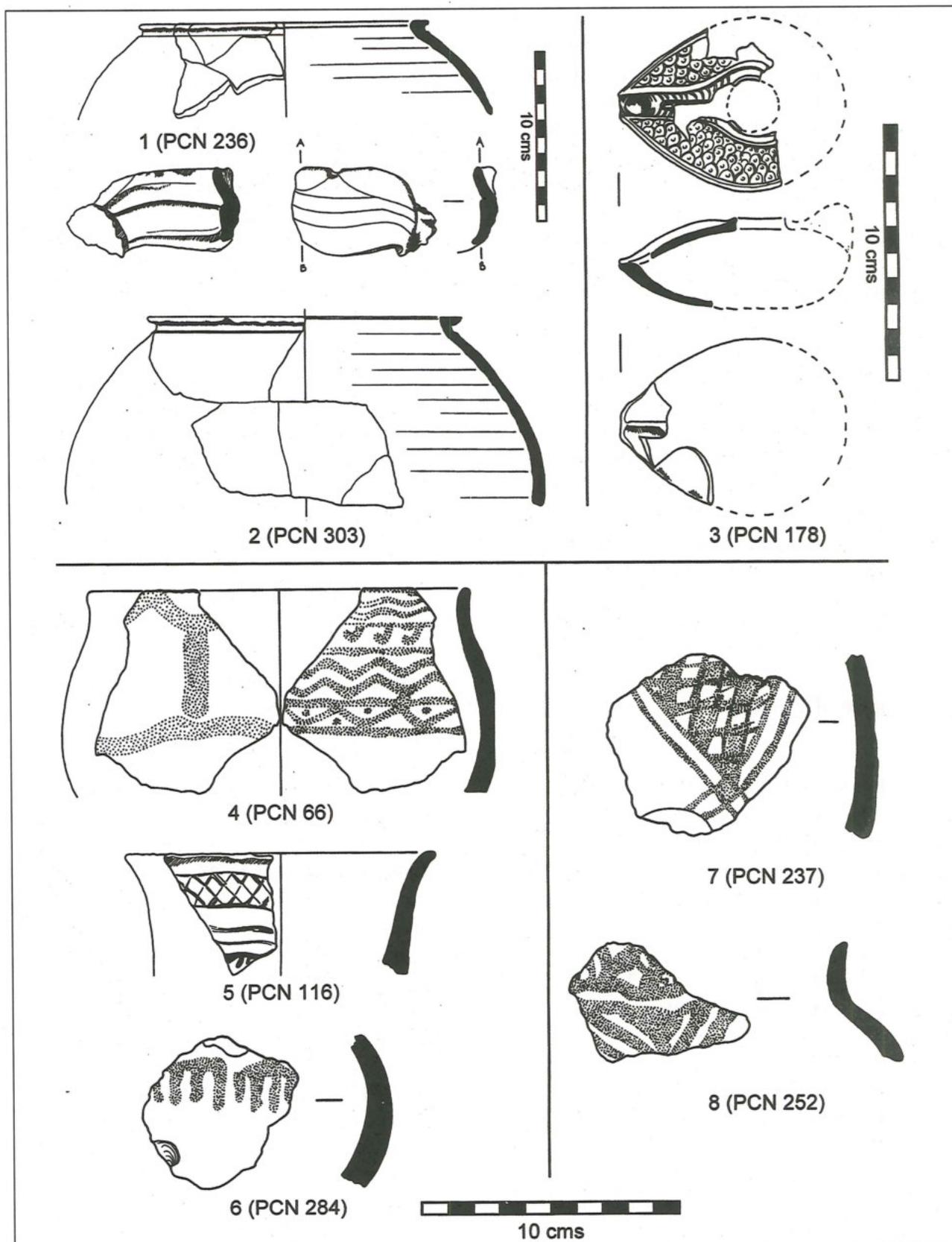
chael Sparks, who imputed the handwritten data into the project databases. Restoration of vessels was undertaken by Project conservator Noël Siver. Illustration of the catalogued items was done by Judith Sellers.



10. Pottery from Area A (Church Level 2), dated to ca. late eighth-tenth century. See Catalogue for details (Sellers 1998).



11. Pottery from Area A (Church Level 3), dated to ca. later eleventh century. See Catalogue for details (Sellers 1998).



12. Pottery from Area A (Church Level 3). Nos 1-3: ca. the later eleventh century; nos 4-6: twelfth century; nos 7 and 8: early thirteenth century. See Catalogue for details (Sellers 1998).

Citadel (Whitcomb 1988; Northedge 1992), these early handmade varieties probably date to the eleventh century, but could have originated in the later tenth. Interesting is the variety of forms (jars, jugs, bowls in different sizes), and the intense regional differences these early handmade wares display. Next in the sequence appear the first painted wares (Fig. 12:4-6). The fabric is much the same, with much chaff and thinly formed, but now with paint applied to the exterior, usually red in linear designs and sometimes in thick 'blobs' (Fig. 12:6). Incised decoration is also present (Fig. 12:5). External surfaces can be slipped. Parallels with the pottery from Robin Brown's excavations at Shawbak (Phase 1) and al-Wu'ayrah invite a twelfth century date (Brown 1987; 1988), which would certainly agree with the Gharrandal sequence. Subsequently in the thirteenth century the earliest HMGP wares appear (Fig. 12:7-8), with geometric painted decoration on a thicker ware with less chaff and a more treated surface.

### Catalogue of Pottery

*Fig. 10*

#### 10.1:PCN 95, A/A20-25.13

Jar (rim), Metallic ware (hardness: hard, Mohs 6), wheel made.

Fabric: Quartz-rich with large angular quartz and occasional lime and black inclusions; iron-rich, fired metallic; thin-walled. Core: 7.5YR N7/1 'light grey'-5YR 7/1 'light grey'; external surface ("ext"): 7.5YR 6/2-5YR 6/2; internal surface ("int"): 2.5YR 6/4-6/6.

Decoration ("Dec"): combing.

#### 10.2: PCN 96, A/A20-25.13

Jar (body sherd), Coarse sandy jar ware (soft, Mohs 3), wheel made.

Fabric: Coarse sandy ware with large angular quartz, occasional lime, fired oxidised and fairly soft (grey, clear and white quartz). Core: 2.5YR 6/6 'light red'-5/6 'red'; ext:

2.5YR 6/6 'light red'-10R 6/6; int: 5YR 8/4-7/2.

Dec: combing, rouletting.

#### 10.3:PCN 97, A/A20-25.13

Jar (body sherd), Coarse sandy jar ware (soft, Mohs 3), wheel made.

Fabric: Coarse sandy ware, abundant large angular quartz, voids, friable, soft, oxidised. Core: 2.5YR 5/6-5/8 'red'; ext: 2.5YR 6/6; int: 5YR 7/3.

Dec: combing.

#### 10.4:PCN 100, A/A20-25.13

Jar (base), Coarse sandy jar ware (medium, Mohs 4.5), wheel made.

Fabric: Coarse gritty sandy oxidised ware, laminar. Core: 2.5YR 6/8 'light red'; ext: 5YR 7/6-2.5YR 6/6; int: 2.5YR 6/6.

Dec: none visible.

#### 10.5, PCN 98, A/A20-25.13

Jar (body sherd), Coarse sandy jar ware (medium, Mohs 3.5), wheel made.

Fabric: Coarse sandy ware, laminar, voids, abundant ill-sorted angular quartz, white, grey and clear. Core: 5YR 7/6 'reddish yellow'-2.5YR 6/6 'light red'; ext: 10YR 6/1 'light grey'; int: 2.5YR 5/6-10R 6/6.

Dec: combing, slip.

#### 10.6:PCN 92, A/A20-25.13

Jar or jug (handle), Red painted ware (medium, Mohs 4), wheel made.

Fabric: Fine silty sandy ware of abundant small angular quartz. Core: 5YR 7/4 'pink'; ext: 5YR 7/6; int: 5YR 7/6.

Dec: Slip, monochrome paint (10YR 8/3).

#### 10.7:PCN 91, A/A20-25.13

Bowl (rim), "Fine Byzantine ware" (medium, Mohs 5), wheel made.

Fabric: Fine ware, hard-fired, thin-walled, very few inclusions except for occasional lime. Core: 5YR 8/4 'pink', ext: 2.5YR 6/8; int: 2.5YR 6/6.

Dec: burnished, slip.

**10.8:PCN 105, A/A20-25.13**

Jar (rim & neck), Coarse sandy jar ware (medium, Mohs 3.5), wheel made.

Fabric: Oxidised sandy ware with possible chert plates, very little lime. Coarse hard-fired in metallic style, but not quite to metallic hardness. Core: 2.5YR 6/8 'light red'; ext: 5YR 5/1 'grey'; int: 5YR 5/1 'grey'.

Dec: none.

**10.9:PCN 99, A/A20-25.13**

Jar (rim & neck), Coarse sandy jar ware (medium, Mohs 4), wheel made.

Fabric: Coarse sandy ware with voids, abundant ill-sorted angular quartz of varying size, fired reduced and fairly hard but not quite metallic. Core: 10YR 5/1 'grey'; ext: 7.5YR N5/1; int: 7.5R N5/1

Dec: none.

**10.10:PCN 101, A/A20-25.13**

Storage jar (body sherd), Palm branch jar ware (medium, Mohs 4), handmade.

Fabric: Coarse sandy oxidised ware with large angular smoky and clear quartz; thick-walled and rather hard. Core: 2.5YR 5/6 'red'; ext: 2.5YR 5/6 'red'; int: 2.5YR 6/8-10R 6/8; slip: 10YR 8/3.

Dec: impressed, slip.

**10.11:PCN 94, A/A20-25.13**

Storage jar? (body sherd), Basalt-tempered coarse ware (hard, Mohs 6.5), wheel made.

Fabric: Very, very coarse and hard-fired with dense suite of large angular ill-sorted inclusions including temper of chert and basalt? Core: 10YR 6/2 'light brownish grey'-7.5YR N6 'light grey-grey'; ext: 7.5YR N4; int: 7.5YR N4.

Dec: ribbing (functional?).

*Fig. 11*

**11.1:PCN 86, A/B-C40.27**

Globular cooking pot (complete profile), Early plain handmade ware (soft, Mohs 3).

Fabric: Chaff and grog-tempered coarse ware, lightweight, friable, low-fired, black

core, fairly thin. Core: 7.5YR N4 'dark grey'; ext: 10R 6/6 'light red'-7.5YR 5/6 'strong brown'; int: 10R 5/6 'red'.

Dec: applied bands, slip.

**11.2:PCN 202, A/E20.16**

Jar (complete profile), Early plain handmade ware (soft, Mohs 2).

Fabric: Soft, lightweight, chaff-tempered coarse ware with numerous chaff impressions, large lime and friable black core and margins fired buff. Some firing shrinkage and cracks; smoothed. Core: 7.5R N2 'black'; ext: 7.5YR 7/4 'pink'; int: 5YR 6/4 'light reddish brown'.

Dec: none.

**11.3:PCN 251, A/C30-35.19**

Jar, jug or small cooking pot (rim & neck), Early plain handmade ware (soft, Mohs 2).

Fabric: Lightweight, soft, friable, chaff-tempered coarse ware, thin-walled with buff margins. Core: 7.5YR N4 'dark grey'; ext: 5YR 6/4 'light reddish brown'; int: 5YR 6/4 'light reddish brown'.

**11.4:PCN 120, A/E20.7**

Globular cooking pot (rim), Early plain handmade ware (soft, Mohs 2.5).

Fabric: Chaff-tempered ware, low-fired, cindery black at core; thin-walled. Core: 5YR 3/1 'very dark grey'; ext: 2.5YR 6/4 'light reddish brown'-2.5YR 6/6 'very light reddish brown'; int: 2.5YR 6/4 'light reddish brown'-6/6 'light red'.

Dec: slip.

**11.5:PCN 170, A/E20.20**

Globular cooking pot (rim, handle, shoulder, body), Early plain handmade ware (medium, Mohs 3.5).

Fabric: Thin-walled, low-fired, lightweight, chaff-tempered ware with voids, burnt out material and black cindery core. Core: 7.5YR N3 'very dark grey'; ext: 5YR 6/3 'light reddish brown'; int: 5YR 6/3 'light reddish brown'.

Dec: none.

**11.6: PCN 260, A/C35.108**

Cooking pot (rim), Early plain handmade ware (soft, Mohs 3).

Fabric: Lightweight, soft, low-fired, chaff-tempered coarse ware with friable black core and narrow buff margins/surfaces. Core: 5YR 5/1 'grey', ext: 7.5YR 7/3 'pink'; int: 5YR 6/4 'light reddish brown'.

Dec: none.

**11.7: PCN 247, A/C35-40.16**

Cooking pot or jar, closed form (rim), Early plain handmade ware (soft, Mohs 3).

Fabric: Lightweight, coarse, chaff-tempered ware with limestone up to 8 mm across, thick black friable partly carbonised core. Very similar to 'Mamluk' wares. Core: 7.5YR N3 'very dark grey'; ext: 2.5YR 6/4-6/6 'light reddish brown'; int: 5YR 6/4 'light reddish brown'.

Dec: none.

**11.8: PCN 248, A/C30-35.19**

Bowl (rim and body), Early plain handmade ware (soft, Mohs 2).

Fabric: Chaff-tempered coarse ware with thick black friable core and uneven exterior surface. Core: 7.5YR N3 'very dark grey'; ext: 10YR 8/3 'very pale brown'; int: 2.5YR 5/6-5YR 5/6 'yellowish red'.

Dec: slipped.

*Fig. 12*

**12.1: PCN 236, A/C35-40.16**

Cooking pot (rim and handle), Wheelmade brown cooking pot ware (soft, Mohs 3), wheel made.

Fabric: Quartz-tempered ware fired brown, fairly thin-walled. Core: 2.5YR 4/6 'red'; ext: 2.5YR 5/4 'reddish brown'; int: 2.5YR 5/4 'reddish brown'.

Dec: none.

**12.2: PCN 303, A/B-C40.24**

Cooking pot (rim and body), Wheelmade

brown cooking pot ware (medium, Mohs 4).

Fabric: A brittle, thin-walled ware, sandy with abundant small quartz, oxidised brown. Core: 2.5YR 4/6 'red'-5YR 4/4 'reddish brown'; ext: 10R 5/3-2.5YR 5/3 'reddish brown'; int: 5YR 5/3 'reddish brown'.

Dec: none.

**12.3: PCN 178, A/B-C40.34**

Lamp (front half), Fine lamp ware (soft, Mohs 3.5), mould made.

Fabric: A fine silty sandy ware with occasional lime visible, fired buff in colour, thin-walled, fairly soft. Core: 7.5YR 6/2 'pinkish' ext: 7.5YR 6/2 'pinkish grey'-6/3 'light brown'; int: 7.5YR 6/2 'pinkish grey',-6/3 'light brown'.

Dec: moulded (relief).

**12.4: PCN 66, A/B25-30+B-C30.18**

Jug (rim), Handmade painted ware (soft, Mohs 3).

Fabric: Very coarse, low-fired, cindery black friable core with burnt out chaff, sparse lime and quartz. Core: 10YR 3/1 'very dark grey'; ext: 5YR 8/4 'pink'; int: 10R 6/8; ext. slip 10R 6/8.

Dec: slip, monochrome paint (7.5YR 3/2).

**12.5: PCN 116, A/E25.39**

Jug (rim), Handmade painted ware (soft, Mohs 3).

Fabric: Coarse, lightweight, low-fired ware with voids and cindery black core. Core: 7.5YR N3 'very dark grey'; ext: 5YR 7/2 slip 'pink'; int: 5YR 7/2 'pink'.

Dec: monochrome paint, slipped.

**12.6: PCN 284, A/E20.4**

Jug? (body sherd), Early handmade painted ware (medium, Mohs 4).

Fabric: A lightweight, coarse, chaff-tempered ware with large chaff impressions, oxidised outer margin and reduced core and inner margin. Core: 2.5YR N4 'dark grey'; ext: 5YR 7/4 'pink'; int: 2.5YR N5 'grey'.

Dec: slip, monochrome paint 10R 4/4 'weak

red'.

**12.7: PCN 237, A/C35-40.16**

Dish/bowl (body sherd), Early handmade painted ware (soft, Mohs 2.5).

Fabric: Soft, friable, lightweight, low-fired, chaff-tempered ware with carbonised black core. Core: 2.5YR N3 'very dark grey'; ext: 10R 6/6 'light red'-2.5YR 6/6 'light red'; int: 2.5YR 6/6 'light red'.

Dec: slip, monochrome paint.

**12.8: PCN 252, A/C30-35.19**

Jug (neck), Early handmade painted ware (soft, Mohs 2.5).

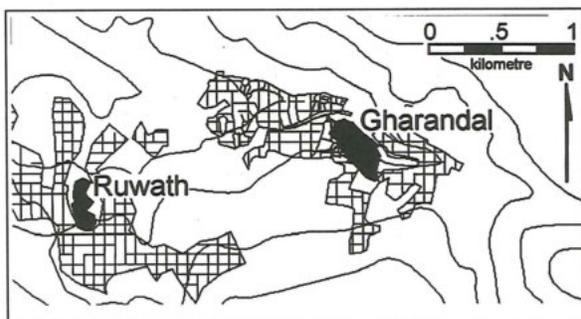
Fabric: Chaff-tempered ware with friable, carbonised black core and buff margins. Core: 2.5YR N4 'dark grey', ext: 10R 6/6 'light red'; int: 5YR 6/4 'light reddish brown'.

Dec: slip, monochrome paint (7.5R 4/4 'weak red').

**Ruwāth**

A major attempt was made to record by planning and photography the extensive standing remains of the infelicitously named site of Ruwāth. After two days of initial reconnaissance, the surveyor, Hugh Barnes, was unfortunately prevented from doing any further recording by the landowners.

Ruwāth is to be equated with Byzantine Rabatha, located a short distance to the northwest of Gharandal (Fig. 13). The Arabic sources display some confusion over



13. Map showing the location of Ruwāth in relation to Gharandal and adjacent field systems (mod. Barnes 1998).

this place, especially about the spelling of its name, due to its unfortunate meaning (animal droppings) in Arabic. Ruwāth and its district of al-Jibāl are described as fertile by the tenth century Arab geographers al-Istakhri and Ibn Hawqal, but inhabited by the *Arabs* (meaning the Bedouin) who had, as they noted, gained (political) mastery over the district (Ibn Hawqal 1938: 173.12-14, 170; Al-Istakhri 1927: 58.7-10). It would seem that, by the tenth century, Ruwāth had displaced Gharandal as the main centre of al-Jibāl. It seems as though the sources observed a significant transfer of political power from the traditional urban elites that had persisted in the primary towns of Late Antiquity to the new tribal leaders based on equally long established sites—compare the power shift from Areopolis (Maab, Rabbah) to al-Karak at about the same time.

The site is considerably damaged. The upper part has been partially bulldozed and built over with modern housing, and a road and electricity poles encroach upon the site in the middle of it and on its east. Ruwāth is in great danger from modern development.

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other Embassy staff is also much appreciated. Particular mention must be made of a very generous Cultural Relations grant from the Embassy to produce a bilingual report on the first two seasons of work at Gharandal, which should be completed by the end of 1999. Ms Alison McQuitty, Director of the British Institute at Amman, and the Assistant Director Mr George Findlater have provided much moral and logistical support, for which we are equally grateful. Thanks also go to the mayor of Gharandal for his warm reception and for supplying a truck and bulldozer free of charge to remove excavated spoil from the site. In Australia, the support of Associate Professor Ahmad Shboul is especially acknowledged. Finally, and most importantly, acknowledgement must be made of all the GAP98 team members who worked exceptionally hard to attain the Project objectives

in 1998.

Alan Walmsley  
Department of Semitic Studies, A14  
University of Sydney  
NSW 2006  
Australia

Philip Karsgaard  
11 The Bogan  
Coldingham, Eyemouth  
Berwickshire TD14 5ND  
Scotland

Tony Grey  
Museum of London  
Walker House  
87 Queen Victoria Street  
London EC4V 4AB  
England

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# LATE ISLAMIC VILLAGES IN THE GREATER PETRA REGION AND MEDIEVAL "HORMUZ"

by

Manfred Lindner

## Introduction

During excavations at ash-Shawbak (1986) and al-Wu'ayra (1987), Robin M. Brown obtained pottery types specific to 12th (and early 13th ) century occupations, covering the historically documented Crusader and Early Ayyubid periods (Brown 1987: 287; 1988: 232). It seems that during that time, denominated "Late Islamic" or "Medieval" in this context, in addition to a locally produced, hand-made, undecorated ware, decorations of simple linear, followed by criss-cross and eventually geometrical patterns were developed. Of the geometrically decorated later "Mamluk style", only a few were recorded at ash-Shawbak and al-Wu'ayra (Brown 1987: 284; 1989: 629). Vannini and Desideri confirmed Brown's results concerning the pottery finds of al-Wu'ayra, i.e. a sequence of a plain to (an additional) painted coarse ware during the 12th (and early 13th) century, all of which was produced by barely specialized craftsmen in the neighbourhood of al-Wu'ayra (Vannini and Desideri 1995: 535-8)<sup>1</sup>.

Ash-Shawbak and al-Wu'ayra were not the only settlements in the Greater Petra region during this respective time. Therefore, during exploratory surveys in the Petra region by teams of Naturhistorische Gesellschaft Nürnberg (NHG), directed by the author, several "village" sites previously disregarded or unknown, have been examined together with their surface pottery since 1991 (Fig.1). Where and how the villages were built and what kind of pottery was used by the peasants, may improve the archaeological map of the Petra region and,

additionally, shed some light on the political, social and economic situation of "Archaeologically one of the least known periods of Transjordan" (Brown 1987), "a crucial gap in our knowledge of Transjordan" (Vannini and Tonghini 1997).

## THE VILLAGES

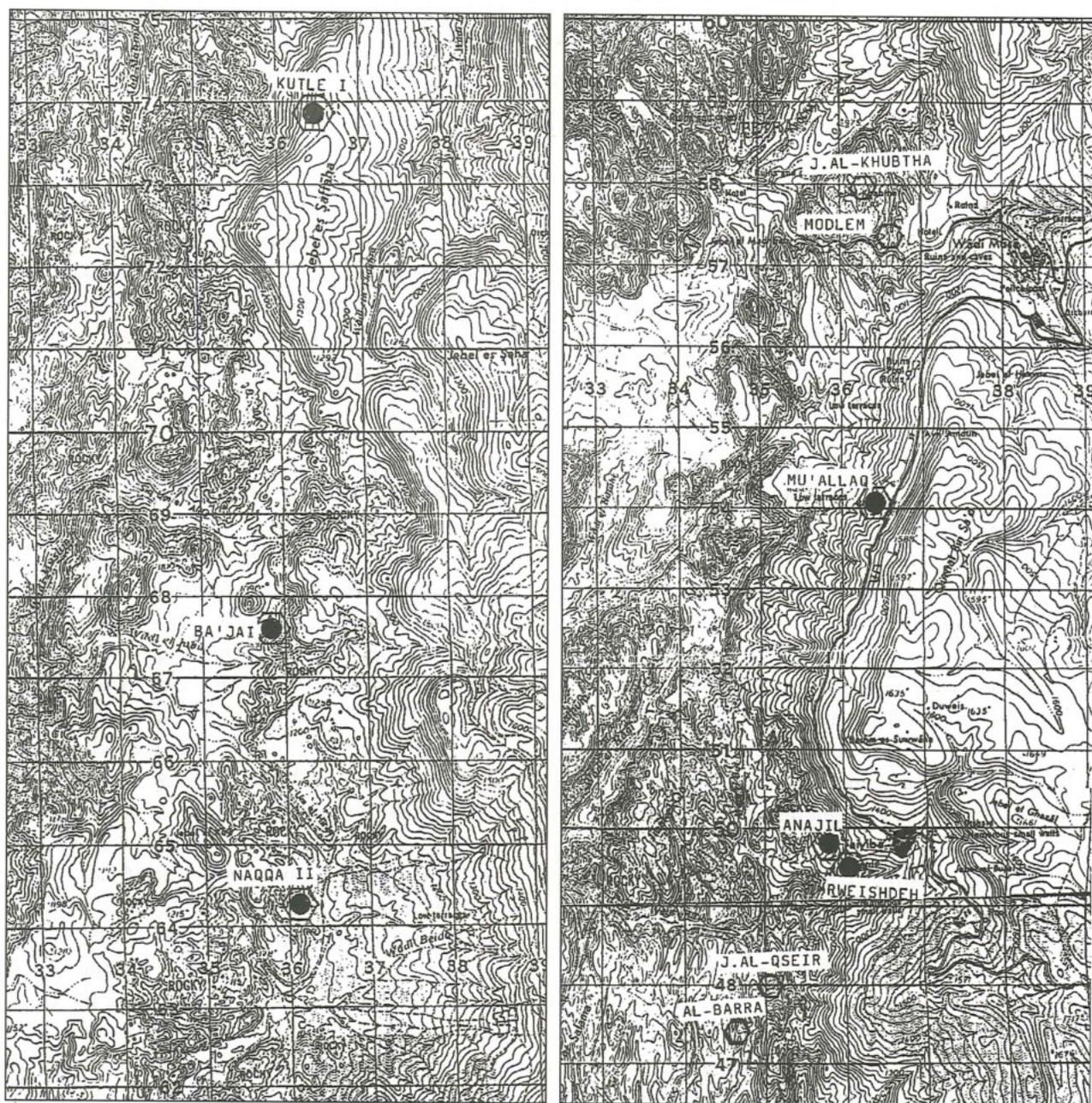
### 1. Khirbat al-Mu'allaq: On Top of an Edomite Fortress.

A small-scale excavation (1991-1995) was carried out by the Naturhistorische Gesellschaft Nürnberg under the author's direction in Khirbat al-Mu'allaq, which is a ruin field of 60 x 48 m between Wādi Mūsā and aṭ-Ṭayyiba at 1335 m (YU 364 544) (Fig. 2). This excavation revealed a Late Islamic village built on top of an Iron II (Edomite) fortress guarding a commercial route on the shoulder of Jibāl ash-Sharā (Lindner, Knauf and Zeitler 1996 and Fig. 3). Remnants of the Edomite border wall were restacked and most of the building stones were reused for erecting double walls of houses that are partly attached to the bordering wall (Fig. 4). The village was destroyed by earthquakes attested by a thick layer of building stones tumbled over the living space. Much later, round shafts and "cellars" were built by a pastoralist or partly sedentary population. According to information from a bedouin, stones from the ruin field used to be taken to Wādi Mūsā. A "voussoir" with chipped surface treatment, shows that stones were worked on site.

The "pseudo-prehistoric" hole-mouth cooking pots with ledge handles, sometimes evolving from a "taenia", as well as numer-

1. After new excavations at al-Wu'ayra, Vannini and Tonghini (1997: 38) were not able to confirm

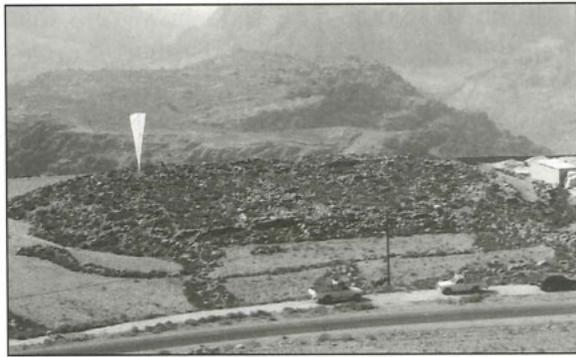
Brown's hypothesis of an evolution from plain to painted pottery anymore.



A. B. Location of several Late Islamic villages and occupations in the Greater Petra Region (Palestine map 1: 50 000. Sheet 3050 series K737.

ous bowls of various forms and sizes, and some lids, were reminiscent of Brown's Phase 1 pottery of the 12th century. Of the painted pottery, one pot was daubed white, and another black, while only one sherd with criss-cross lines was found. Explicit geometrical patterns were missing (Fig. 5). Another dating evidence of the food preparing zone excavated at Khirbat al-Mu'allaq, is the result of a C14 analysis of charcoal closely

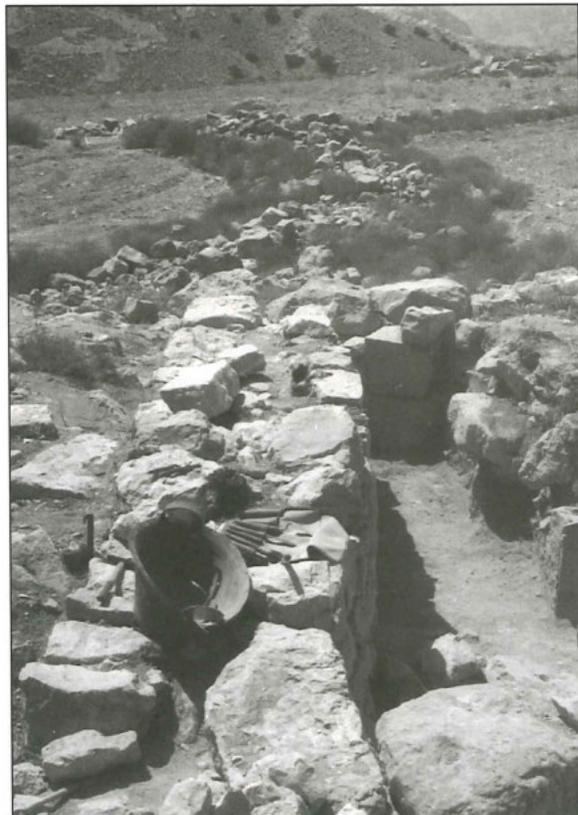
associated with the pottery of a *ṭābūn*, that was "calibrated AD 785-1015". An imported wheel-thrown juglet from the excavation could have been a third dating evidence if it were possible to find dated parallels from Syria, Gaza or elsewhere. However, it might be designated to the Early Islamic period. In any case, the pottery of Khirbat al-Mu'allaq has to be preliminary dated to the Phase I of Brown's excavations. The excellent quality



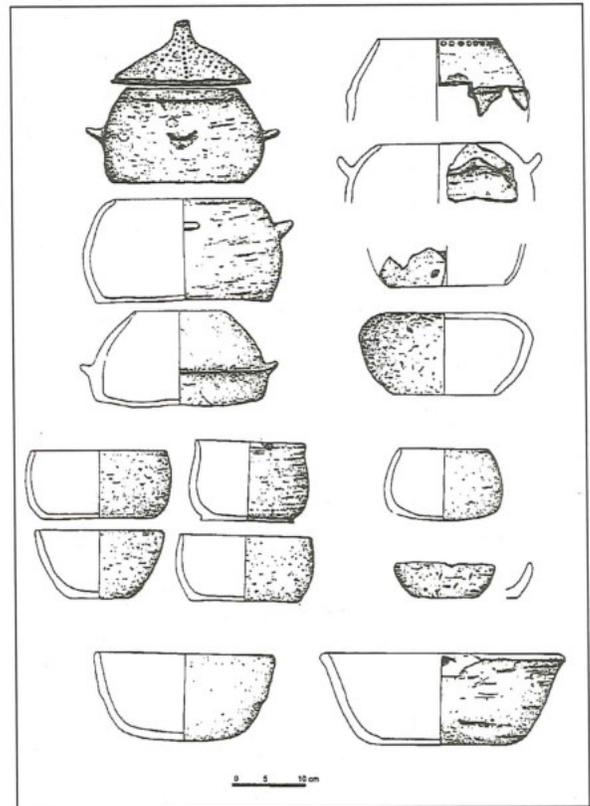
2. Khirbat al-Mu'allaq: The ruin field seen toward Jabal Hārūn.



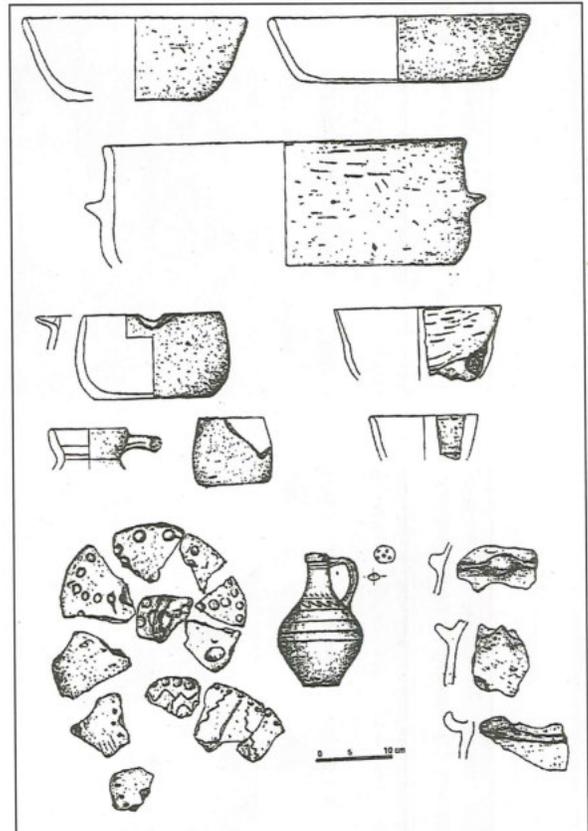
3. Foundation of the Late Islamic house on top of a foundation of compressed alluvial limestone gravel.



4. Wall I of the excavated courtyard with the road to at-Tayyiba in the far background (upper right).



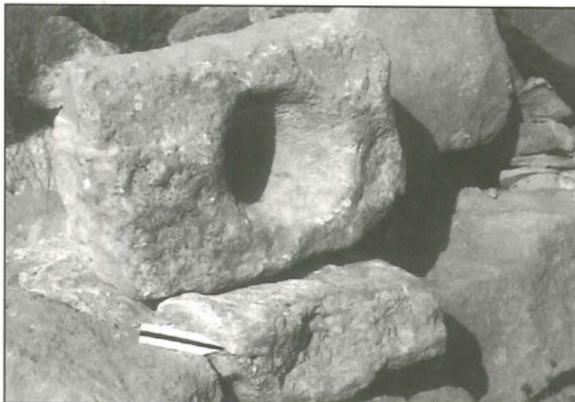
A.



B.

5. A/B. Selected pottery from Khirbat al-Mu'allaq

of some vessels, though being hand-made, recalls a pre-Islamic tradition of wheel-made pottery. Perhaps due to the small part of the excavated ruin field (ca. 50 m<sup>2</sup>), no water reservoir was found except for an ashlar with a circular hole in the center possibly belonging to a cistern (Fig. 6). Of course, 'Ayn al-Mu'allaq, the spring at the slope of Jibāl ash-Sharā might have produced more water than observed during the dig. There were no traces of a conduit down to the ruin field. Corroborating Musil's report on remnants of olive trees still existing in 1898 (Musil 1907: 283), the lower part of an olive press was noticed in 1991 (Fig. 7). That the inhabitants of the site lived fairly well at times is attested by the presence of bone remains of cattle, by the number of millstones, by the discovery of grape vines, fig and apricot trees around the spring and by the rapid growth of an extended irrigated garden, adjoining the ruins.



6. Ashlar with a hole in its centre from Khirbat al-Mu'allaq, perhaps belonging to an (undiscovered) cistern.



7. Lower part of an olive press from the ruin field.

It needs to be stressed, however, that (Khirbat) al-Mu'allaq was neither remote, nor hidden, but accessible through the commercial route mentioned above and surrounded by reused parts of the old Edomite walls.

## 2. Khirbat Anajil: A Fortified Village

Khirbat Anajil is located west of at-Ṭayyiba, above a wadi of the same name (YU 358 498). Consisting of three levels, Anajil I is the ground level that is now sand-filled, open toward and approachable from the modern at-Ṭayyiba-Batha road at 1100 m (Fig. 8). Surrounded by vertical rock walls, the site is protected from winds and was presumably well supplied with water in wintertime. There are actually traces of a waterfall at the right rock wall, and a gigantic cleft not far from it might have conducted water from above. From here, there is no path to go further up. Only an inclined, steep and narrow ledge in the rock wall has been provided with holes, to be used as a stairway or a ladder. A rock shelter opposite with a Nabataean-style basin and three pick-axe strokes in front was inhabited at some unknown time.

Anajil II, the second level at 1150 m to the north, could formerly be reached from the steep incline with holes, but not from the at-Ṭayyiba-Batha road. Even by climbing across steep sandstone slopes, with meter-sized limestone boulders threatening to roll

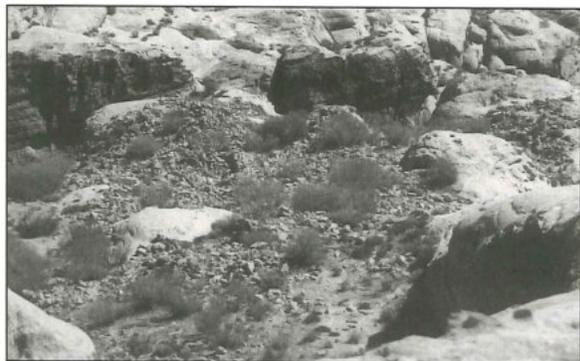


8. Anajil I, a large rock courtyard with a "staircase" of rock-cut holes originally leading to Anajil II.

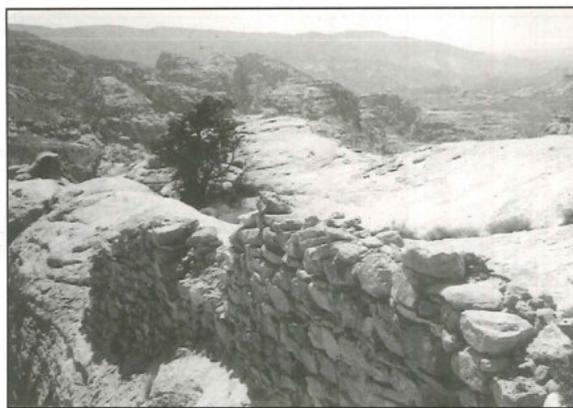
down at any time, the site can be seen but not entered (Fig. 9). The actual access runs through a series of narrow gorges - rather canyons - clefts and gullies, easy to bar and to defend. Eventually, at the top of a final water-worn ravine, the village could be entered. By means of inserting beams in rock holes, this entrance, too, was defensible.

The village proper of Anajil II which is of ca. 60 x 30 m perimeter size, consisted of ca. 20 houses built on projecting hillocks or huddled together in order to protect themselves. Toward Anajil I, the cliff drops vertically but could be reached through the previously described incline. Many beam holes in the walls of a shady gorge as well as in a large boulder at the rim belonged to lean-to houses. No cistern was found, but water might have been collected in one of the gorges leading to the village. A level area somewhat hollowed out, right in the centre of the village, might have been a reservoir. As in the other villages, a millstone with two holes was found, in addition to a seemingly older fragment of an oval quern.

Further to the north of Anajil II, the third level Anajil III at ca. 1185 m can only be reached by climbing over very steep and dangerously smooth sandstone slopes. With a rock shelter and a stout masonry wall, it was a last point of resistance and refuge in case of an attack (Fig. 10). From Anajil III, by negotiating almost impassable gorges and walking on tiny ledges, Rās Batha, Şabra and Wādī Mūsā could be reached. On



9. Anajil II seen from a point from where a complicated detour has to be taken to reach the village.



10. Stout wall of Anajil III.

the way from Rās Batha to Anajil, I. Künne succeeded in discovering *Origanum jordanicum*, a new botanic species from Jordan (Danin and Künne 1996).

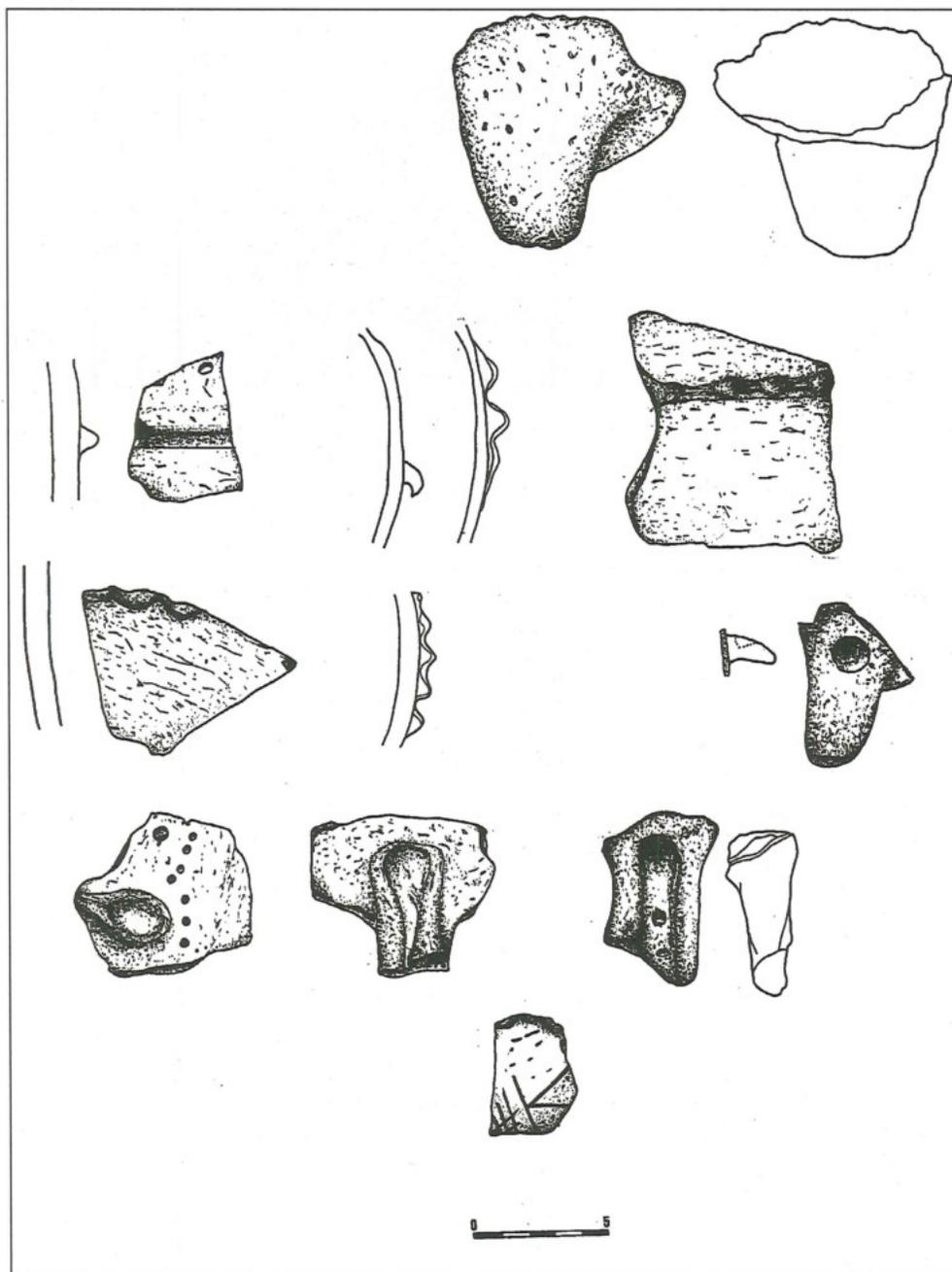
Generally, Anajil was a hidden and extremely defensible village. Even a gorge still higher up was closed by a stout wall. The place might thus be called a rural fortified refuge.

#### *The pottery of Anajil II* (Fig. 11)

Of 45 collected sherds there were 9 Nabataean-Roman-Byzantine, the rest being Late Islamic with one painted body sherd (criss-cross pattern), fragments of large storage jars, and cooking pots with ledge handles, some evolving from a "taenia" circling the whole circumference. The large handles are equipped with round holes near the shoulder of the vessel and/or deeply cut rills (to prevent breaking during the firing). Corresponding to heavier vessels there are large ledge handles of the "swollen tongue" type, one with prick-holes underneath. Finger- and implement-indented ledge handles are more a result of decoration than necessity. The color of the clay ranges from yellowish-brown to red-brown and grey. Mineral and organic grits can be observed.

### **3. Khirbat ar-Ruwayshid: Medieval at-Ṭayyiba**

The ruin field of ar-Ruwayshid to the SW of at-Ṭayyiba of ca. 80 x 80 m at 1060-1080m, is located on a sloping spur of Jibāl

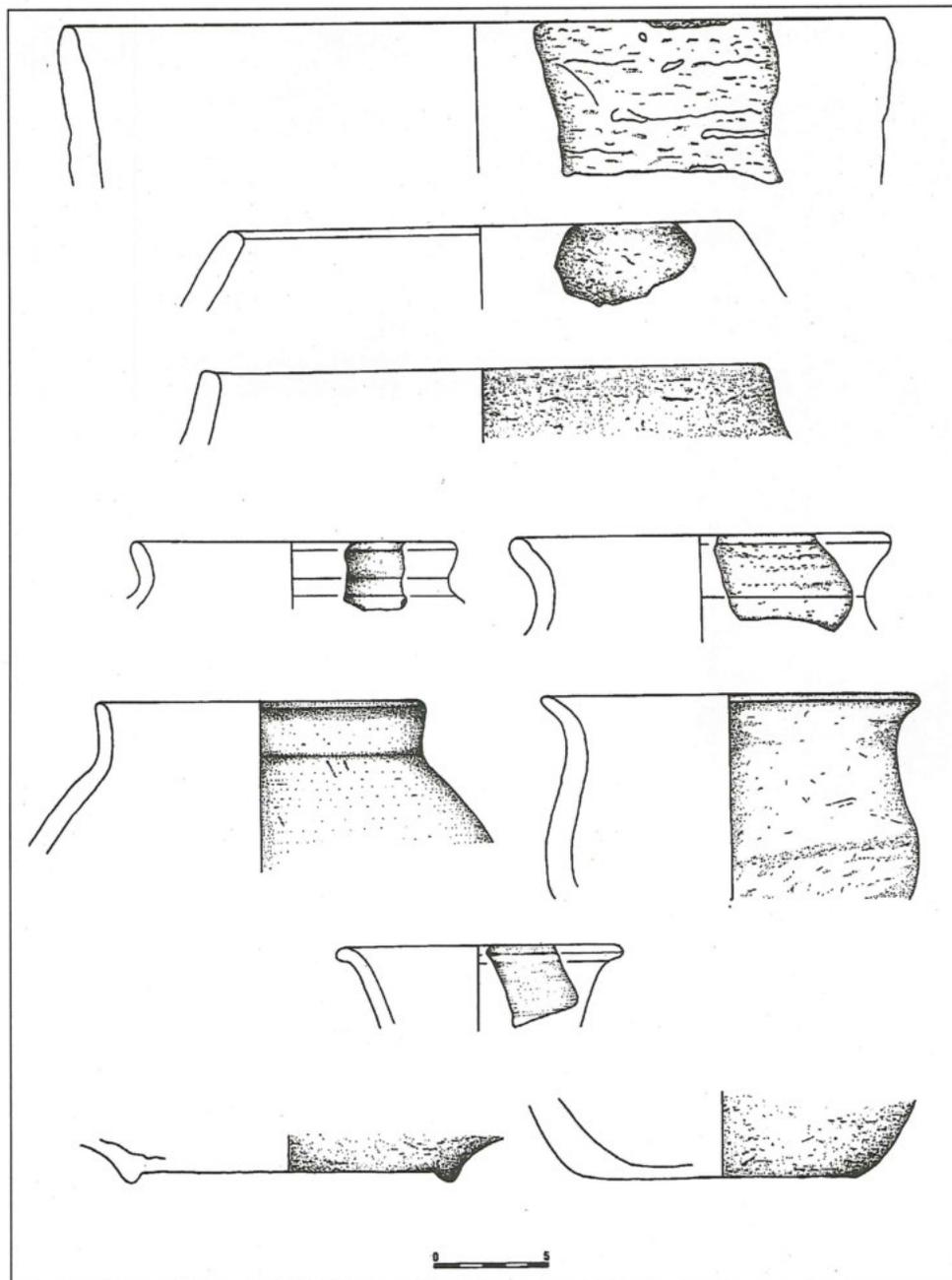


11A. Pottery from Anajil II.

ash-Sharā between Wādī aṭ-Ṭayyiba and Wādī ar-Ruwayshid (YU 361 495). Whereas the former wadi passes through treacherous alluvial limestone, the latter bores its way through impassable gorges with easy access only from the north and from a spot to the north-west. The *khirbat* preceded “old aṭ-Ṭayyiba”, a typical Ottoman village, built ca. 120 years ago at a time when people still lived in tents most of the year. More or less preserving the village style, it was lately

turned into a hotel which in its present configuration still demonstrates its location on a defensible spur (Fakhoury and Sweiss 1995: 368-9).

Ar-Ruwayshid or “medieval aṭ-Ṭayyiba” was called en-Nefei‘at by Glueck (1935:80), who described it as “a small Arabic site” with a few Arabic sherds. Previously, Musil (1907: 282) had seen “das zerstörte Dorf h. en-Nf‘at”. Comparing the explorers’ notes, it is evident that Glueck followed the exact



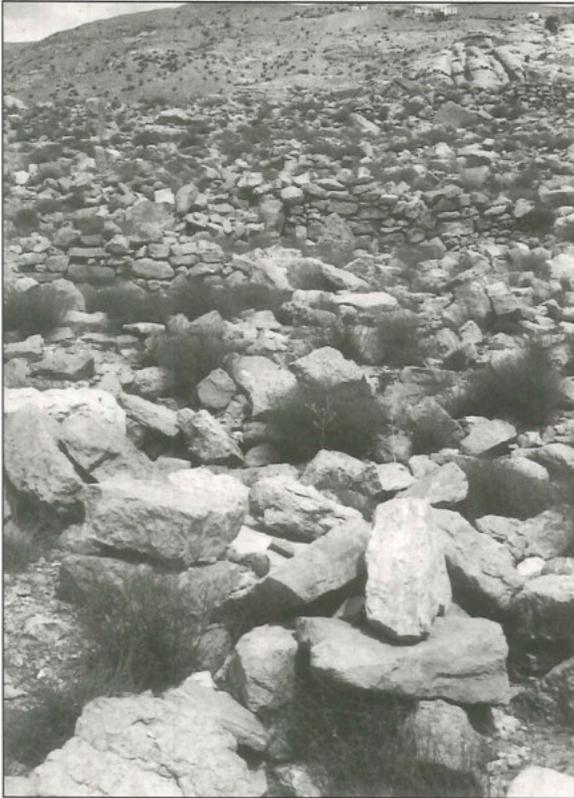
11B. Pottery from Anajil II.

itinerary of Musil. However, the "small Arabic site" consists of at least 20 ruins of houses up to sizes of 8 x 6 m circumference and built of massive limestone ashlars and slabs, of which a good number of them, especially the cornerstones are still standing. The dry-stone walls were destroyed by earthquakes and subsequent stone robbing. Ar-Ruwayshid, too, extended to the end of a spur (Fig. 12). The slopes in the vicinity are terraced. Beside the building stones and a

curved stone of unknown function, no architectural pieces were observed. Millstones with an eccentric hole were found to be in use (Fig. 13).

*The Pottery of Khirbat ar-Ruwayshid (Fig. 14)*

Of 85 sherds that were collected - preferably without body fragments - from the surface, one is of an Iron II storage jar and 5 are of Nabataean-Roman origin. Of the 79

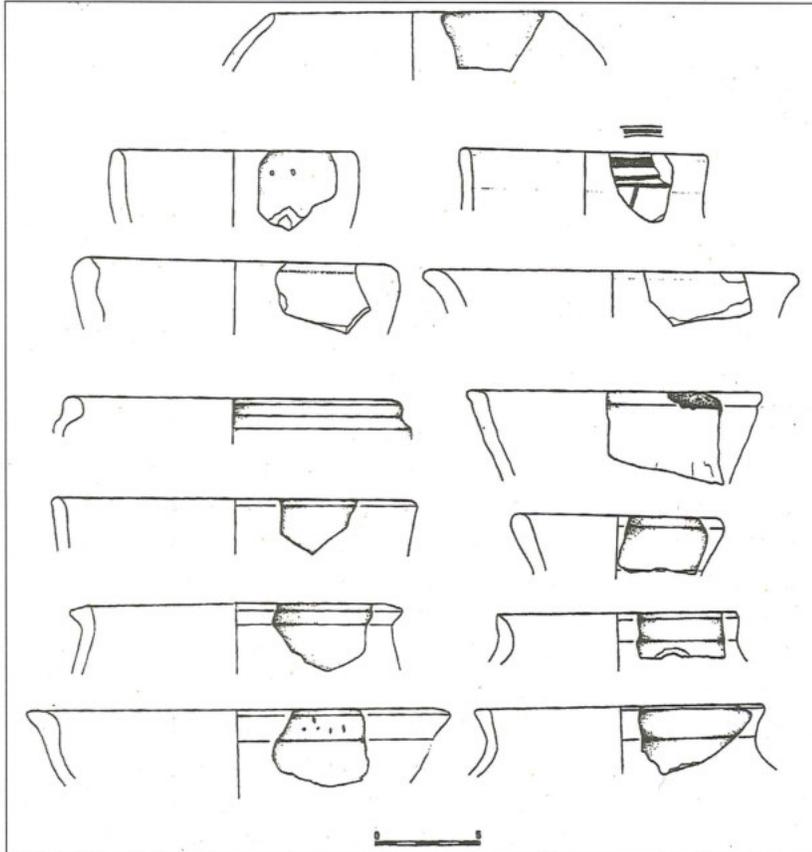


12. Khirbat ar-Ruwayshid toward N with houses of modern at-Tayyiba at top of photo.



13. Millstone from ar-Ruwayshid.

Late Islamic sherds, the clay is generally red-brown, with a reddish slip, which is more often found at Khirbat ar-Ruwayshid than at Khirbat al-Mu'allaq. Two fragments of grey color, thin and light, are decorated with an implement-indented band, respectively with a coarsely indented ledge handle. Other decorations are scarce, there is only one fragment with a line of prick-holes and another with finger indentations along the rim of a vessel. The inventory displays

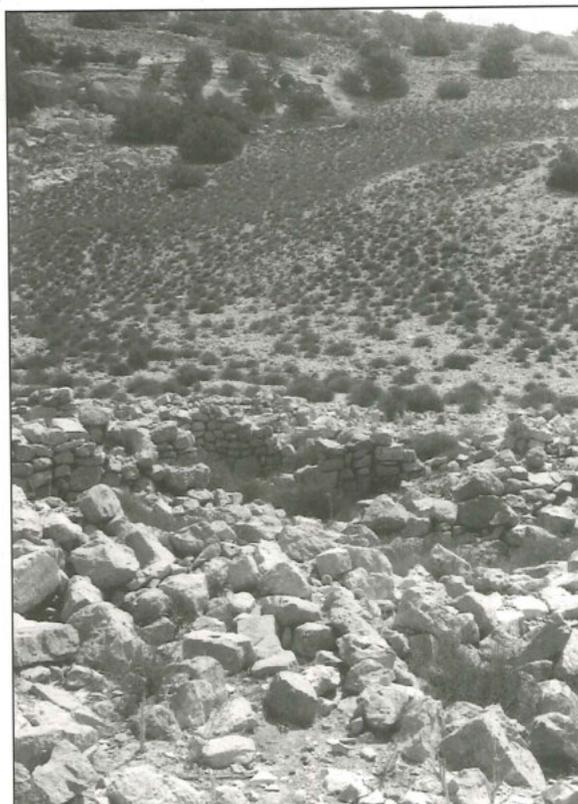


14. Selected pottery from ar-Ruwayshid.

extreme thick and coarse cooking pots and bowls, to which large ledge handles belong. Their shape is either reminiscent of a badly swollen or a forked tongue, or a grotesque spout. There are less "taeniae" and less fine ledge handles than at Khirbat al-Mu'allaq, but they occur nevertheless. A few rims with a red slip belong to relatively thin juglets. Of 10 painted body sherds, a few of which come from broken handles, one is decorated with a broad red band, the others with single or criss-cross lines in black or red. Explicitly geometrical decoration is lacking.

#### 4. Kutle I (YU 365 737)

Kutle I is located at the western rim of Jabal aş-Şuffāḥa at 1140 m, ca. 16 km north of Petra (Fig. 15). The village built of limestone ashlar of different sizes and of varying quality, covers ca. 80 x 30 m. One of the houses measures 5.0 x 3.5 m on the inside. The gap between the double walls is filled with rubble. Walls are still standing up to 2 m (Fig. 16). By its southern house walls, built together on a rocky embankment, it dominates a wellspring, an old pathway from the south and an original *han* recognizable by its foundation stones. Any



16. Detail of the ruin field.

person approaching from the south and coming to the spring, was in stone-throw or arrow-shot distance from the walls. A steep embankment protected Kutle I from the east. The plateau on its top may have been used in summer as dwelling places and tree gar-



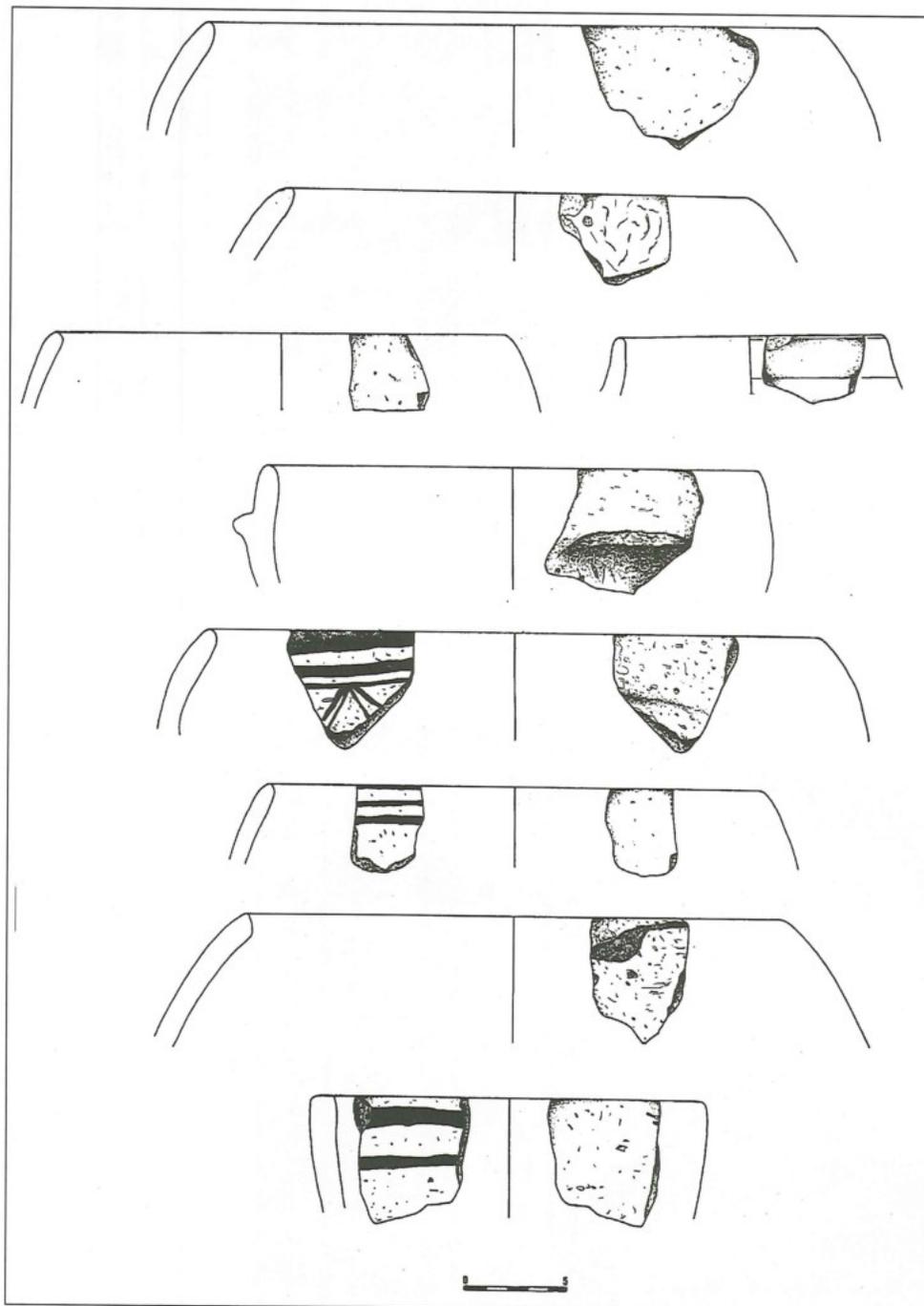
15. Aerial photograph of the Late Islamic village of Kutle I.

dens (arabic: *al-Ḥaūṭa*). Attackers from the north would have been at a loss how to cross unobserved the aṣ-Ṣuffāḥa ridge or to climb steeply up from the northwest without being observed by the inhabitants of Kutle I.

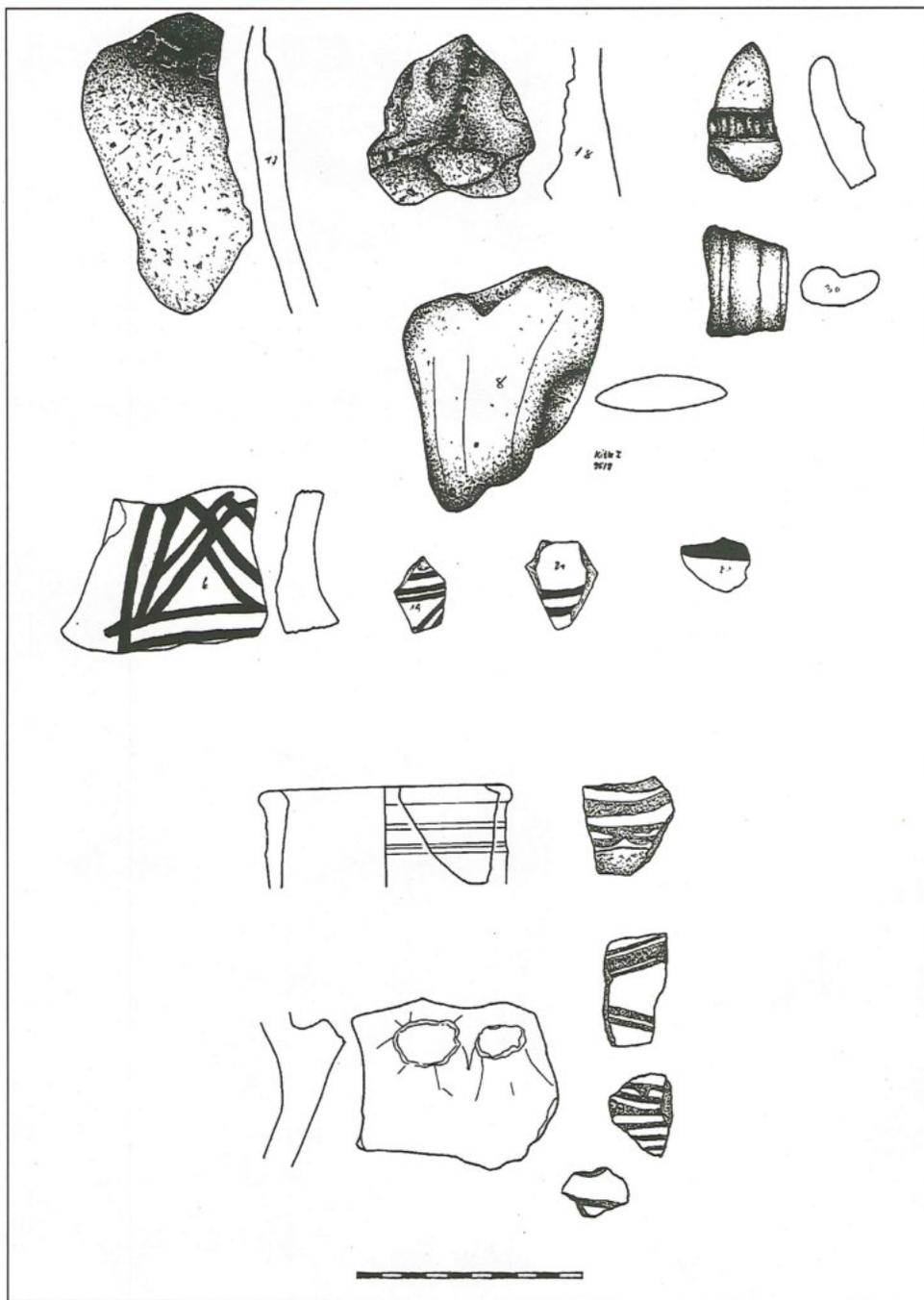
*The Pottery of Kutle I* (Fig. 17 A/B)

Of 38 sherds, there are 5 that belong to Iron II, 4 Nabataean-Roman and one piece

of modern China. The rest includes different types within the Late Islamic. Four wheel-thrown Ayyubid fine ware sherds may indicate an occupation in the 12th/13th centuries AD. Most of the sherds belong to the hand-made coarse village ware without decoration, and only a small portion displays linear and criss-cross painted decoration. Despite seemingly tentative beginnings, not



17A. Selected pottery from Kutle I.



17B. Selected pottery from Kutle I.

a single explicitly geometrically painted "Mamluk style" sherd was found.

### 5. Ba'ja I: Reoccupied in the Late Islamic Period

At the foot of the Jabal Ba'ja massif ca. 10 km north of Petra, a ruin field of ca. 80 x 80 m was originally mentioned by D. Kirkbride (1961: 255) and later described by the author (Lindner 1986: 116; 1996: 249-255).

In view of the discovery of a PPNB settlement halfway up the mountainside (Ba'ja II) and of an Iron II (Edomite) stronghold on top (Ba'ja III), both discovered by teams of NHG (Lindner 1986: 121-130; 1996: 255-273; Lindner and Farajat 1987: 175-185), the ruined village was called Ba'ja I (YU 358 677).

A lot of the built structures of Ba'ja I have collapsed from a natural terrace and a

ground plan is difficult to establish. Standing in the centre of the village one has the impression of a recently bombed site. From the air, more than 20 houses can be seen arranged in a certain order (Fig. 18). Built against the rock wall on a natural terrace with the wadi to the south, the village was remote and defensible at the same time. The extent of destruction tends to conceal the Nabataean past of the multi-phase village, but not the Late Islamic phase of re-occupation.

Already during the first surveys (Lindner 1986: 116), pottery fragments of the Ayyubid-Mamluk periods were taken from the surface (Fig. 19). During later surveys, a large rock cistern of Nabataean-Roman origin with an Arabic inscription to the right of its entrance was detected. 'Amārin bedouins who had built two houses at the foot of the massif (Figs. 20 and 21), cleaned the reservoir several years ago, and found fine geometrically painted Mamluk pottery<sup>2</sup> similar,

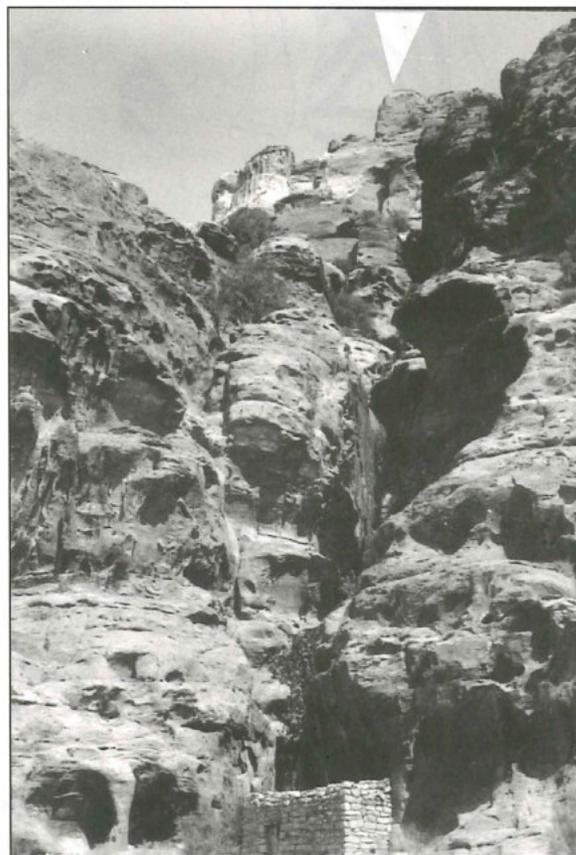


18. Aerial view of Ba'ja I.

2. The few geometrically painted Mamluk sherds taken out of the material excavated from the large



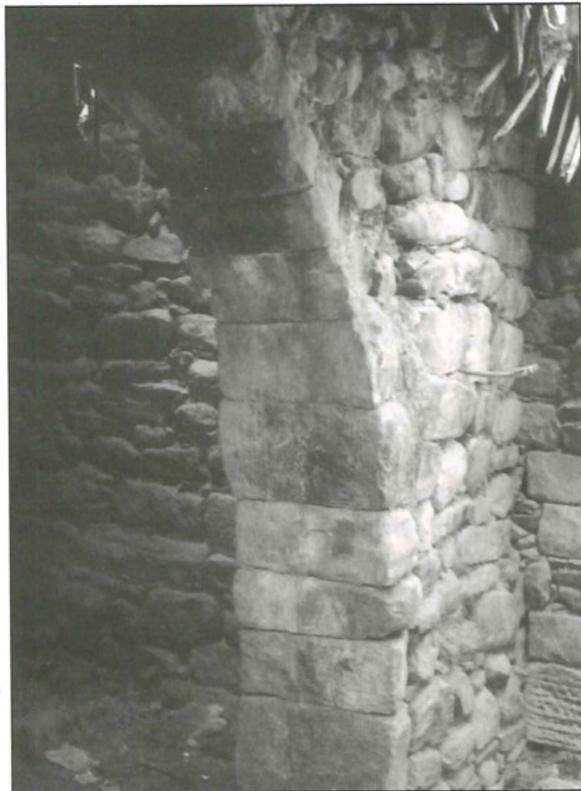
19. Surface finds in the ruin field of Ba'ja I (1983): Edomite to Mamluk pottery and quern fragments.



20. Al-'Amārin house at the foot of the Ba'ja massif with a view (arrow) to Edomite Ba'ja III.

to sherds found on al-Ḥabīs above the basin of Petra in 1978 (Lindner 1978: 89-90). The pottery spectrum of Ba'ja I comprises surface finds of the whole Late Islamic, as the period is called in this treatise.

cistern of Ba'ja I point to a transient use of the site rather than to an occupation.



21. Arch made from spoils in the al-'Amārin house of Ba'ja I.

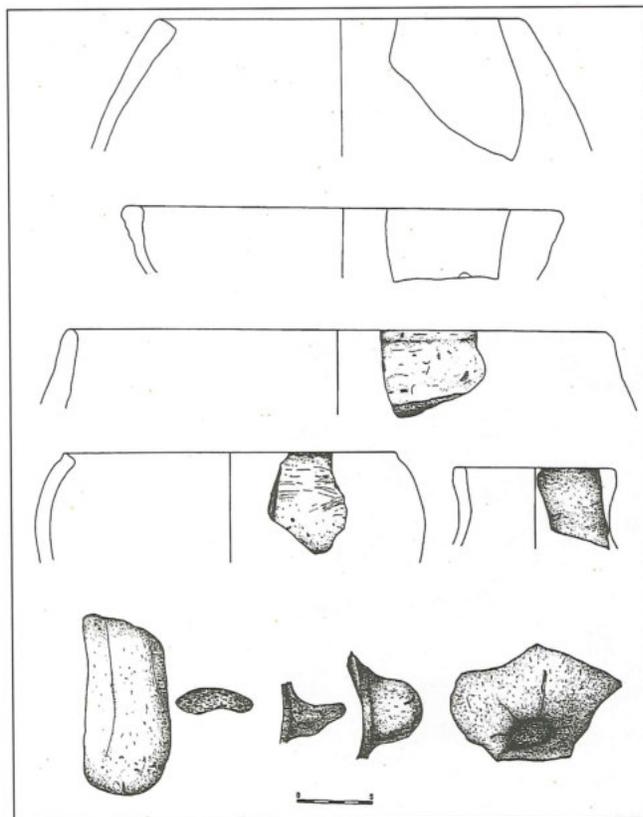
*The pottery of Ba'ja I (Fig. 22A/B)*

Of 60 sherds collected from the surface, eight are Iron II (possibly washed down from the Edomite stronghold Ba'ja III); 5 Nabataean-Roman; 47 Late Islamic, of which 5 are painted (4 Mamluk with geometrical decoration from juglets, 1 linear decoration). Fragments of large bowls, cooking pots with small ledge handles, loop handles with a hole near the shoulder of the vessel, large tongue-like handles, and one implement-indented decoration are to be noted. The colour ranges from grey-brown to brown-red, and a few have a red slip on the interior and exterior.

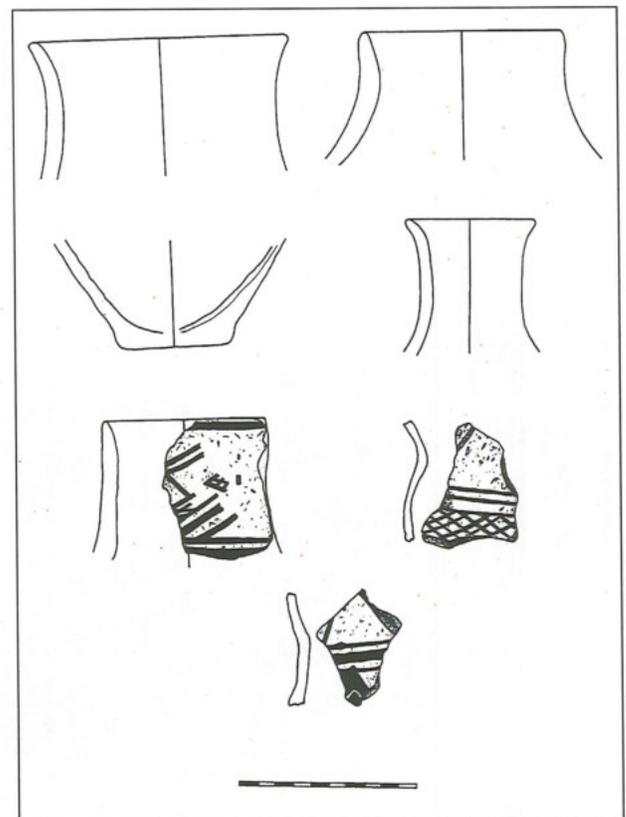
*Other finds:* 1 chipped lithic (hand-axe ?), 1 oval quern.

**6. An-Naq'a II above the Wādī Mūsā - an-Nemala Route**

Where the modern road (and ancient route) from Petra-Wādī Mūsā to Naqab Ne-



A.  
22 A/B. Selected pottery from Ba'ja I.



B.

mala passes a sandy plain, 4 or 5 houses were built by the 'Amārin on a rocky outcrop around 20 years ago. The place an-Naq'a was inspected and described before by Musil as h.Hurmuz (II,2: 220).

The houses on top of the described rise are used as storage rooms today. They are entirely constructed of spolia, obviously from previous structures that were present at the same spot. In one place, iron rails were used instead of roof beams. A few building stones in an open house are diagonally dressed in the Nabataean fashion. The surface ceramics contain a few Late Islamic and Nabataean-Roman sherds. At the foot of the hill, a nicely made wine press is reminiscent of the Nabataean-Roman occupation of the site.

From an-Naq'a I, as the place is called here, another ruin field was seen through binoculars about 50 m up on the mountainside to the west (YU 362 643) (Fig. 23). Easily defensible and almost unapproachable from the foot of the mountain, it was reached from behind through a steep-sided gorge with remnants of walls barring the entrance. Directly behind the entrance and on two terraces at 1080 m, ca. 20 houses of ca. 3 x 4m were built abutting each other in a space of ca. 80 m in the north-south, and 30 m in the east-west direction (Fig. 24). Local brown

sandstone and almost white ad-Dīsi sandstone that could be easily broken in slabs were used. The foremost structure toward Jibāl ash-Sharā, 'Atnub (Etnub, at-Tnub) and an-Naq'a I was erected directly on a spur of the mountainside. The origin of one Nabataean fine ware fragment (first-second centuries AD) was later explained by the discovery of a preceding ancient site behind and above an-Naq'a II. There, a Nabataean-Roman cistern that is still in use today, may have provided the inhabitants of the Late Islamic Period with water.

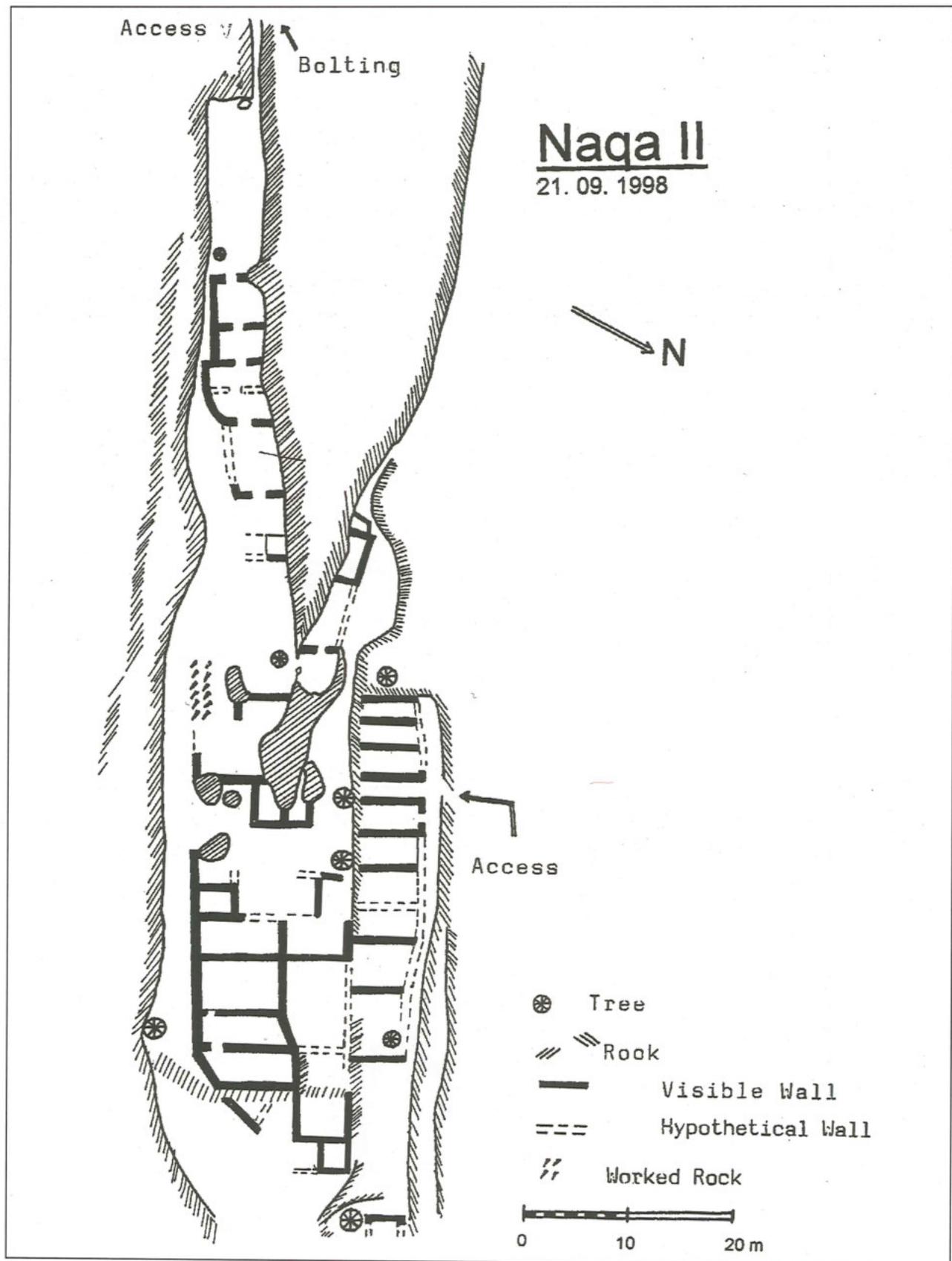
The name of an-Naq'a II was given to the village without an immediate implication that there might have been some kind of connection with Naq'a I. Fields and pastures for the people of an-Naq'a II were, of course, down in the plain. They may have lived on the mountain only seasonally or during dangerous periods.

The labour invested in constructing the place up on the mountainside and fortifying its access (even the almost vertical cliff toward the east, showed remnants of walls) may shed some light on the security needed by the people living in the area.

Since he visited an-Naq'a II in 1997, E.A.Knauf has been convinced that it should not be trivialized as a fortified village, but that it is in fact the long-sought



23. Ruin field (arrow) on the ledge of a rock wall above the plain of an-Naq'a (an-Naq'a II). (photo: U.Hübner).



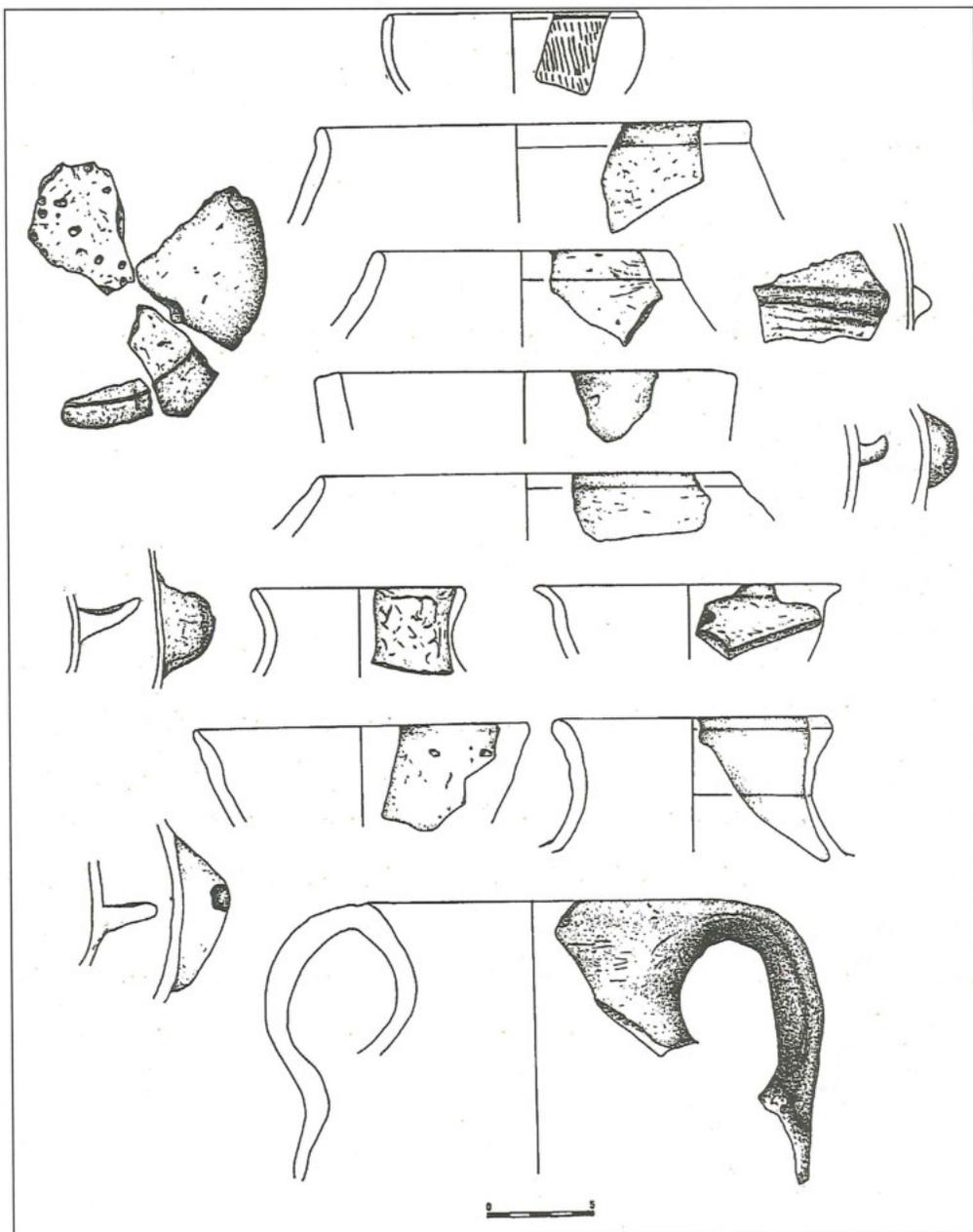
24. Sketch plan of an-Naq'a II (U.Hübner, I.Künne).

third Crusader fortress of the Petra region, Hormuz. The "houses" have to be regarded as casemates of the razed castle complex (Knauf pers. comm.). As the surface finds show, Late Islamic pottery was used before its destruction. It was assumed that the "occupational forces", Crusaders as well as indigenous personnel, used village-made pottery from the vicinity. Another small fortress, partly rock-cut, partly stone-built at 'Atnub not far away from an-Naq'a II, examined during previous archaeological cam-

paigns of NHG (publication pending) could not be identified as medieval Hormuz or another Crusader installation because of its Nabataean-Late Roman- Byzantine surface ceramics and the lack of Late Islamic pottery betrayed an earlier origin. Yet, the location at the ancient Nemala route proves the importance of later an-Naq'a II.

*The Pottery from an-Naq'a II (Fig. 25)*

Of 31 surface sherds one is of Nabataean fine ware, the rest are Late Islamic, be-



25. Selected pottery from an-Naq'a II.

longing to light cooking pots with taeniae and dainty ledge handles. One loop handle belongs to a grotesque jug, and another to a storage jar. There are four fragments of lids, one with a groove parallel to the rim, and another with pick holes. Two rims of jugs are rather thin, and one equipped with a ledge handle. The color of the clay is brown, mostly with self-slip, while two pieces are with red slip. All of them show a grey to black core, and there aren't any painted sherds. The ceramics belong more to household than to storage types.

### *The Pottery of the Villages and of Hormuz*

Summarizing the pottery of the village sites and an-Naq'a II, described above together with their locations and characteristics, it has to be envisaged in the first place that (except for Khirbat al-Mu'allaq) we are dealing with surface finds of handmade, strictly utilitarian ceramics without any glazed ware. Concerning the amount of sherds, already from the surface more sherds pro square were collected at Khirbat al-Mu'allaq, Ba'ja and Khirbat ar-Ruwayshid, than at the other sites. As to quality, al-Mu'allaq has the highest and the most found through excavation. The poorest products come from an-Naq'a II and Ba'ja I, where only a rudimentary technology can be attested. Surprising is the relatively low number of medium and large-sized storage vessels. This might be due either to the lack of need or to the lost ability to manufacture them. After all, there was no regression of pottery in the villages, but rather a devolution since the time when people used Nabataean and Roman style pottery made by professional potters. Or, were the beginnings of their pottery poor imitations of wheel-thrown Early Islamic production? The better quality of part of the al-Mu'allaq ceramics and the finds of wheel-thrown Fatimid or Early Ayyubid sherds at Kutle I may point in that direction. As to decora-

tion, at al-Mu'allaq there was no substantial painted pottery, though there was decoration by finger- and implement indentation. Most painted (black or red lines to criss-cross at the exterior and/or interior) sherds were collected at Kutle I and ar-Ruwayshid, revealing either a longer span of existence or a later foundation of the settlement. If that is correct, then al-Mu'allaq must be considered as the earliest settlement, coinciding with the better (or the least devolved) quality of its ceramics. Apart from such differences, there is an astounding similarity in the use of ledge handles, though in different styles and sizes, from dainty specimens to the "large swollen tongue" type, obviously fitting smaller or larger vessels. Common to all sites, is the almost total lack of cups and the predominance of bowls and cooking pots, the latter to be expected. The lack of imported pottery in the villages and in an-Naq'a may be due to the absence of people having the means to afford them. Or was the painted pottery used (and ordered to be made) by persons of higher "rank" or wealth? In any case, the painting of pottery seems to either indicate a step to overcome the pure functionality of plain pots, or otherwise, we have to envisage neighbourly or foreign influences during the 12th-13th centuries.

Generally, the surface pottery finds in several villages, at an-Naq'a II in the Petra region and at reused sites (to be mentioned later on) can be linked to the material excavated and described by R. M. Brown at ash-Shawbak and al-Karak. The coarse and rustic material with lots of lithic grits and straw was manufactured in the villages, probably also for use at the fortresses. Apparently the potters had only a few traditions to follow, and it seems that the population increased numerically, but why one had to defend oneself is still to be discussed.

### *Two Different Scenarios*

Looking back at the sites presented to-

gether with spectra of their surface ceramics, it is clear that they were - Khirbat al-Mu'allaq being the least - either remote or hidden, i.e. at any rate defensible. Khirbat al-Mu'allaq may have preceded the Crusader suzerainty. Given that we do not know how the people of the Petra area acted in the presence of the new overlords in the 12th century, two extremely contrasting, rough scenarios can be drawn up. In one scenario, there would have been constant tension and terror between the local people and the new government. After all, the Frankish rulers had to be able to control a subject people who had no allegiance to their rulers and who would willingly side with any opposition (Boas 1998: 154). According to historical reports, among other quarrels, during punitive expeditions, bedouins were smoked out of their caves and their stocks driven away. The fortress of al-Wu'ayra had to be recaptured after the moslems had taken it in 1141<sup>3</sup>. In order to protect themselves people fled to places where they were able to hide and if necessary to defend themselves.

In the second scenario, as sketchily drawn as the other one, the local people were not subjugated but, though being, at least *de jure*, "property" of the Palestinian aristocracy<sup>4</sup>, accepted like subjects who pledged allegiance to the new rulers. For them they had to produce food and beverage and the vessels for consumption. Proving a certain similarity of everyday life in all villages, round millstones with an excentric hole were used (see Fig. 13). It is likely that the indigenous people had to build fortress-

es and roads for the occupying power, menial tasks which need a lot of supervision, if done by slave labour. They might have been prevailed upon to build defensible villages partly from spoils instead of, or in addition to, living in tents and caves. Surrounded by such places, the defensive significance of al-Wu'ayra and al-Ḥabīs, the fortresses proper, and quite probably also of el-Gi (Wādī Mūsā), was increased. Building and manning of an-Naq'a II fits beautifully in this scenario, especially, if Mayer (1990: 189) is right about the meaning of *vallis Moysi*, i.e. that its significance for the Christian overlords was not the economic exploitation of the region but security and control (and taxation) of caravans.

Without trying to differentiate between truth and propaganda in the historical reports, both scenarios, even alternatingly, according to their pottery, allow defensible villages as dwellings and shelters to have come into existence during the 12th century. At the same time (generally with the same type of pottery), sites easy to defend like Jabal al-Qšeir, Jabal aš-Šuffāḥa, Jabal al-Khubtha, Rās Batha, al-Barra, Khirbat al-Mudhlim and others were reused<sup>5</sup>. Together with the fate of the Petra region, which soon "after the Crusaders and the brief Ayyubid occupation became a peripheral area" (Vannini and Tonghini 1997: 383), eventually all of them were relinquished, reused sometimes, but not inhabited again in the original way, i.e. in intact stone houses. This was either because there was no possibility for re-habitation (earthquakes!) or because there

3. See e.g. Fulcher von Chartres in P.C. Pernoud (ed.), *Die Kreuzzüge in Augenzeugenberichten*, Düsseldorf 1961; Runciman, St., *Geschichte der Kreuzzüge*, München 1968; Albertus Aquensis Hist. Hierosolymit. in: *Recueil d'Hist.d.Crois. (Hist.Occid.I)*, Paris 1879; Willermus Tyrensis, Hist. rerum in partibus transmarinis gest., *Rec. Hist.d.crois. (Hist.Occid.I)*, Paris 1841; Recently: Vannini and Tonghini 1997: 377.

4. Queen Melisandis enfeoffed the vicecount Ulrich von Nablus with al-Wu'ayra and the surrounding

country in 1150 (Mayer 1990: 189/90). "Villagers, however ....remained on the land with a near-serf status little changed from that which they had held under Muslim rule" (Boas 1988: 139).

5. As to Late Islamic pottery on Jabal al-Qšeir see Lindner *et al.* 1996: 148/9, on Jabal aš-Šuffāḥa see Lindner *et al.*, From Edomite to Late Islamic - Jabal aš-Šuffāḥa North of Petra (ADAJ 1998); on Jabal al-Khubtha, at al-Barra, in the al-Mudhlim settlement and at Rās Batha (unpublished observations and collections of pottery).

was no need (reduced population!) to live there anymore. The last villagers may have returned to their previous, more or less, nomadic life or concentrated perhaps in el-Gi (Wādī Mūsā) where new excavations are due to reveal further information<sup>6</sup>.

### Conclusion

It can be proposed that according to the pottery and the political situation inferred from historical sources, the villages described as well as an-Naq'a II were all built and inhabited around the Crusader period in the 12th century, with Khirbat al-Mu'allaq as the least hidden and earliest. It seems that they were relinquished before the explicit geometrically painted Mamluk pottery of the 12th, 13th and 14th century AD had a chance to be introduced *en masse* to village life. Some of the villages survived for a while, perhaps even into Ottoman times, but none of them into the present. Stated otherwise, they were a "transient phenomenon" in relation with the Crusader occupation of the Petra region.

### Appendix

Thanks are due to Dr Jeremy Johns of Oxford University who kindly allowed me to read his unpublished paper on "The Rise of Middle Islamic Hand-Made Geometrically-Painted Ware in Bilad-al-Sham (11th - 13th Centuries AD)". Except that he calls Middle Islamic what I call Late Islamic, the village pottery that is presented together with the architecture of the villages antedates the rise of HMGPW. Unfortunately, my paper was already finished, by the time I was able to study Dr John's profound and far-reaching treatise. Hope-

fully, I may still contribute some local observations to what Dr Fawzi Zayadine adequately calls "the medieval suburbs of Petra" (pers. comm.).

### Acknowledgements

For constant support during the various surveys and examinations of the Late Islamic villages in the Petra region, the author would like first to express his gratitude to the Department of Antiquities of Jordan and its Directors-General, especially Dr Ghazi Bisheh and to the Department of Antiquities representatives Mr Suleiman Farajat and Mr Hani Fallahat. My companions were (not always present of the same time) Prof. Dr U. Hübner, Prof. Dr E.A. Knauf, Mrs. I. Künne, Mrs. E. Schreyer, Dipl. Ing. Dr J. Hübl, Mrs. E. Gunsam, Mrs. A. Schmid and last but not least Mr Dakhlallah Qublan from Petra - Umm Şayḥūn. The typescript was read by Dr Fawzi Zayadine, Dr Jeremy Jones, Prof. Dr W. Hütteroth and Dr Jürgen Zangenberg. For their helpful suggestions I am extremely thankful.

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The pottery was drawn by Mrs. Gisela Vorndran, Mrs. E. Schreyer and Dr Manfred Lindner.

Manfred Lindner  
Naturhistorische Gesellschaft  
Gewerbemuseums platz 4  
D-90403 Nürnberg  
Germany

6. I have to thank my friend Dr Fawzi Zayadine for suggesting that the political situation of the 12<sup>th</sup> century in the Petra region was more complex than indicated in this essay. I fully agree with the Jordanian archaeologist. Part of the complexity referred to should be the fate of the Christians

around Petra who might or should have cooperated with the Crusaders and suffered after their defeat. However, for the presentation of pottery and architecture from the villages, the rough description of the 12<sup>th</sup> century should suffice.

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# ARCHAEOLOGICAL SURVEY AND EXCAVATION AT WĀDĪ AL-YUTUM AND TALL AL-MAGAŞŞ AREA - 'AQABA (ASEYM) A PRELIMINARY REPORT ON THE FIRST SEASON 1998

by

Lutfi Khalil and Ricardo Eichmann

in collaboration with

Helmut Brückner, Jochen Görsdorf, Andreas Hauptmann, Lothar Herling, Heiko Kallweit, Susanne Kerner, Riham Miqdadi, Reinder Neef

## Introduction

A Jordanian-German cooperative project was created in 1998 with the aim of collecting more information about the pre-history of the 'Aqaba region, including Wādī al-Yutum. The project also aims at continuing previous work, which had been carried out by L. Khalil at Tall al-Magaşş and Ḥujayrāt al-Ghuzlān in 1985 and 1990. The first season of the joint research project (ASEYM) was from January 10 to February 13, 1998. It was sponsored and funded by the Deanship of Research at the University of Jordan and the Orient-Abteilung of the Deutsches Archäologisches Institut in Berlin, in cooperation with the Department of Antiquities in Jordan (Eichmann and Khalil 1998).

The staff included Jihad Abu Ali (square supervisor), Ayish Abu Hilal ('Jerichoman'), Khalid Al-Manassir (square supervisor), Heribert Braun (draughtsman), Darar Depolsky (field technician), Salem Dhiab (representative of the Department of Antiquities), Stefan Fengler (photographer), Heiko Kallweit (archaeologist), Riham Miqdadi (square supervisor), and Christiane Meckseper (square supervisor). The work was directed by the authors.

Moreover, a number of specialists participated in the project on a part time basis: Helmut Brückner (geomorphologist), Susanne Kerner (Near Eastern archaeologist), Reinder Neef (palaeobotanist) and Thomas Urban (archaeologist and surveyor). This report is based on contributions by all collaborators mentioned in its title. Their complete reports will appear in a forthcoming

issue of *Orient-Archäologie*, which is a new series published by the Deutsches Archäologisches Institut, Orient-Abteilung, in Berlin (Eichmann and Khalil in press).

The main aims of the Project can be described as follows:

### A. Survey

- 1- To survey and document the archaeological sites in the area between Tall al-Magaşş and the mouth of Wādī al-Yutum (Fig. 1).
- 2- To prepare detailed contour maps of the sites of Tall al-Magaşş, Ḥujayrāt al-Ghuzlān, and al-Yutum B.
- 3- To collect and document archaeological surface remains found in Ḥujayrāt al-Ghuzlān and the surrounding area.

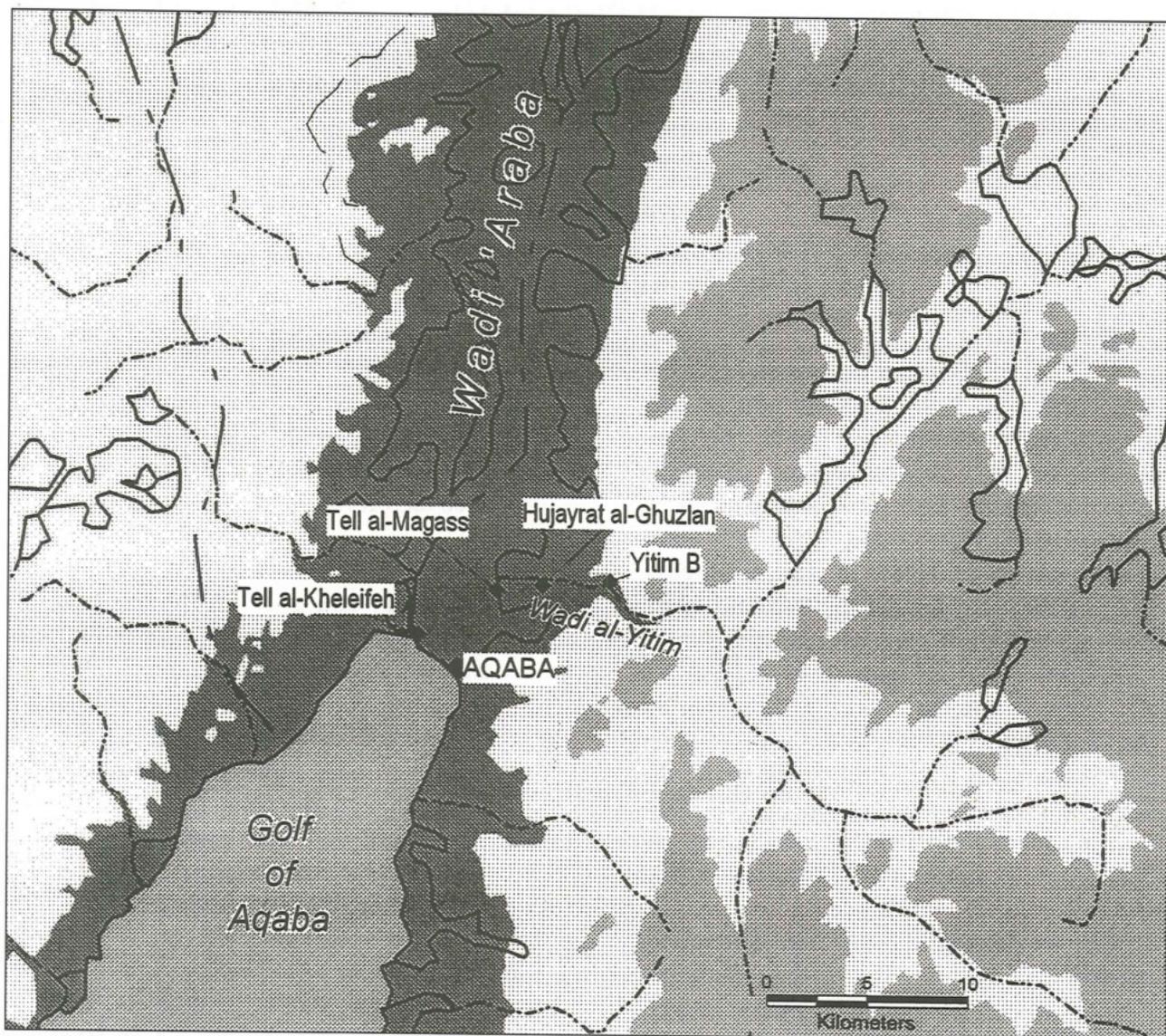
### B. Excavation

- 1- To expand the excavation in Tall al-Magaşş in order to expose architectural features, to understand the relationship between walls discovered in previous seasons' work, and to determine whether the large retaining walls from square B2 and C1 are related.
- 2- To examine the stratigraphy and the date of al-Yutum B by means of small soundings.

### C. Miscellaneous

- 1- To take C14 and palaeobotanical samples from various sites.
- 2- To study the palaeogeographical setting of the 'Aqaba gulf region and its coastal evolution during different periods.

What follows is an account of excava-



1. Map of the southern Wādī 'Arabah with sites studied in the ASEYM '98 project (Tall al-Magaṣṣ, Hujayrāt al-Ghuzlān and al-Yutum B).

tions at Tall al-Magaṣṣ, an archaeological survey at Hujayrāt al-Ghuzlān, and soundings at al-Yutum B.

### Geoarchaeological Aspects

The Late Chalcolithic/Early Bronze Age sites of Tall al-Magaṣṣ and Hujayrāt al-Ghuzlān are situated at a height of ca. 64 m and 110 m asl on the alluvial fan of Wādī al-Yutum, a few kilometres west of its confluence with Wādī 'Arabah (Fig. 1). Composed primarily of sand and gravel, the alluvial fan offered conditions which were hardly conducive to farming. This is also confirmed at

the site of Wādī al-Yutum B on the northern cliffs of the wadi, roughly 1 km east of its entrance and 90 m above the wadi bed. The present savanna-like vegetation is comprised of bushes and desert shrubs, with the dominance of acacia trees, allowing sheep and goat raising. During the time of our work, mainly herds consisting of around 120 goats were observed. According to preliminary results of the palaeobotanical charcoal analysis carried out by Reinder Neef, the ancient climatic conditions did not differ greatly from those of today. The fact that wood was a scarce commodity during the Chalcolithic

period is evidenced by the use of dung as fuel, as can be deduced from the layers of ash at Tall al-Magaşş and Hujayrât al-Ghuzlân.

Although the annual rate of precipitation is less than 50 mm, agriculture must have been possible to a small extent, since there is evidence of irrigation. Samples from trenches at Tall al-Magaşş and Hujayrât al-Ghuzlân contained among others, remains of flax and naked wheat, both of which require irrigation. It seems that the runoff water that flowed down the Wâdi al-Yutum during the rainy seasons was collected and used in irrigation. This observation corresponds with the construction of ancient walls (see below), which transverse the wadis in the vicinity of the formerly settled areas. Such structures were already reported by an American survey team (Smith, Stevens and Niemi 1997).

The situation described here can be confirmed by accounts of travellers of the 19th and early 20th century. For example, A. Musil (1907: 256), who reported that in Wâdi 'Arabah farming was only attempted after heavy rainfall, he noted that in the lower Wâdi al-Yutum remains of extensive terrace walls, gardens along the terraces on the slopes and enclosed springs in the near vicinity could be observed. Moreover, F. Frank (1934: 245) described the remains of structures 80 m in diameter ('wells'), that are probably cisterns, as being at a distance of 1,25 km from 'Aqaba, on the eastern periphery of the alluvial fan of the Wâdi al-Yutum. One should bear in mind that this distance is related to the ancient settlement of 'Aqaba (Whitcomb 1997).

The ancient alluvial surface of the 'Aqaba region has been disturbed by development in its outskirts since the 1960s. Additionally, extensive levelling work was carried out for the construction of truck parking lots and service roads. Hence, archaeological and geological evidence has been destroyed to a considerable extent. Even the sites under

study, which are known as archaeological monuments and protected by a fence, display modern damages and destruction.

The purpose of the geoarchaeological research, carried out by Helmut Brückner in collaboration with Heiko Kallweit during February 1-12, 1998, as part of the ASEYM-project, was to find remains indicating the palaeogeographical setting of Chalcolithic sites in the 'Aqaba region. The focus of attention was directed towards coastal evolution and environmental changes during the Holocene. As D. Whitcomb has already explained, there was a seaward and south-eastern movement of settlements in the 'Aqaba region: The Chalcolithic sites of Tall al-Magaşş and Hujayrât al-Ghuzlân are situated 4 km north of the present shoreline; the settlement of Tall al-Khalayfi dating to the first millennium BC is only 550 m away from the coast, while the Byzantine and early Islamic sites are closer to the water (Whitcomb 1997). The reasons for these movements might have been either a shift in the shoreline or the changing availability of freshwater sources.

To solve questions concerning the former shift in the shoreline a bore sample was taken from the present beach via Tall al-Khalayfi, 700 m to the north (Fig. 2). Marine sediments were detected below the settlement site of Tall al-Khalayfi and further inland.

Until now, the farthest northward extension of the former Gulf of 'Aqaba, i.e. the peak of the Holocene marine transgression, is still unknown. However, we know about the time of the regression. Shell fragments from littoral deposits in two bore samples were radiocarbon dated to the first half of the second millennium cal. BC and the first half of the fifth millennium cal. BC. Thus, the marine strata were deposited during the Holocene sedimentary cycle. The littoral milieu 350 m north of the present shoreline had evolved into a terrestrial one by ca. 1500 BC at the latest (Brückner in press). In view of



the fact that the Chalcolithic sites of Tall al-Magaşş and Hujayrât al-Ghuzlân are located at altitudes of 64 m asl and 110 m asl, they cannot be considered as nearby harbour sites.

According to observations made by H. Brückner in a 2 m deep pit near Hujayrât al-Ghuzlân, Chalcolithic deposits, constituting fine-grained, silty sand layers, contained many specimens of snail *Melanopsis praemorsa buccinoidea* (Olivier 1801; identified by Dr H. Schütt, Düsseldorf). This snail is a freshwater species, living in moving, non-stagnant waters, often in canals or springs. Its occurrence is limited to the Chalcolithic layer, which may be indicative of a more humid environment during that period.

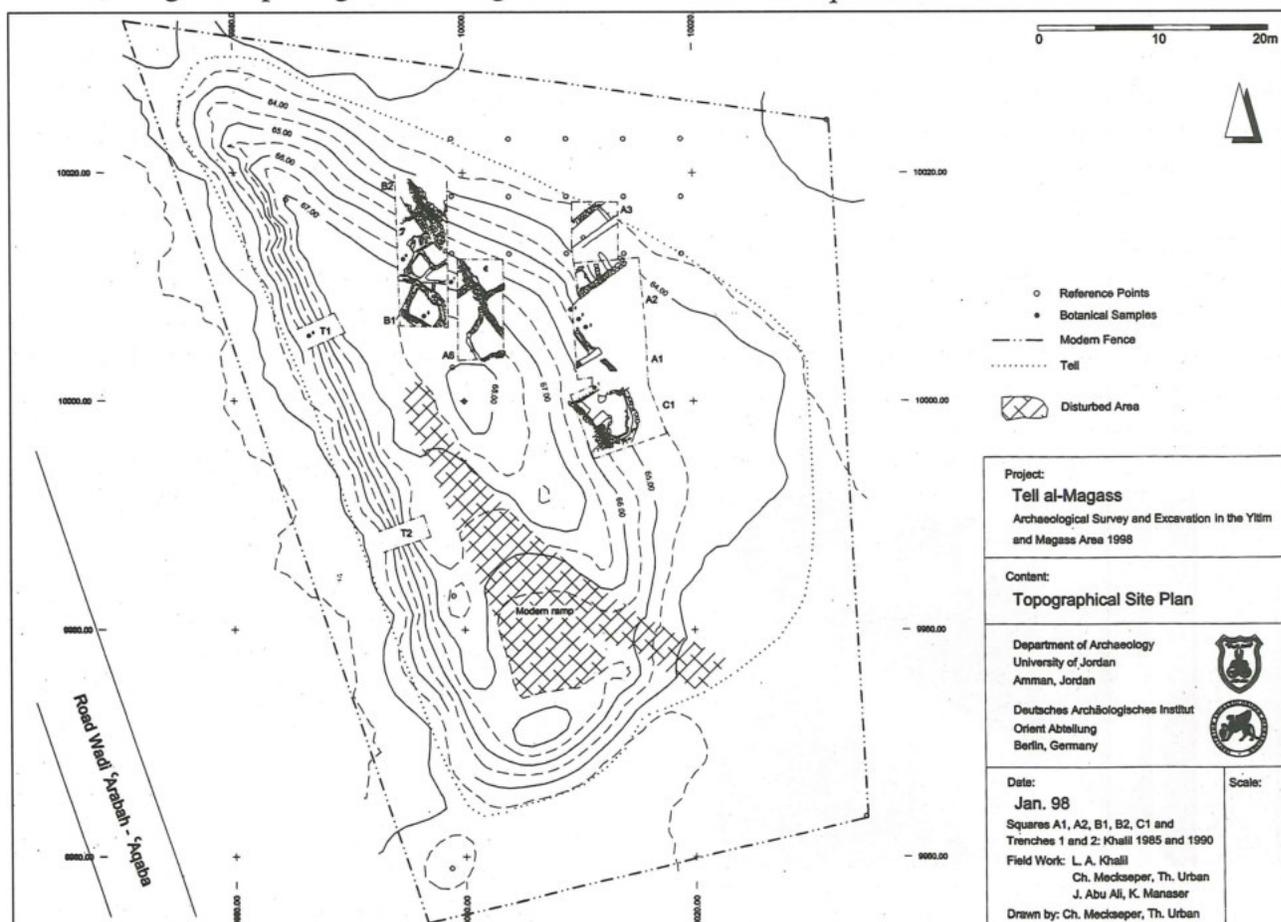
Taking into account that flax and wheat were cultivated, and that terrace walls were built in the wadis leading down to Wâdi al-Yutum, the geomorphological investigations

point to a sophisticated water and soil management, carried out as early as ca. 3600 BC (cal.), according to C14-dates, currently being processed at the radiocarbon laboratory at the German Institute of Archaeology (J. Görsdorf in press).

### Excavations at Tall al-Magaşş

Despite two seasons of excavation at the site (Khalil 1988; 1995), the relationship between the different architectural features which were discovered in areas A-C, is still not well understood.

Two squares, A3 and A6 were laid out in the north-eastern sector of the site. Square A3, measuring 5x5 m, lies north of A2 at the foot of the tall, while square A6, measuring 5x9 m, lies east of B1 and B2 near the summit of the site (Fig.3). The following is a description of the stratigraphy and architecture of both squares.



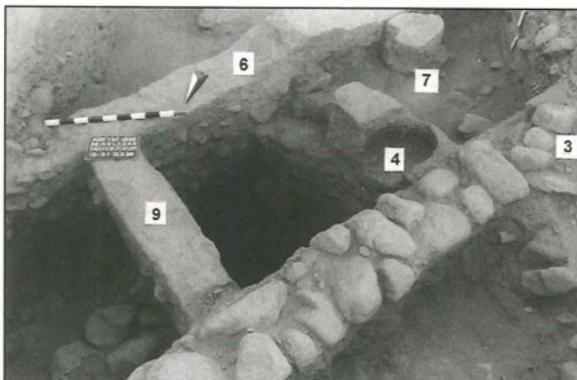
3. Tall al-Magaşş: General plan of the site with the major architectural structures.

*Square A3*

At an incline towards the east, the top soil consisted of loose sandy layers and measured 17-62 cm. This sand deposit is a result of the alluvial sediments of the nearby Wādī al-Yutum. Digging below the sandy layers revealed two types of walls. The first type, consisting of undressed alluvial stones, is built in irregular rough courses, for example wall 3 is made of two rows with clay used as the binding material. It runs from the middle of the north balk to the middle of the west balk. Wall 21 is also built of the same material as wall 3, but it comprises only one row. The second type of wall is constructed of a mixture of undressed stone and mud, such as walls 6 and 9. Walls 18 and 19 are of the same type, and represent the extension of walls 10 and 8 of square A2 from the 1990 excavation season (Khalil 1995: 68).

Juxtaposed to the southern side of wall 3, and near the west balk is a mud wall with an oval pit (locus: 4). It was filled with sand of the same type as of the top soil. A circular mud column - like locus 7 is located north of wall 6 which runs south-west to north-east (Fig. 4). The walls 3, 6 and 9 formed a room-like structure; loci 4 and 7 might have been part of the ceiling system of the room.

Many layers such as 1, 2, 5A, and 5B were sealed against the walls mentioned above. Both layers 5A and 5B are ashy, easy to dig and were above layer 11. The latter layer (11), brownish in colour and difficult



4. Tall al-Magaşş: Square A3, rectangular room with a round construction of mud and a pit, in which a storage vessel was found.

to excavate, lay above the mud floors 12 and 13. These in turn are related to the walls and continue irregularly, while mud floor 20 slopes towards the east with one step (locus 4).

The deposit layers between the walls represent phase I, where a storage jar was excavated. The mud floors and the walls represent phase II of the latest occupation. The excavated layers below the mud floors, loci 23-25, represent phase III which represents an earlier occupation.

*Square A6*

Removing the top soil, which was a thin layer of sand, revealed an ashy layer (locus 3), 5-10 cm deep and covering most of the square. This ashy layer was the result of using the area as a rubbish dump. Two rubbish pits (loci 6 and 7) are of the same nature as the locus 3 layer, but are very rich in bones, pottery sherds, flints, shells and a considerable amount of charcoal. They are also similar in nature and content to loci 4, 7, 9, 10, 21 and 22 in square B1 (Khalil 1988: 81). Excavation of pit 5 recovered a large, almost complete pottery storage jar. It was located against the north balk and the west edge of the pit, formed by the mud brick wall (locus 16). Excavating a similar pit (locus 26), which was also rich in finds, resulted in another storage jar.

A small hearth (locus 13) was situated against the north front of wall 21 and directly above the mud floor 14, which covers most of the square.

Several walls were discovered while excavating the ashy layers and pits. They displayed almost the same material and method of construction as other walls, which were discovered in different squares. Walls 16 and 18 were built of a mixture of stones and mudbricks, and the eastern front of wall 18 was plastered (Fig. 5). Walls 19 and 21 may have formed part of a small room in the eastern part of the square. Wall 18 might represent an extension of the structure as well. It



5. Tall al-Magaşş: Square A6, face of a curved wall with white plaster (locus 19).

is possible that the walls are an extension of the architectural features which were discovered during the excavations of previous seasons in squares B1 and B2.

In conclusion, the excavated occupation layers, mud floors, stone and mud walls with associated pottery and other finds, illustrate three phases of occupation in square A3. The Early Bronze Age period can be suggested as a date for phases I - II. The foundation of the structure discovered in square A6 has not yet been reached. Therefore, it is difficult to suggest the function and age of the walls at this stage of excavation.

### Survey at Tall Ḥujayrāt al-Ghuzlān

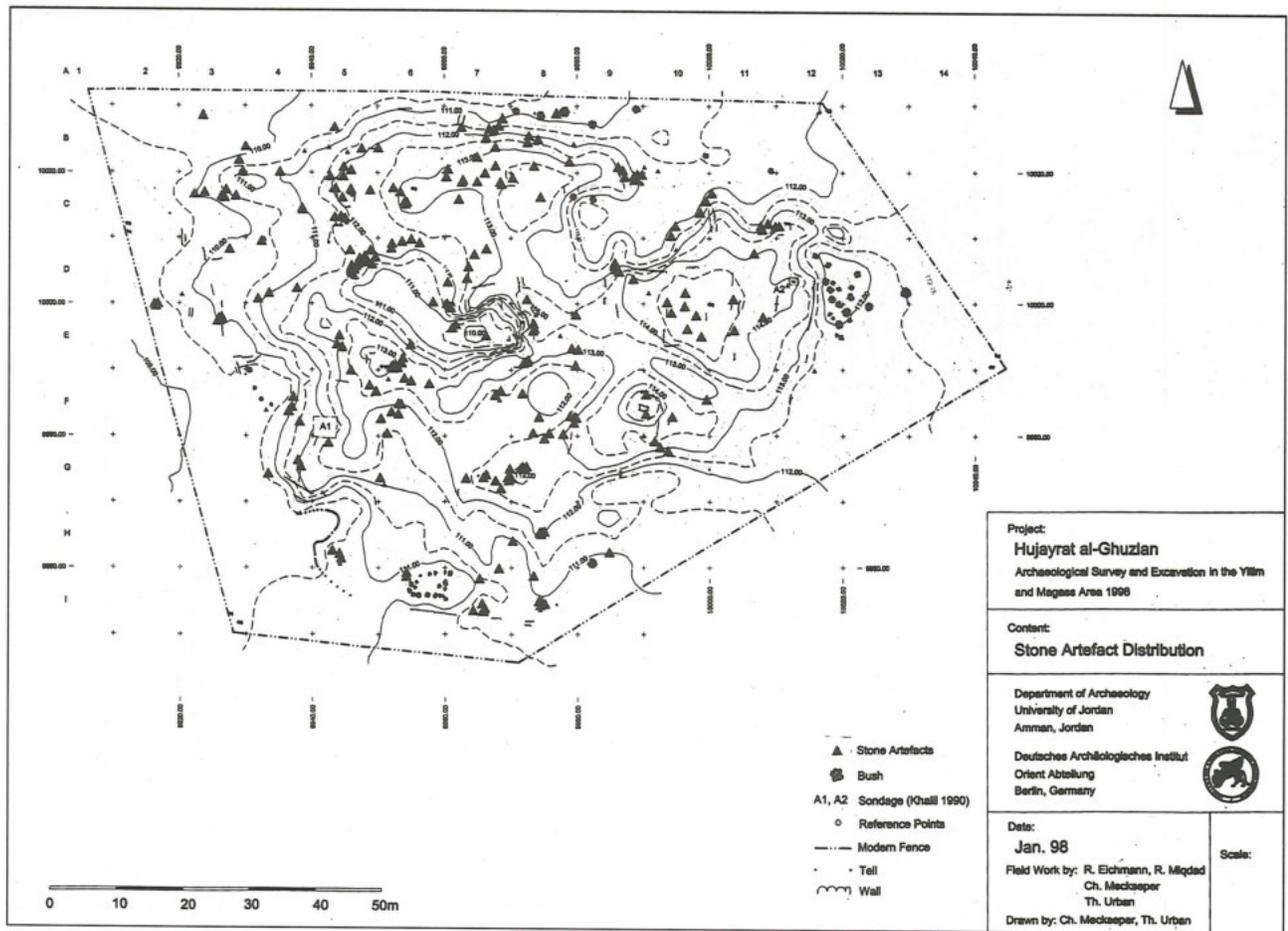
In 1990, Lutfi A. Khalil carried out two soundings at Ḥujayrāt al-Ghuzlān in order "to determine the chronology of the site and to locate any possible relationship between the site and Tall al-Magaşş" (Khalil 1995: 65). The two 3m x 3m soundings, one on the summit, the other at the western edge of the tall, yielded pottery sherds, flint artefacts, stones, bones, shells and copper remains. These artefacts proved to be similar and contemporary with those found at Tall al-Magaşş. Nevertheless, the results were uncertain to a degree, as the stratigraphy was heavily disturbed: "Where modern remains such as glass fragments and pieces of wood are found, they were mixed with the ancient debris" (Khalil 1995: 77), which reflect late

Chalcolithic/early Bronze Age household and workshop activities.

The site was indeed radically destroyed (Fig. 6). Deep squares had been cut into the mound, and the debris were piled up in big heaps, when the site was used for military purposes in the 1940s (Khalil 1995: 77). According to the archaeological research conducted so far, Ḥujayrāt al-Ghuzlān played an important role in the metallurgy of southern Jordan. Measuring about 150 m x 80 m, which is much larger than Tall al-Magaşş, the site seemed to be promising for future excavations. Thus, an intensive survey was carried out to gather more information about possible settlement patterns and undisturbed areas. This work was intended to facilitate planning future excavations and to provide us with more data regarding to the ancient societies in southern Jordan. The archaeological survey, carried out by R. Eichmann and R. Magdadi in squares measuring 10m x 10m covering an 80 m x 150 m area, produced pottery sherds of around 40 different fabrics, in addition to many products related to metallurgy, ranging from copper ores and slags to smelting crucibles and a remarkably high density of incinerated residues. Additionally, numerous groundstone artefacts and other small finds, such as bone and shell artefacts, were recorded (see below), as well as several walls of stone and mudbrick, which will be described elsewhere (Eichmann and Khalil in press).

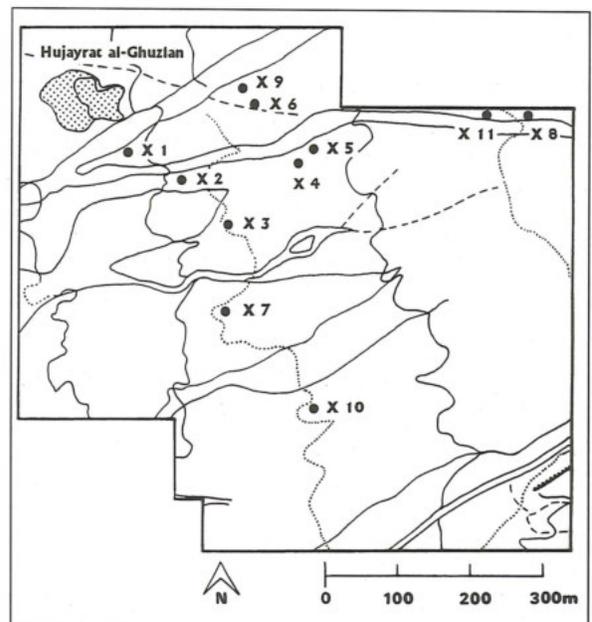
### Survey to the East, Southeast and South of Ḥujayrāt al-Ghuzlān

As mentioned above, archaeological sites in the 'Aqaba region are endangered by levelling works and building activities, reaching Wādī 'Arabah. These activities will rapidly change the landscape around Ḥujayrāt al-Ghuzlān, where several ancient structures had been noted. To collect as much information as possible, an area of 500 x 700 square meter was chosen southeast of the Tall, in order to study and document the sur-



6. Hujayrāt al-Ghuzlān: General plan of the site with find spots of groundstone artefacts indicated by black triangles.

face remains of eleven find locations with several built structures (Fig. 7: X1 - X11). Field work, carried out by Heiko Kallweit, took place from 10 to 27 January. According to his observations, the main features are 10 m x 5 m large horseshoe shaped structures (X1; X2; X4), circular structures (X2; X10), and heavily damaged multicellular architectural units (X3), in addition to a 38m long, 4m wide 'boat shaped' structure (X9) oriented east-west along the wadi flow, and walls crossing the drainage lines, coming down Wādī al-Yutum. These structures most probably reflect ancient water management techniques, which might have been applied during the settlement periods, represented by Hujayrāt al-Ghuzlān. The surface finds include pottery sherds similar to wares found at Hujayrāt al-Ghuzlān, slags, copper ores, flint tools, fragments of groundstone tools,



7. Map indicating the survey area and find locations X1 - X11 in the surroundings of Hujayrāt al-Ghuzlān.

as well as worked and unworked shell fragments. However, the diagnostic capacity of this material is limited, and future excavations might provide us with more precise data.

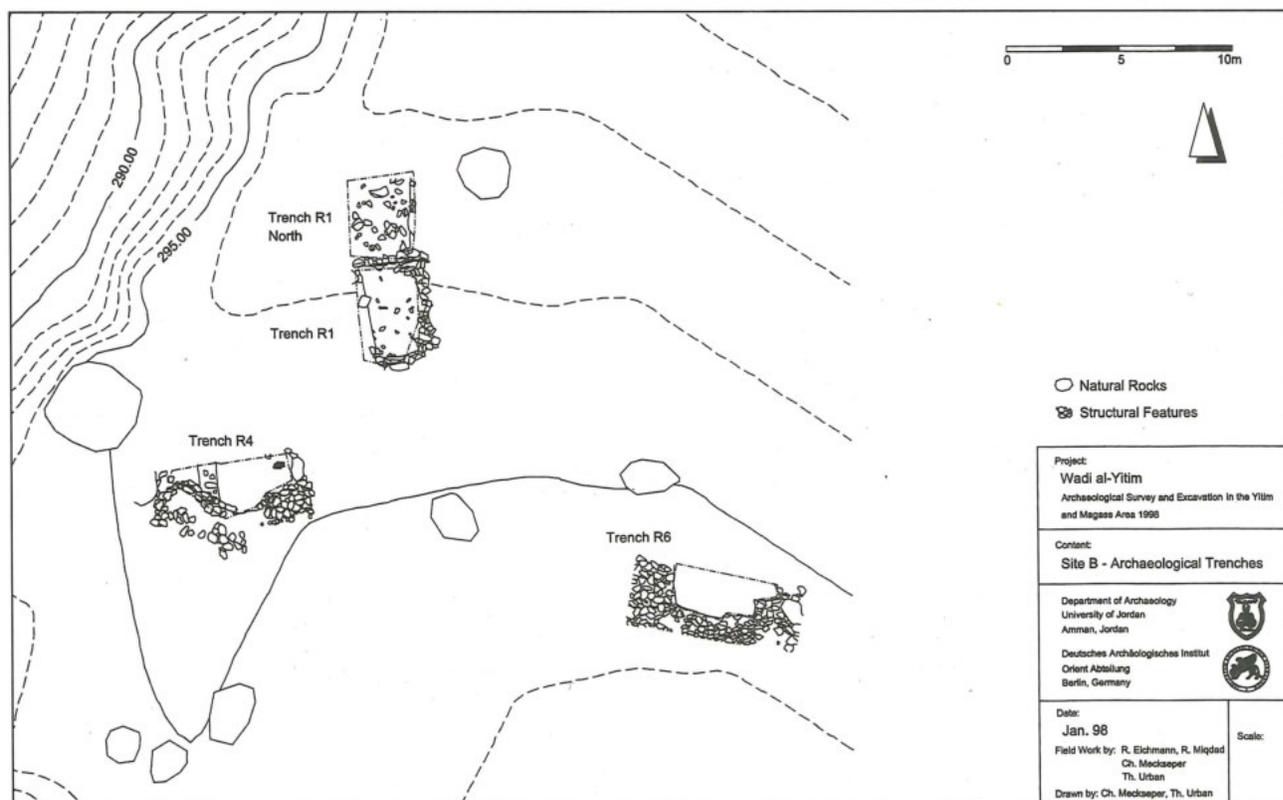
### Soundings at al-Yutum B

At Wādī al-Yutum, where the 'King's Highway' once passed, several archaeological sites could be identified with the help of aerial photographs. The sites, bearing the remains of rectangular and circular structures ('houses'), are located on cliffs along the wadi. One site, al-Yutum B (see Fig. 1), situated about 90 m above the wadi bed, is distinguished by the walls of at least 25 different houses. These walls are constructed of worked and unworked stones; their ground plans show straight running, quadrangular or round walled structures. In order to obtain more information about the settlement, surface finds were collected and small soundings were carried out (Fig. 8). The cultural

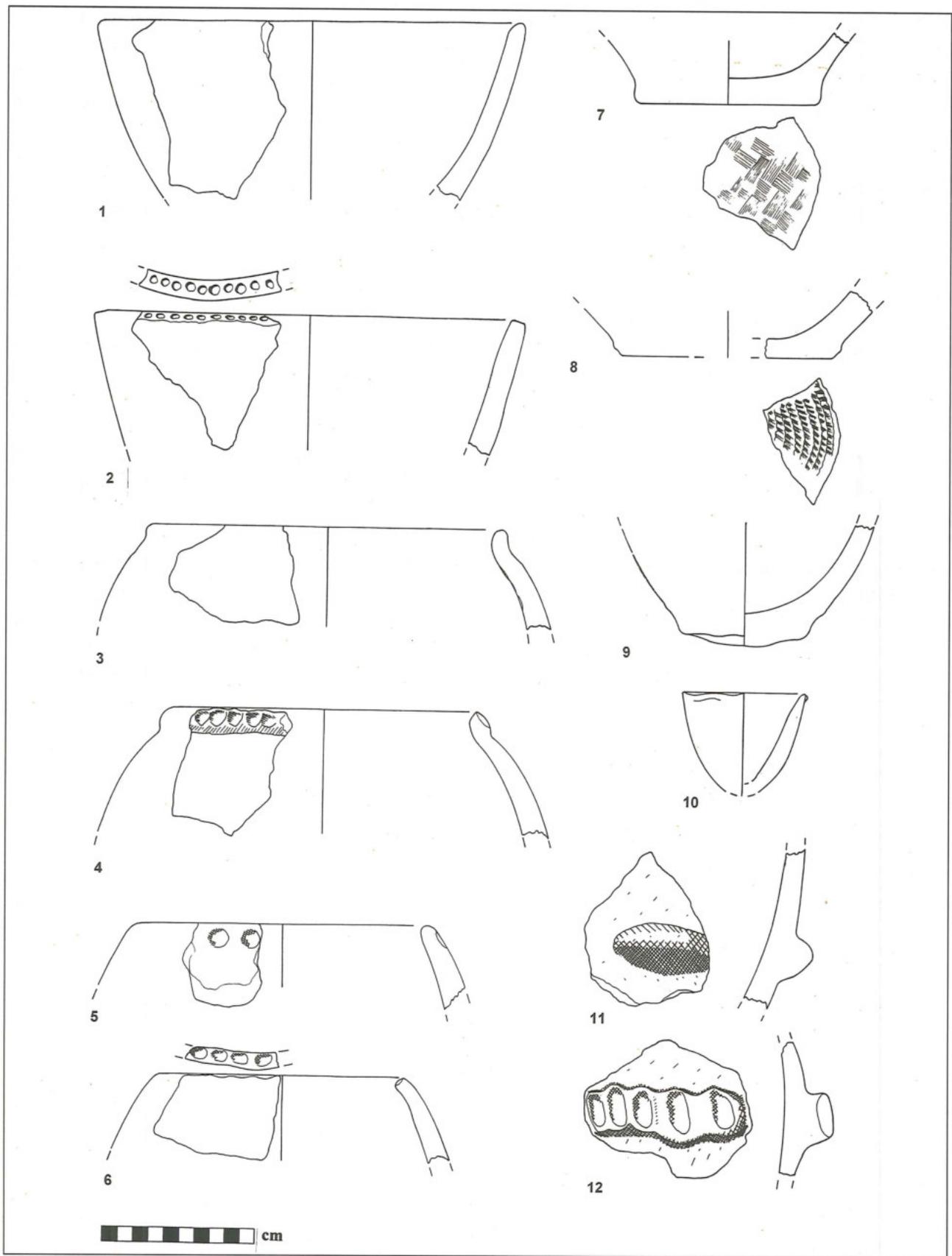
deposits studied in three trenches (Fig 8: R1, R4 and R6), no more than 40 cm thick, contained ash, some pottery fragments, grinding stones, a stone mortar, and two copper awls. Diagnostic pottery fragments, both from the survey and the soundings point to an Early Bronze Age date (see below); C14 dating of samples is currently underway. Up to now, only a few structures could be documented. The whole plan of the settlement will be completed in a future campaign.

### Pottery from Ḥujayrāt al-Ghuzlān and al-Yutum B

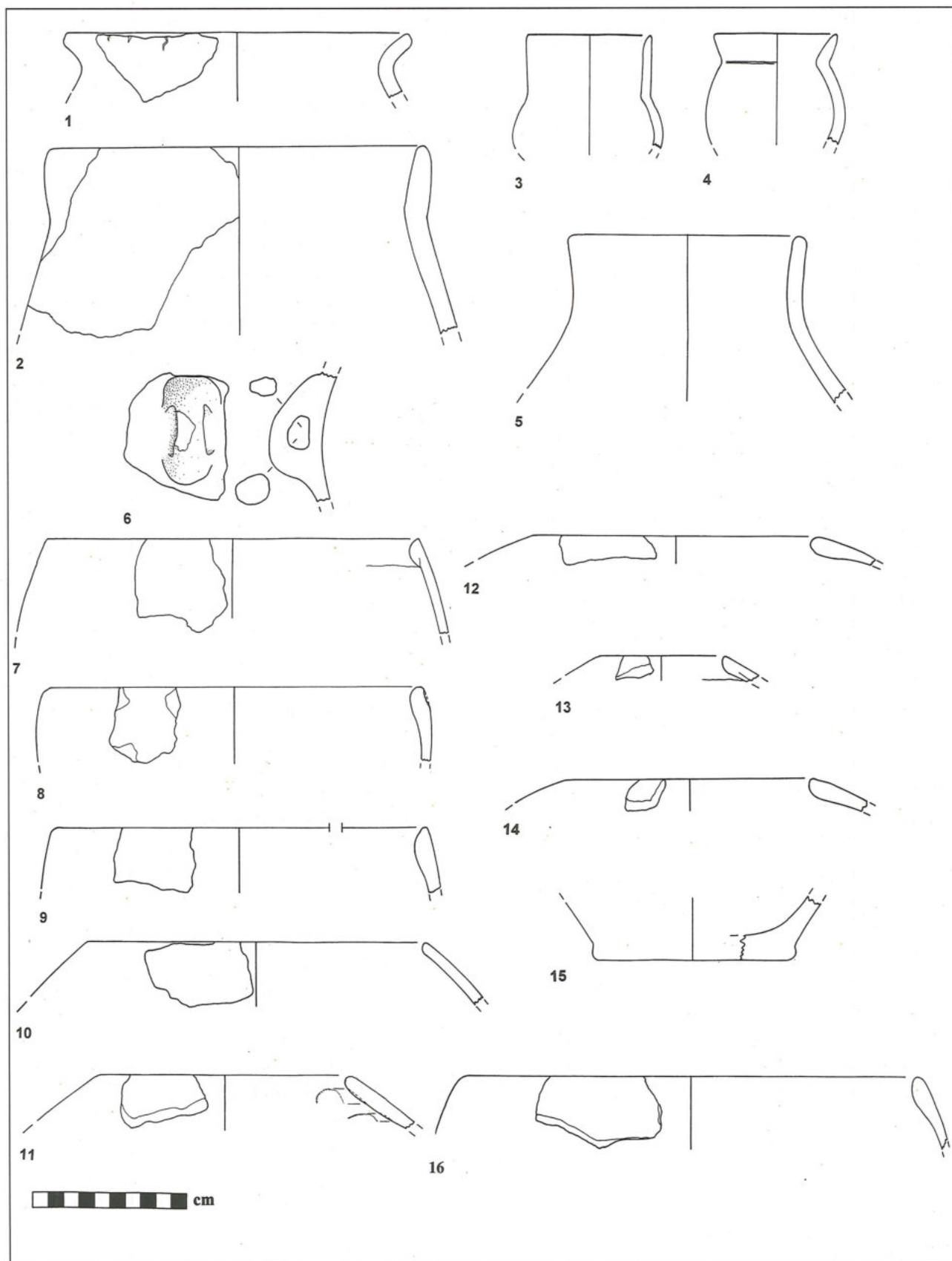
During the survey of Ḥujayrāt al-Ghuzlān only diagnostic sherds were collected (Figs. 9 and 10). They represent 40 different fabrics that could be classified into 8 groups, and generally show a high degree of similarity to the material from Tall al-Magaṣṣ (Khalil 1988; Kerner 1998). All of the pottery is handmade and the coils are still recognizable on the inner and outer surface of several



8. Al-Yutum B: Archaeological trenches within a superficially visible Early Bronze Age (?) settlement, which is not yet completely documented.



9. Pottery from the archaeological survey at Hujayrāt al-Ghuzlān.



10. Pottery from the archaeological survey at Ḥujayrāt al-Ghuzlān (1- 6), surveys and soundings at al-Yutum B (7,10,11,13), and from the surroundings of Ḥujayrāt al-Ghuzlān (8,9,12,14-16).

pieces. Buff wares, are common. They are either granite tempered (grain size up to 0.6 cm) or straw tempered.

The formal repertoire is limited to bowls (Fig. 9: 1-2), hole-mouth jars (Fig. 9: 3-6), jars (Fig. 9: 1-5) and pithoi, sometimes with ledge or knob handles, which can be decorated (Fig. 9: 11-12). The bases are flat, relatively thick and show clear signs of the manufacturing process. Often, fingerprints of the potters and mat impressions (Fig. 9: 7-8) are visible. The decoration consists of incisions, finger impressions (Fig. 9: 2 and 4-6), and rows of holes, made with small roundish instruments.

For most of the pottery from Ḥujayrāt al-Ghuzlān, comparisons can be found in either very late Chalcolithic or early Bronze Age IA contexts. So far, Wādī Faydān 4 and 100 provide the best comparisons for the forms as well as the fabrics. Other possible comparisons are those to pottery found in levels V and IV in 'Arad, as well as in Pella (area XIV) in addition to a few similarities with the pottery of Jericho and 'Afula. The pottery at Ḥujayrāt al-Ghuzlān is made in a late chalcolithic tradition, but has forms which are more common in the Early Bronze Age I (Kerner in press; Kerner 1997).

The pottery from al-Yutum and from a small area close to Ḥujayrāt al-Ghuzlān (Fig. 7, find locations X 7 and X 11) is clearly different from that of Ḥujayrāt al-Ghuzlān (Fig. 10: 7 - 16). The wares are partly wheel-made, better fired, denser and harder. The temper, which consists mainly of lime and shells, is much finer, of better quality and lesser quantity. The surface is wet-smoothed and often slipped. The only reconstructable form so far is a medium-sized hole-mouth jar with a slightly thickened rim (Fig. 10: 7, 11, 12 and 14 from al-Yutum B; Fig. 10: 8-10, 13, 15, 16 from Ḥujayrāt al-Ghuzlān X 7 and 11). The pottery is difficult to date. The fabrics are more comparable to the general fabrics of the Early Bronze Age and the only known shape

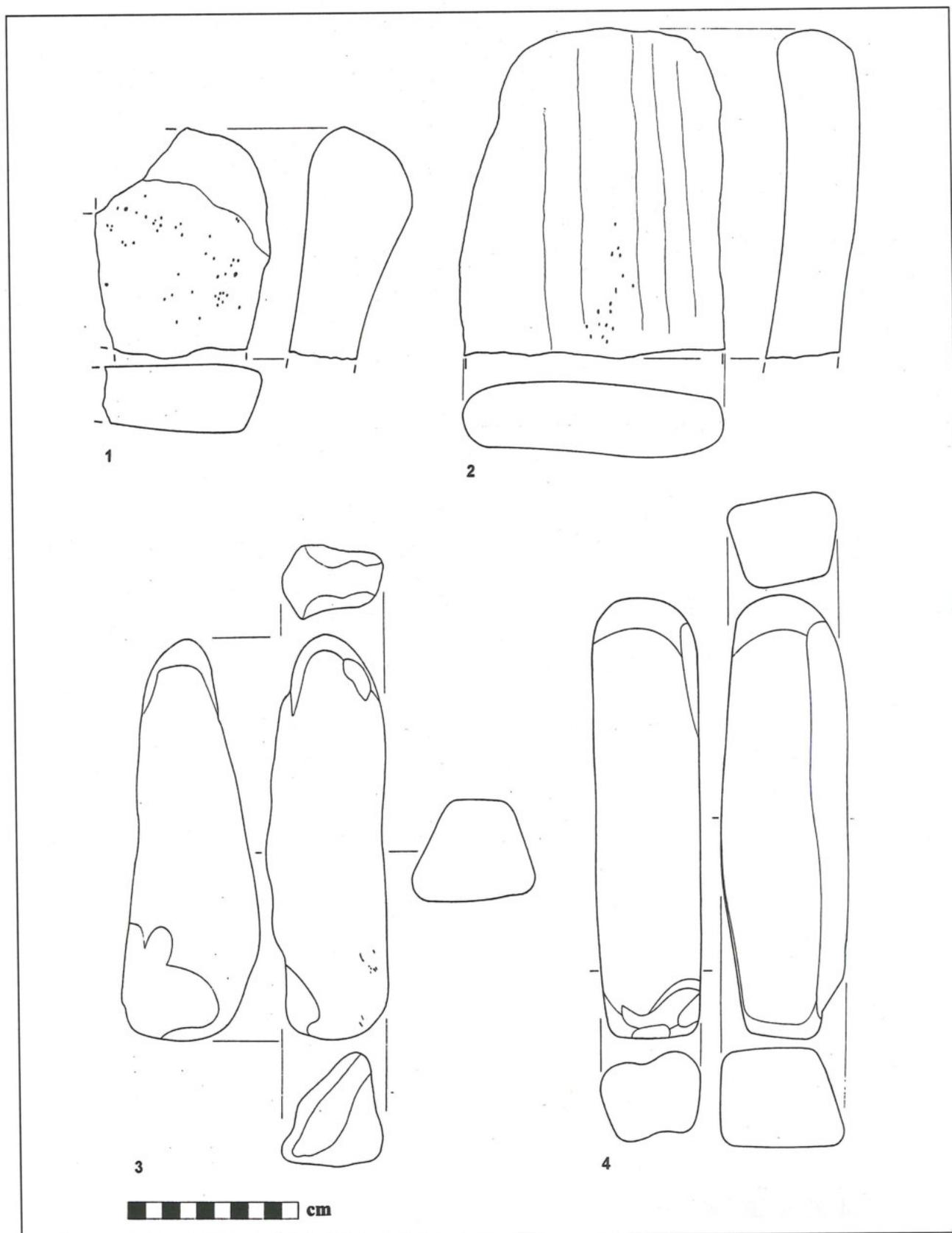
can also be found in Early Bronze Age I and Early Bronze Age II contexts.

### **Groundstone Artefacts from Ḥujayrāt al-Ghuzlān**

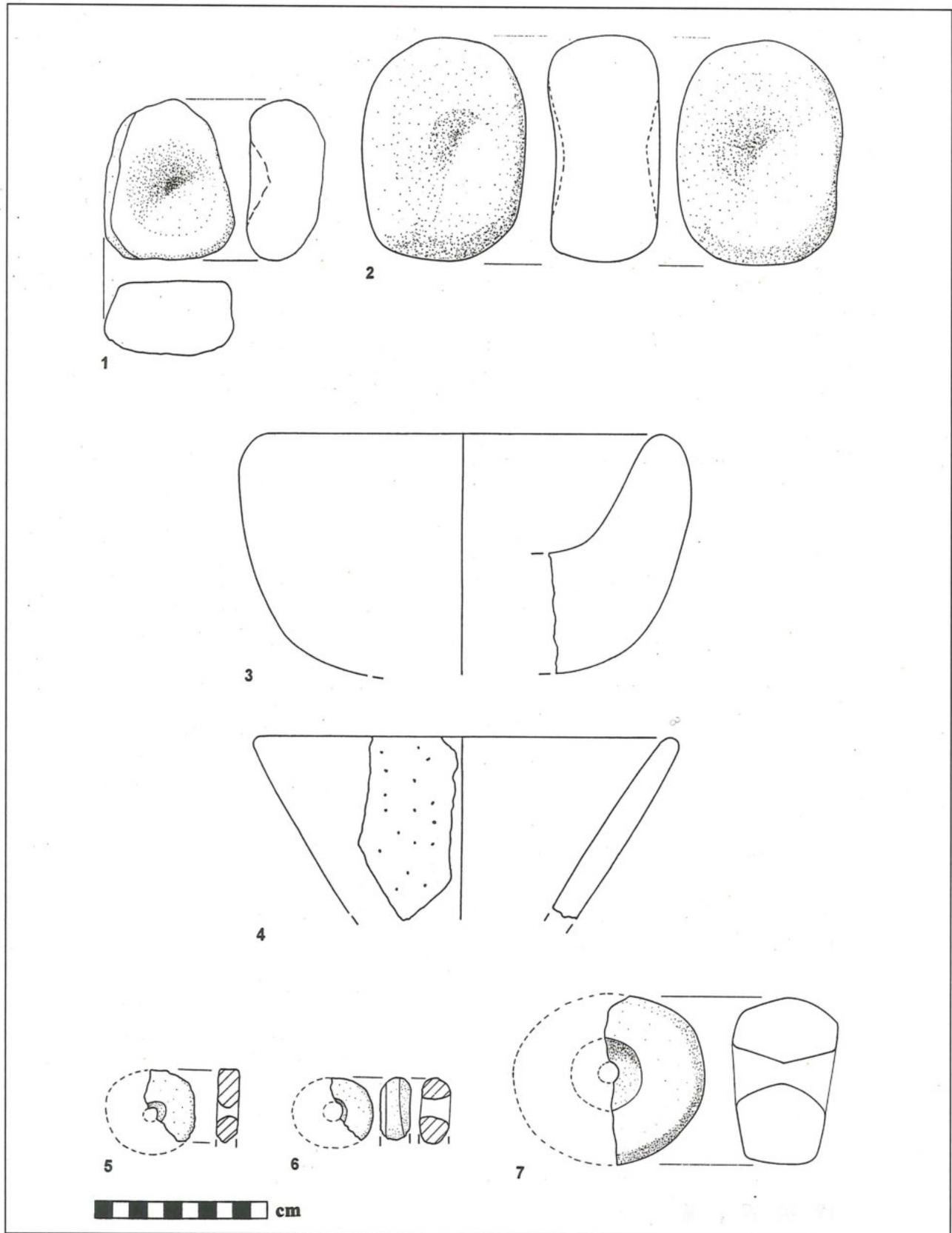
The groundstone artefacts (Figs. 11 and 12) are composed of 316 grinding stones, 2 hand stones, 23 mortars, 5 pounders, 6 pestles, 8 fragments of stone vessels and 4 other items (e.g. loom-weights, Fig. 12: 7). According to the distribution of the tools analysed by Susanne Kerner, only a few find clusters can be observed. These can be interpreted to a limited extent and used as evidence for the reconstruction of different functional areas. For example, there is a dense concentration of grinding slabs, pestles, pounders, mortars around square C5 and its adjacent squares. This combination of finds, which is associated with slags and small pieces of copper ore, can be interpreted as the remains of a working, possibly metal-working, area. The same might be true for squares E6 and F6, although there is a less pronounced density of material. The pores of two grinding stones (Fig. 11: 1 - 2) show clear signs of ore remains and therefore the stones might have been used in connection with the preparation of ore. The majority of grinding slabs was most probably used for grain preparation. The evidence of more vessels and possible loom-weights in the eastern part of the tell, and more grinding stones in its western part might indicate a division of Ḥujayrāt al-Ghuzlān into a more domestic eastern and a more craft oriented western side.

### **Lithic Artefacts from Tall al-Magaṣṣ and Ḥujayrāt al-Ghuzlān**

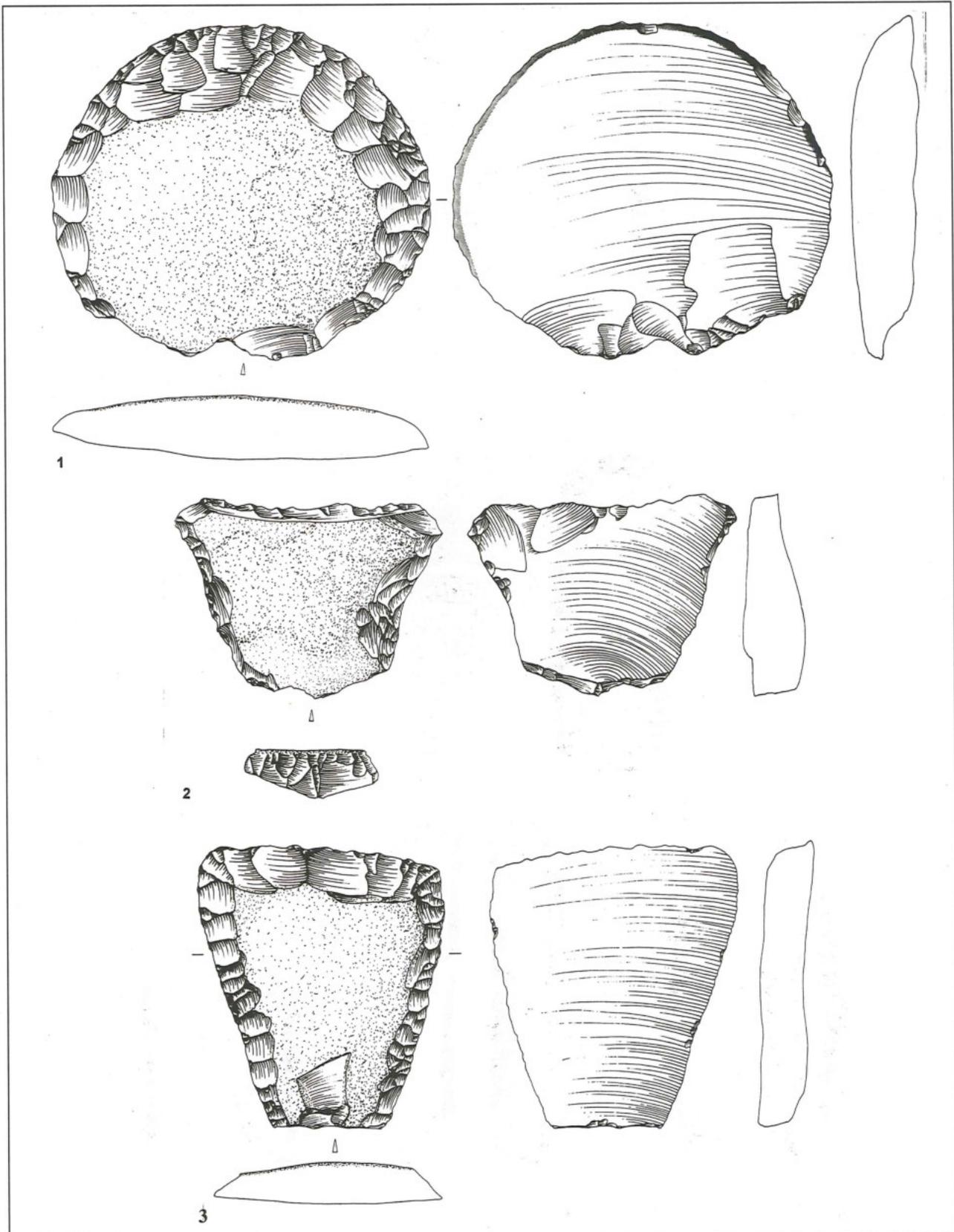
Lithic artefacts (Figs. 13 - 15) were recorded at the two sites, of Tall al-Magaṣṣ (finds from the excavation and the surface) and Ḥujayrāt al-Ghuzlān (finds from archaeological survey). They were thoroughly studied by Lothar Herling (Herling in press), who prepared the documentation of all lithic



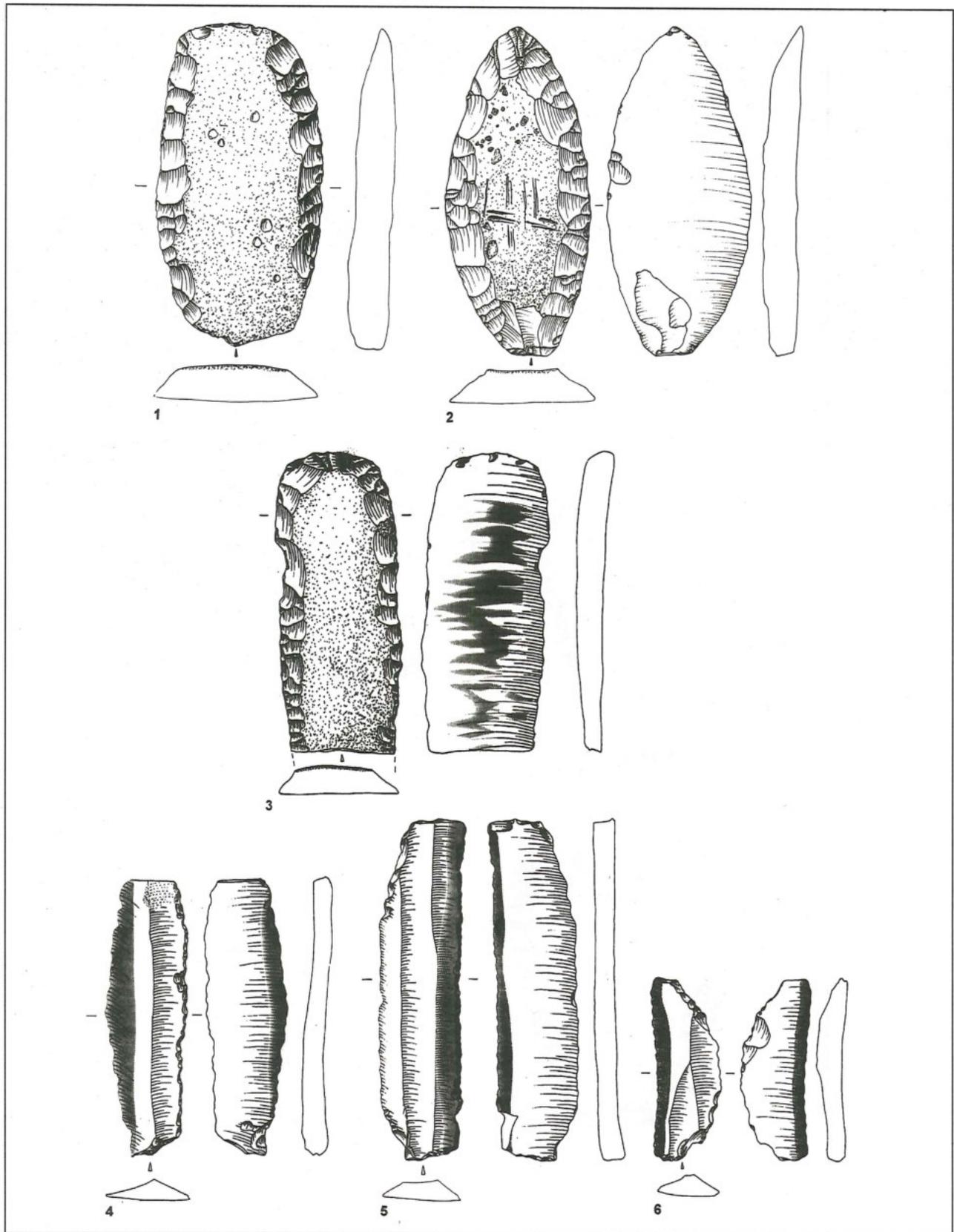
11. Groundstone artefacts from the archaeological survey at Ḥujayrāt al-Ghuzlān. 1-2 = grindstones with remains of copper, sandstone; 3-4 = Pounders with traces of use on both ends, basalt.



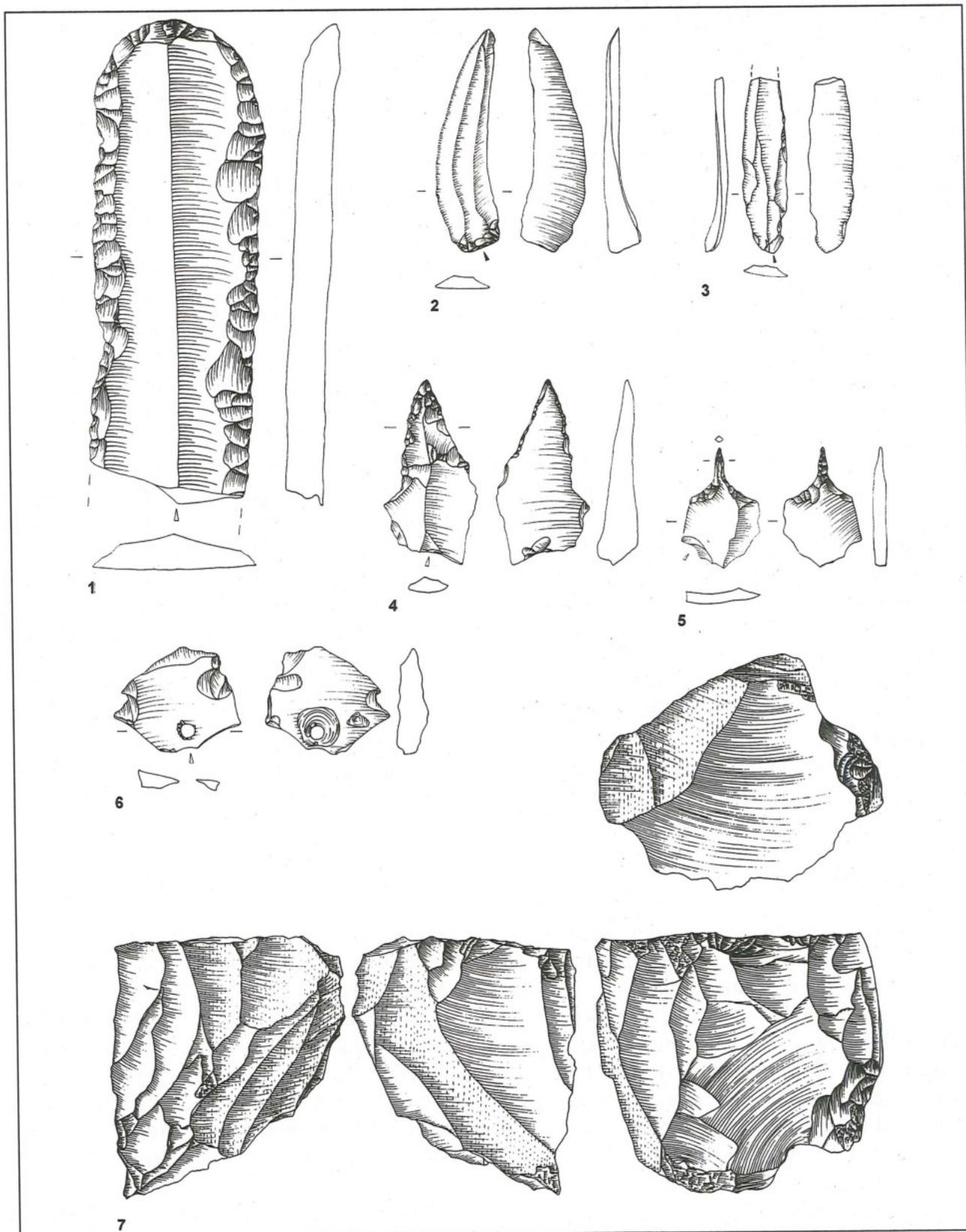
12. Groundstone artefacts from the archaeological survey at Hujayrāt al-Ghuzlān. 1-2 = Moulded objects ('pebble mortars'); 3-4 = Stone vessels; 5-7 = Stone rings.



13. Silex artefacts from Tall al-Magaşş: Cortex tools (‘tabular scrapers’); greatest lengths: 1=8.8 cm; 2 = 6.3 cm; 3 = 6.7 cm.



14. Silex artefacts from Tall al-Magaşş (1- 2 and 4-6) and Ḥujayrāt al-Ghuzlān (3). 1-3 = Cortex tools; 4-6 = Blades (3-6 with use-gloss); greatest lengths: 1 = 7.9 cm; 2 = 8.1 cm; 3 = 12.2 cm; 4 = 6.8 cm; 5 = 8.5 cm; 6 = 4.5 cm.



15. Silex artefacts from Tall al-Magaşş (1-6) and Hujayrät al-Ghuzlän (7). 1 = Retouched blade; 2-3 = Twisted blade-lets; 4-5 = Borers; 6 = Perforated implement; 7 = Core; greatest lengths: 1 = 10.5 cm; 2 = 4.9 cm; 3 = 3.8 cm; 4 = 4.0 cm; 5 = 2.6 cm; 6 = 2.7 cm; 7 = 8.7 cm.

finds, not only from the 1998 campaign, but also from earlier seasons (1990; 1985). The following account is based mainly on material excavated at Tall al-Magaşş. Of special interest is a group of ca. 40 tools with a dorsal cortical cover ('cortex tools'), which can be found at many Chalcolithic and Early Bronze Age sites in the Levant. Their contours include round, oval, long and narrow, rectangular, trapezoidal or irregular shapes (Figs. 13 and 14: 1-3). Although the formal repertoire may indicate a special use for the tools, their precise function (e.g. scraper or knife for the processing of meat or hides) is still unclear.

Blades and implements of blades show a large variation in size, shape and function (Figs. 14: 4-6 and 15: 1-5). There are pieces with a bilateral steep retouch, which might have been used as borers, as well as blades retouched on all edges (Fig. 15: 1) or not modified at all. Use-gloss has been found on single blades and on bladelets and segments, which were part of composite tools (Fig. 14: 4-6). Some twisted bladelets (Fig. 15: 2-3) point to an Egyptian influence (Rizkana and Seeher 1988: 19; Rosen 1997: 67).

Borers and one microborer, possibly used for the production of beads, were made from blades as well as flakes (Fig. 15: 4-5). The function of a perforated implement (Fig. 15: 6) remains unknown.

There are a few artefacts, which indicate an on-site primary production, such as cores (Fig. 15: 7), core-heads, a core tablet and several platform preparation flakes.

The large number of isolated observations together provide a more precise picture of the lithic industry at Tall al-Magaşş. It becomes clear that the flint tools must have been used for very varying purposes. Single artefacts can be connected with either herding, farming or bead-production, while the use of other implements remains obscure.

A comparison of the lithic finds from Tall al-Magaşş with those of other sites illustrates, that the site was been mainly inhabited in the

Chalcolithic and into the Early Bronze Age. The finds from Hujayrāt al-Ghuzlān complete the inventory of a Chalcolithic lithic industry only. So far, no Early Bronze Age tools could be identified at that site.

### Archaeometallurgy

According to previous studies conducted by Lutfi A. Khalil (1987; 1988; 1998), Faynān and Timna can be considered as possible sources of the copper ores, which were worked at Tall al-Magaşş and Hujayrāt al-Ghuzlān. After a macroscopic study by Andreas Hauptmann, most of the ores originate from the copper deposits at Timna, while no ore from Faynān could be identified with certainty. Obviously the major trade routes of ores from Faynān extended to the west, to the villages in the Beer Sheba basin (Abu Matar, Bir Safadi, Nahal Tillah, Gilat, Shiqmim, and Eien) as far as Wādī Ghazzeḥ (Hauptmann 1998) but not to the south, where nearby Timna must have been the more convenient source.

According to A. Hauptmann, Chalcolithic copper metallurgy at Timna is problematic. Rothenberg (1978) proposed that Chalcolithic copper smelting was conducted at site 39, but a radiocarbon date revealed that such activities were executed in the first millennium AD. The material found at Tall al-Magaşş confirms a trade of copper ores from Timna to the southeast. The copper itself was mainly produced in the interest and under the protection of villages, as was the case in the Beer Sheba basin.

The finds from Tall al-Magaşş additionally confirm that copper was smelted in ceramic crucibles, as is well known in the Levant and Anatolia. The smelting furnace discovered by Rothenberg at Timna Site 39 is, for the time being, unique in the Middle East.

In many respects, the archaeometallurgy of Hujayrāt al-Ghuzlān seems to be comparable with that of Tall al-Magaşş. Most interestingly, a few pieces of slag, one of which contains a typical clayrod as an inclusion,

point to smelting experiments during the Early Bronze Age II. The material is identical with that from numerous Early Bronze Age II/III smelting sites at Faynān (Hauptmann 1998).

Future metallurgical analyses of slags and copper artefacts, which will be carried out by A. Hauptmann and L. Khalil, will aim at checking the preliminary results and characterizing the copper produced at Tall al-Magaṣṣ and Ḥujayrāt al-Ghuzlān. By means of light and scanning electron microscopy, and by chemical and isotopic analysis, the 'fingerprints' of locally produced copper will be investigated and the results compared with those from Faynān and other sites. Because the copper ores of the al-Magaṣṣ and al-Yutum region cannot be found locally, the identification of their provenance will be of special interest.

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Lutfi Khalil  
Department of Archaeology  
University of Jordan  
Amman, Jordan

Ricardo Eichmann  
Deutsches Archäologisches Institut  
Orientabteilung  
Podbielskiallee 69-71  
14195 Berlin  
Germany

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# THE 1998 SEASON OF ARCHAEOLOGICAL SURVEY IN THE REGIONS OF 'IRĀQ AL-'AMĪR AND WĀDĪ AL-KAFRAYN A PRELIMINARY REPORT

by

Chang-Ho C. Ji and Jong Keun Lee

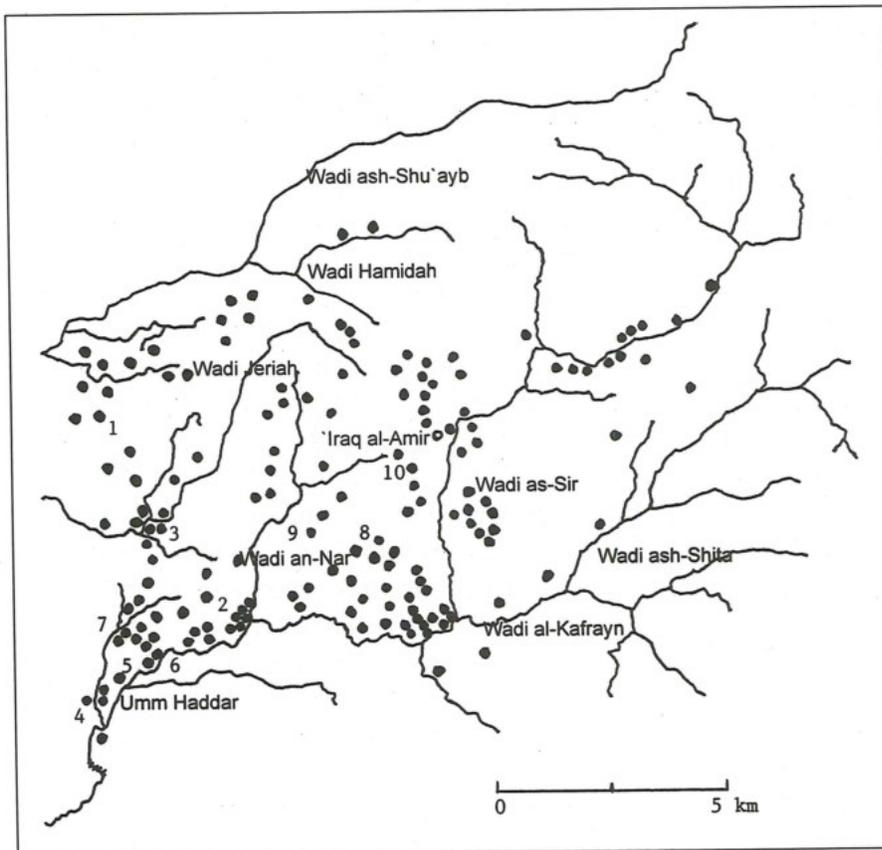
## Introduction

The 'Irāq al-'Amir Project conducted its second intensive surface survey and archaeological study during the period from August 5 to August 31, 1998. The fieldwork was directed by the authors, and Sophinaz Kabagah joined the survey team as a drafts-person. Ahmad Tawahiah was the representative of the Department of Antiquities and rendered valuable consultation and assistance.

The initial intention of the 'Irāq al-'Amir regional survey project was to cover the area within 5-km radius of 'Irāq al-'Amir. Hence, in 1996, the survey focused on the region along the Wādī as-Sir and recorded

86 archaeological sites (Ji 1997a; 1997b; 1998a). Finds from the 1996 survey indicated that the vicinity of 'Irāq al-'Amir witnessed high settlement intensification in the Byzantine and Islamic periods and low intensification in the Early Bronze, Iron II-Persian, Hellenistic, and Roman periods.

It was soon found, however, that the artificial boundary was impractical for the understanding of the settlement pattern and occupational history in the region of 'Irāq al-'Amir, and thus the survey area was extended westward to the Jordan Valley in the course of the 1998 archaeological survey season (Fig. 1). In 1998, the survey team covered an area of approximately 35 square



1. The 1996 and 1998 Archaeological Survey Sites. 1. K. al-Magfiāt; 2. R.Umm Qaṭṭāf South 3. R. al-Klāl; 4. R.Umm Haddar; 5. Tulaylāt Umm Haddar South; 6. K. aṣ-Ṣūwwān' 7. Tulaylāt Umm Haddar North; 8. R.Umm al-Madāris; 9. R. al-Aḥmar; 10. K. al-Mdayyna.

kms which extends from Wādī al-Kafrayn in the south to the rocky ranges and hills overlooking Wādī ash-Shu'ayb to the north and the west. Between Wādī al-Kafrayn and Wādī ash-Shu'ayb are Wādī Jeriya (Wādī Amir), Wādī an-Nār (the Wādī Ḥūwwāra), and their tributaries. Hence, the survey area can be roughly divided into six sub-regions: (1) the Wādī al-Kafrayn region which extends 1 km to the north of the Wādī al-Kafrayn bed, (2) Wādī Jeriya region which extends 1 km on each side of the Wādī Jeriya bed, (3) the Wādī al-Kafrayn dam-lake area which is called the Umm Haddar Plains, (4) the section between the Wādī an-Nār and the Wādī as-Sir, (5) the section between the Wādī Jeriya and the Wādī an-Nār and (6) the section between the Wādī ash-Shu'ayb and the Wādī Jeriya. The last three regions are characterized by rocky ridges, arid terrains, moderate to steep slopes, and many small wadi tributaries.

Much of the region under consideration has never been properly surveyed for archaeological remains. Previous surveys concentrated either on the areas close to 'Irāq al-'Amīr and Wādī as-Sir or on the immediate vicinity of the Wādī al-Kafrayn dam-lake (cf. de Vaux 1938; Villeneuve 1988; 1989; Prag and Barnes 1996; Waheeb 1997). In general, the hilly area between Wādī al-Kafrayn and Wādī ash-Shu'ayb is very difficult to explore because of the hot climate and steep hills, and just as difficult to use agriculturally. The area receives about 200 mm of rain per annum which is minimal for sheep and goat herding in the area, but is not sufficient for extensive agriculture. An exception to this generalization is the Wādī Jeriya Valley which varies in width from 0.5 km to 2 km. This valley reaches its maximum width of about 2 km in the vicinity of Rujm al-Klāl and expands to the dimensions of a small plain. The Wādī Jeriya Valley is fertile and thus currently under intensive cultivation. It, however, completely dries up during the summer season except for a

couple of small water springs (e.g., 'Ayn Jeriya and 'Ayn Ḥassān) along the wadi. Accordingly, Wādī al-Kafrayn is the only major perennial water source in the entire 1998 survey area.

The 1998 fieldwork had a twofold research purpose. First, it was designed specifically to investigate the existence of ancient settlements along Wādī al-Kafrayn and Wādī Jeriya, and in the hilly region between the Wādī ash-Shu'ayb and Wādī al-Kafrayn. Second, efforts were made to understand the relationship between the settlements in the survey area and those in the region of 'Irāq al-'Amīr with special attention to the possible Iron II-Persian and Hellenistic road systems connecting the Jordan Valley with 'Irāq al-'Amīr, particularly along Wādī al-Kafrayn and Wādī Jeriya.

### 1998 Survey Results

The research background and survey methodology have been dealt with in previous reports (Ji 1997a; 1997b; 1998a), and thus, the present report focuses primarily on the findings of the new fieldwork. In 1998, a total of 88 archaeological sites were visited. These sites, when added to the 86 sites visited in 1996, bring the 'Irāq al-'Amīr survey of sites to a total of 174 (Tables 1-6). Of the 88 sites recorded during the 1998 season, 19 sites (21.59%) contained pottery sherds dated to the Chalcolithic and Early Bronze periods. Late Bronze sherds came from one site (1.14%), whereas Iron I and Iron II-Persian sherds were found at five sites (5.68%) and 32 sites (36.36%) respectively. The distinction between Iron II and Persian pottery was not made for this report since it has recently become increasingly clear that in central Jordan, late Iron II ceramic corpus flourished right through the Babylonian period and lasted well into most of the Persian period (Herr 1995). Moreover, thirty-four sites (38.64%) produced Hellenistic sherds and 18 sites (20.46%) had Roman sherds. Byzantine

**Table 1.** Cross-tabulation by Chronology and Area in the Region of 'Irāq al-'Amir.

	CEB*	MB	LB	I1	I2/Per	Hell	Rom	Byz	Els	Mls
Wadi as-Sir	14 (0)**	4 (0)	2 (0)	4 (2)	11 (2)	11 (1)	7 (2)	22 (0)	4 (0)	2 (0)
Wadi al-Kafrayn	11 (1)	3 (3)	0 (0)	3 (3)	17 (16)	18 (17)	7 (6)	23 (22)	0 (0)	1 (1)
Umm Haddar	4 (4)	0 (0)	0 (0)	0 (0)	0 (0)	6 (6)	4 (4)	5 (5)	0 (0)	0 (0)
Wadi Jeriah (Amir)	3 (1)	0 (0)	2 (1)	4 (2)	13 (7)	3 (2)	5 (3)	15 (9)	6 (0)	4 (2)
Wadi ash-Shu'ayb	1 (1)	0 (0)	0 (0)	0 (0)	2 (2)	0 (0)	1 (1)	9 (8)	0 (0)	1 (1)
Farawit	3 (1)	0 (0)	0 (0)	0 (0)	6 (4)	6 (5)	3 (2)	15 (9)	4 (0)	1 (0)
Wadi an-Nar	5 (1)	0 (0)	0 (0)	0 (0)	6 (1)	6 (2)	3 (1)	13 (2)	8 (0)	4 (0)
Wadi Hamidah	0 (0)	0 (0)	0 (0)	0 (0)	2 (0)	0 (0)	0 (0)	1 (0)	1 (0)	1 (0)
Wadi ash-Shita	5 (0)	0 (0)	0 (0)	0 (0)	1 (0)	2 (0)	2 (0)	7 (0)	4 (0)	4 (0)
Total	46 (19)	7 (3)	4 (1)	11 (5)	56 (32)	53 (34)	32 (18)	110 (57)	27 (0)	18 (4)

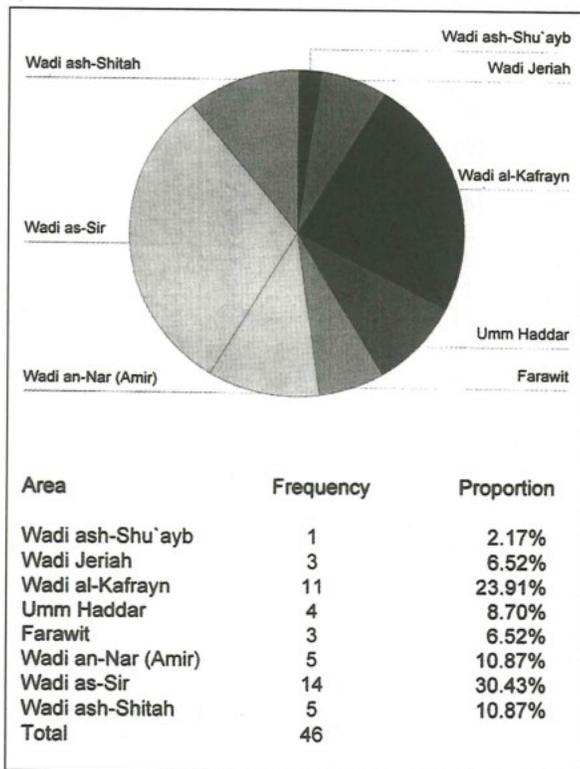
\*CEB: Chalcolithic and Early Bronze; MB: Middle Bronze; LB: Late Bronze; I1: Iron I; I2/Per: Iron II and Persian; Hell: Hellenistic; Rom: Roman; Byz: Byzantine; Els: Early Islamic; Mls: Mid Islamic.  
 \*\*(): The number of sites that were surveyed in 1998.

**Table 2.** Cross-tabulation by Chronology and Site Type in the Region of 'Irāq al-'Amir.

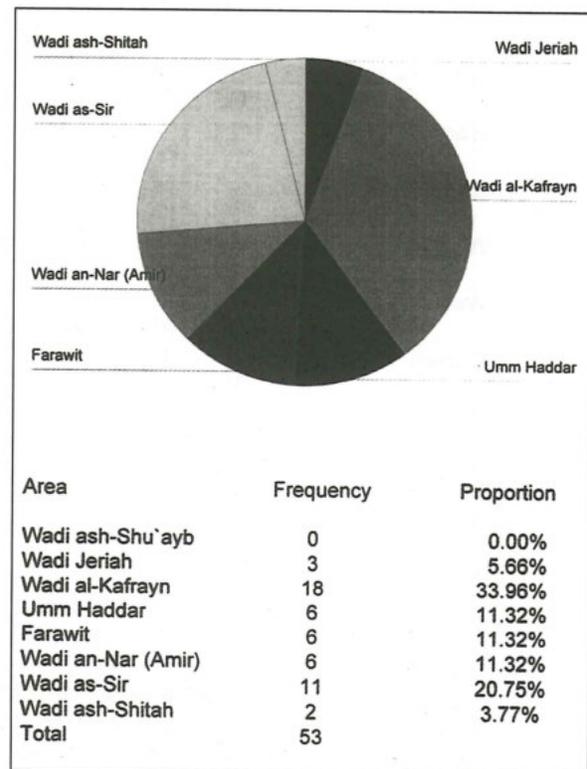
	CEB*	MB	LB	I1	I2/Per	Hell	Rom	Byz	Els	Mls
Village and City	13 (9)**	2 (2)	2 (0)	6 (2)	15 (5)	17 (7)	10 (3)	20 (7)	12 (0)	8 (0)
Watchtower & House	14 (9)	1 (1)	1 (1)	2 (2)	28 (23)	24 (20)	16 (12)	58 (41)	6 (0)	4 (4)
Wall Line	1 (0)	0 (0)	0 (0)	0 (0)	3 (2)	1 (1)	1 (1)	3 (3)	0 (0)	0 (0)
Scatter Site (Pottery)	2 (0)	0 (0)	0 (0)	1 (1)	2 (1)	0 (0)	1 (0)	2 (1)	2 (0)	1 (0)
Tomb	6 (0)	3 (0)	0 (0)	0 (0)	1 (0)	4 (2)	1 (0)	6 (2)	1 (0)	1 (0)
Campsite	1 (1)	0 (0)	0 (0)	0 (0)	2 (1)	4 (4)	1 (1)	5 (3)	1 (0)	0 (0)
Cave	3 (0)	0 (0)	0 (0)	0 (0)	3 (0)	2 (0)	1 (0)	8 (0)	4 (0)	3 (0)
Rock-cut Features	3 (0)	0 (0)	0 (0)	1 (0)	1 (0)	1 (0)	1 (0)	4 (0)	0 (0)	0 (0)
Watermill	2 (0)	1 (0)	1 (0)	1 (0)	1 (0)	0 (0)	0 (0)	2 (0)	0 (0)	0 (0)
Terrace-Dam	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0)	1 (0)	1 (0)
Total	46 (19)	7 (3)	4 (1)	11 (5)	56 (32)	53 (34)	32 (18)	110 (57)	27 (0)	18 (4)

\*CEB: Chalcolithic and Early Bronze; MB: Middle Bronze; LB: Late Bronze; I1: Iron I; I2/Per: Iron II and Persian; Hell: Hellenistic; Rom: Roman; Byz: Byzantine; Els: Early Islamic; Mls: Mid Islamic.  
 \*\*(): The number of sites that were surveyed in 1998.

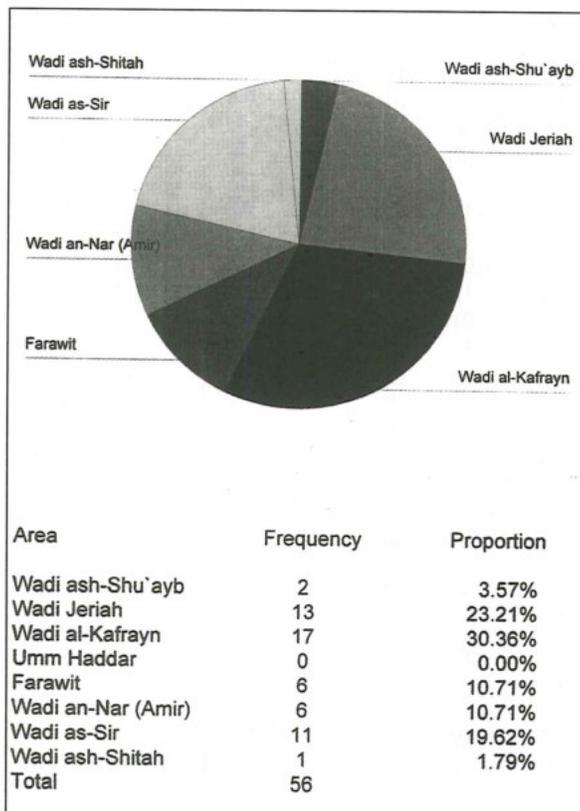
**Table 3.** Frequency Table and Pie Chart of the Chalcolithic and Early Bronze Sites



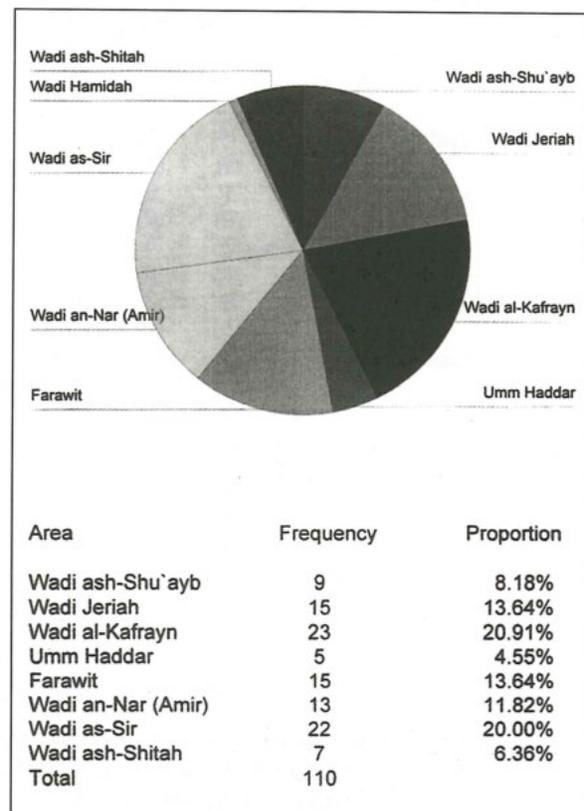
**Table 5.** Frequency Table and Pie Chart of the Hellenistic Sites



**Table 4 .** Frequency Table and Pie Chart of the Iron II and Persian Sites



**Table 6.** Frequency Table and Pie Chart of the Byzantine Sites



sherds came from 57 sites (64.77%), while Middle Bronze and Middle Islamic sherds were found at three (3.41%) and four sites (4.55%) respectively. Surprisingly, Early Islamic sherds were absent in the area surveyed in 1998. Sixty of the 88 sites (68.2%) were situated on top of hills or on slopes, whereas 28 sites were at the bottom of or in immediate proximity to a wadi. In addition, 14 sites were classified as city or village (15.9%) and 65 sites as watchtowers or isolated buildings (73.9%). Campsites accounted for 4.5% of the total (four sites) and two sites were identified as cemeteries (2.3%). Three sites (3.4%) merely produced pottery sherds or lithic tools without any architectural evidence.

Should we associate these findings with sub-regions within the 1998 survey area, we see that regions differ in terms of their settlement intensification over the periods. Chalcolithic and Early Bronze sites tend to be situated along the Wādī al-Kafrayn and in the Umm Haddar Plains. These two regions include 15 Chalcolithic and Early Bronze sites, which make up 78.95% of 19 Chalcolithic and Early Bronze sites in the 1998 survey region. Some examples are village remains found at Tulaylāt Umm Haddar South and North (Survey Sites 121 and 132), and Survey Sites 139 and 157. They are all located in the narrow strip along the Wādī al-Kafrayn. Note that Chalcolithic and Early Bronze sites are noticeably absent in the Wādī Jeriya region and the hilly area between Wādī al-Kafrayn and Wādī ash-Shu'ayb. The only exception is Survey Site 95, a large circular structure located near a tributary which flows westward into Wādī ash-Shu'ayb.

The period from Early Bronze II to Iron I represents the low point in the occupation of the area between Wādī al-Kafrayn and Wādī ash-Shu'ayb. The sparsity of Iron I sites is not totally surprising, since it was already noted in the previous survey seasons and studies (Ji 1997c; 1998a). Yet, such sparsity

is still somewhat problematic if we take into consideration the high intensification in population in the plateau region during the given period (Ji 1995). Although the progress of the survey may fill this gap, it is not improbable that the survey area remained largely unoccupied during Iron I when the plateau region flourished in population and settlements. Diagnostic Iron I sherds were uncovered at Rujm Magfiāt (Survey Site 98), Rujm al-Klāl (Survey Site 112), Khirbat aṣ-Ṣūwwān (Survey Site 127), at a watchtower-like site (Survey Site 128) near Khirbat aṣ-Ṣūwwān, and at an impressive rectangular structure (Survey Site 138) near the confluence of Wādī an-Nār with Wādī al-Kafrayn. Yet, given the strength of the evidence, these sites appear to have been small isolated watchtower-like sites or seasonal settlements during Iron I. All these Iron I sites yielded Iron II-Persian sherds, and this fact perhaps indicates a continuity of settlement from Iron I to Iron II-Persian in the survey region.

The settlement pattern in the surveyed region for the Iron II and Persian periods shows no concentration of sites, although the majority of them are found along Wādī al-Kafrayn and Wādī Jeriya. Twenty of 31 Iron II-Persian sites are situated along these two wadis. In other words, about two-thirds of the Iron II-Persian sites in the surveyed area center along Wādī al-Kufrayn and Wādī Jeriya. Judging from the number of Iron II-Persian sherds and the size of architectural remains, we may suggest that some of the Iron II-Persian sites will prove to have been sizable garrisons or towns. They are Rujm Magfiāt (Survey Site 98), Rujm al-Klāl (Survey Site 112), Khirbat aṣ-Ṣūwwān (Survey Site 127), and Khirbat al-Mdayyna (Survey Site 172). Most of the remaining Iron II-Persian sites are characterized by circular or rectangular watchtower-like structures. In addition, it is worth mentioning that in 1997, a Jordanian Cultural Resources Management Project team collected several

Iron II-Persian sherds at Khirbat as-Sūr (Survey Site 67) (personal communication with M. Waheeb). Given the several Iron II-Persian towns and villages documented in 1996 (e.g. Khirbat Ḥassān, Khirbat ath-Thughra, Khirbat al-Farāwīt, and Tall abū-'Unayz), it becomes clear now that there were clusters of Iron II-Persian urban towns and villages on the hilltops in the survey area, particularly along Wādī al-Kafrayn and Wādī Jeriya. In addition, certainly these cities and villages were closely associated with watchtower-like structures built in their vicinities.

The analysis suggests fairly high concentrations of Hellenistic sites along Wādī al-Kafrayn and the Umm Haddar Plains. On the hilltops close to Wādī al-Kafrayn or on the slopes which lead down to the wadi, there are at least 25 Hellenistic sites. In 1996, the survey team recorded about 15 Hellenistic sites along Wādī as-Sir and Wādī al-Kafrayn. Hence, there are more than 40 Hellenistic sites lined up along these two wadis. This number makes up about 70% of the 53 Hellenistic sites in the entire 1996 and 1998 survey region. Hellenistic remains have proven to be absent or only slight in Wādī Jeriya region and the section between Wādī Jeriya and Wādī ash-Shu'ayb. Exceptions are Rujm al-Klāl (Survey Site 112) and Survey Site 114 located along Wādī Jeriya. It should be noted, however, that these two sites seemed to have been associated with Khirbat as-Sūr which is located about 2.5 to 3.0 km northeast of the sites, and provides a commanding view over these two Hellenistic sites in the Wādī Jeriya Valley. In addition, many of the sites that had Iron II and Persian pottery also yielded Hellenistic pottery. This is particularly the case for the urban settlements along Wādī al-Kafrayn. Eleven of the 34 Hellenistic sites surveyed in 1998 also include Iron II-Persian sherds, ten of which are situated along Wādī al-Kafrayn and the vicinity of Khirbat al-Farāwīt (Survey Site 28). This fact posits

that in the Wādī al-Kafrayn region, the Iron II-Persian population centers continued to hold that status in the Hellenistic period. Not only are there continuously occupied Iron II-Hellenistic settlements along Wādī al-Kafrayn, but the 1998 survey also revealed quite a concentration of new small tower-like structures along the wadi, most of which are dated to the Hellenistic period. It is also noteworthy that the Umm Haddar Plains witnessed quite high levels of settled population during the Hellenistic period. Many of the sites in the Umm Haddar region have visible, impressive architecture that dates to the Hellenistic period. Examples are building remains and fortification structures at Survey Sites 118, 119, 120, 121, 131, and at Khirbat aṣ-Ṣūwwān (Survey Site 127).

The possibility of ancient road systems associated with Wādī al-Kafrayn and Wādī Jeriya during the Iron II-Persian and Hellenistic period (Ji 1998a; 1998b; forthcoming) was a topic of interest to the authors. The work of the 1996 survey in the region of 'Irāq al-'Amīr and Wādī as-Sir showed that there was a group of sites at which Iron II-Persian and Hellenistic pottery were collected. As demonstrated above, the 1998 survey has also provided a list of Iron II-Persian and Hellenistic sites that can be added as a fortress or settlement system related to Wādī al-Kafrayn. Given the geographical and topographical conditions, this chain of visible Iron II-Hellenistic settlements along Wādī al-Kafrayn and Wādī as-Sir perhaps attests to the existence of ancient roads along the wadis during the given periods (cf. Dorsey 1991). This being the case, the western gateway to 'Irāq al-'Amīr along the Wādī al-Kafrayn appears to have been Khirbat aṣ-Ṣūwwān (Survey Site 127) during the Iron II-Persian and Hellenistic periods. Presumably, Rujm Umm Haddar and its nearby sites such as Survey Sites 119 and 120, and the "plateau fort" of Prag and Barnes (1996) are interpreted as outposts or

garrisons associated with Khirbat aṣ-Ṣūwān. The course of this road ascends to 'Irāq al-'Amīr along Wādī al-Kafrayn and Wādī as-Sīr for miles by way of Khirbat al-Farāwīt (Survey Site 28), Tall abū-'Unayz (Survey Site 26), and a line of small watchtower sites. Khirbat al-Farāwīt and Tall abū-'Unayz thus probably functioned as way stations and forts in conjunction with this road system.

Wādī Jeriya may have been another strategic route which linked 'Irāq al-'Amīr with the Jordan Valley during the Iron II. We can incorporate Rujm al-Klāl, Khirbat Ḥassān (Survey Site 20), Khirbat ath-Thughra (Survey Site 32), Khirbat as-Sūr (Survey Site 67), and several small settlements (e.g. Survey Sites 16, 17, 87, 100, and 113) into this road system. During the Hellenistic period, this route was probably no longer vital, since most of the sites except for Rujm al-Klāl and Khirbat ath-Thughra were abandoned after the Iron II. It is also possible that a branch of this road led from Rujm al-Klāl to 'Irāq al-'Amīr by way of Khirbat as-Sūr, Khirbat al-Mdayyna, and the easily traveled valley of the Wādī an-Nār. There is evidence of the existence of fortresses and small watchtowers associated with this road the examples of which are Survey Sites 67, 107, 171, 173, and Rujm Umm al-Qaṭṭāf North and South (Survey Sites 105 and 106). This being the case, Rujm al-Klāl was probably an important hub of the region's road network.

To recapitulate, the Hellenistic period was very likely one of increased population and proliferation of settlements along Wādī al-Kafrayn and in the region between Wādī Jeriya and Wādī as-Sīr. In contrast, the area between the Wādī ash-Shu'ayb and the Wādī Jeriya experienced a nearly complete occupation gap during the Hellenistic period, which continued until the Byzantine period. Accordingly, the combination of the preceding findings may support the previous suggestion that: (1) Iron II and Persian set-

tlements tend to cluster in the areas close to Wādī as-Sīr, Wādī al-Kafrayn, and Wādī Jeriya; (2) there was continuous occupation in the regions of Wādī as-Sīr and Wādī al-Kafrayn from Iron II to the Hellenistic period, although many of the sites in the area of Wādī Jeriya were abandoned during this period; (3) the Iron II-Persian settlement pattern points to the potential existence of road systems of the period connecting the Jordan Valley with 'Irāq al-'Amīr and the Transjordanian plateau, particularly along Wādī al-Kafrayn and Wādī as-Sīr; (4) this Wādī al-Kafrayn route was intensively reused in the Hellenistic period, whereas the Wādī Jeriya road network appears to have been somewhat neglected (Ji 1998a; 1998b).

The Roman and Byzantine sites are rather evenly scattered over the survey area. This is particularly true of the Byzantine period, which indicates that there must have been a substantial settled population across the survey area during the Byzantine period. A glance at the settlement pattern for this period shows that many Hellenistic sites remained in use during the early Roman period. An overall impression is, however, that the late Roman period had a decline in settled population, since most of the Roman pottery collected in the survey area seems to be dated to the early Roman period. Undoubtedly, the Byzantine period afforded the greatest population in the 'Irāq al-'Amīr region. In addition, note that the predominant pottery collected at the sites between Wādī Jeriya and Wādī ash-Shu'ayb is from the Byzantine period. This fact indicates that in the section between the Wādī Jeriya and Wādī ash-Shu'ayb, a first increase in population came during the Iron II-Persian period, and there was a stronger resurgence of population during the Byzantine period. A puzzling feature of the survey area is the absence or sparsity of Islamic sites in the Umm Haddar Plains and the regions between Wādī al-Kafrayn and Wādī ash-Shu'ayb. This fact stands in contrast with the 1996 observation that the Is-

lamic period saw a flourishing occupation in the neighboring regions of Wādī as-Sīr and Wādī ash-Shita (cf. Ji 1998a). This 1998 finding indicates that: (1) at least the region between Wādī al-Kafrayn and Wādī ash-Shu'ayb experienced a decline of settled population during the Islamic period; (2) the Islamic settlement pattern cannot be treated in conjunction with the Byzantine period; and (3) impressive Islamic sites tend to be situated in the regions close the plateau and in the northern extremity of the survey area (Figs. 2 and 3).

### Description of Selected Sites

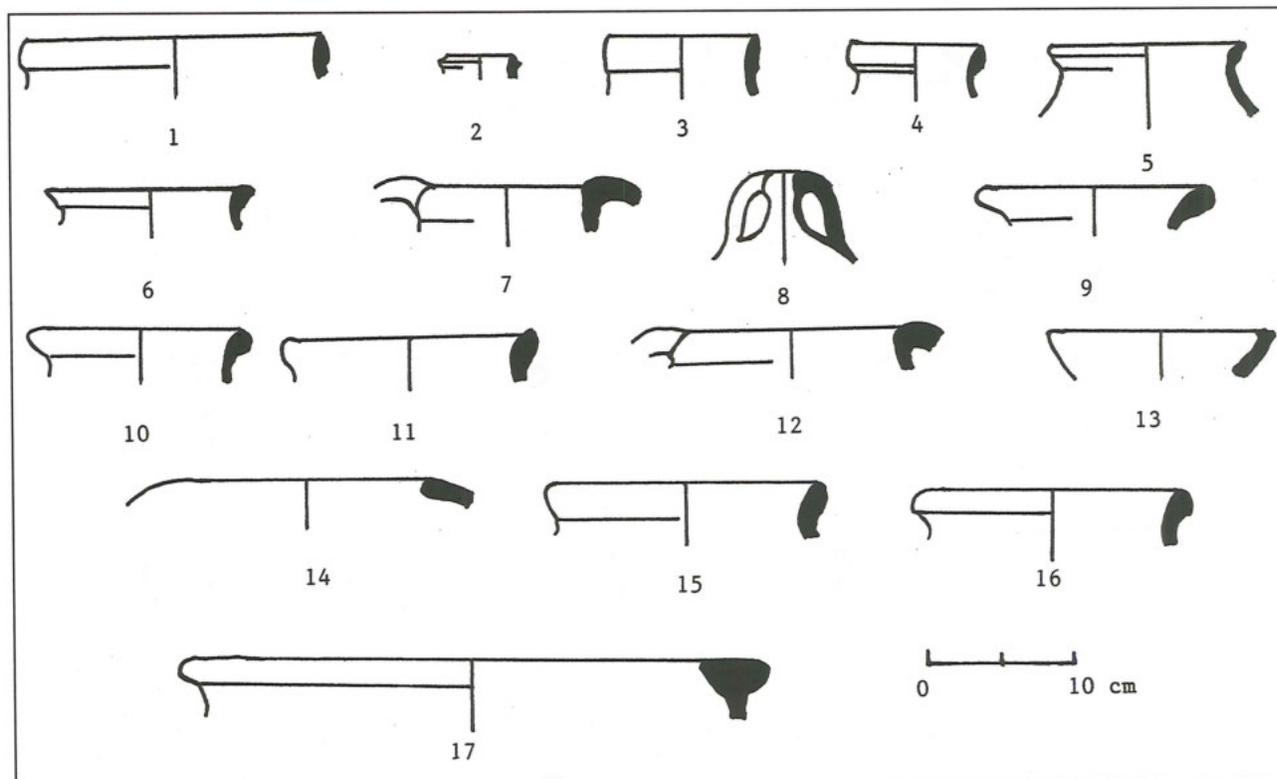
Khirbat al-Magfiāt (Survey Site 98; PG: 214.5/147.4; Fig. 4)

Khirbat al-Magfiāt is located on a very pronounced hilltop south of the Wādī ash-Shāfah, about 1 km northeast of Site 99 and about 3.0 km northwest of Rujm al-Klāl (Survey Site 112). Situated in a strategic location, this site commands a panoramic view of the surrounding terrain. Collapsed ruins of seven buildings can be identified including a couple of caves and a potential animal pen on the east. No surrounding walls are discernable. The southernmost structure is rectangular, measuring 2.7 x 2.9 m and stands about 1 m high. The building is made up of medium and large semi-hewn stones with walls measuring about 70 cm thick. About 7.5 m north of this first structure is a circular one composed of medium to large stone blocks 2 to 4 courses high. The diameter of this building is about 3.7 m, and the walls are about 60 cm thick. Immediately northwest of the second structure is an impressive oval structure (4.8 x 6.1 m) made up of fairly large stone blocks. The walls measure 80 cm high and 1.2 m thick. Immediately south of this structure is a small round building about 3.2 m in diameter. This structure is built of medium to large boulders and currently stands up to 1 m high above the ground. The walls are about 1.5m

thick. Another circular structure is visible about 2.5 m northwest of the third structure, which includes an inner oval-shaped chamber (1.5 x 1.7 m). This building measures about 3 m in diameter, with its walls about 45 cm thick. In the northeastern part of this site are a round structure and a rectangular building. The round structure, which measures 4.5 m in diameter, is made up of roughly hewn medium to large stones. The rectangular building measures ca. 4.3 m (north-south) by 6.6 m (east-west) with internal walls dividing it into two chambers. The entrance to this building seems to be situated on the northwest corner. Amidst of these structures is a potential cave complex composed of at least three caves which are now completely collapsed. This cave complex appears to have been used for a variety of purposes in antiquity such as dwelling, storage, and animals. A potential ancient animal pen is visible about 20 m northeast of this site. The pottery of this site is dated to the Late Bronze II-Iron I, Iron II-Persian, and Byzantine periods.

Survey Site 99 (PG: 213.8/146.8; Fig. 5)

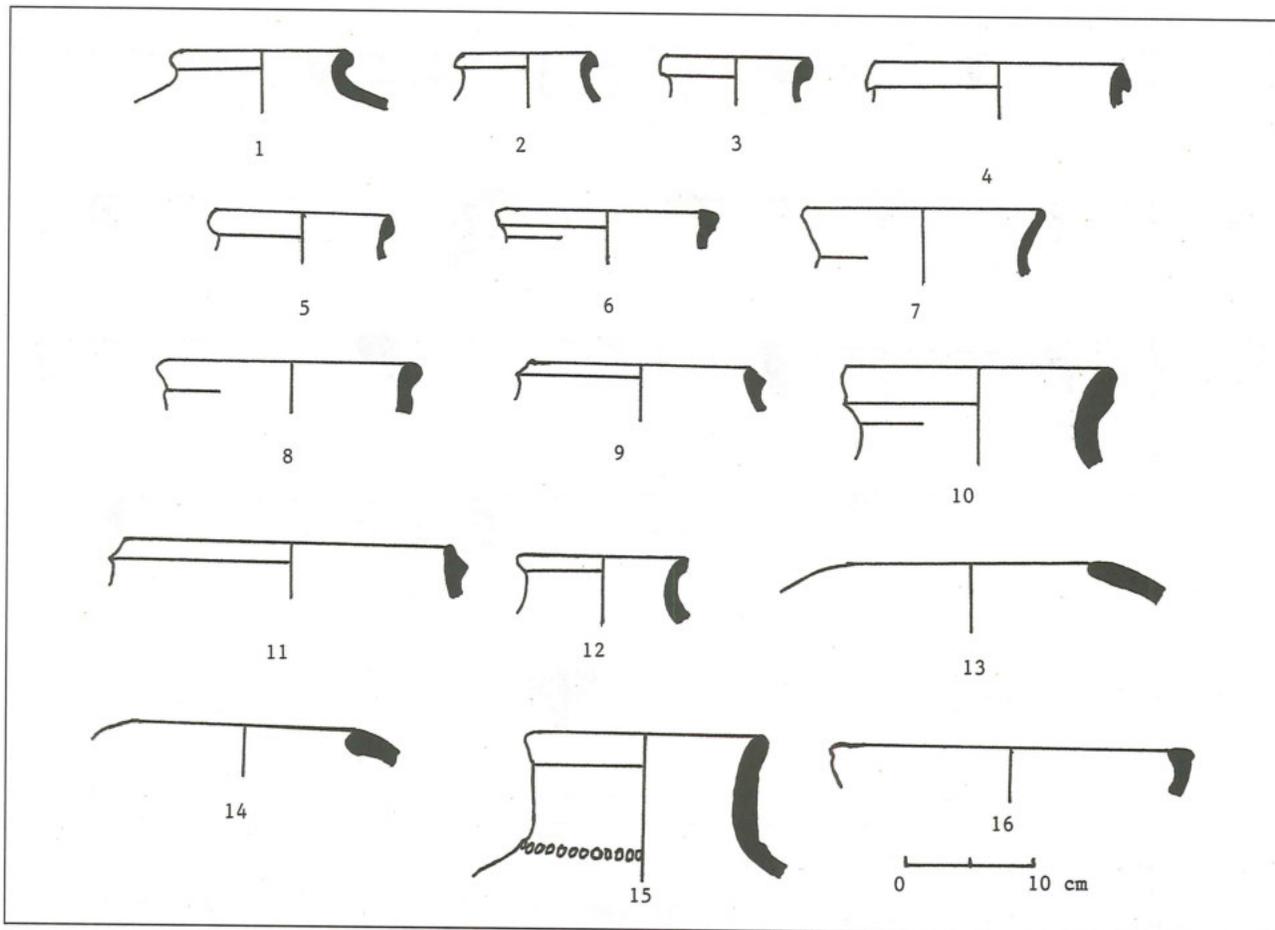
Site 99 is located on a pronounced hilltop, covering an area of 30 m (east-west) by 40 m (north-south), about 1 km southwest of Khirbat al-Magfiāt, overlooking Wādī Jeriya from its southern rim. In addition, like Khirbat al-Magfiāt, this site provides an excellent vantage point from which to view the entire terrain between the al-Mahḍar ridge and Ghrūb al-Klāl as well as providing a good view over the Wādī al-Kafrayn dam and the Umm Haddar Plains. This site consists of three round watchtower-like structures composed of small to medium rough limestone blocks measuring about 25 x 30 x 30 cm. Two of the three structures measure about 5 m in diameter and remain standing up to 70 cm on the ground. Their walls measure about 85 cm thick. The other structure is slightly smaller than the first two buildings, measuring 4.1 m in diameter and



No.	Provenance	Pottery ID	Type	Date	Description
1	Site 112	ISP 112-1	Cooking pot	Iron 1-E Iron 2	Brown (7.5YR 5/4) (Ei*), gray core (7.5YR 5/1), many small to medium white inclusions
2	Site 112	ISP 112-2	Jug	L Hell-E Rom	Red (2.5YR 5/8) (Ei), gray core (5YR 5/1), no inclusion
3	Site 118	ISP 118-1	Jar	L Hell-E Rom	light reddish brown (2.5YR 7/4) (Ei), pale yellow slip (2.5Y 8/2) (I), no core, few small white inclusions
4	Site 118	ISP 118-2	Jar	L Hell-E Rom	Pale yellow (2.5 YR 8/4) (E), pink (5YR 7/4) (I), gray core (5YR 6/1), very few small white inclusions
5	Site 118	ISP 118-3	Jar	L Hell-E Rom	Very pale brown (10YR 7/4) (Ei), gray core (5YR 5/1), many very small white inclusions
6	Site 118	ISP 118-4	Jar	L Hell-E Rom	Very pale brown (10YR 8/3) (Ei), light red core (2.5YR 6/6), very few small white inclusions
7	Site 118	ISP 118-5	Cooking pot	Hell	Reddish yellow (5YR 6/8) (Ei), light reddish brown slip (5YR 6/4) (E), no core, few medium white inclusions
8	Site 118	ISP 118-6	Jug	L Hell-E Rom	Light red (2.5YR 6/6) (Ei), no core, no inclusion
9	Site 120	ISP 120-1	Jar	Hell	pink (7.5YR 7/4) (Ei), no core, numerous small white and gray inclusions
10	Site 120	ISP 120-2	Jar	Hell	Very pale brown (10YR 7/4) (Ei), gray core (10YR 5/1), many small white and gray inclusions
11	Site 120	ISP 120-3	Jar	Hell	Very pale brown (10YR 7/3) (Ei), no core, many small gray inclusions
12	Site 120	ISP 120-4	Cooking pot	Hell	light red (2.5YR 6/6) (Ei), no core, no inclusion
13	Site 121	ISP 121-1	Bowl	Chal-EB	Yellow reddish (5YR 5/6) (Ei), reddish gray core (5YR 5/2), many small to medium white inclusions, very crudely hand-made
14	Site 121	ISP 121-2	Jar	Chal-EB	Pink (7.5YR 7/4) (Ei), no core, many small to large white and gray inclusions, hand-made
15	Site 121	ISP 121-3	Jar	Hell	Pink (7.5YR 8/4) (Ei), no core, many small white and gray inclusions
16	Site 121	ISP 121-5	Jar	Hell	Pink (5YR 7/4) (Ei), reddish gray core (2.5YR 5/1), some small white and gray inclusions
17	Site 121	ISP 121-4	Krater	Byz (?)	Reddish yellow (5YR 6/6) (Ei), pink slip (7.5 YR 8/4) (Ei), gray core (10YR 6/1), very few medium white inclusions

\* E: exterior, I: interior

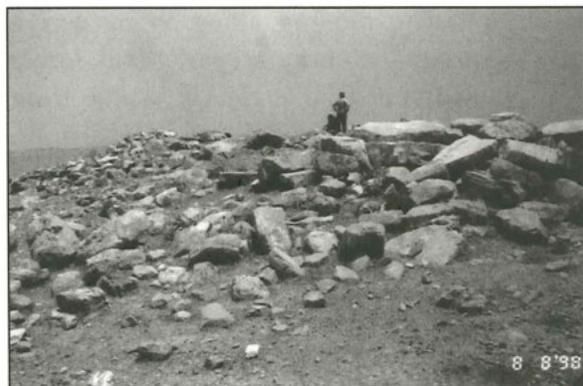
2. Selected Pottery from the 1998 Archaeological Survey and Descriptions.



No.	Provenance	Pottery ID	Type	Date	Description
1	Site 127	ISP 127-1	Jar	Hell	Pink (5YR 7/4) (EI*), very pale brown slip (10YR 8/2), gray core (10YR 6/1), few small white inclusions
2	Site 127	ISP 127-2	Jar	Hell	Very pale brown (10YR 8/4) (EI), light gray core (10YR 7/1), many very small gray inclusions
3	Site 127	ISP 127-3	Jar	Hell	Reddish yellow (5YR 6/6) (EI), gray core (10YR 5/1), some medium to large white and gray inclusions
4	Site 127	ISP 127-4	Jar	Hell	Reddish yellow (5YR 6/6) (EI), gray core (10YR 5/1), some medium to large gray inclusions
5	Site 127	ISP 127-5	Jar	Hell	Very pale brown (10YR 7/4) (EI), gray core (10YR 5/1), many small to medium white inclusions
6	Site 127	ISP 127-6	Jar	Hell	Light brown (7.5YR 6/4) (EI), pinkish gray core (5YR 6/2), some medium to large gray inclusions
7	Site 127	ISP 127-7	Jar	L Hell-E Rom	Pink (5YR 8/3) (EI), no core, many small to medium white inclusions
8	Site 127	ISP 127-8	Bowl	Iron I	Pink (5YR 7/4) (EI), very pale brown slip (10YR 7/3) (E), gray core (10YR 5/1), many medium to large white and gray inclusions
9	Site 127	ISP 127-9	Cooking pot	Iron 2	Reddish brown (5YR 5/4) (EI), no core, numerous small to medium white and gray inclusions
10	Site 127	ISP 127-10	Jar	Hell	Light reddish brown (5YR 6/4) (EI), gray core (5YR 5/1), many small to large white and gray inclusions
11	Site 127	ISP 127-11	Cooking pot	Iron 2	Reddish brown (2.5YR 5/4) (EI), gray core (7.5YR 5/1), many small to medium white and gray inclusions
12	Site 132	ISP 132-1	Jar	Chal-EB	Reddish yellow (5YR 6/6) (EI), no core, some medium white inclusions, hand-made
13	Site 132	ISP 132-2	Jar	Chal-EB	Pink (5YR 7/4) (EI), no core, many small to large white and gray inclusions, hand-made
14	Site 132	ISP 132-3	Jar	Chal-EB	Light reddish brown (5YR 6/4) (EI), gray core (7.5YR 6/1), numerous small to medium white inclusions, hand-made
15	Site 132	ISP 132-6	Jar	Chal-EB	Light reddish brown (5YR 6/4) (EI), gray core (5YR 5/1), many small to large white inclusions, hand-made, thumb decoration on the collar
16	Site 133	ISP 132-5	Bowl	Iron 2	Pink (5YR 7/4) (EI), gray core (5YR 6/1), few small white inclusions

\* E: exterior, I: interior.

3. Selected Pottery from the 1998 Archaeological Survey and Descriptions.



4. Khirbat al-Magfiāt (Survey Site 98; looking north-east).



5. Survey Site 99 (looking north).

remains only one to two courses high above the ground. There are a series of bedouin tombs about 50 m north of this site. The pottery is Iron II-Persian, Byzantine, and Middle Islamic.

#### Survey Site 100 (PG: 214.7/146.4; Fig. 6)

This site is situated slightly more than 1km southeast of Site 99 on the precipitous promontory close to the Wādī Jeriya. It covers an area of 20 m (north-south) by 40 m (east-west), and is composed of two round watchtower-like structures that command a panoramic view over Wādī Jeriya, the Jordan Valley, and the surrounding terrain. Some traces of the eastern structure were obliterated by modern seasonal cultivation, yet it is likely that the building was originally a round structure constructed from unworked medium-sized limestone blocks with small cobbles. This structure measures 3.6m in diameter, and the walls are about 70 cm thick. The better preserved of the two struc-

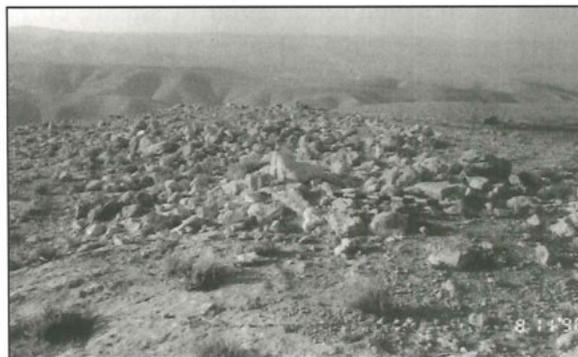


6. Survey Site 100 (looking south)

tures is located further up the slope about 30m northwest of the first one. Constructed with the same materials as the eastern one, some sections of the exterior walls stand at about 80 cm above the ground. The structure is a round building, measuring 4.0 m in diameter, with its external wall lines currently visible at three courses high (about 80cm) and up to four courses thick (about 1.1 m). Notable in this structure is an interior circle which is clearly definable and measures 1.2 m in diameter. The pottery is Iron II-Persian, Byzantine, and Middle Islamic.

#### Rujm Umm al-Qaṭṭāf South (Survey Site 105; PG: 216.5/143.9; Fig. 7)

This small-sized site occupies a hilltop on the al-Maḥar ridge, overlooking Wādī Jeriya to the west and Wādī al-Kafrayn dam to the south. It is located about 200 m southeast of Rujm Umm al-Qaṭṭāf North (Survey Site 106). The ruins indicate three to four round structures composed of small to medium



7. Rujm Umm al-Qaṭṭāf South (Survey Site 105; looking southwest).

rough limestone blocks. The best preserved one, which measures ca. 2.3 m in diameter and includes one round inner chamber, is situated on the north side of this site. The external walls remain only one course high (ca. 30 cm) and three to four courses thick (ca. 65 cm). Next to this structure is another round structure, which measures 4.4 m in diameter, with its walls about 85 cm thick. Further to the southeast of this second structure, there are remains of two round structures which are now completely ruined. The pottery is Hellenistic and Byzantine.

Rujm Umm al-Qaṭṭāf North (Survey Site 106; PG: 216.6/144.2)

Rujm Umm al-Qaṭṭāf North is a major fort-site on the al-Maḥḍar ridge which contains a cluster of watchtower-like or fort sites. This site is located on a high knoll, situated approximately midway between Khirbat as-Sūr and Rujm al-Klāl, and appears to be a stopping spot on the ancient road from Khirbat as-Sūr to the Jordan Valley along the al-Maḥḍar ridge. It overlooks the modern dirt road from Khirbat as-Sūr down to the Wādī Jeriya and the Umm Haddar Plains. One large building at this site measures ca. 11.4 x 13.2 m. What appears to be an entrance is noted on the north side of the structure. The external walls are 1 m thick and still remain standing up to 1.2 m above the ground. The outlines of several inner wall lines are discernable, which indicate that this building is divided into at least six to seven rectangular or square compartments or rooms. There appears to be a central round room or tower. All the walls of the building are of medium to large limestone blocks, three to four rows wide. The pottery is Iron II-Persian and Byzantine.

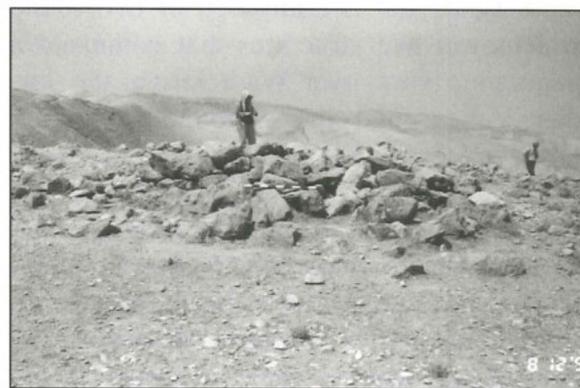
Rujm al-Klāl (Survey Site 112; PG: 214.9/144.7; Fig. 8)

Rujm al-Klāl is on a high knoll situated at the western edge of Wādī Jeriya Valley, which provides an excellent lookout point to

monitor traffic moving along Wādī Jeriya and to survey the entire area of Wādī Jeriya Valley. Rujm al-Klāl is clearly visible from Khirbat Ḥassān (Survey Site 20), Tall Hilālī, Khirbat as-Sūr (Survey Site 67), and the watchtowers along the al-Maḥḍar ridge (e.g., Survey Sites 105-109). Just north of this site is a small spring called 'Ayn Jariya. According to a bedouin family near the spring, 'Ayn Jariya provides enough water for three families and about 100 sheep and goats during the summer. On this site are the remnants of a rectangular building with a couple of compartment walls. The building measures 4.2 m (east-west) by 8 m (north-south), and the walls remain standing two to three rows wide (ca. 65 cm) and two courses high (ca. 50 cm). A potential entrance, measuring 1.1 m wide, is noted near the southwest corner of the building. Immediately east of this building is a smaller rectangular building (ca. 3.9 x 5.6 m) which has survived up to three courses high (ca. 1 m). Both buildings are comprised of various size of undressed and semi-dressed limestone blocks. The pottery is Iron I, Iron II-Persian, Late Hellenistic-Early Roman, and Byzantine.

Rujm Umm Haddar (Survey Site 118; PG: 214.2/141.2; Waheeb's Survey Site 1; Figs. 9 and 10)

This prominent ruin is situated on the high hilltop, covering an area of 40 m (east-west) by 50 m (north-south), in the center of

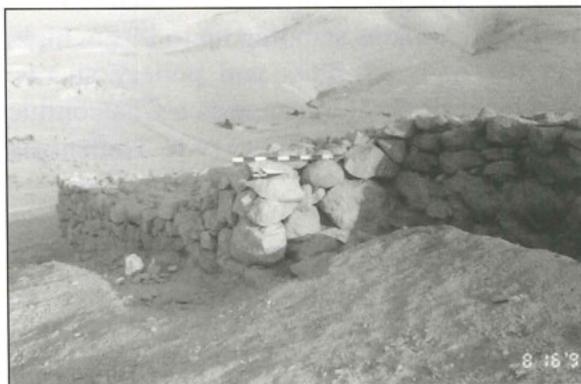


8. Rujm al-Klāl (Survey Site 112; looking west)

the Wādi al-Kafrayn basin area with excellent visibility in all directions. Rujm Umm Haddar is characterized by a rectangular late Hellenistic and early Roman fort with roughly square towers at each corner. The fort is built of roughly-dressed limestone blocks measuring approximately 20 x 35 x 40 cm. The wall lines indicate a rectangular fort-like structure (ca. 31 x 41m), and there are occasional inner wall lines that divide the structure into several chambers. The external walls are four to five courses thick (ca. 1.5 m). Waheeb (1997: 466-67) conducted soundings in the northern and southern part of that the fort and noted a destruction layer which may indicate the fort was once destroyed by a conflagration. There is a large cistern in the center of the fort which probably collected the run-off water from the roof. On the north side of this cistern is a water channel leading to an opening in the cistern. The archeological



9. Rujm Umm Haddar (Survey Site 118; looking northeast)



10. The southern fortification wall of Rujm Umm Haddar

soundings revealed traces of post holes in the hard compact floor of the structure, which may indicate that the fort was a two-story structure. Waheeb suggests that the fort used stones for the lower courses of the structure and mud-brick for the upper courses. The structure was probably roofed with wood and various organic materials. The pottery is Late Hellenistic-Early Roman.

Survey Site 119 (PG: 214.2/141.3; Waheeb's Survey Site 2)

Immediately north of Rujm Umm Haddar is a rectangular late Hellenistic structure half of which has been obliterated by recent bulldozing activities. The building appears to have been about 13 m (east-west) by 17 m (north-south) and was built of roughly-dressed limestone blocks. The external walls measure 70 cm thick. Waheeb's soundings (1997: 463) show that the floor of this building consists of hard compact soil, and the building includes a large rectangular inner chamber. Waheeb correctly suggests that this site is associated with the fort at Rujm Umm Haddar. The pottery is Late Hellenistic-Early Roman.

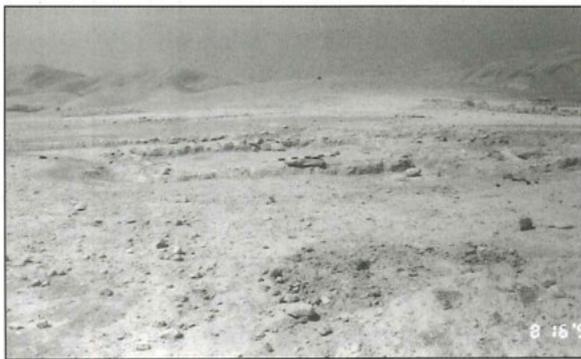
Survey Site 120 (PG: 214.0/141.3; Waheeb's Survey Site 10)

Approximately 200 m east of the late Hellenistic buildings at Rujm Umm Haddar (Survey Site 118) and Survey Site 119 is another Hellenistic building which roughly measures 9 x 13 m. The walls remain standing about 60 cm high, and the external walls measure 90 cm thick. Waheeb (1997) put down a test trench at this site and noted a potential reservoir built beside a water drainage. Waheeb assigned this building to the Hellenistic and Byzantine periods. The pottery collected by the survey team at this site and its vicinity indicates the early Hellenistic and Byzantine periods. Hence, the Hellenistic building at this site seems to have been slightly earlier than the counterparts at Rujm Umm Haddar and Site 119.

The pottery is Early Hellenistic and Byzantine.

Tulaylāt Umm Haddar South (Survey Site 121; PG: 214.6/141.8; Waheeb's Survey Site 5; Fig. 11)

Tulaylāt Umm Haddar, about 500 m northeast of Rujm Umm Haddar (Survey Site 118), occupies a couple of medium-sized knolls on the northern edge of the Wādī al-Kafrayn dam-lake. Numerous foundation wall lines in different directions are discernable on the surface. Waheeb (1997: 467-68) conducted archaeological soundings and reported, "The Chalcolithic occupation on the site seems to be represented by extensive and rectangular rooms built of two rows of undressed limestone, but unfortunately, only the foundations were found *in situ* and in very poor conditions." The survey team noticed several broad-room houses that Waheeb excavated. The houses were built using small to medium stones with walls about 70 cm thick. One of the houses found on the northern edge of this site includes a broad rectangular room with a round hearth. About 50 m southeast of the center of this Chalcolithic site is a large enclosure wall possibly bisected by a compartment wall. The enclosure measures about 22 m (north-south) by 50 m (east-west). It is difficult to decide whether these remains represent part of the Chalcolithic village. The concentration of possible Hellenistic and Byzantine body sherds associated with



11. Tulaylāt Umm Haddar South (Survey Site 121; looking northeast)

this enclosure is noted, which may indicate a later date of this structure than the Chalcolithic village. The pottery is Chalcolithic-Early Bronze I, Late Hellenistic-Early Roman, and Late Roman-Byzantine.

Survey Site 123 (PG: 214.9/143.2; Waheeb's Survey Site 4)

Approximately 2.5 km north of Rujm Umm Haddar (Survey Site 118) along the modern dirt road is Site 123 located on a small sand hill. The site includes several stone structures which appear to have been built according to a careful plan. In the center of this site is a roughly circular burial chamber lined by large stone slabs. The survey team collected a large number of human bone fragments inside the chamber. The outer diameter of this chamber is 2.3 m, and the walls stand about 1.3 m high above the ground. The burial chamber seems to have been surrounded by a rectilinear structure composed of roughly shaped stones, which is also reminiscent of the wall line found at Site 122. About 40 m southwest of the burial chamber is a possible outer enclosure wall built along the contour line of the knoll. The visible wall measures about 20 m long and 30 cm thick. To the east of the burial chamber is a rectangular structure with a possible entrance on the east side. The structure measures 2.2 m (north-south) by 2.4 m (east-west) and stands up to 1.3 m above the ground. The walls are about 40 cm thick, and the possible entrance is about 50 cm wide and remains standing up to 90 cm high. On the basis of flints and pottery sherds, Waheeb (1997: 466) suggests a Chalcolithic date for this site. The pottery is Hellenistic and Byzantine.

Khirbat aṣ-Ṣūwwān (Survey Site 127; PG: 215.3/142.4; Waheeb's Survey Site 6; French Survey Site 25; Figs. 12 and 13)

Khirbat aṣ-Ṣūwwān must have played an important role in the control of communication and trade routes between 'Irāq al- 'Amīr



12. Khirbat aş-Şūwwān (Survey Site 127; looking southwest)



13. A Silo at Khirbat aş-Şūwwān.

and the Jordan Valley during the Iron II-Persian and Hellenistic periods. This site is a currently unoccupied settlement site on the summit of an isolated promontory, ca. 3 km southeast of the Wādī al-Kafrayn dam, on the west side of Wādī al-Kafrayn. The promontory is characterized by steep sides except for an approach from the northwest along a relatively narrow ridge. Situated on an isolated peak, Khirbat aş-Şūwwān provides a clear view of the entire area of the Umm Haddar Plains and the approaches along the Wādī al-Kafrayn from the Jordan Valley to the Transjordan plateau. Tumbled building ruins of large blocks are scattered in the northwest-southeast direction. The collapsed remains of a structure dominate the north side of the site, which represents a solidly-built fort with multiple inner chambers and a round tower. It is very difficult to trace the exact building plan of the fort because of its poorly preserved state, yet a

careful investigation leads to the deduction that it has a rectangular plan (ca. 25 x 35 m) with four rooms on the west side and probably three rooms on the east side. The most significant element of this fort is a rectilinear courtyard on the north side, which includes an enigmatic 10 m diameter round structure. The remains of enclosure walls found to the south of this fort appear to represent an animal pen used in antiquity. The survey of the southern edge of the promontory leads us to suggest that earlier walls, possibly a fortification system, exist to the south of the rectangular fort. The wall lines cover an area ca. 20 m (north-south) by 35m (east-west). It is worth noting that the majority of Iron I sherds are collected in conjunction with these possible earlier walls, whereas Hellenistic sherds dominate the area of the fort. In addition, on the land bridge between the fort and Survey Site 126 are seven to eight stone-lined silos spread over an area ca. 10 x 15 m (Fig. 13). Some of them are well preserved and measure about 2 m deep. The diameter of silo mouths ranges from 1.1 m to 2.2 m. About 15 m south of these silos are the foundations of a rectangular building that was almost completely stripped by robbers in the past years. The 10 x 15 m building has no visible internal wall lines. The pottery is Iron I, Iron II-Persian, Hellenistic, Roman, and Byzantine.

Tulaylāt Umm Haddar North (Survey Site 132; PG: 214.7/141.9)

Survey Site 132 appears to be a large Chalcolithic and Early Bronze I village closely associated with Tulaylāt Umm Haddar South (Survey Site 121). Situated on a low sandy knoll ca. 200 m northeast of Tulaylāt Umm Haddar, the village overlooks the entire area of the Umm Haddar Plains. Numerous wall lines dot the site, yet the surface ruins are largely indistinguishable except for the remains of several houses. The house at the highest point of this site was

built using a broad-room house plan and measures 3.8 m by 6.9 m. At the center of the site is a broad-room house (ca. 3 x 6 m) divided into two rooms by a compartment wall. Approximately 70 m east of this house is a building complex including a couple of possible enclosed structures and several broad-room houses. Most of the visible walls are built two to three rows wide (ca. 25 cm) using small limestone and chert blocks. This site seems to be an extensive Chalcolithic site and will help in the study of the transition from the Chalcolithic to Early Bronze I in the southern Jordan Valley. The pottery is Chalcolithic-Early Bronze I.

#### Survey Site 136 (PG: 216.5/142.7)

This site appears to be the remains of a large village situated on a natural rocky terrace ca. 1.5 km northeast of Khirbat aṣ-Ṣūwwān. This site covers an area ca. 50 x 100 m and includes a large number of wall lines and a dolmen. Wall lines seem to be spread over the entire site, yet it is quite difficult to distinguish most of them with confidence. On the southern edge of the terrace is a circular structure built of medium undressed stone blocks. Its external diameter is ca. 4 m and the walls are 60 cm thick. To the east of this circular structure are randomly scattered wall lines and various stone heaps which may represent a complex of houses. Further to the east are the remains of a possible dolmen which is partially collapsed. The dolmen is oriented roughly north to south and built of rudely shaped natural stones. It consists of a capstone (45 x 90 x 140 cm) and two upright stone slabs in addition to one upright stone at the back. This dolmen appears to have been built on a rectangular platform formed of small limestone blocks, and is reminiscent of the dolmens in the region of Wādī as-Sīr and belongs to the same repertoire of types as those near 'Irāq al-'Amīr (Ji 1997a; 1997b). About 50 m northwest of the dolmen is a rectangular house (ca. 2.2 x 2.8 m) plus two

stone tumbles which also represent ancient buildings. These buildings consist of small limestone blocks with walls about 40 cm thick. The pottery is Early Bronze, Middle Bronze, and Iron Age body sherds.

#### Rujm Umm al-Madāris (Survey Site 159; PG: 219.7/144.6)

This small-sized site occupies a prominent hilltop in the region of Umm al-Madāris, a rocky ridge northwest of Khirbat al-Farāwīt (Survey Site 28), and provides a clear view in all directions, particularly over Wādī al-Kafrayn. Khirbat al-Farāwīt is clearly visible to the southwest, and includes two small structures built side by side. The better preserved and more impressive one is situated on the northern side of the site and measures ca. 5 m in diameter. The walls are three to four rows thick (ca. 1.5 cm) and stand at two courses high. It is constructed of medium to large roughly hewn stones. Immediately south of this structure is a circular structure (ca. 4.3 m in diameter) constructed of small to medium undressed stones. Considering the rocky terrain, which is mostly unsuitable for agriculture, and its strategic location, we may suggest Rujm Umm al-Madāris was a watchtower site built as a lookout or for defense. The pottery is Hellenistic and Byzantine.

#### Rujm al-Aḥmar (Survey Site 171; PG: 218.7/145.4; Fig. 14)

Near the head of the Wādī al-Aḥmar, a tributary to the Wādī an-Nār, are the ruins of some buildings and wall lines on a rocky hilltop. Khirbat as-Sūr (Survey Site 67) and the Wādī an-Nār are clearly visible to the west. This site was almost totally bulldozed for agriculture, and thus it is quite difficult to trace the ancient wall lines. The remaining wall lines may represent a building compound which was larger than 10 x 10 m. The walls are two to three rows wide (ca. 90 cm) and remain standing up to 50 cm above



14. Rujm al-Aḥmar (Survey Site 171; looking northwest)

the ground. Further to the east is a potential oval-shaped enclosure. This site seems to have been a relatively substantial ruin which covered an area ca. 30 x 30 m. The pottery is Iron II-Persian and Byzantine.

**Khirbat al-Mdayyna** (Survey Site 172; PG: 220.1/146.2; Fig. 15)

Situated on the slope of a prominent hill ca. 2 km northeast of Rujm al-Aḥmar (Survey Site 171) and ca. 1 km southeast of the modern village of Hamdir is Khirbat al-Mdayyna which has been almost totally obliterated in the course of modern agriculture and construction. According to the local residents, the area was bulldozed in 1995 and 1996 to build terrace walls and olive groves which currently cover an entire hillside. This site, however, contains some evidence of ruined architecture some of which was built immediately on bedrock.



15. Khirbat al-Mdayyna (Survey Site 172; looking northwest)

The remaining wall lines represent two large rectangular structures comprised of large undressed limestone blocks. One measures 7 x 10 m without any inner compartments, while the other one, built immediately north of the first one, measures 8 x 11 m and is divided into two sections by an inner wall. East of these structures are several wall lines spread over an area, ca. 20 x 20 m. All these structures seem to represent enclosures that were used for animals or storage. A seemingly residential structure is noted on the north-western side of this site near the modern gateway to the olive groves. The survey team identified at least three walls lined up in the east-west directions. The walls are constructed of medium-sized undressed stones and are two rows thick. Khirbat al-Mdayyna seems to have been a substantial village including many buildings and animal enclosures laid out on the western slope of a hill. The site commands a good view over the entire Wādī an-Nār region: Khirbat as-Sūr (Survey Site 67) is clearly visible to the west and Khirbat 'Ayn Grada (Survey Site 57) to the northwest. The pottery is Iron II-Persian.

### Conclusion

Previous archaeological surveys were primarily concerned with the sites in the immediate vicinity of 'Irāq al-'Amir and the Wādī al-Kafrayn dam-lake, ignoring the region of Wādī Jeriya and the hilly area between Wādī ash-Shu'ayb and Wādī al-Kafrayn. The 1998 surveys proved that the area along Wādī al-Kafrayn and the Umm Haddar Plains was intensively inhabited during the Chalcolithic-Early Bronze, Iron II-Hellenistic, and Byzantine periods. There are many Iron II-Persian and Hellenistic settlements and watchtowers on the slopes and ridges between Wādī al-Kafrayn and Wādī Jeriya, most of which were seemingly reused during the Byzantine period. The Iron II-Persian and Byzantine periods are also well represented on the slopes close to

Wādī ash-Shu'ayb. Yet, until now there is little evidence of any Hellenistic settlements in this region.

To combine the 1998 data with the 1996 survey results, in the region of 'Irāq al-'Amīr and Wādī al-Kafrayn, Chalcolithic and Early Bronze pottery was found at 46 sites (26.4%) and Iron II-Persian sites account for 31.6% of the total (54 sites of 174 sites). Middle Bronze and Late Bronze sherds came from seven sites (4.0%) and four sites (2.3%) respectively. Eleven sites (6.3%) are dated to Iron I. Hellenistic sites make up 30.5% (53 sites), and Roman pottery came from 32 sites (18.4%). The Byzantine period witnessed the peak of settlement intensification; 110 sites included Byzantine pottery (63.2%). Early Islamic pottery was collected at 27 sites (15.5%) and Middle Islamic sherds came from 18 sites (10.4%).

Accordingly, a provisional suggestion is that the Byzantine period showed a considerable increase in population and settlement in the region of 'Irāq al-'Amīr and Wādī al-Kafrayn. Chalcolithic-Early Bronze, Iron II-Persian, Hellenistic, and Roman pottery was also collected at more than 30 sites. Thus, the survey area may have witnessed high settlement intensification during the Byzantine period and low settlement intensification in the Chalcolithic-Early Bronze, Iron II-Persian, and Hellenistic-Roman periods. As pointed out in the pre-

vious report, Iron I is under-represented in the survey area in comparison to the Transjordanian plateau region, which is more or less in line with the view that Iron I sites were sparse in the southern Jordan Valley and its neighboring regions.

### Acknowledgments

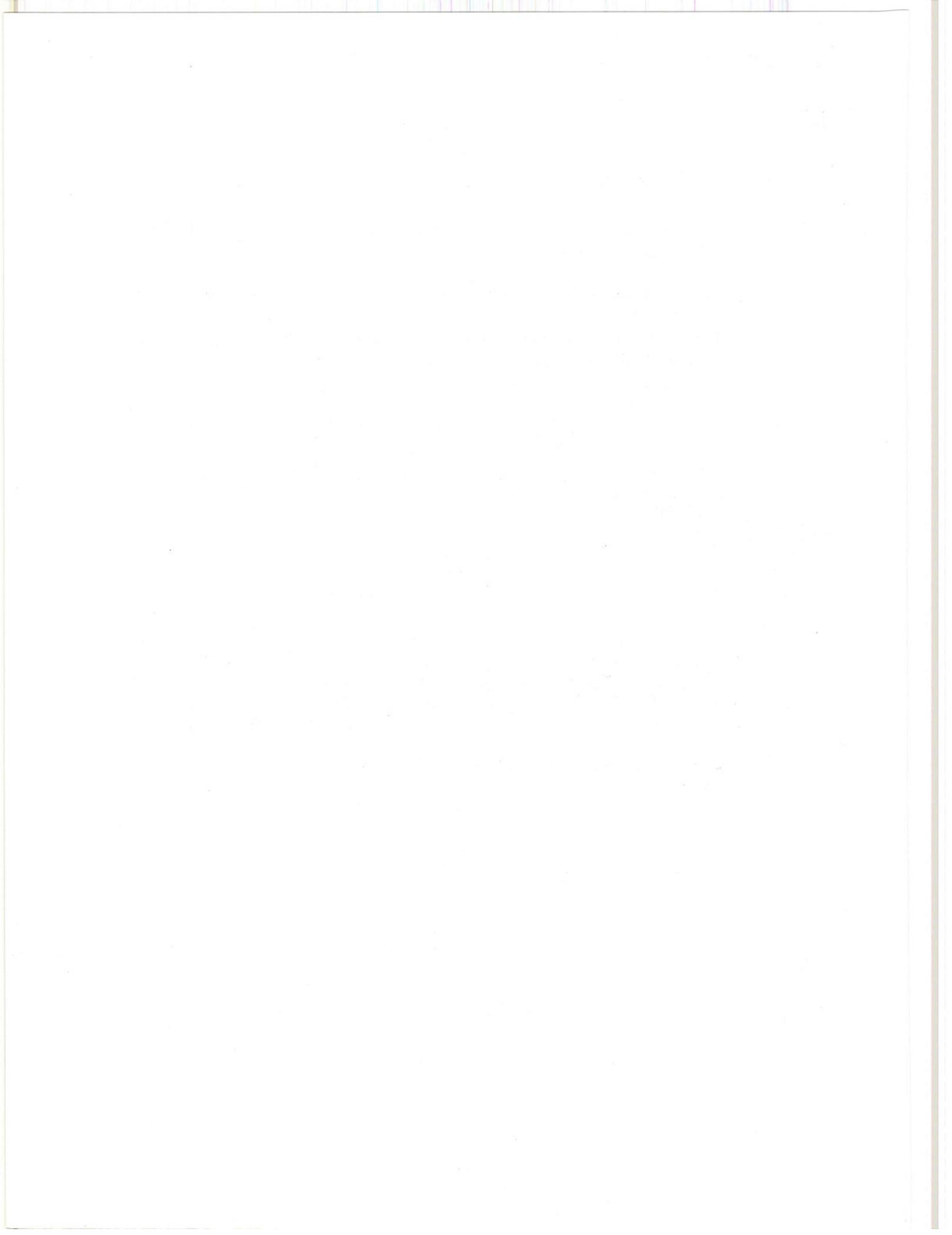
The 1998 'Irāq al-'Amīr survey team members are grateful for the enthusiastic support of the then, Director-General Dr Ghazi Bisheh and his staff at the Department of Antiquities and for the assistance provided by the staff at the American Center of Oriental Research at Amman. The fieldwork and research were funded by the Korean Research Foundation, La Sierra University, Sam Yook University, the Mādabā Plains Project, and individual donors. In addition, the authors would like to express sincere gratitude to Dr Lawrence T. Geraty, Dr Kye Hoon Shin, and Dr Øystein S. LaBianca for their continuous support and interest in the 'Irāq al-'Amīr research project.

Chang-Ho C. Ji  
La Sierra University  
Riverside, California  
USA

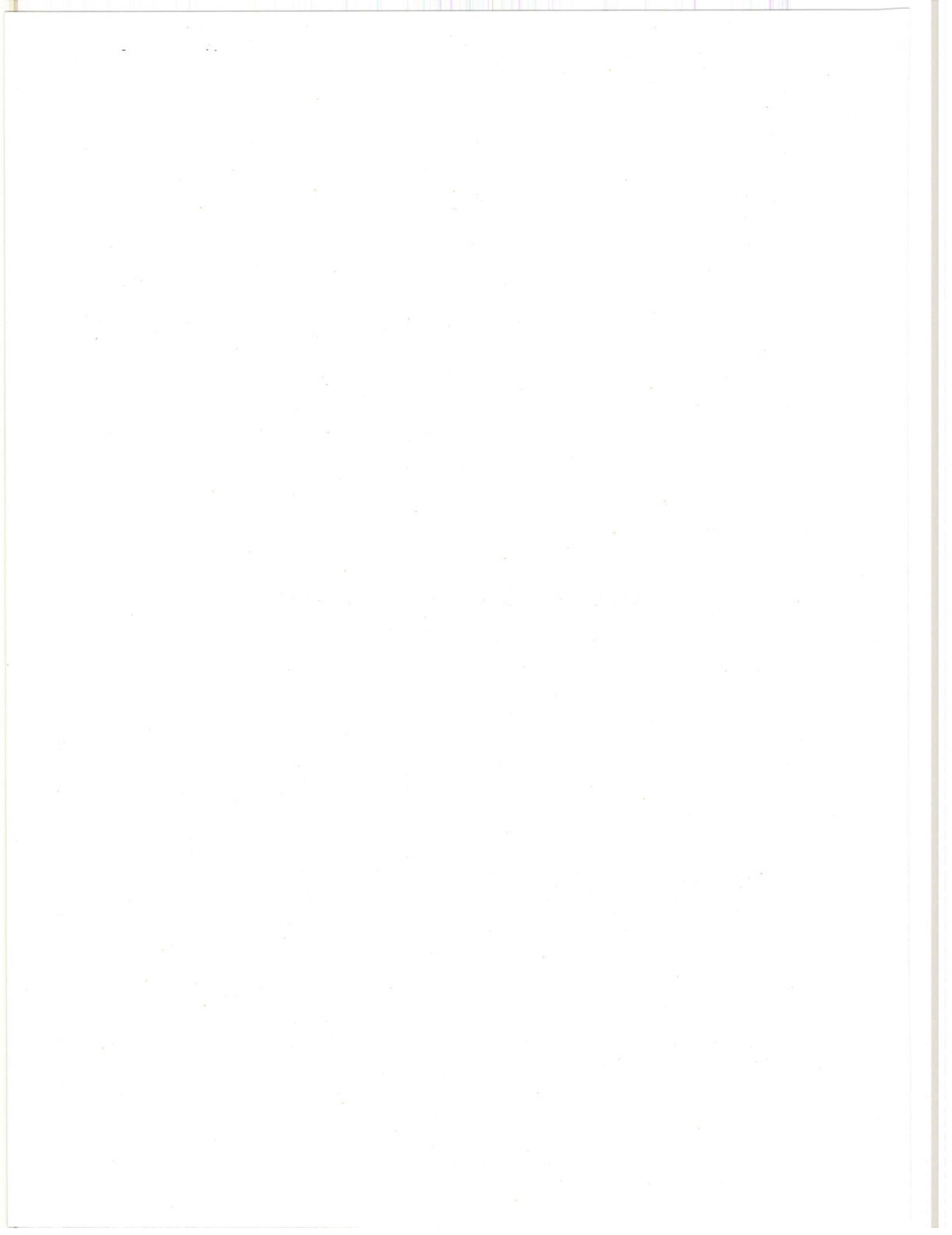
Jong Keun Lee  
Sam Yook University  
Seoul  
Korea

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**Archaeological Notes and News**



# TULEILĀT QAŞR MŪSĀ ḤĀMID, 1999

by  
Konstantinos D. Politis

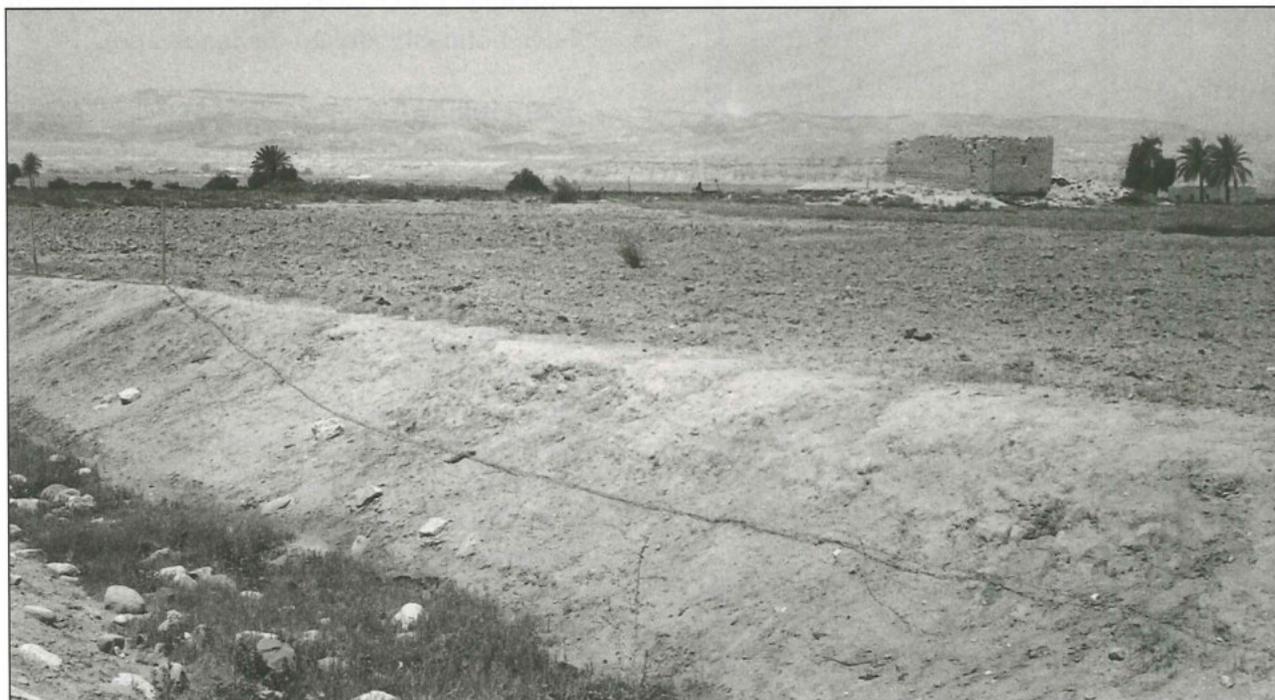
## The Discovery

In April 1999 local people from the Ghawr aş-Şāfi brought to my attention Qaşr Mūsā Ḥāmid, approximately 2 kilometres due west of Khirbat ash-Shaykh 'Isa in the Ghawr aş-Şāfi (UTMG, 31 01.3587 N, 35 27.3690 E). The site consists of a 20th century adobe-built farmstead once belonging to a Mūsā Ḥāmid Hashoush. It was called *qaşr* (=palace in Arabic) because the relatively large house used to dominate the local landscape (Fig.1). The descendents of Mūsā Ḥāmid claimed to have seen antiquities there during agricultural ploughing and the installation of irrigation canals. And indeed, after an initial investigation, it was apparent that the site was a low-lying archaeological mound extending over several hundred square metres. I therefore named the site, Tulaylāt Qaşr Mūsā Ḥāmid.

## The Ancient Site and its Setting

Although Tulaylāt Qaşr Mūsā Ḥāmid has been badly disrupted by agricultural activities, enough archaeological material survived on the surface to date it. Pottery characteristic of the Iron Age II period was distinguished as well as two fragments of flint sling stones (Fig. 2). No architecture was visible from the ploughed surface but there was some evidence of adobe bricks and ashy occupational layers in the sections made by the Jordan Valley Authority's deep leaching trenches.

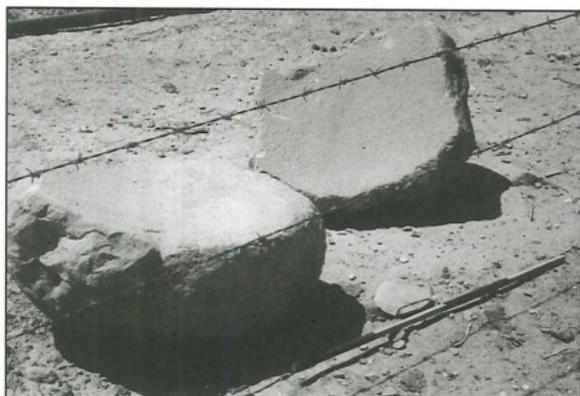
Over a dozen unusually large saddle quern stones (some over a metre long) were found on the southern side of the site (Fig. 3). These non-portable querns, indicate that substantial agricultural activity was being carried out by a sedentary community. Considering the rich alluvial soils of the Wādi



1. Tulaylāt Qaşr Mūsā Ḥāmid from east (photo: K. D. Politis)



2. Iron Age II pottery sherds and sling stones fragments (photo: K. D. Politis).



3. non-portable saddle quern stones (photo: K. D. Politis).

al-Ḥasa delta on which the site lies, coupled with the readily available fresh water source of the wadi, the choice of location for the settlement is not surprising.

The reason that an Iron Age settlement was not founded in the general proximity of the Byzantine and medieval Islamic sites of an-Naq' and Khirbat ash-Shaykh 'Isa over 2 kilometres to the east may be that the to-

pography of that area was more prone to flooding 3,000 years ago (alluvial deposits have noticeably altered the landscape).

### Conclusion

The location of Tulaylāt Qaşr Mūsā Ḥāmid just west of the Wādī al-Ḥasa, rich in alluvial soils, would have made it an ideal location for an agricultural settlement. Large saddle querns attest to a substantial agrarian economy. The discovery of Iron Age II pottery sherds date the site to around 900-600 BC, a period with Biblical associations according to many scholars. It is possible therefore, that Tulaylāt Qaşr Mūsā Ḥāmid was *Old Testament Zoar*, one of the "cities of the plain".

Konstantinos D. Politis  
British Museum,  
London WC1B 3DG  
UK

# WĀDĪ AL-MŪJIB ARCHAEOLOGICAL SURVEY

by

Adeeb Abu-Shmais and Mohammad Waheeb

## Introduction

The Ministry of Water and Irrigation is planning to build a new dam at the location of the bridge along the King's highway crossing the Wādī al-Mūjib. No previous archaeological explorations were conducted in the area, which requires a careful impact assessment before the construction is started.

The planned reservoir will cover an area of approximately six square kilometers, and major road works will be conducted in order to re-align the King's highway over the dam. The maximum water level of the reservoir will be 213 m asl, i.e. over 60 m above the level of the present valley bottom.

The goals of the project were as follows:

- 1) to recover, by means of an intensive archaeological survey, all the archaeological sites which will be destroyed by the Wādī al-Mūjib dam construction or by the water reservoir resulting from such construction.
- 2) to conduct excavations and soundings at sites which are rated of scientific potential importance.
- 3) to prepare site presentation and landscaping plans for the sites which will not be totally destroyed by the construction, in order to create an archaeological park of scientific and touristic interest.
- 4) to process the data for publication.

The Scope of work: From other intensive survey projects conducted in Jordan, it seems that the average number of archaeological sites is approximately six per square km. We might then expect locating over thirty sites in the impact area. Not all of the sites will require excavation. This proposal is based on a compromise between expected number of sites and sites with structures or features of a

certain importance which will need detailed investigation.

The intensive survey was conducted by a team of ten archaeologists which recorded every single feature visible on the ground. The assessment made by the team will serve as a basis for the second phase of the project, which is the actual mitigation work. In preliminary visits conducted by the Cultural Resource Management Team of the Department of Antiquities of Jordan, eleven sites have already been located, which will suffer various kinds of damage as a result of the dam construction. These sites range in date from the Paleolithic to the Ottoman period, thus covering the entire cultural history of Jordan.

Soundings and excavations will characterize the second phase of the project, as well as mitigation according to the assessment made during the survey. Sites rated of potential scientific importance will be test excavated for their stratigraphic sequence. These soundings might lead—if the data recovered are of particular importance — to more intensive excavations. There are already two sites that will require this type of intensive excavation: Tall as-Sfei and Khirbat al-'Ajam.

An archaeological park along the sides of the reservoir can be created, adding a potential touristic attraction to the area. Sites which are going to be only partially flooded can be presented to the public by adding signs and footpaths, and, by landscaping. This work will be conducted towards the end of the project, at sites with more evident archaeological remains and at the most easily accessible locations.

Finally, data recovered during the survey and excavation phases will be studied and

prepared for publication as a monograph. This work can be conducted during or after construction has started at the site.

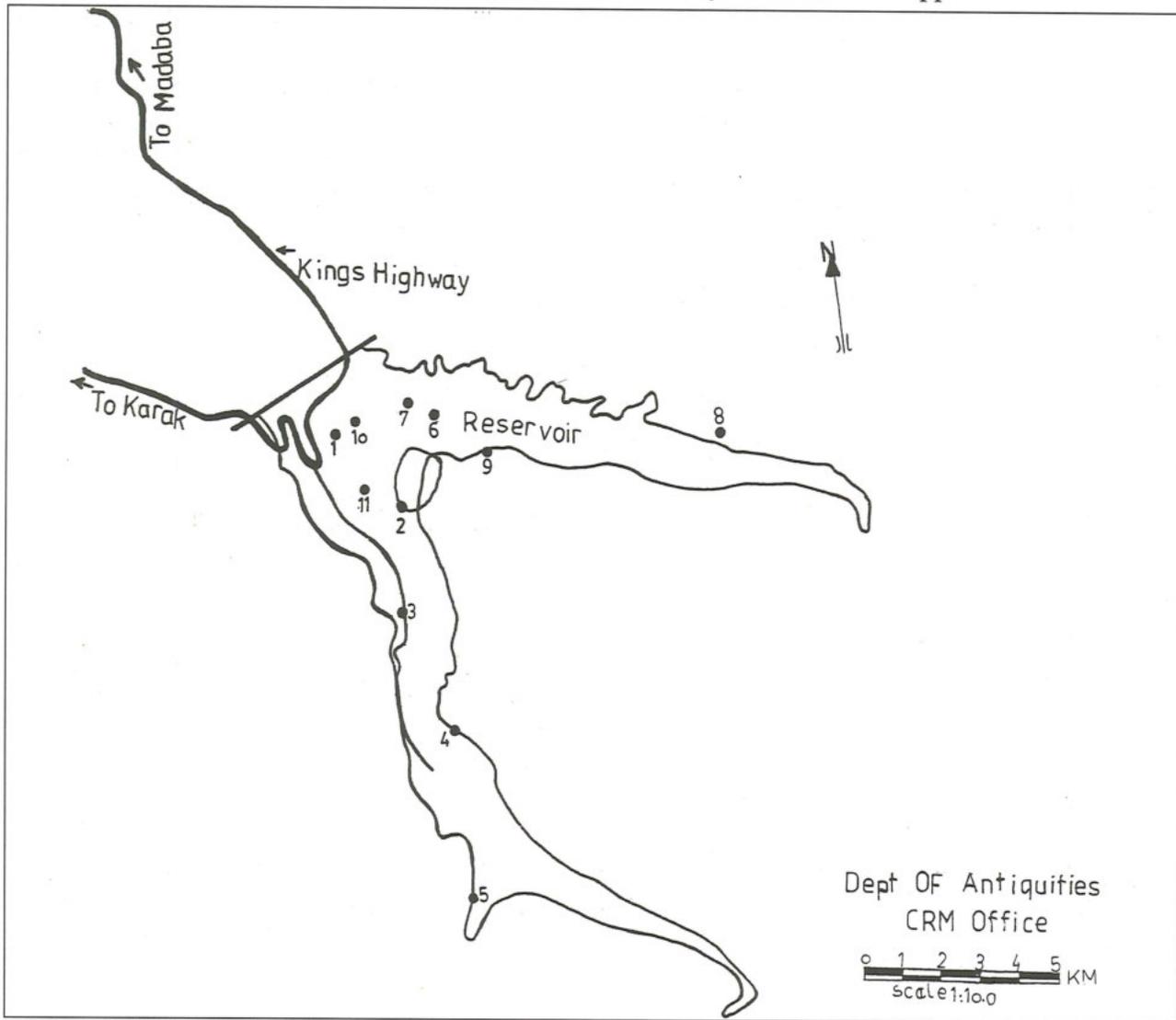
**Assessment**

A total of eleven sites were discovered in the area of the Wādī al-Mūjib reservoir. Of these only one site which is Khirbat al-'Ajam, (our site no.3; Fig. 1) was previously known by Glueck. The sites are:

1. An Ottoman (?) water mill 200 m, east of the bridge (P.g. 227.9E/094.5N; elev.: 140asl). A Tower that is semi-destroyed, and water channel still visible on the surface. Other structures are also associated.
2. Tall as-Sfei (P.g. 228.3E; 094.1N; elev.:

200asl). A small site on a prominent, semi-eroded hill overlooking Wādī al-Mūjib, with clear fortifications encompassing an area of approximately 40x20 m. Pottery, flints, basalt grinding-stones and limestone door sockets are observed in the area. Modern tombs on the hilltop. Periods of occupation are PPNB, Chalcolithic, EB, Iron Age, Hellenistic, Poss. Roman.

Khirbat as-Sfei (P.g. 228.4E/098.3N; elev.:170-230asl). Large (12 hectares) PPNB site, with clear architectural remains and a high density flint scatter. Crops and agricultural roads have partially disturbed the upper strata of the de-



1. Wādī al-Mūjib Archaeological Survey 1999.

posit.

A deep bulldozer cut, however, revealed over three meters of deposits, with well-preserved architectural remains of a house with two phases of plastered floors (the top one red-painted) and plastered walls. The bulldozer cut was drawn and photographed.

3. Khirbat al-'Ajam (P.g. 228.3E/093.5N; elev.:170-180 asl.). It has numerous wall lines, pottery, and a large limestone olive-press stone. The walls are built with very large basalt blocks. Periods of occupation: Roman, Byzantine, Mamluk, Ottoman, Modern.
4. A possible ruin, with structures (P.g. 228.7E/092.8N; elev.: 200-230 asl.).
5. A buried site characterized by a long (60m), thick ashy layer (only a pottery sherd and a flint implement were located during the survey (P.g. 228.8E/091.7N; elev.: 2100 asl.).
6. Epipaleolithic (?) flint scatter, characterized by great quantities of debitage. Possibly a flint reduction site (P.g. 228.5E/094.6N; elev.: 160-170 asl).
7. Adjacent to site 6, site 7 is a long wall nicely built in header and stretcher technique. Possibly an enclosure or boundary wall, running for at least 100/150m in a N/S direction (P.g. 228.4E/094.6N; elev.: 160 asl).
8. A Small settlement characterized by dense architectural remains, and partially disturbed bulldozing. Periods of occupation: Pal?, Chal/EB, Hellenistic, Nabataean, Roman, UD flints (P.g. 230.3E/094.6N; elev.: 220 asl).

9. Watchtower on a spur overlooking Wādi al-Mūjib measures 5.5x5 m. Periods of occupation: Iron Age ? (P.g. 228.8E/094N; elev.: 215asl).

10. A Watchtower or small farm on a wide terrace that is intensively cultivated, 4 m above the present wadi bed. The structure measures 10x15 m. Periods of occupation: Byzantine (P.g. 228.0E/094.6N; elev.: 140 asl).

11. Water mill or watchtower along the present wadi bed. Not dated (P.g. 228.1N/094.2E; elev.: 150asl).

#### **Evaluation of Impact** (see Fig.1)

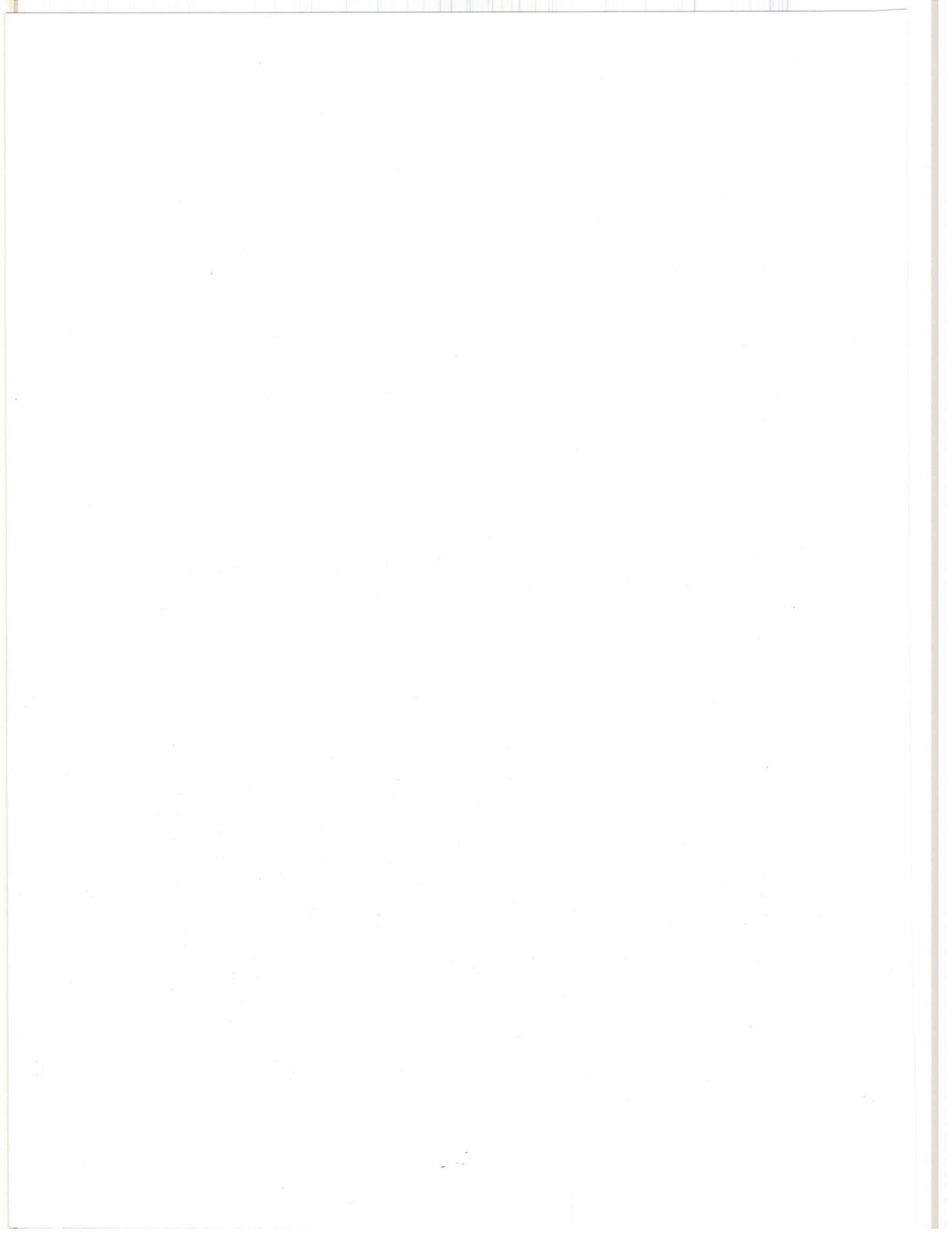
Sites nos.1,3,6,7,10,11 will be totally flooded by the reservoir.

Sites nos. 2,2 bis,4,5 will be partially flooded, or flooded in rainy years.

Sites nos. 8 and 9 will not be flooded.

The identification of eleven archaeological sites gives an idea of the potential of the entire area in terms of the presence of archaeological remains. Three of the sites, in particular, Tall as-Sfei (2), as-Sfei (2 bis), and Khirbat al-'Ajam (3), are large and of deeply stratified deposits. Because of their elevation, sites 2 and 2 bis will be impacted only marginally, or only during rainy years. In general, however, the impact of the dam construction and of the resulting reservoir on the archaeological sites of Wādi al-Mūjib is severe. The authors estimate, based on the density of archaeological sites in areas intensively explored, that eleven to fifteen sites will be located in the areas directly impacted by the dam construction and the reservoir.

Adeeb Abu-Shmais  
 Mohammad Waheeb  
 Department of Antiquities  
 Amman-Jordan



# WĀDĪ AL-KHARRĀR ARCHAEOLOGICAL PROJECT: THE MONASTERY

by

Mohammad Waheeb

## Introduction

The ongoing excavations along the Wādī al-Kharrār and on the Tall east of the Jordan River (Fig. 1) by a team from the Department of Antiquities of Jordan have identified the remains of several architectural features, such as churches, a water system, and other buildings.

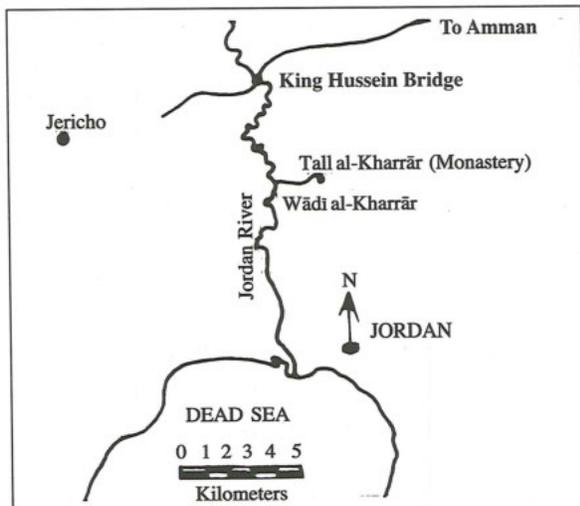
This preliminary report of the two seasons of archaeological excavations in the

area of Tall al-Kharrār contains an assessment of the type of archaeological features found in this area and the periods of occupation they represent. Simply stated, the aim of the archaeological excavations at Tall al-Kharrār is to reconstruct phases of human occupation on the Tall and in the region by identifying the relationship between the Jordan River and its eastern bank with Tall and Wādī al-Kharrār during different historical periods, especially during the Roman and Byzantine periods (Fig. 2).

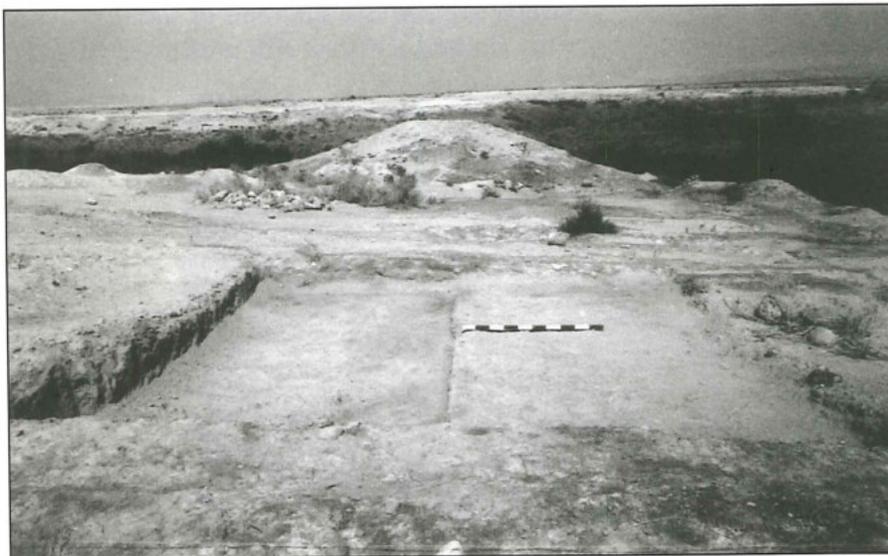
Excavations were conducted in area A/B/ C/D) of Site No.7 and concentrated on area C/D as follows:

## Excavations in Area D (The Prayer Hall) (Fig.3)

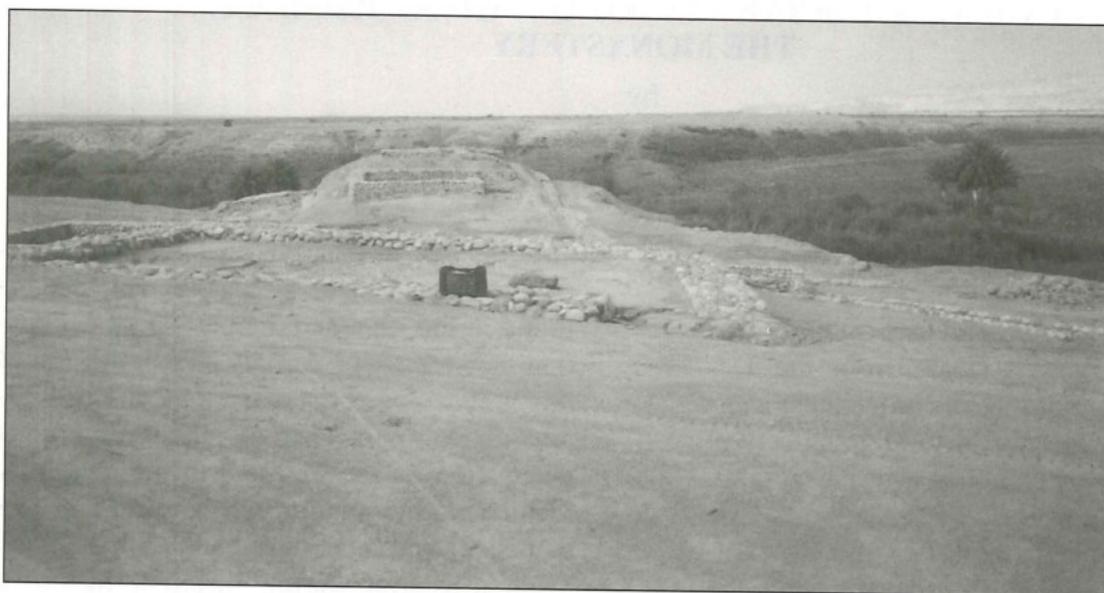
Excavations revealed the presence of a rectangular building of undressed field stones, measuring approximately 11.50 m E-W and 7.30m N-S, located near the south-eastern corner of Tall al-Kharrār. The floor of the structure was already in a bad state of



1. Location of Wādī al-Kharrār.



2. Some Archaeological remains of Wādī al-Kharrār.



3. Excavations in Area D.

preservation before the latest use of the building during the late Byzantine period. The floor was paved with a white mosaic pavement, while the ashes of the final destruction rested directly on the extant parts of the white mosaic. The ashy layer possibly represents the remains of fired wood beams which were used in roofing the structure. The manner of construction and location of this structure supported our suggestion that the structure functioned as a prayer hall for Christians, rather than as a chapel.

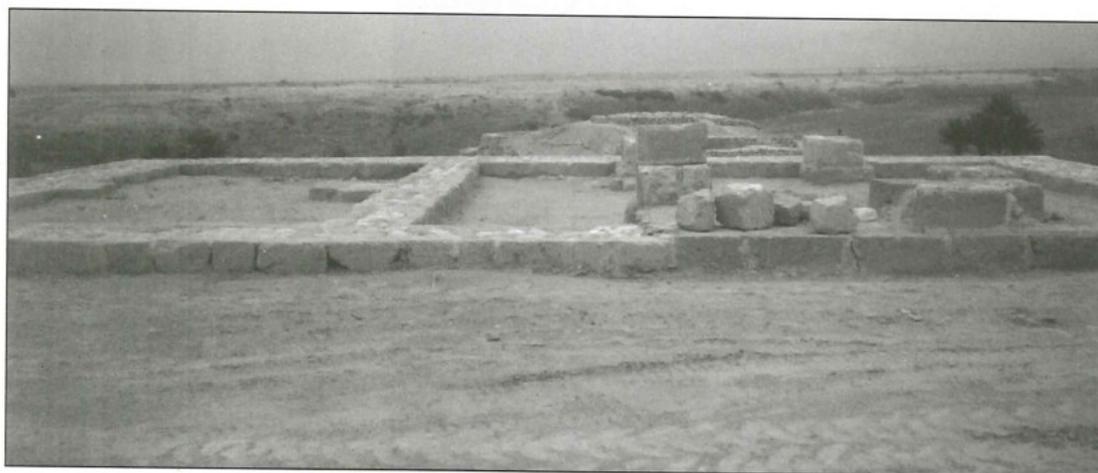
The available material recovered during the excavations gave the structure an earlier date which is the late Roman period.

Two medium rooms were located adjacent to the north-eastern corner, and pos-

sibly served as service rooms related to the structure; the floors; were paved with cobble stones, and fieldstones were used in building the walls. The rooms suffered severe destruction during the construction of the aqueducts in the Byzantine period.

#### Excavations in Area C (The Church)

Excavations conducted in area "C" to the south of Tall al-Khrrar uncovered a structure built of well dressed sandstone blocks. The general shape of the structure is rectangular, its dimensions are approximately 13.5m E-W and 9m N-S; many parts of this building have disappeared, especially the upper courses, the walls, and part of the floor, with only limited portions still preserved (Fig. 4).



4. Excavations in Area C.

What remains are a few stones resting on a lime-plastered surface overlying a carefully prepared rubble stone and gray to dark ashy mortar which resembled the bedding cement of the structure. The colored mosaic floor with cross marks depicted on it was largely destroyed and removed, and only a small portion in the south-eastern corner of the church is still *in situ*. The fill contained fragments of lime with some mosaic tesserae still adhering to it. Impressions on the mortar bedding and the springs of arches indicate that an arch system was used to support the roof of the structure. It is clear that the structure represents a small chapel located near the south-western corner of Tall al-Kharrār. The chapel consisted of two parts, with three arches to support the roof. Courtyard remains were recovered near the north-western corner of the structure. It is difficult to locate the doorway of the chapel, but the location of the courtyard suggested that the door was possibly located in the northern wall, especially the northwestern corner just opposite Tall al-Kharrār. The recovered material dated the structure from the fourth to the sixth century AD.



5. The Water System.

### The Water System (Fig. 5)

People of the Roman and Byzantine era often brought water over considerable distance to cities, towns, villages and buildings. The test soundings conducted by the Department of Antiquities of Jordan team, about 300m southeast of Tall al-Kharrār, revealed the presence of ceramic pipes and aqueducts which link the area of Wādī al-Kharrār with the nearby wadis such as Wādī al-Kafrayn and Wādī ar-Ramah. Numerous springs still feed the area, such as 'Ayn al-Kharrār (John the Baptist spring) which is located in Wādī al-Kharrār, and other springs to the east such as 'Ayn Salim, 'Ayn al-Fawara, 'Ayn al-Hammam and others.

The need for more water to be used for daily life and other cultic purposes is the reason for constructing the water system. The ceramic pipe, which is partly preserved, reaches the site near the prayer hall, where a medium size settling tank was built. The water then continues through the stone aqueduct to two small settling tanks and afterwards is directed to the pool and via another branch to the cistern, while a third branch goes to the north-eastern side which

is still under excavation.

It seems that the water system was designed to carry the water to the pool and the nearby cistern. In addition, stone pillars carried the water through the aqueduct to Tall al-Kharrār, where three pools were discovered. Only a few remains of the stone pillar foundations were discovered *in situ*; the bases of the pillars consist of field stones mixed with gray lime to fix it, with well cut sandstone ashlar built over a possible arch system to carry the aqueduct. Building the aqueduct and the pillar, just adjacent to the northern part of the prayer hall, directly affected the remains of the two rooms, which are related to the prayer hall, and clearly indicate that the aqueduct was added later.

The two main water constructions located between the prayer hall and the small chapel and near the settling basins are the pool and the cistern.

### The Pool

The pool measures 8m E-W and 6.50mN-S, and was dug in the natural *lisān* marl rock. The inner sides of the pool are built of well-cut sandstone ashlar, over which a thick layer of lime was added, followed by a smooth layer of plaster to prevent any seepage. Apparently, the pool was roofed by using a vault system; remains of the arch system are still visible on the upper parts of the pool, while remains of a mosaic floor were located on the roof of the pool. It is reasonable to assume that roof aimed to reduce the evaporation in the water of the pool during summer.

Excavations of the pool revealed fallen ashlar and mosaic tesserae, with sand and pottery sherds dating to the late Byzantine period.

### The Cistern (Fig. 6)

The cistern is located near the north-western corner of the pool, and an aqueduct branch reached the cistern; the general shape of the cistern is cylindrical (pear shaped).



6. The Cistern.

Excavations in the cistern revealed the presence of fallen ashlar mixed with smooth sand and some pottery sherds which are dated to the Byzantine period. The inner sides of the cistern were coated with a plaster layer to prevent seepage.

The abundance of water in the cistern (due to the water table) forced the team to pump out the water. Nevertheless, it has been difficult to excavate deep below this level.

### Tall al-Kharrār

Tall al-Kharrār is a small low hill located east of al-Kafrayn village, between Wādī Nimrin and Wādī Gharāba. The hill is situated at the south-eastern side of Wādī al-Kharrār. Palm, tamarisk trees and reeds, grass as well as an active spring surround the site from the north, east and west sides. The Tall consists of white *lisān* marl mixed with brown-red marl at the top. The eastern, western and northern slopes of the Tall descend steeply down in the bed of the Wādī, which flows westward approximately 2 kilometers to join the Jordan River where the traditional place of baptism is located.

Thus, the banks of the Wādī al-Kharrār, especially the southern bank, represent a natural route from the Tall itself to the Jordan River. A grid was established and the site was divided into four areas (A/B/C/D) for systematic excavations. Obviously, at a site with steep topography, like Tall al-Kharrār the builders were obliged to erect a pro-

tective wall.

A wall built of fieldstones, discovered during the excavations, was built at the middle slope of the hill, and surrounds the Tall from the northern, western and eastern sides. The extensions of the wall reach the prayer hall and the small chapel located to the south of the hill. It can be assumed that the protective wall was built in order to support the buildings which were erected at the top and middle slopes of the Tall. Several structures and buildings were constructed on the hill during several periods of occupation, especially during the Byzantine period. Among these structures were three pools and churches.

### **The Pools (Fig. 7)**

Three pools were attested on the Tall. The first one is located at the lower southern slope, while the other two pools were situated at the higher top of the northern edge of Tall al-Kharrār.

#### *The Southern Pool*

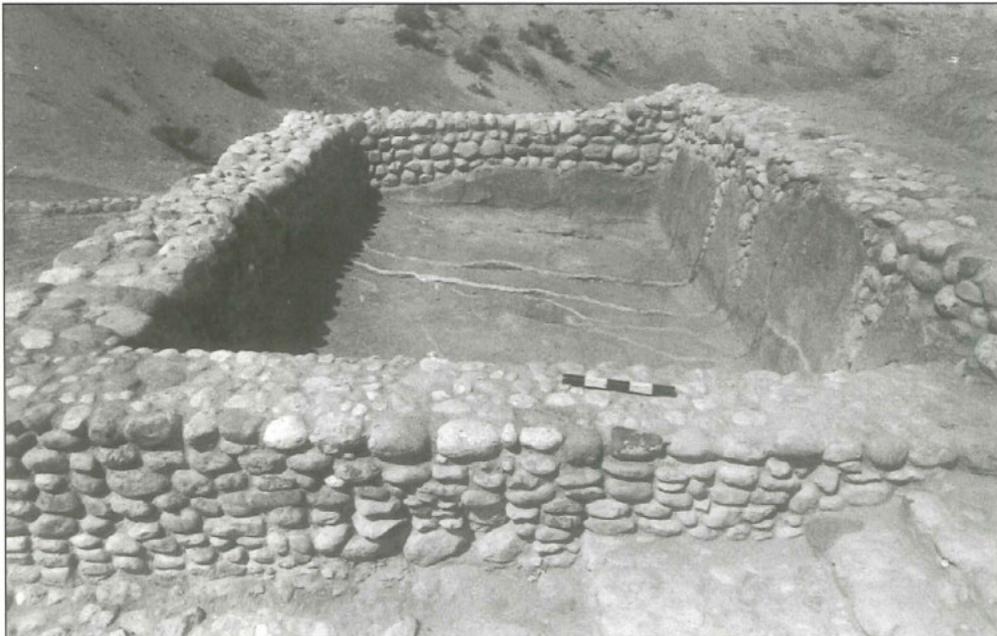
The southern pool was totally excavated and well documented. Damage caused by robbers at the eastern side of the pool revealed medium undressed stones mixed with

gray to dark lime adhering to it. The systematic excavations at this section revealed a staircase built of local fieldstones and lime; the remains consist of 9 steps that were used to enable the people to reach the pool, and the other two pools at the northern edge of the Tall (Fig. 8).

The discovered pool measures 4.1m N-S x 7.50m E-W, representing a rectangular structure with an inner staircase located on its eastern side. Only four steps that are still *in situ* extended the whole width of the pool. These were apparently used to enable people to go down into this pool and either be baptized or have a refreshing wash. The inner sides of the pool were coated with three layers of lime and plaster, possibly to prevent seepage. The floor of the pool consisted of fieldstones covered by a lime layer. The only way to fill this pool with water is by the aqueduct located to the south of the pool, and through the channel supported on stone pillars and which partly rested on the western side of the protection wall to reach the pool. Unfortunately, the channel near the pool was demolished in antiquity.

### **The Two Northern Pools**

Excavations at the northern parts of the



7. One of the pools found at the Tall.



8. Steps leading to the pool.

hill uncovered the presence of two pools linked together and built of local field stones with gray lime mortar in between.

The north-western pool measures 3.40m E-W x 4.30m N-S; some ashlar were later added near the southwestern corner of the pool, possibly as a staircase to go down into the pool (Fig. 9). The northeastern pool measures 4.85m NS x 2.50m E-W. This pool has severely suffered destruction caused by

extensive usage during the later periods. Part of the western wall and the floor were damaged and removed. More digging under the damaged floor uncovered a water cistern. It's top part is circular in shape, and built of well-cut sandstone ashlar, while there are no remains of lime or plaster covering the inner sides, which leads us to think that the well was built on the spot of the water table of the nearby spring. To date, the depth of



9. The north-western pool.

this cistern has reached 12m from the top. The recovered material from this well consists of fallen ashlar, sand, pottery sherds, and coins. The remains date back from the Early Roman to Late Byzantine periods (Fig. 10).

The question that arises is whether the well was built before the pools, during the Roman period or was dug later during the Byzantine period. It is difficult to answer this question at this moment, taking into consideration that during the later occupations, all the material or buildings from earlier periods were removed and some were possibly thrown into the cistern.

Remains of a channel and the base of a pillar built of local fieldstones were uncovered near the southern wall of the two pools, and were designed and built to feed the two pools with water. The Byzantine pottery sherds found in and near the pools suggested a date from the fifth and sixth century AD. The similarity in construction methods of the three pools on the tall in-

dicated that the building of the pools was related and was linked with the discovered churches on the Tall.

### The Northern Church (Fig.11)

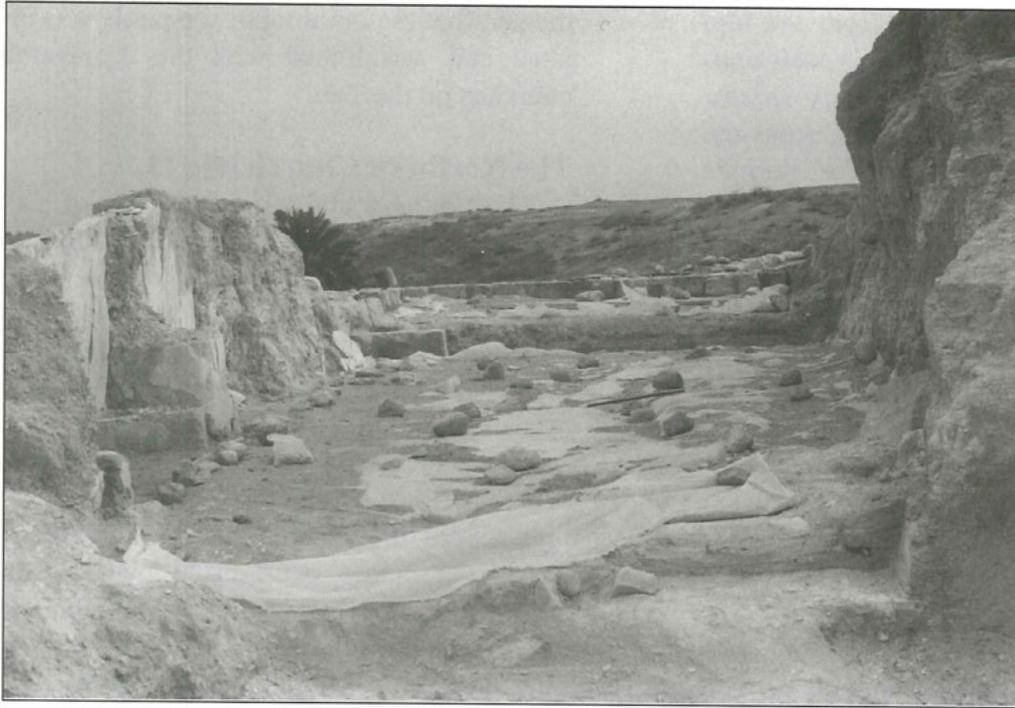
The northern and western slopes of Tall al-Kharrār were chosen by the builders to construct churches and other cultic structures. First they were obliged to cut the *lisān* marl rock of the hill, and after levelling the area, a church was built just north of the two pools. The church consists of two sections: the chancel screen which measures 4.20m N-S x 4.15m E-W and the nave which measures 8.85m E-W x 4.15m N-S. The chapel has two entrances, one located in the northern wall, measuring (70 cm wide) and the other located on the western side. What distinguishes this church is the Greek inscription found inside (Waheeb 1998:636).<sup>1</sup>

The floor of the church was covered with a coloured mosaic floor composed of a frame and crosses depicted with geometrical designs. Pillars along the northern wall of



10. The well found at the site.

1. See M. Waheeb, 1998, Wādi al-Kharrār (Al-Magħtas). *AJA* 102 /3: 601.



11. Remains of the Northern Church.

the church were designed to support the roof. No roof tiles were recovered from the excavations, and possibly the roof comprised wooden beams which were washed away. The internal walls of the church were covered with a smooth white plaster layer. Other buildings associated with the church near the northern wall were severely damaged by natural factors during later periods. The available recovered material suggests a late Byzantine date for this church.

### The Western Church

After cutting the western *lisān* marl slope of the hill, a retaining wall was built, and afterwards the church was constructed, consisting of two parts. The apse was cut in the natural rock and located under the north-western pool. The apse was well prepared and a lamp niche was dug in its southern side. The remains of the door of the chancel screen are still visible. The other part of the church consisted of four bases built of well dressed sandstone ashlar creating a nave and two aisles (Basilica type). The roof and the arch system were demolished, where only remains of arch springs were found.

The floor was covered with coloured mosaics, that were unfortunately totally destroyed. Only fragments with remains of gray lime mortar were found during the excavation. Some of these fragments show cross signs which decorated the floor. It is vital to understand the reasons behind this destruction, since the nearby mosaic floor of the northern church was still preserved. Pottery sherds indicate a Late Byzantine date.

The excavations uncovered a small building located north of the second church and west of the northern church. What remains from the site is the coloured mosaic floor, decorated with floral designs, but in a poor state of preservation due to natural factors and erosion. The walls of the church were built of fieldstones. Unfortunately only the foundations are still in situ. The function of this structure should probably be interpreted in association with the nearby churches.

The top of the Tall is the highest point on which remains of foundations of a medium sized rooms were recovered, built of local fieldstones. Heaps of smooth red soil indicate that the upper parts of the rooms were built of mud bricks. These rooms date back

to the 18th century, and were possibly built by Greek Orthodox monks who lived in this area since the 12th century. The top of the Tall was reused as a modern cemetery by the local people.

**Conclusion**

The archaeological evidence uncovered at Tall al-Kharrār is sufficient to allow a re-

construction of the appearance of the complex. The reconstruction emphasizes its character of as a monastery. The churches, water system, and pools represent a unique monastery situated in the wilderness.

M. Waheeb  
Department of Antiquities  
Amman - Jordan

