THE HASHEMITE KINGDOM OF JORDAN

ANNUAL OF THE DEPARTMENT OF ANTIQUITIES OF JORDAN

Volume 55

AMMAN
2011

Annual Subscription:
20 Jordanian Dinars (For Hashemite Kingdom of Jordan)
60 US Dollars (elsewhere, inclusive of registered mail)

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Address:
Annual of the Department of Antiquities of Jordan
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Amman 11118, Jordan
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Fax: +962-6-4615848

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UMM ṢAYḤŪN: GEOGRAPHY AND HISTORY OF A PERMANENT BEDOUIN SETTLEMENT ABOVE PETRA, JORDAN

Christopher C. Angel

Abstract

Numerous studies have addressed social development in nomadic populations after resettlement across the Middle East, but few have investigated the planning and layout of these towns. This study of a *bedouin* settlement represents a unique investigation into Levantine urban morphology, settlement planning and transitional nomadic practices. Petra, Jordan is renowned for its classical-period rock-hewn structures and built architecture, and was designated a World Heritage Site in 1985 with the recommendation that its *bedouin* residents be relocated. The Bdoul clan of *bedouin* were resettled from the valley to a terrace at the valley's northern rim. Measuring about two square kilometers, the village of Umm Ṣayḥūn was created to support around 100 families. Supported through UNESCO, the World Bank and the Jordanian government, in consultation with national agencies and Bdoul elders, the city was designed around a single two-lane road connecting Wādī Mūsā with Petra's northern road. The city now has around 3000 residents. Satellite imagery of Umm Sayhoun confirmed a peculiar series of oval 'blocks' flanking the main road that were observed through ground-level observations. This morphology can be attributed to *bedouin* tent arrangement and familial relationships while living in the caves of Petra. Interviews with residents present at the early planning sessions and *bedouin* elders revealed that the oval blocks permitted activities and interaction common to nomadic arrangement of tents, i.e. protection from the elements outside the ring, while inside the ring we found livestock corralling, car parking and inter-clan socializing, much like *bedouin* living in the nearby open deserts.

Introduction

Throughout history, nomadic clans have had to create and adjust to new varieties of settlement through a number of different processes. There have been few studies done about how nomadic clans design their own villages and towns, leaving their nomadic ways behind as they become sedentary, whether through 'natural processes' or enforced settlement. During the days of the earliest cities, city design was commonly left to administrators, royalty or priests. However, it was not until recently that urban design was entrusted to trained and educated specialists. Only on rare occasions are we able examine in detail the transition of nomadic culture into sedentary and structured culture. The Bdoul *bedouin* of southern Jordan are currently making that very transition. Within the past 25 years, owing to political circumstances, a local *bedouin* clan has been forced to abandon their nomadic lifestyle in favor of permanent settlement, resulting in the evolution of a small hamlet containing a few families into a thriving village / town of nearly 3,000 people, filled with shops, garages, playgrounds, a mosque and elementary school, close to the popular tourist destination of Petra. What is most interesting about this town is its form and development over time. What was a random scattering of cement block structures is developing into an organized, structured space of common areas, gridded streets and oval block arrangements characterized by their unique open public spaces – a form unknown in previously studied urban morphologies (**Fig. 1**). Through town resident interviews and highly detailed digital mapping and cartography, the placement, development and evolution of this town and its distinctive design has yielded important results that will contribute to future *bedouin*, anthropo-

1. Mosaic of Google Earth images showing the unique urban morphology of Umm Ṣayḥūn.

logical, geographical and urban morphological studies.

Since the 1920s, the Bdoul *bedouin* of Petra have understood the economic importance of tourism. Coupled with agriculture and goat herding, the Bdoul were able to utilize tourism as a means of maintaining a semi-nomadic existence within the valley of Petra. They have been living among the tombs and caves for over 170 years and, after the development of tourism, were able to adapt a more settled lifestyle. As travel agencies and large scale accommodation developed within the valley and around the area, the Bdoul were increasingly excluded from the larger decision-making processes taking place about the archaeological site.

Due to political circumstances, this local *bedouin* tribe has been forced to abandon their semi-nomadic lifestyle and was relocated on a plateau above Petra. Discussions of a possible new location for the Bdoul were taking place as early as 1968 (Lane and Bousquet 1994). However, owing to UNESCO recommendations for their relocation outside of the new World Heritage site, design and construction of the concrete block houses in Umm Ṣayḥūn began around 1980 and the Bdoul began relocating in 1984. In the village of Umm Ṣayḥūn, the transformation of the Bdoul tribe was swift, with the immediate creation of a school, piped water, electricity and simple health-care services as a part of the relocation plan. Life within a conventional urban infrastructure including, for example, utilities, permanent gardens and pens, sub-floor plumbing and glass windows, was a new indulgence as well as a new lifestyle for the Bdoul (Angel 2008).

After their relocation from Petra, the *bedouin* slowly reduced their cyclic movement from pasture to pasture, following water sources (e.g. cisterns, wadis) and seasonal resources (e.g. pasture, winter and summer wheat). Their life became focused on revenue and food production based on goat herding and vegetable (e.g. tomato, courgette, cucumber) and fruit (e.g. apricot, pomegranate, apple) cultivation. This sudden shift from a semi-nomadic to sedentary lifestyle was relatively unexpected for the tribe and, prior to removal, was seen as something "far away and insubstantial" (van Geldermalsen 2006: 114). Now the Bdoul are faced with challenges of unsustainable tourism, rapid village growth, changes in identities and regulations from local and national authorities. This article will discuss the events leading to relocation, examine the historical development and construction of their buildings and community complexes (e.g. mosque, school), and assess the current state of the Bdoul and their village.

Bedouin Life in Jordan

There has been strong encouragement by the Jordanian government to settle the *bedouin* in Petra and across the Kingdom. Over the past

four decades, throughout the Middle East and North Africa, conscious attempts have been made by governments to integrate nomadic and semi-nomadic *bedouin*, Berber and Tuareg populations into both emerging and historically sedentary communities across the region (Dinero 2010; Cole 2003; Falah 1983). In most cases, states played the decisive role in the location and organization of the settlements. These relocations have had both positive and negative effects on *bedouin*, but effects have also been felt among across the country within the non-*bedouin* communities of the region. Even though settling the *bedouin* is seen as both positive and desirable, many of the non-*bedouin* communities and societies view pastoralism and the *bedouin* lifestyle negatively – even though it is continually romanticized in Arab television soap operas, theme restaurants across Jordan and the region, and in Western and Arab novels and popular fiction.

Jordan has taken an approach different from its neighbors to settling the *bedouin*. In Jordan, settlement usually involves incorporating *bedouin* into an established community. This may or may not mean removal from their original land, but more often involves an incorporation of tribal lands. In the case of the ‘Abbadis tribe, who reside in the Jordan Valley, tents are still used for most special occasions and rites of passage, and are the preferred form of shelter in summer (Layne 1987). Most families have permanent dwellings amongst the houses distributed by the government, however they still move to al-Ardah to escape the summer heat. Their migratory pattern has not changed to any great extent, even though the importance of pastoralism is declining. Some *bedouin* already had houses of their own, prior to moving into the new government housing, which helped facilitate migration patterns. As the new government housing became available, the *bedouin* began to favor the newer buildings and started renting out their older structures (Layne 1987). This was one of the reasons for the decrease in mobility among the ‘Abbadis tribe. Currently, there is a shift in this particular *bedouin* population to move towards a capitalist economy.

One of the main reasons for consistent *bedouin* marginalization lies in their contribution to the national economy, vision and national essence. Administratively, if *bedouin* are settled they can be counted, and thereby be forced to contribute to other aspects of the nation and national identity, including the census, taxation and national plans for development. Unfortunately, the reasons are numerous as to why *bedouin* villages and settlements are not taking shape in a way that facilitates and maintains the traditional *bedouin* lifestyle. These influences include the difficulties attached to nomadic routines in urban settings, the imprint of ’nation’ rather than ‘clan’ that can unintentionally be associated with government planned and maintained settlements (Falah 1983), and the complex concept of a democratic system imposed on a clan-based hierarchy where elders are valued over the young. Many aspects of *bedouin* culture simply cannot be integrated into urban settings, whether of the past or present. The complications developing in Umm Ṣayḥūn may represent the same issues and problems facing *bedouin* as they integrate into larger sedentary communities across the Middle East and North Africa.

Bdoul Bedouin in Petra (Pre-1980s)

The Bdoul tribe is currently the main *bedouin* group living in and around Petra. Prior to 1984, research has shown that the Bdoul lived in the valley of Petra for at least the previous 150 years (Bienkowski 1985; Ohannessian-Charpin 1995). Throughout Bdoul history, from what little is known, subsistence was primarily based on the herding of goats, supplemented by seasonal cultivation of small plots of barley, tobacco and wheat, and the hunting and gathering of available plant and animal resources (Russell 1993). Other *bedouin* tribes exist both north and south of Petra, consisting of the Amarin and Liyatnah tribes. These tribes are similar to the Bdoul in that they too supported themselves by goat herding and subsistence agriculture.

Traditionally, the local *bedouin* lived either in nomadic tents or resided seasonally in caves throughout the region (Bienkowski 1985). However the Bdoul *bedouin*, through much of their known history, have been considered seminomadic since they would seek higher ground during the summer months to herd goats and cultivate the land while occasionally settling in parts of the valley. While settling in the caves and tombs, the Bdoul constructed makeshift

walls, doors, and windows while still setting up tents outside in the open areas. Much of the terrain of Petra is not conducive to farming and agriculture, so movement was still a necessary aspect of daily life (Bienkowski 1985). Their 'traditional' dwellings in the caves and tombs of Petra allowed for a mobility not seen in other *bedouin* tribes of the region, Levant or North Africa. Cultivation and herding of goats and camels still contributed to most of their subsistence living. Living within the confines of the valley of Petra gave them a touristic head start over other *bedouin* tribes in the area.

In the 1920s, Thomas Cook and Sons established a tourist camp in the main valley of Petra. Members of the Bdoul and other tribes were employed as help and guides. By 1937, the camp was converted into a hostel housing tourists and research teams (Russell 1993), known locally and advertised as Nazzal's Camp. While most Bdoul families at the time remained pastoralists and goat herders, more and more members participated in and were hired for touristic activities, as well as archaeological excavations. As tourism became an increasingly large component of Bdoul lifestyle, shops were set up by members of the tribe in the main valley, at the end of the as-Sīq near al-Khazneh, and at other tourist concentrations (Shoup 1985). *Bedouin* began to sell artifacts – both real and fake – and rides on camels, donkeys or horses. They also filled other roles in the valley and surrounding area. Some served as tourist guides and tourism police, or became owners of refreshment stalls, or even re-enacted *bedouin* tribal dances and rituals for tourists.

While the Bdoul were living in the caves in Petra, numerous studies were carried out which assessed their use of space in the caves, as well as spatial organization of the area as a whole (Bienkowski and Chlebik 1991). Many of the caves were spacious and allowed room for growth among families. During the winter months the focus of family life would be inside the cave. In summer, the Bdoul set up tents outside the caves and at nearby al-Bayḍa, with the focus of family activity being at the cave (Bienkowski 1985). At that time there seemed to be no specific organization or traditional social distribution of caves (Bienkowski 1985). While living in the caves, the Bdoul preferred a certain amount of isolation and would choose caves in more remote parts of Petra. As their ways of living developed at Petra, three aspects of use of space could be distinguished: one was residential, another was for work and the third was seasonal, usually in the form of a temporary tent. As can be seen in the image below, the Bdoul always allowed room for some sort of outdoor living area or courtyard that facilitated aspects of *bedouin* culture, such as weddings, guest entertainment or other gatherings. The natural placement of the caves allowed for these public areas and facilitated these aspects of Bdoul culture.

The caves also illustrate why the Bdoul were considered to be semi-nomadic (Ohannessian-Charpin 1995). The caves allowed for settlement and shelter during the winter months, and the tents allowed them to retain their nomadic tendencies and move to higher ground for grazing and cultivation. Considering that the nature of nomadism implies mobility, the Bdoul still actualize this movement in their lifestyle, but a semi-permanent residence also existed in Petra. Shifts towards settlement were already occurring prior to their removal from Petra. Even though seasonal movement was apparent, sedentary aspects could be seen. The Bdoul added structures to the caves, usually in the form of walls or windows to help facilitate the privacy that is common in Muslim cultures. Also, the Bdoul would add walls and fences to tents, for containing goats or in further attempts at privacy (Bienkowski 1985). These methods of 'tent building' can still be seen throughout the area today.

After Petra attracted international attention as a result of tourism, the valley was nominated for and became a UNESCO (United Nations Educational Scientific and Cultural Organization) World Heritage site in 1985. As early as 1968, the Jordanian Government – with help from USAID – developed a plan to 'resettle' the Bdoul into permanent units outside Petra. This was part of the Jordanian government's re-organization of Petra along more commercial lines in an attempt to improve facilities for tourists (Bienkowski 1985). Therefore in 1985, the new village of Umm Ṣayḥūn was constructed. The Bdoul were forced to move into the new units over the next few years. By removing the Bdoul from Petra, Russell (1993) pointed out that

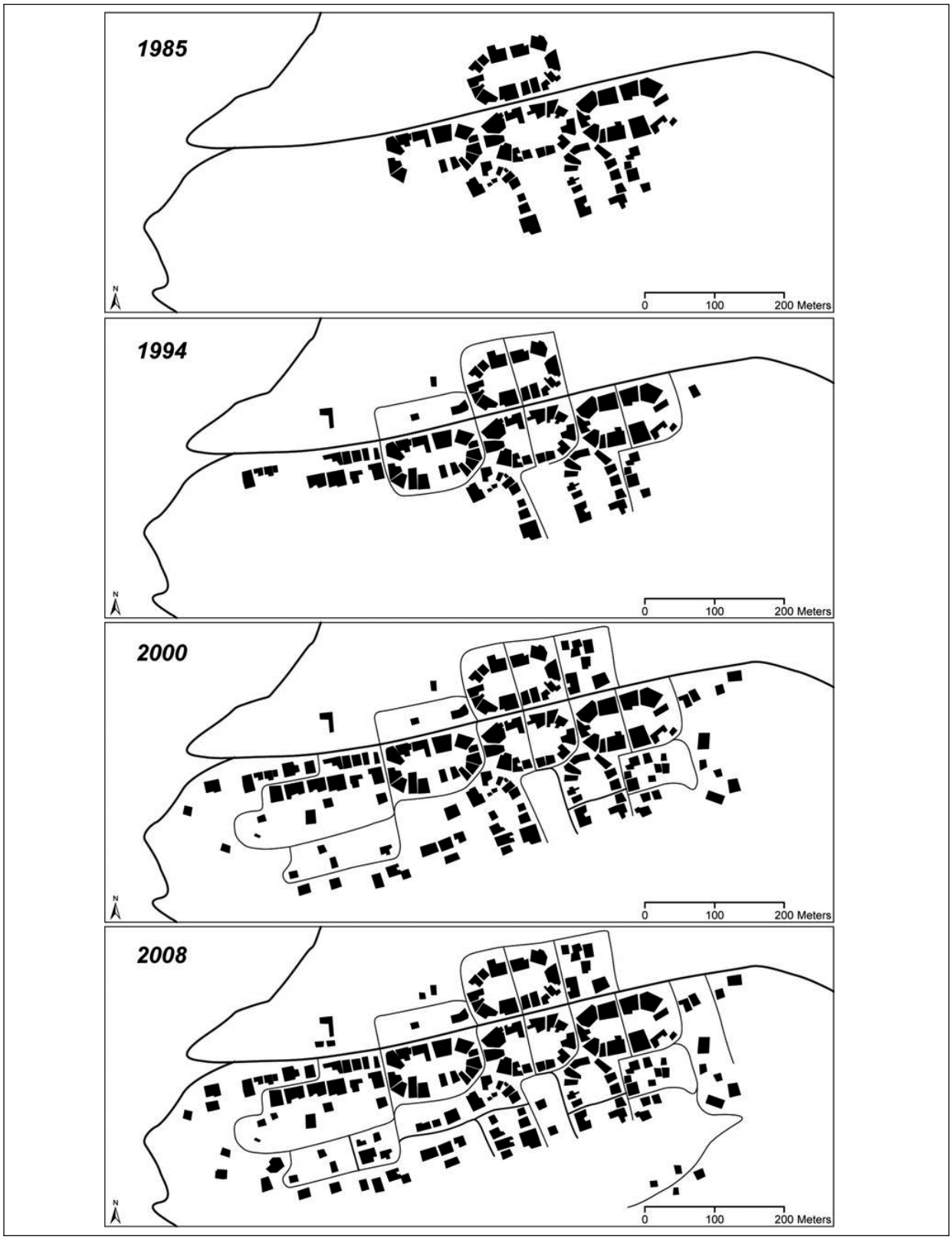
"many of those old enough to still remember the distant past through their childhoods or the stories told by their fathers and grandfathers will soon pass away" and how the removal "brought a final end to traditional Bdoul lifeways for most families". Ken Russell's observations in the 1990s are still evident today; Bdoul elders can still be seen goat-herding in the village, using herbal medicines, practicing traditional cooking (e.g. *Mansaf*) or playing age-old games like *Dhab*.

Previous studies have been conducted on the Bdoul, on subjects including ethnohistory, tourism, nomadism and spatial organization of settlements (Bienkowski and Chlebik 1991; Russell 1993; Tarawneh 2000). To date, however, no studies have been conducted on the spatial organization of Umm Ṣayḥūn as a single spatial unit. Previous studies on Umm Ṣayḥūn have investigated living conditions and spatial layouts of the original structures from the mid-1980s. Studies have also been concerned with societal perspectives of the Bdoul and the Bdoul perception of themselves. Tourism has had the largest effect on the Bdoul, being the single most important reason for their shift to sedentary life and their survival therein. Since their removal from Petra, the Bdoul have gained a new perspective on the world and themselves. Their placement in Umm Ṣayḥūn has led to a national recognition of this specific *bedouin* group. Contrary to other sedentarization projects throughout Jordan, these *bedouin* have been given a specific village in which only Bdoul reside. In other areas of Jordan, as mentioned above, settlement has taken place more as integration within a previously established location, usually in another nearby village or city. Since their placement within the new village of Umm Ṣayḥūn, the Bdoul have exploited their centralized existence, especially with regard to tourism. This new Bdoul *bedouin* identity is consistently reaffirmed in the area of tourism (Cole 2003).

The Bdoul and their New Village (1980s-1990s)

The new settlement of Umm Ṣayḥūn is located west of Wādī Mūsā and north-west of Petra. The village itself is still within the official boundaries of the National Park, is situated on a narrow limestone plateau directly above the Nabataean quarries at 'Anjar, and is visible from the main valley below. In 2000 the population was estimated at about 1,300, and is currently between 2,000 and 3,000 individuals. In its original form, in 1984, the village consisted of 120 houses (Bienkowski 1985) but the village itself has increased dramatically in its physical extent since its creation nearly thirty years ago. The original city plan and layout has been modified and expanded in all directions (**Fig. 2**). With the increase in tourism since the World Heritage declaration, the growth of Umm Ṣayḥūn has been rapid, especially in recent years. The rise in tourism has contributed to sharp rises in income for the Bdoul and Umm Ṣayḥūn as well. What began as simply a village of unpaved roads, simple one-storey concrete brick structures (**Fig. 3**) and few vehicles, is now filled with paved roads, streets and parking areas lined with cars, trucks, and occasional tour buses, ice cream and food stores, services, handicraft shops, car shops, a pool hall and even a travel agency. These streets provide quick and easy access to the Petra National Park, al-Bayḍa and Wādī Mūsā, although public access into Petra from the village is restricted. Also, we have seen increases in structure size, changes in structural function, planned and unplanned growth of the village as a whole, discrepancies in living standards, abandonment of traditional resources and the rise of a new generation raised solely under the influence of tourism. In comparison to surrounding communities, the Bdoul *bedouin* of Umm Ṣayḥūn can be considered most affected by the sharp increase in tourism and may prove Ken Russell's observation of a "final end to traditional… lifeways" to be both correct and observable.

Since their relocation, the Bdoul have developed a new perspective on the region, the world and themselves. Their removal to Umm Ṣayḥūn has sparked a national recognition of this specific *bedouin* group. Lane and Bousquet (1994) conducted an investigation into the management of the National Park as a whole and reported on the influence of tourism on surrounding communities, including the village. Their findings suggest that the Bdoul were primarily concerned with "the need for social and national recognition" (Lane and Bousquet 1994: 78) and that Umm Ṣayḥūn was fulfilling that exact role. The new 'identity' of the Bdoul *bedouin* is con-



2. Composite map representing the evolution of Umm Ṣayḥūn's urban morphology from its establishment (1980s) to the present (2008), highlighting pivotal periods in the town's growth. The most dramatic expansion occurred between 1998 and 2002 (Angel 2008).

3. An original single storey, simple cement block house built in the 1980s (photograph by Paradise 2007).

sistently reaffirmed and / or 'fossilized' in the area of tourism. One author describes this shift in self-perception, noting that:

"*…a sense of bedouin identity still remains, an identity that is constantly shifting and being re-defined…'bedouin' is still the social category with which the Bdoul are associated and in the presence of tourists, it is this identity which most often comes to the forefront…They still see themselves of 'more bedouin' that the others involved in Petra's tourist industry… [and this] industry helps to maintain and reinforce this identity for them*" (Wooten 1996).

In the past, income and resources mainly focused on farming, goat herding and subsistence, with some attention being paid to tourism. Currently, much of the solidification of the new Bdoul lifestyle has contributed to tourism being the main cultural focus of tribal members. With this change, the Bdoul are now able to 'sell' their identity to tourists. This can be seen as the *bedouin* invent new 'traditional' art, including sand-bottles filled with colored sand and different types of jewelry, as well as artifacts both real and fake (Cole 2003). It is also important to note that the Bdoul hide their new ways of life from tourists, especially their "televisions and other modern conveniences, [they] are literate and increasingly have university-level education, and are becoming like *Europe people*" (Cole 2003). Other economic ramifications of this shift are still to be seen. In the end it can be easily determined that relocation has changed the way the Bdoul view themselves in relation to the changing world around them, and that a new sense of what it means to be a Bdoul *bedouin* has developed in the village. Tourism played a major factor in the removal of the Bdoul from Petra and plays a factor still as their main connection to their traditional cultural heritage while living in Umm Ṣayḥūn. Beginning in the 1920s, the *bedouin* have had to learn how to adapt to this new source of income and industry, and have since been capitalizing on it - the *bedouin* used to encounter tourism, now it encounters them.

Methodologies

This research provides an understanding of the origin and growth of the village. The preliminary methods were meant to determine whether there were any visually discernable reasons for the layout or growth of the village. These methods were based on qualitative analysis of remote-sensing data using Geographical Information Systems (GIS) and Google Earth. Once the preliminary qualitative analyses were completed, *in situ* data collection was carried out in Umm Ṣayḥūn. This section of the research consisted of gathering data for further qualitative analysis. The team conducted this research through photographic documentation, interviews and town meetings. Also, the completion date of each structure was ascertained, allowing for time lapse analysis of the growth pattern of Umm Ṣayḥūn. Through preliminary observations and *in situ* research, these methods provided a framework from which to draw conclusions about the origin and growth of Umm Ṣayḥūn as well as implications for urban morphological research about nomadic resettlement.

The preliminary data were gathered using geo-referenced Google Earth satellite imagery, which allowed accurate measurements and analysis to be conducted. The statistical analyses of this research were conducted in ArcGIS. The structures in the imagery were vectorized using a variety of methods (Donnay, Barnsley and Longley 2001). Vectorized structures were exported from Google Earth thus:

1. Vector outlines were created in Google Earth;
2. The vector outlines were exported using the Kml2Shp program. This was developed by Zonum Solutions as a means to accurately export data from Google Earth into GIS formats, in this case as a shapefile (www.zonums.com 2007);
3. The new shapefile was imported into a new map document in ArcMap.

A variety of geostatistical analyses were car-

ried out on the vectorized structures, which allowed the quantitative form of layouts and arrangements to be assessed (Jiang and Claramunt 2002). The following analyses were conducted:

1. The city center was located as a control using a tool located in the ArcToolbox in ArcGIS. The city center helped to provide information as to whether the layout and arrangement of the structures were centered on a specific location;
2. The central feature was located as a control using another tool in the ArcToolbox. This provided information about whether a specific structure (e.g. religious, political) was the reason for the layout and arrangement of Umm Ṣayḥūn;
3. The area in square meters of each structure was calculated;
4. Frequency analysis was also conducted about the overall arrangement. This provided information about average, maximum and minimum structure sizes, and generated a chart detailing information about the frequency of each structure.

Once the statistical analyses had been completed, we made on-the-ground observations. Time-lapse data would be necessary to obtain an accurate cartographical view of what happened in Umm Ṣayḥūn. A map was prepared using Google Earth imagery, ArcGIS and Adobe Photoshop. Because this was meant as a tool to be used in town meetings, it did not need to be geo-referenced. Also, prior to leaving for Umm Ṣayḥūn, the team decided on a variety of predesignated locations for town meetings and interviews. These meetings were allotted in a manner to diversify the possible answers that were received (**Fig. 4**).

On arrival in the village, we began the photographic documentation of Umm Ṣayḥūn. The team's primary focus was on the oval block arrangements of the structures. Each of the block arrangements were labeled accordingly, as block A, block B, etc. Photographic documentation was also conducted in the western and eastern districts. These images helped to define the visible growth process that was occurring in the village at the time of the interviews. It also provided a visual reference to the block arrangements and determined how each arrangement was being used. These photographs will aid future research on Umm Ṣayḥūn, by enabling the growth patterns of each structure to be assessed. This photographic documentation was collected from various directions and viewpoints, including cardinal directions, ground level observations and numerous roof-top vantage points.

Seven town meetings were held in the village. A pre-defined set of guided questions were presented to each group, after which open discussion was encouraged. It was expected that

4. Spatial distribution of town meeting locations.

each group would focus on different aspects of the village, including its growth, history or current state. The completion dates of the buildings were the primary focus in each town meeting, and each patron at the meetings provided answers and corroborated other responses. This ensured little error in the final result, especially when entered into the previously created databases. There were three general questions that were used to guide discussions with the Bdoul:

1. In what year was each building completed?
2. Currently, how are the oval block arrangements utilized?
3. What was the original purpose of these arrangements – if known?
4. What other information do you think would be pertinent to know about the village?

After gathering all the photographs, dates and responses from the resident *bedouin*, local Jordanians and new residents, the attributes and data were used to update the previously created shapefile. This will allow the original layout to be accurately interpolated in collaboration with any acquired primary source data (Jiang and Claramunt 2002). Once the data was added to the vector shapefile, an accurate time-lapse cartographic representation was created.

The Village of Umm Ṣayḥūn

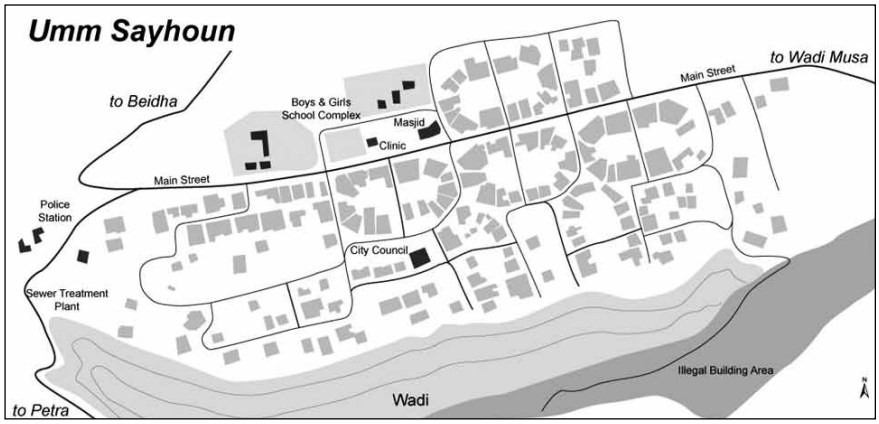
The village of Umm Ṣayḥūn was originally equipped with running water, electricity and sewerage. These have subsequently been greatly expanded and improved. According to the Jordanian Water Authority (2005), Wādī Mūsā and Umm Ṣayḥūn maintain the most reliable running water infrastructure in the area. A majority of the roads and pathways in Umm Ṣayḥūn are now paved; the main road running through Umm Ṣayḥūn can be described as the main arterial flow of traffic and income (**Fig. 5**). At the far downhill end of the main road, the Bdoul are afforded quick and easy access into the main valley of Petra where they receive most, if not all, of their income. Income is then transferred to shops or restaurants within Umm Ṣayḥūn, or the main road is used again for travel to Wādī Mūsā contributing to the local economies there (Angel 2008).

The growth of Umm Ṣayḥūn can be easily evaluated by investigating the pivotal points in its history. In 1985, around 120 houses were

5. A view looking up the main street of Umm Ṣayḥūn. Only paved in the mid-1990s, the road now represents the main artery for commerce, transportation and utilities (e.g. water, electricity) in Umm Ṣayḥūn and Bayḍa (photograph by Paradise).

completed to accommodate about 100 families (Bienkoswki 1995). Using national and regional planning assistance in tandem with input by Bdoul elders, the original plan (**Fig. 8**) created a series of oval housing blocks which encircled open areas for parking, playing, gardens, storage and easy access to other houses within each section. These oval city blocks appear to be unique within the Levant, as well as practical (Angel 2008). Each structure had a single residential purpose: to house one or two Bdoul families (**Fig. 2: 1985**). At this time, the roads were unpaved and travel to Petra, Wādī Mūsā and Bayda was arduous and difficult by vehicle. The majority of movement in and out of the village was to and from the valley of Petra. The village itself was laid out in a series of oval blocks to compensate the Bdoul for their loss of open areas as well as to enhance the privacy of major Bdoul families. By 1994, just prior to the first re-investigation of the Petra management plan, the structures and the village had grown at an alarming rate (**Fig. 2: 1994**). New structures were built, including a school, mosque and clinic. Also, the main road was paved contributing to growth in south-eastern parts of Umm Ṣayḥūn. These new structures remained in close proximity to the main road (**Fig. 6**).

In 1998, the Bdoul requested assistance from a number of governmental and non-governmental organizations to assist in the creation of a city council. This led the Housing and Urban Development Corporation (HUDC) to sign an agreement with the United Nations Center of Human Settlement (UNCHS) to take responsibility for city consultations in Umm Ṣayḥūn. The objectives of this agreement were as follows (Tarawneh 2000):



6. Map showing the physical terrain, morphology and urban features of the village / town of Umm Ṣayḥūn in 2008 (Angel 2008).

1. To provide access to appropriate residential land for the residents of the village;
2. To develop existing urban patterns to cope with economic and tourist development in the region;
3. To promote policy changes at national and local level regarding land management;
4. To enhance participation of the local population in land-use decision making and development of the settlement.

This agreement also led to other community developments, including a *sabeel* (water fountain adjacent to the mosque, serving a social and religious function), recreational park and the development of a community hall (Tarawneh 2000).

By 2000, the largest new structures were being built in more remote areas to the south-east, which afforded better views overlooking Petra (**Fig. 2: 2000**). The village continued to expand at a rapid pace in order to accommodate the growing population, which had increased to over 1,300. By this time the village had received improvements to infrastructure with the addition of a sewage treatment plant to the south-west (**Fig. 6**). Finally, a police station was placed at the 'entrance' to Petra at the end of the main road. This was meant to limit the movement of tourists through Umm Ṣayḥūn. By 2008, the majority of the open areas around the outer edges of the plateau had been filled in with structures of all kinds. Some of the original structures were converted into shops, markets, travel agencies and other service-based store fronts, or into open garages. Many of the smaller structures that existed within Umm Ṣayḥūn were developed to provide corralling of livestock and locations for storage of vehicles or various supplies (Angel 2008).

The original village was relatively limited in space, yet growth was inevitable (**Fig. 2: 2008**). Currently, a new built-up zone is developing around the town's southern fringe. Most of this growth is shifting towards the cliffs facing Petra (south-west of Umm Ṣayḥūn) – this may be Umm Ṣayḥūn's first 'suburb' or newest neighborhood (**Fig. 6**). Most of the houses in this zone are larger in area, have more stories and are of an overall higher quality; these new residences tend to be owned by wealthier Bdoul. On this side of the village (to the south-west), there is a sharp drop down a 50 to 100 meter escarpment which affords these parts of town a spectacular view of Petra. This is important because new luxury houses are being built there to exploit the view, in the hope that one day tourist accommodation may be developed in Umm Ṣayḥūn.

In 1984 the average size of a single unit was 150 square meters, which has subsequently expanded to an average of 255 m^2, with the largest structure at 725 m^2 (Angel 2008). The residential buildings were seen as too small for practical use, especially in comparison to the spaciousness of the caves in Petra (**Fig. 3**). As a result, buildings that were originally constructed on one level are now being remodeled or renovated to include two or three stories. These housing modifications are possibly the result of perceptions that the Bdoul developed while living in Petra (Lane and Bousquet 1994). Here, the Bdoul were accustomed to differentiate between caves in terms of use, in that there were work caves, residential caves, open public areas for recreational and social gatherings, gardens and areas set aside for tents during summer months (Bienkowski 1985). Therefore, it should

be expected that the Bdoul would rebuild, renovate or retrofit the newly acquired structures and open areas in ways that would reflect this differentiation. Some of the modifications and extensions have been horizontal, tearing down government-built walls and extending their territory to build more rooms, and some have been vertical, constructing new floors and creating multi-dimensional living spaces (**Fig. 7**). As was the case in Petra prior to relocation, buildings are now being used for non-residential purposes (Angel 2008). These modifications have contributed to modern urban development in the area, with the new creation of work places, public facilities and paved streets. It was reported in 1994 that these changes had been at "the Bedouins own expense" (Lane and Bousquet 1994: 76). Therefore, they can be seen as a reflection of increased prosperity resulting from increased tourism.

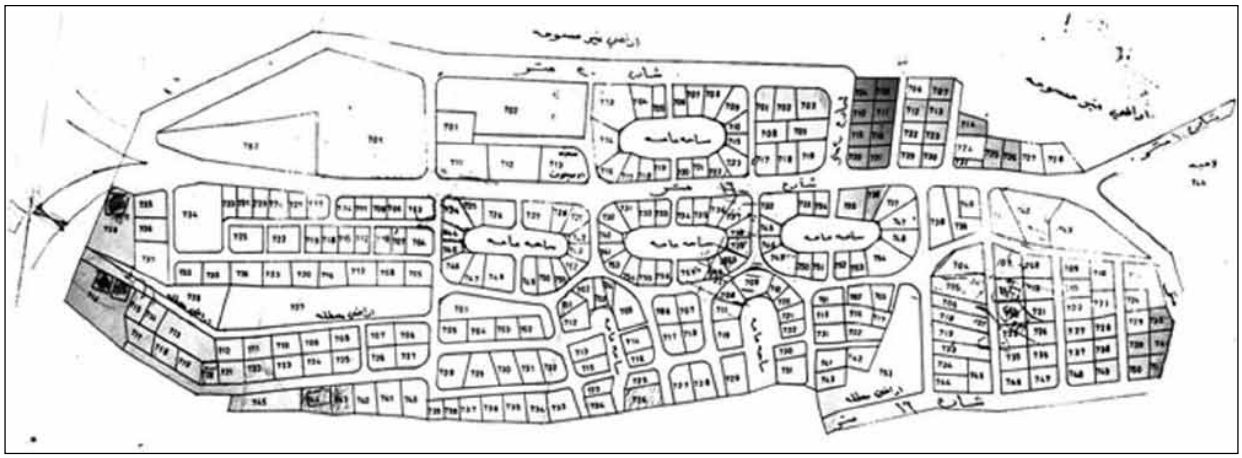
West of the main road, a mosque and school provide the *bedouin* with access to education, religious classes, and daily and Friday worship without having to travel outside the village (**Fig. 6**). This new centralization of education and religion has also changed the mobility of the Bdoul and their identification with Islam.

New structures have also been built entirely to their inhabitants' own specifications, designs and needs. These structures are usually built by wealthier individuals and are complete with balconies, multiple gardens, gated walls for privacy and obvious attempts to acquire the best views of the valley. Other new structures are now appearing in an 'illegal' area to the east of Umm Ṣayḥūn, separated by a large ravine and wadi. Currently no infrastructure has been set up to support this peripheral growth. Some Bdoul are petitioning local authorities to prohibit growth here or to permit it. It will be interesting to see how this new area develops and whether or not the government will continue to allow this expansion. What is important to note about this area is that it is a clear indication of the need for more expansion to accommodate the growing village.

7. Three- and four-storey structures such as this one represent the emerging architectural style in a new neighborhood of Umm Ṣayḥūn. Most of these large homes are located south and south-west of the main arterial road (photograph by Paradise 2007).

Since economic transitions were inevitable after the relocation to Umm Ṣayḥūn, work places have been separated from living spaces; these included tent shops in Petra or local shops within Umm Ṣayḥūn. In attempt to capitalize on the appeal of *bedouin* culture to tourists, the Bdoul have set up tents and shops within Umm Ṣayḥūn to cater for that demand. There are also small shops along the main streets in Umm Ṣayḥūn, some specializing in tourist items and services while others provide for local needs such as groceries and personal items.

By 2007 and 2008, a number of new trends were obvious. The newest structures included a pool hall, rentable lodging (however questionable in legality), new shops, cafes and small restaurants (for years there was only one), and three travel agencies. Also, the Bdoul are now utilizing technologies that were unavailable in the past, such as computers, high-speed wireless internet for e-mail, Twitter and Facebook, automatic garage doors and luxury vehicles. The new roads that run through major parts of the village contribute to the growing number of cars in the area, especially in the nodes and areas of primary use. *Bedouin* are often seen driving their trucks or cars into the back entrance to Petra on their way to work. Work in Petra includes retail shops (e.g. souvenirs, books, snacks, jewelry), services (e.g. town guides, tours and medical assistance), food and recreation (e.g. hiking guides, camel treks), and out-of-town '*bedouin* experiences' in large tented complexes for dining, dancing and overnight stays. Many shops in the village are for local use, but many have also been set up to provide assistance, products and services to the tourists who now visit the village. This is also why there are now a few lodgings in the village, which increasingly serve tourists, archaeologists and visiting scholars, especially once regional lodging policies and licensing are standardized (Angel 2008).



8. Original map (1980s) of the village of Umm Ṣayḥūn before relocation from Petra to the village (Angel 2008).

At the end of the main road, above the police-manned, gated road into Petra, is the main road to Bayḍa, a small Neolithic site and home of the burgeoning tourist destination of so-called Little Petra. Many *bedouin* maintain relationships with other Bdoul as well as with the other tribes who live there. Because of this easy access to Bayḍa, many who own shops or work in Petra may now live some distance from their main sources of income. However, because travel to and from Bayḍa is dependent on access to a vehicle, it is usually the wealthier *bedouin* who travel to and from Petra on a daily basis from Bayda (or hitch a ride). As Bayḍa develops into a satellite community for Umm Ṣayḥūn, businesses have grown in Bayḍa where tourists can experience 'local *bedouin* culture' by dining and dancing in the open air, or by staying in goat hair tents serving grilled chicken, hummus and bread while the Bdoul entertain them with traditional songs and string instruments (*rababa*). This exposure to *bedouin* culture has propagated the creation of similar venues and businesses across southern Jordan, and many of the Bdoul can be found involved in these new tourist ventures.

Similarly, tours have been established from the nearby town of Wādī Mūsā into Umm Ṣayḥūn to provide tourists with an 'authentic' *bedouin* experience. The majority of recent internal changes have been for touristic development. Travel agencies, information centers, tours and accommodation (e.g. bed and breakfast, small hotels) are becoming the norm in the village. Umm Ṣayḥūn is quickly becoming a powerful example of the effects of tourism on villages near high profile attractions like Petra.

As the population of Umm Ṣayḥūn is continually expanding, the *bedouin* are in constant need of more land for cultivation. Unfortunately, increasing the amount of land under cultivation is impossible because the lands surrounding the area belong to other tribes or the terrain is non-cultivable. The majority of the Bdoul sustain their lifestyles on the basis of access to tourism within Petra. Some areas have been set aside within the valley to allow for shops to be built and maintained. These areas are now 'owned' by Bdoul from Umm Ṣayḥūn, sometimes in partnership with non-*bedouin* Jordanians. This is important since ownership also implies exclusion. There are many *bedouin* who have little to no access to tourism within the valley. Therefore, their lifestyles, if possible, are still somewhat maintained through subsistence farming and herding, whilst at the same time being forced to live in Umm Ṣayḥūn. Unfortunately, the lack of arable land and restrictions placed on pastoralism outside the boundaries of Umm Ṣayḥūn create a wide disparity in living standards within the village. Many *bedouin* are finding it difficult to remain within Umm Ṣayḥūn and have found residency and mobility at Bayḍa, while some Bdoul continue to build onto their already large homes creating multi-storey 1,000-2,000 m^2 palaces overlooking Petra. These disparities in income, possessions, connections (*wasta*), tradition and a sense of belonging are broadening, and will only get larger and more challenging for the Bdoul, the wider community and the region in general.

Explaining the Urban Patterns

The results of this research suggest that the original public spaces and residential oval blocks of the original plan were completed at the same time. After initial construction phases were complete, families began moving into selected locations based on clan relationships. Therefore, it appears that the layout was developed to cater for the tribal and familial needs of the Bdoul *bedouin*. The oval layout is a spatial representation of the tribal relationships surviving from when the Bdoul were living in Petra. Still, these reasons did not explain the purpose for the oval shape, but instead demonstrated the apparent segregated sections that make up the oval patterns. Questions, however, still remained: what were the uses of those particular spaces, and were the main entrances of the residential buildings facing the open areas rather than the streets (inward *versus* outward)? For answers to these questions, one must look at the responses from the *bedouin*.

So, why the oval house arrangement? In an attempt to find answers, specific questions were asked about the previous and current uses of the open areas in each layout. Also, current uses of the open areas were assessed by visits, observations, discussions and photographic documentation. It was found that the open central areas were being used for car parking, storage, gardens, public areas, camel and donkey stabling, and other miscellaneous activities including playground use, soccer and ball games. After each town meeting, the research team realized that these areas also had other specific attributes. In particular, they were designed to be set aside for large communal public gatherings and events, such as weddings, parties, play areas and rites of passage. It also became apparent that this was a secured setting. Most of the houses faced inwardly towards the open area rather than outwards to the streets. Early Muslim towns were built with houses placed closely together to maintain privacy and adherence to spiritual laws (Golany 1995). The balconies of the village also face inward, on to the open centers. The central areas are meant to be public spaces upon which all attention is focused, reinforcing *bedouin* concepts of friendship and family, while at the same time maintaining safety and privacy.

It is important to note that the early planners involved the Bdoul in the early stages of village design. Also, if one were to plan this village based solely on the layouts of the caves and dwellings that were modified by the *bedouin*, one would easily conclude that space and family are of prime importance (Russell 1993). Regardless of who planned the layout, it was definitely intended to maintain Bdoul culture, clan networks and relationships.

Since the original layout was developed, the village has grown into a mixture of planned, grid-iron and organic morphologies. The 'planned', however loosely, portions are the original oval blocks. The grid-iron layout began taking shape in the early 1990s, and started as a function of the ridge and wadi topography. The original UNESCO memoranda about the status of Umm Ṣayḥūn state that much-needed additional land was not given to the *bedouin* until the early 1990s. Therefore, until that time more building was not legally possible. However, building was already taking place outside the 'planned' areas, so eventually the governing authorities decided that the village boundaries needed to be extended. This confirmed that the houses of this second phase were not planned, much as described by the Bdoul at town meetings.

It is interesting to note that a grid layout was still developing in 2008. This is most likely the case because the main road was already in existence, albeit unpaved, and the Bdoul began building along that road. Also, the main road followed the primary ridge that descended the plateau, with a few unpaved side roads arranged orthographically that may also have contributed to the grid-iron appearance. Regardless of the reason for the grid-iron layout, the oval central public areas were not continued across the newly acquired land. There is a new urban area that is developing at the village edge. This could be considered the suburban area of the village. Most of this area, as can be seen in the movement patterns recorded in this research, is shifting towards vantage points of Petra (south-west of Umm Ṣayḥūn). As mentioned above, new houses are being built in this area to take advantage of the views. Also, as can be seen in the photographic documentation, most of the houses being built in this new area to the south-west are of higher construction standards. This new tendency is organic and spontaneous, but with a

specific purpose.

Finally, an area of illegal growth is now appearing east of the village. It will be interesting to see how this new area develops and whether or not the government will continue to allow it. The *bedouin* themselves prefer to allow the areas to develop. This is important because it illustrates the Bdoul's perspective on the growth of the village. Either way, it is apparent that something needs to be done to accommodate the rest of the incoming *bedouin*.

Implications and Suggestions

This research explored the historical and geographical development of Umm Ṣayḥūn through examination and mapping of its unusual settlement and growth patterns. Also, this research sought to understand the peculiar patterns and layouts that can be seen in aerial photography. This was accomplished through mass interviews and town meetings with the *bedouin* involving questions on the construction dates and purposes of each structure, the reason for their location and, particularly, the oval block arrangements. After various data sets had been gathered, GIS was used to conduct spatial analysis of town growth over the past twenty years. A series of maps showing the development of Umm Ṣayḥūn were created. These shed light on the thinking behind the unique urban patterns found in Umm Ṣayḥūn.

This shift from nomadism to sedentism at Umm Ṣayḥūn has allowed a unique urban morphological process to occur. This process is unique in that previous literature on urban morphology has failed to explain what has happened in Umm Ṣayḥūn. This research has filled a gap by providing detailed observations on the layout, pattern and growth of a permanent *bedouin* settlement. This research has also used innovative technologies to pose questions and solve problems concerning more remote regions of the world, especially in the Middle East.

Through new technologies, data is more readily available than ever. This is why urban geography, morphology and analysis can benefit from software programs such as Google Earth and ArcGIS. These technologies were able to provide the team with informed expectations of possible results from Umm Ṣayḥūn. Also, these technologies helped provide a cartographic framework within which to examine the layout, pattern and arrangement of Umm Ṣayḥūn, especially with regard to the oval block arrangements. Although these technologies and geo-statistical tools could not answer all of the questions relevant to this research, they were helpful in understanding the overall character of Umm Ṣayḥūn.

Seeing that technology alone could not explain the reasoning behind the layout, the team conducted *in situ* research. This portion of the research was the most important because it shed light on cultural influences. This on-the-ground research involved photographic documentation, interviews and town meetings. Through photographic documentation, we were able to generate a baseline for future research on this village. Also, this documentation assisted in demonstrating the layout and uses of the block arrangements. The interviews and town meetings explained the reasoning behind the layout as well as the history of the village, including time-lapse data, clan structure and history, and historical documents.

This research discovered various uses of the current layout (see above), as well as the reasoning for the layout in the first place, for example:

- The Bdoul value the arrangements for privacy and family use;
- The Bdoul have no intentions to build within the block arrangements;
- The arrangements were specifically designed to cater for cultural aspects of Bdoul clan structure not seen elsewhere;
- Each block arrangement was originally occupied by a different family unit, which accorded with the clan structure from their earlier days living in Petra.

The new village / town of Umm Ṣayḥūn has provided numerous benefits to the Bdoul. Immediate access to healthcare and education has greatly influenced population growth within Umm Ṣayḥūn and participation in education throughout Jordan. The original goal of integrating the Bdoul within the Kingdom, nation and fabric of Jordan has met with some success. Many members of the new generation of educated Bdoul pursue opportunities in other parts of the country and across the world.

For the time being, geography imposes limitations on any future village growth. As well as the lack of arable land around the urban plateau,

the Bdoul are running out of land upon which to build. For now, a few of the poorer Bdoul are building illegally on the plateau to the south-east. Also, limitations on future growth may lead some Bdoul to return illegally to the caves and tombs in Petra (in fact, some have continually resided in the caves between Petra, the Snake Monument and Jabal Hārūn). This will ultimately lead to greater conflict between the Bdoul and local authorities, in a return to the policy concerns and disputes that developed during their relocation. The buildings are expanding vertically which contributes to the village / town being easily visible from across Petra (**Fig. 7**). This already affects the tourist experience throughout the valley.

As the town's population grows faster and faster, the number of Bdoul entering the work force will increase. These Bdoul will expect and plan to work within this unique service and retail industry. Studies need to be conducted to investigate the relationship between the Bdoul, their skills, the active workforce, their changing jobs and needs, and overall opportunities for employment in Petra, Wādī Mūsā and Umm Ṣayḥūn. Increases in the number of workers in the valley will place strain on those working families already established both there and in adjacent towns and tourism-related businesses. This will undoubtedly create new friction between the Bdoul, their co-workers and Jordanian competitors, as well as new policy conflicts between the Bdoul, local authorities and future regulations, and within the Bdoul community itself.

Upon their relocation from Petra to the plateau above in the 1980s, one of the original purposes of Umm Ṣayḥūn was to assist in the integration of the Bdoul *bedouin* within wider Jordanian society. Currently, the major problems exposed here underscore a weak vision and direction for Umm Ṣayḥūn, and limited opportunities for diversification of employment and income sources for its *bedouin* residents. The growth of Umm Ṣayḥūn requires enforced management of current (**Fig. 8**: structural placement) and future regulations (possible zoning requirements). Effective urban planning integrates land use, activities, transportation, infrastructure and education to improve the built, economic and social environments of communities; Umm Ṣayḥūn would benefit greatly from this type of foresight and strategy. Simple measures in creating land-use zones, improving infrastructure, enforcing planning policies and actively involving community elders and residents would be a significant first step.

Unfortunately, current educational opportunities are limited within the village. Since Umm Ṣayḥūn's inception, the Bdoul have become more isolated from other local communities in the region, and within Jordan as a whole. When the Bdoul lived in the valley, all of them interacted with visiting foreigners on a daily basis. However, there are now many residents of the village / town who no longer regularly intermingle and 'network' with the Arabs, Africans, Asians and westerners who frequented Petra then and now. The emerging world of global tourism and industry requires broad foundations, and formal secondary and college education may be one answer. Scholarships or government grants for the Bdoul could be made available to them at new local colleges such as al-Hussein bin Talal University in nearby Ma'ān. In 2004, al-Hussein bin Talal University opened a College of Archaeology, Tourism and Hotel Management in Wadi Musa, and a number of Bdoul have successfully graduated. This will help the Bdoul to diversify their skills and be stronger candidates in a dynamic global workforce, as well as promoting involvement outside Petra and Umm Ṣayḥūn and reducing competition for service industry jobs in Wādī Mūsā and the valley of Petra.

Ultimately, the success and sustainability of the Bdoul and Umm Ṣayḥūn will depend on the creation of opportunities and a strong vision for the future. Improvements to Umm Ṣayḥūn through urban planning and infrastructure mitigation, in conjunction with improved and accessible educational opportunities may be the key to the future of Bdoul *bedouin* of Petra and their sprawling town of Umm Ṣayḥūn.

Acknowledgements

I would like to thank Dr Tom Paradise for assisting and advising in this research endeavor. Also, I would like to thank the King Fahd Center for Middle East Studies at the University of Arkansas for their generous financial support.

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THE ANCIENT CEMETERY OF KHIRBAT AS-SAMRĀ: 2010 EXCAVATIONS AT SITE A2

A. J. Nabulsi, C. Eger, A. Abu Shmeis and N. Khasawneh

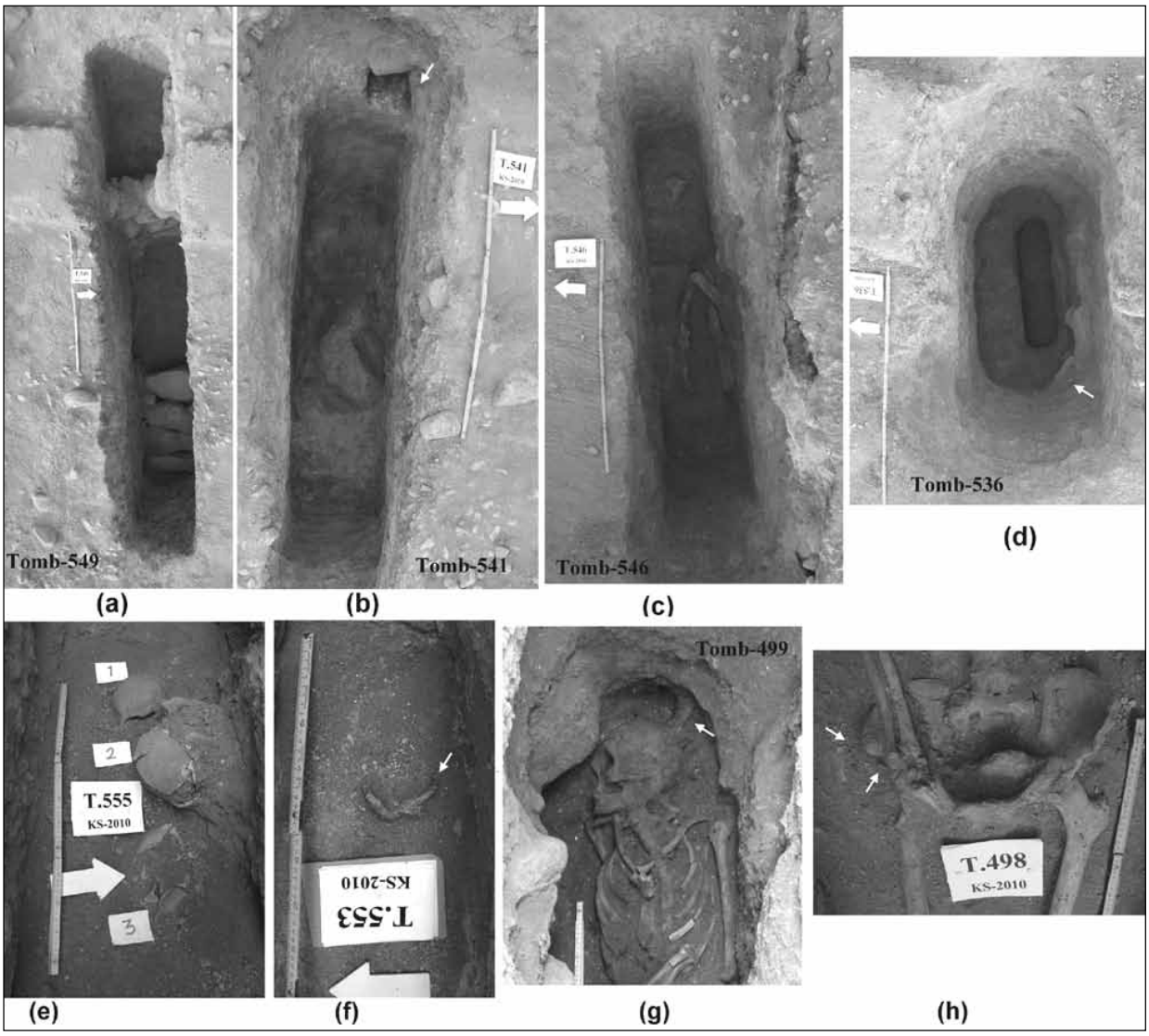
Excavations were carried out at Site A2 between 14 September and 19 October 2010, opposite the portion of Site A1 excavated in 2006 (Nabulsi *et al*. 2007: **Fig. 2**). It was the tenth season of systematic excavation at the ancient Khirbat as-Samrā cemetery. The northern part of the site was excavated in six squares in 1997. The remaining, larger part became available for excavation after the recent removal of animal shelters and a subsequent request from the land owner for an archaeological team to come in and 'clear' his property. A 5 x 5 m grid of four rows (1 to 4) and five columns (A to E) was laid out and excavated according to standard procedures (Nabulsi 1998: 271). A total of 17 squares were opened (total area 395 m□), four of which were 5 x 3.5 m. Of the 66 tombs located and excavated (**Fig. 1**), only six were intact. One further tomb was located but not excavated, as it had recently been re-used as a rubbish pit. The number of tombs excavated in the cemetery as a whole has now reached 560, or at least 10 % of the estimated total (Nabulsi *et al*. 2007: 280).

Overview of the Site A2 Excavations (Fig. 2)

As with the other sites, Site A2 was orientated west-east. The layout of graves was relatively simple, with a few more complex arrangements as well as some variations from the standard vertical shaft tombs with sealed burial cists. These variations included the unusually long Tomb-549, which included a wall constructed of natural cobbles. It is probable that the emergence of a large stone at about 100 cm depth prompted the eastwards extension of the tomb, with the wall being constructed as its western edge. The small area at the western end showed neither structural nor material evidence that it was used as a burial pit. The tomb, which was similar to Tomb-113 at Site B, was a single burial. A small rectangular pit (30 x 20 cm) was dug in the upper part of the western wall of Tomb-541. The pit, covered by a flat stone, was empty. Tomb-546 was dug for an adult, but was later re-used for the burial of a child. The child's burial cist was V-shaped, being built on the floor of the tomb after removal of the earlier burial. A few substantial cist tombs (Type III, Nabulsi *et al*. 2009: 167) of variable size were also found at Site A2. These were not concentrated in any one area as was the case at Site C; one of them, Tomb-536, appears to have been sealed with a vault.

A number of cut and dressed stones, possibly from the buildings of the ancient settlement, were re-used as capstones. The eastern part of Site A2 revealed a number of burial cists

1. General view of Site A2 after excavation.



2. Site A2 tombs discovered in 2010: (a) and (c) see text, (b) arrow marks position of small rectangular pit, (d) arrow marks start of vaulted closure, (e) skulls 1 - 3, (f) iron anklets found in situ in intact but badly preserved burial of a child, (g) arrow marks in situ position of bronze hair-pin or spatula (KS-1642), (h) arrows mark in situ positions of bronze buckle (KS-1677), near to bones of right arm, and one of the associated buttons (KS-1678).

in which yellowish limestone was used instead of, or along with, basalt capstones. Three tombs yielded a variable quantity (0.1 to >1 kg) of what may be the remnants of wooden coffins, since this material was almost entirely restricted to the burial cists. All of these tombs were disturbed prior to excavation. In the absence of conclusive evidence, a later insertion — perhaps as charcoal — has also to be considered.

Results of Excavations

Human skeletal remains were recovered from 58 tombs, two of which clearly contained multiple burials, *viz.* two individuals in Tomb-449 and three in Tomb-555 (**Fig. 2e**). First indications suggest that most (>50 %) burials were of sub-adults, although this still needs to be confirmed.

Various objects were recovered from Site A2, including items of personal adornment, grave offerings and grave furniture. Some of these objects were clearly displaced, being recovered either from topsoil or from tomb-shaft fill; this was probably the result of the early 20th century looting that Khirbat as-Samrā is known to have been subjected to. Furthermore, fragments of the

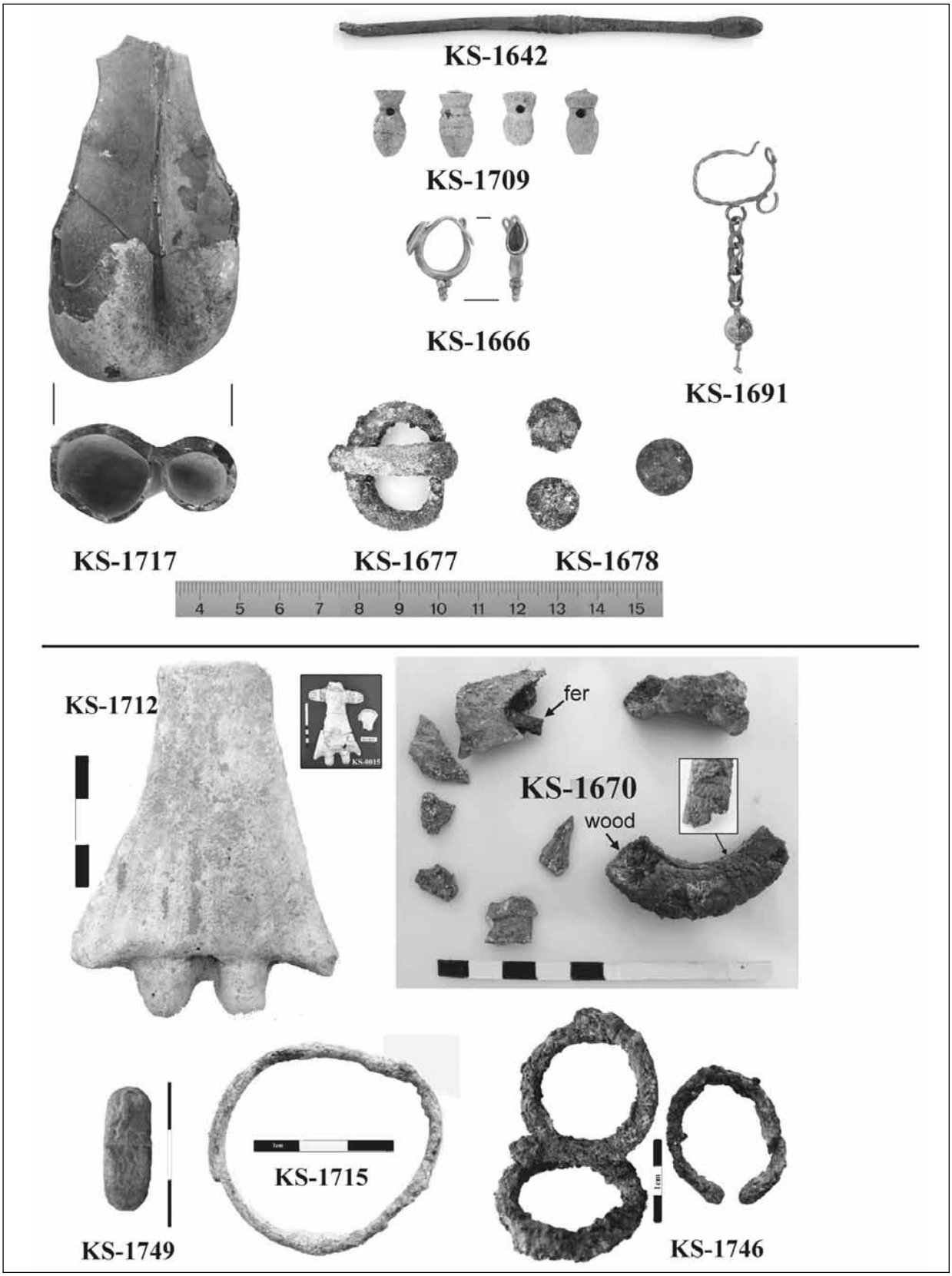
same object were found in different loci on more than one occasion. Bracelets and anklets, which could only be differentiated when found *in situ* (**Fig. 2f**), were common. Many were made of copper alloy, but the majority were of iron and therefore badly corroded. Fragments of the same hollow lead anklet (KS-1670) were found in Tomb-505 and the fill of neighbouring Tomb-551. It had a rounded profile (*ca*. 15 mm diameter), with geometric decoration on the outer surface (**Fig. 3**). Inside, it was filled with small fragments of iron and wood, a combination that would have produced a soft rattling sound.

Another dispersed object was incomplete glass vessel KS-1717, fragments of which were found in Tomb-518 and adjacent Tomb-539. It has been identified as the lower part of a so-called twin *balsamarium* (**Fig. 3**). This was a typical glass vessel of Late Roman Syria and Palestine. It consisted of two oblong tubes, sometimes connected by a wide, curved handle. Both parts are sometimes decorated with serpentine glass strands, but the KS-1717 fragments clearly belong to an undecorated example. Twin *balsamaria* are thought to have been used for cosmetics, and are generally dated to the 4th and possibly early 5th centuries AD (Hayes 1975: 101-102). At present, there is no archaeological evidence with which to accurately date KS-1717. A number of other glass vessels were also found at the site, but unfortunately all were badly preserved. A glass vessel (KS-1667) from Tomb-505 had fragmented into dozens of tiny pieces, all weathered to a yellowish milky white. The original shape has not yet been ascertained, but seems to have been round bodied. Tomb-526 yielded fragments of two glass jars (including KS-1776), with at least one and possibly two or more zigzag handles. Another possible cosmetic item (KS-1642; **Figs. 2g and 3**) was found *in situ*, on the skull of the primary burial of Tomb-499. This could be a fragmented bronze spatula with the narrow blade missing, a hair pin or perhaps even a spatula handle used as a hair pin. It is not the first object of this type to be found at the cemetery.

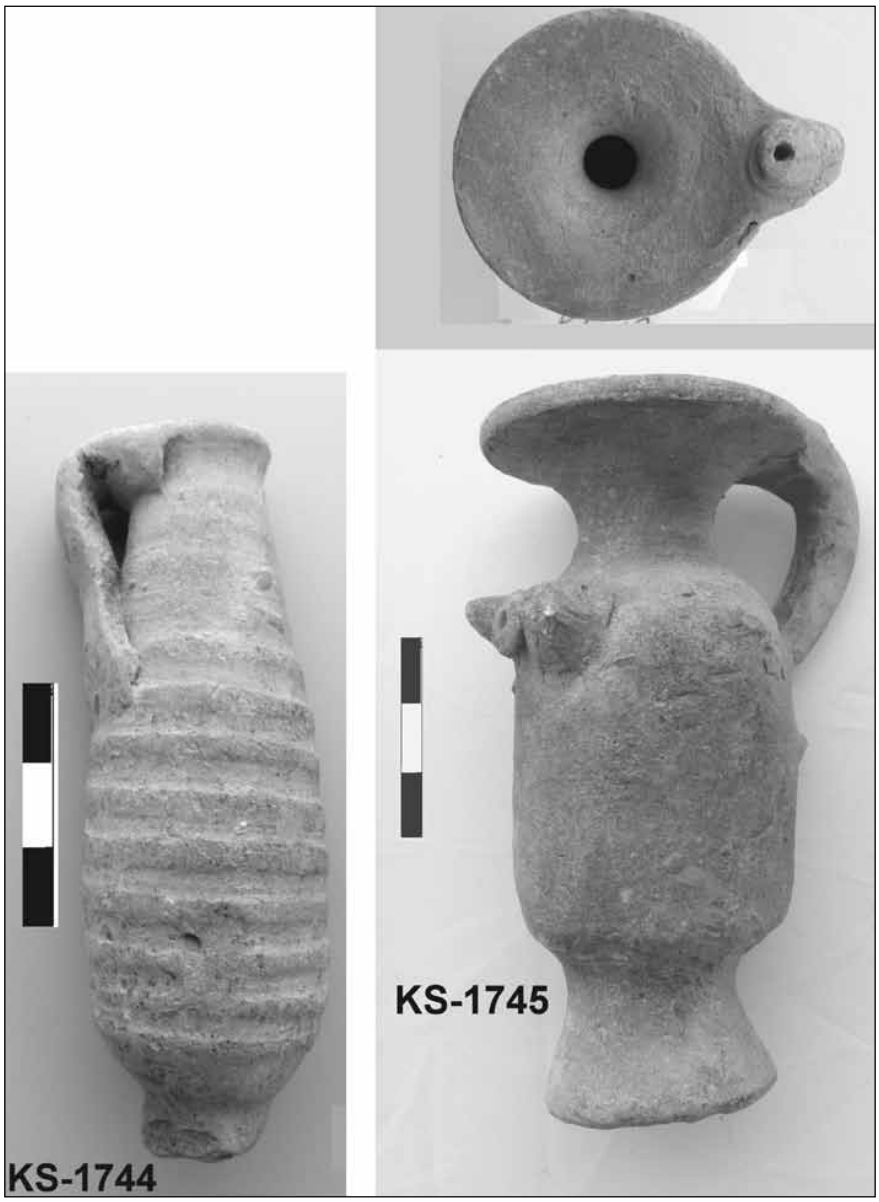
Two gold earrings (**Fig. 3**) recovered from the cemetery may indicate the presence of high status female burials. The first (Tomb-526, KS-1666) was an ovoid loop, closed with a hook and with two soldered decorative elements: a small granulated pendant at the bottom and a drop-shaped mount with a red stone (possibly garnet or ruby) inlay on the side. The form and style of this earring are typically regarded as middle Roman, but this does not preclude the possibility that such pieces were worn well into the 5th century AD (see parallels in Chehade 1972, cat. 17-18). The second earring (KS-1691) was a twisted loop with two attached eyes, from one of which a hollow, spherical pendant — originally decorated with a now lost bead or pearl — was suspended on a chain. Earrings with attached eyes and a wire pendant with inlaid mount were an (eastern) Mediterranean type of the 5th to 7th centuries AD. Examples with more than one eye are less common and may be slightly later within the same general time-frame (Deppert-Lippitz 2000: 62; Bierbrauer 1987: 154-157), although to date there is no firm evidence to support this supposition. It is however known that cast variants with three eyes were not common before the 7th century AD, and that they continued to be worn into the 8th century AD. It seems clear that both the earrings discovered at Site A2 in 2010 are of early Byzantine date (5th-6th centuries AD).

Numerous beads of various kinds were found in many of the tombs excavated at Site A2. As well as monochrome and polychrome glass examples, a few carnelian beads, other stone beads and small white cowrie shells were also found. Some vase-shaped bone beads with grooved decoration were found in Tomb-520 (KS-1709; **Fig. 3**) and Tomb 548; these were similar to previous finds from Site B. Close parallels are now known from southern Syria, in the region of Damascus (C. Eger unpublished report).

KS-1712 (**Fig. 3**) was another plaster figurine to be found at the Khirbat as-Samrā cemetery. The female doll-type figurine was incomplete; only the lower part of the body, from waist downwards (8 x 6.1 cm), was recovered and this revealed no trace of paint. This type of figurine has the form of a woman dressed in a long gown (sometimes decorated with a small mirror), with stubby horizontal or over-the-head arched arms (with a small mirror between head and arms) and small protruding feet. The figurines were originally painted (Nabulsi 2000). Two similar examples are known from Site B (KS-0001; KS-1015), but both were larger (8-9 cm width) and had mirror-decorated gowns. Recent ra-



3. Some of the objects found at Site A2 in 2010.



4. Jars from Tomb-552: (A) KS-1744 and (B) KS-1745.

diocarbon dating of a Site E burial (Tomb-429) containing a plaster figurine dated the material to 615-680 cal. AD at 95% probability (OxA-22446: 1376 ±25 years BP). This, and evidence from Site B (Nabulsi 1998), indicate that a 7th century AD date might be applicable to all plaster figurines from the cemetery.

Personal adornment worn specifically by males is more difficult to identify. Various metal belt buckles may have been typical male accessories, but this is a hypothesis that still needs to be tested. The probable male burial in Tomb-498 yielded a belt buckle (KS-1677), being a simple ovoid with a pin but no fitting, as well as one polygonal and two circular buttons (KS-1678) that were part of a belt. All four objects were made of a copper alloy and were found *in situ* (**Figs. 2 and 3**). This type of button (Ger. *Gürtelhaften*) was worn on the belt directly behind the buckle and is known from many well-documented 6th century AD tombs in south-west, west and central Europe (Sasse 2000: 21). Recently, it has became clear that this type of belt, with a simple buckle and between one and three buttons, was also common in the eastern Mediterranean, where it probably came into use some decades earlier than in the western Mediterranean and its European hinterland.

The fill of Tomb-549 produced an unfamiliar object in the form of a flat bronze cylinder (KS-1749, 24 x 9 x 4 mm; **Fig. 3**). One side of the cylinder was engraved with animal motifs similar to those of Egyptian cartouches. So far, it has not been possible to draw any conclusions about the function and / or authenticity of this object.

Pottery fragments from topsoil and tomb fill at Site A2 included a relative abundance of oil lamp fragments, generally comparable with those from Site B. Preliminary analysis identified different types of round or ovoid (local Jerash type, Scholl 1986) lamps, with a single example of a candlestick form. All have numerous parallels from diverse sites in Jordan, e.g. Jarash (Da Costa 2004), the Jordan Valley (Abu-Shmais and Waheeb 2002) and Ḥisbān (Sauer 1973: 36-39). In general, these oil lamps fragments date to the late Byzantine and early Islamic (Umayyad) periods, i.e. *ca*. 6th to early 8th centuries AD. Lime deposits covered the surface and edges of the majority of sherds, possibly as a result of direct exposure to the elements. This, along with observed similarities with the pottery lamps from Site B, indicates that these objects do not date the excavated tombs at the site, but rather human activity in that same area. The presence of similarly dated, more or less complete cooking pots with charred outer surfaces tends to support this supposition.

Additional pottery finds include two small 'funerary' objects, found *in situ* in Tomb-552 with a unique *unguntarium* form known from the Nabataean to early Roman periods (**Fig. 4**). The first was a small jar (KS-1744, 8.4 cm height, 8.6 cm diameter) with a single flattened strap-handle, crudely attached to the rim. The warped ribbed body was wheel-made, with a fine pink slip (Munsell 5YR7/3), reddish-yellow core (Munsell 5YR7/6) and an irregular, footed, hand-made base. The jar, dated to the late Byzantine period, i.e. 6th century AD, has a good parallel at Yājūz (Suleiman 1999: figs. 22-2). The second object was also a small jar (KS-1745, 10.4 cm height, 9.4 cm diameter, 5.6 cm rim diameter), with an angular loop-handle. The neck had a flattened, flared rim. It was wheel-made with reddish-brown slip (Munsell 2.5YR6/3) on a fine fabric typical of the 6th century AD. The hand-made handle was laterally pressed on to the body. The jar was decorated with knobs and a small relief circle, thereby giving it the shape of a female body. KS-1745 is an unusual funerary jar for the Byzantine period.

Four tombstones inscribed with crude crosses were found in different tombs, all re-used as capstones. They all had the same, previously discussed features (Nabulsi 2010). A large (88 x 41 x 22 cm) inscribed basalt tombstone (KS-1685) was recovered from the fill of Tomb-517 (**Fig. 5**). It had apparently been re-used as a capstone at the eastern end of the broad burial cist. The inscription was later confirmed to be Nabataean (M. Macdonald, pers. comm.); further details will be published in due course. The KS-1685 inscription emphasises the epigraphic richness and diversity of Khirbat as-Samrā ancient cemetery, and is one of the most significant discoveries to be made there since the start of this project in 1995.

5. Inscribed tombstone KS-1685.

Acknowledgements

The team would like to thank Mr Nayef Naser al-Dughmy and his family for generously inviting us to excavate on their property. We would also like to extend our thanks to Michael Macdonald of Oxford University for his epigraphic advice, as well as to numerous colleagues in the Department of Antiquities of Jordan.

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HUMAN BURIALS FROM THE BAPTISM SITE PROJECT

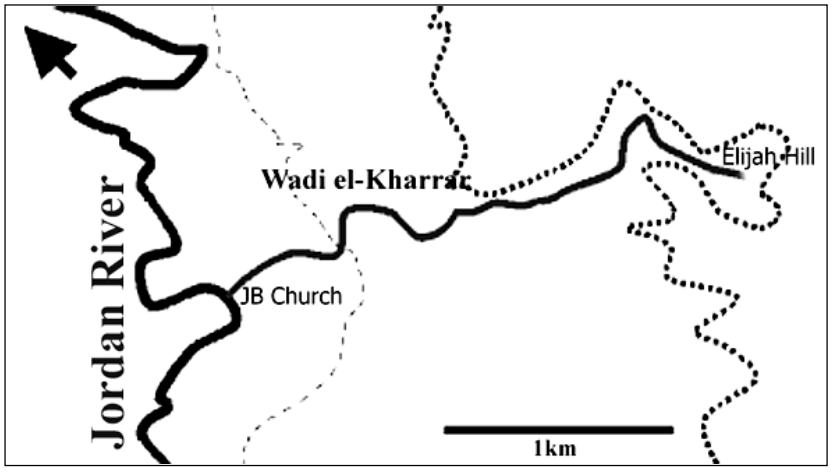
Abdalla J. Nabulsi

Introduction

Since 1997 the Baptism Site Project has carried out excavations for the Department of Antiquities of Jordan at a number of sites along the Wādī al-Kharrār in the Jordan Valley, from Elijah Hill to the Jordan River (**Fig. 1**). The present report documents the excavation and partial analysis by the author[1] between the summer of 1998 and 2001 of the human burials found along the wadi. Though preliminary, this report provides some interesting results on the burials and human skeletal material, most of which is now inaccessible. For archaeological details on the sites, the reader is referred to reports in the Annual of the Department of Antiquities of Jordan (*ADAJ*) and elsewhere by M. Waheeb and R. Mkhijian.

The Elijah Hill Burial

A small niche hewn in the soft limestone was discovered in August 1998 on the western terrace of the so-called Elijah Hill, about two meters south-west of the Rhetorius Church (Area A Square C2) and 10-30 cm below what may have been a destroyed mosaic floor. The subrectangular feature had maximum dimensions of 54 cm x 29 cm and a maximum depth of 21 cm. It was sealed by a limestone slab, 58 cm x 43 cm and 10 cm thick. In the layer above the niche, and in the same general vicinity, a number of white and coloured *tesserae* (10-15 mm), glass fragments and an Umayyad bronze coin (actually a modified Byzantine *filos*) were found. On the eastern side of the niche was a jumble of human and animal bones. The niche had been opened prior to excavation by some curious workers, which allowed earth to trickle into the burial. The bones included an incomplete human cranium surrounded by four fragments of mammalian bone, including two reddish pelvic fragments, possibly of pig or wild boar, a horse or cattle phalanx and a metatarsal[2]. A detached human maxilla, small cranial fragments and seven teeth were found around the



1. The two major sites on Wādī al-Kharrār.

1. The author is a physical anthropologist with the Department of Antiquities of Jordan and a member of the Baptism Site Project.
2. No zooarchaeological report is available.

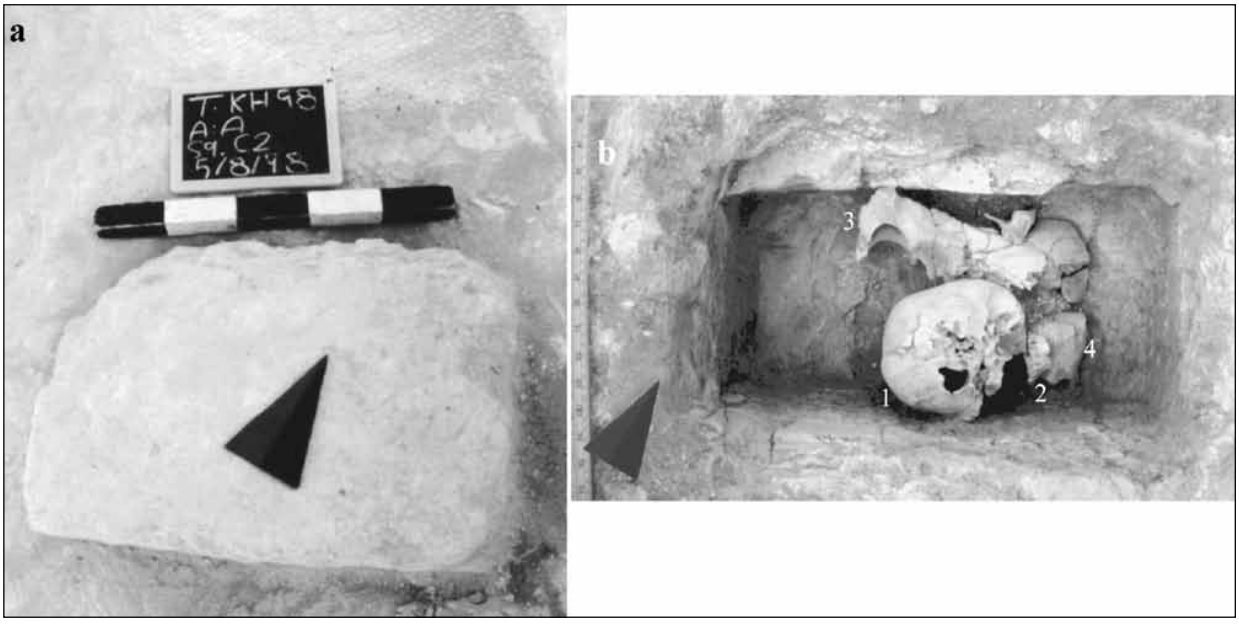
animal metatarsal (**Fig. 2**).

All the human bones belonged to a single individual (Bapt-006). The material is in relatively good condition and whitish in colour owing to mineralization. The cranium was missing most of its facial parts (i.e. zygomatic arc and nasal bones) except for the detached maxilla that was missing four incisors and three molars. Some small cranial elements were partly reconstructed on the skull base. The ends of both mastoid processes were slightly flattened, possibly due to contact with the sealing stone slab. The prominence in the glabellar and supraorbital area, the orbital shape combined with blunt upper ridges, the elongated frontal bone profile, the robust occipital fraction with a strongly expressed linea nuchae and the relatively long mastoid processes, all suggest that the cranium of Bapt-006 belonged to a male individual (Szilvássy 1988). The unerupted 3rd molar on both maxillary sides, together with almost absent or minimal teeth wear, allowed for an estimated age at death of 18-22 years (Sjøvold 1988).

The craniometric measurements (according to Bass 1971; Bräuer 1988; White and Folkens 1991) reflect robustness, particularly in the breadth measurements (**Table 1**), and a more rounded and less elongated mesocephalic cranium (cephalic index = 77.13). A number of non-metric (epigenetic) traits were observed on the skull. These included the presence of a complete metopic suture dividing the frontal bone into two parts, strongly expressed cranial sutures-particularly the lateral side of the coronal and sagittal sutures (grade 4), a bilateral median supra-orbital notch with a median orbital foramen on the right, medium expressed bilateral frontal grooves, parietal foramen (2 mm) on the right, a bilaterally lightly expressed squamo-mastoid suture, bilateral mastoid foramen and 3 lambdoid ossicles (*ca*. 15 mm diameter,) two on the right side and one on the left.

On the external surface of the frontal bone, two linear depressions, about 25 mm in length and more than 1 mm in depth, were observed on the right lateral side. Three lighter and shorter depressions were on the left side. These could be depressed fractures that could have resulted from face-to-face confrontation (Aufderheide and Rodrigez-Martine 1998: 24) and are less likely to be normal anatomical variants (**Fig. 3**). The only other pathological features observed included bilateral light porosity on the outer surface of the temporal bone around the external ear area (porous acusticus externa) and minimal tooth wear, except for minor calculus deposits.

It is evident that the niche represented a secondary burial place. The bones were already



2. Compartment found near the Rhetorius Church: (a) covering stone, (b) opened compartment, including human skull (1) with detached upper jaw (2) animal pelvic bones (3) and fragment of tarsal bone (4) large animal phalanx is below the skull (photograph AN).

Table 1: Anthropometric measurements (mm) and indices (base 100).

Bapt-006 measurements*	**Value**	**Bapt-001 measurements**	**Value (R / L)**
1 Max cranial length (g-op)	188	46 Bimaxillary breadth (zm-zm)	110
2 Glabello-inion length (g-i)	178	48 Nasoalveolar height (n-pr)	88
3 Glabello-lambda length (g-l)	182	**Post cranial bones**	
5 Basion-nasion length (ba-n)	103	1 Humerus total length	456 / -
6a Basion-hormion length (ba-ho)	29	5 Humerus max midshaft diam	25 / 27
7 Foramen magnum length (ba-o)	34	10 Humerus longt head diam	50 / 51
8 Max cranial breadth (eu-eu)	145	1 Radius max length	- / 236
9 Min frontal breadth (ft-ft)	106	1 Ulna max length	268 / 264
10 Max frontal breadth (co-co)	124	11 Ulna dorso-ventral shaft diam	19 / 18
11 Biauricular breadth (au-au)	129	1 Femur max length	457 / -
12 Biasterionic breadth (ast-ast)	113	6 Femur ant post diam	31 / 30
13 Mastoid breadth (ms-ms)	118	19 Femoral head transv diam	50 / 50
14 Min cranium breadth (it-it)	70	1 Tibia max length	370 / 368
16 Foramen magnum breadth	31	8 Tibia midshaft diam	33 / 34
17 Basi-bregmatic height (ba-b)	132	1 Fibula max length	366 / -
17(1) Basion-vertex height (ba-v)	135	2 Fibula max midshaft diam	15 / 15
25 Total sagittal arc (n-o)	382		
26 Frontal longitudinal arc (n-b)	115		
26a Glabella-bregma arc (g-b)	113		
27 Parietal longitudinal arc (b-l)	142		
28 Occipital sagittal arc (l-o)	125		
29 Frontal sagittal chord (n-b)	107		
30 Parietal sagittal chord (b-l)	122		
31 Occipital sagittal chord (l-o)	95		
Indices			
I1 Cephalic (I)=8/1*100	77.13		
I2 Vertical (I)=17/1*100	70.21		
I3 Transverso-vertical (I)=17/8*100	91.03		
I13 T. Frontoparietal (I)=9/8*100	73.10		
I14 T. Parieto-occipital (I)=12/8*100	77.93		

* With reference to the measurements defined by Martin and revised by Bräuer (1988).

mineralized prior to their deposition, indicating that they are some centuries older than the adjacent 6th to 7th century AD church. The inclusion of animal bones makes it less probable that the niche was associated in any way with the church. So far, there are no reports involving animal bone insertions in Christian Byzantine burials, except for reported cases of sheep or goat teeth found placed on the covering stones of tombs in the Blachiya Byzantine cemetery at Gaza (Nabulsi *et al*. 2010). Therefore the niche, found 10-30 cm below a mosaic floor, must be

earlier than the Christian constructions on Elijah Hill. Toynbee (1971) has noted that pigs were buried to legitimise Roman tombs or burial places. In his summary of early archaeological activities in Wādī al-Kharrār, Kopp (1959: 164-5) states that at least five Roman cave tombs, mostly intact human burials, were found on the slopes of the hill. The remains of 50 to 100 houses and associated artefacts were found in the wadi and were dated to the 1st century BC / AD. It is therefore likely that some other cave tombs were either re-used by monks (Kopp 1959: 165) or integrated within later constructions. This and the mineralized state of the bones tend to support the supposition that the niche and its contents predate all 'Christian' features found on Elijah Hill.

Burials at the John the Baptist Church Site

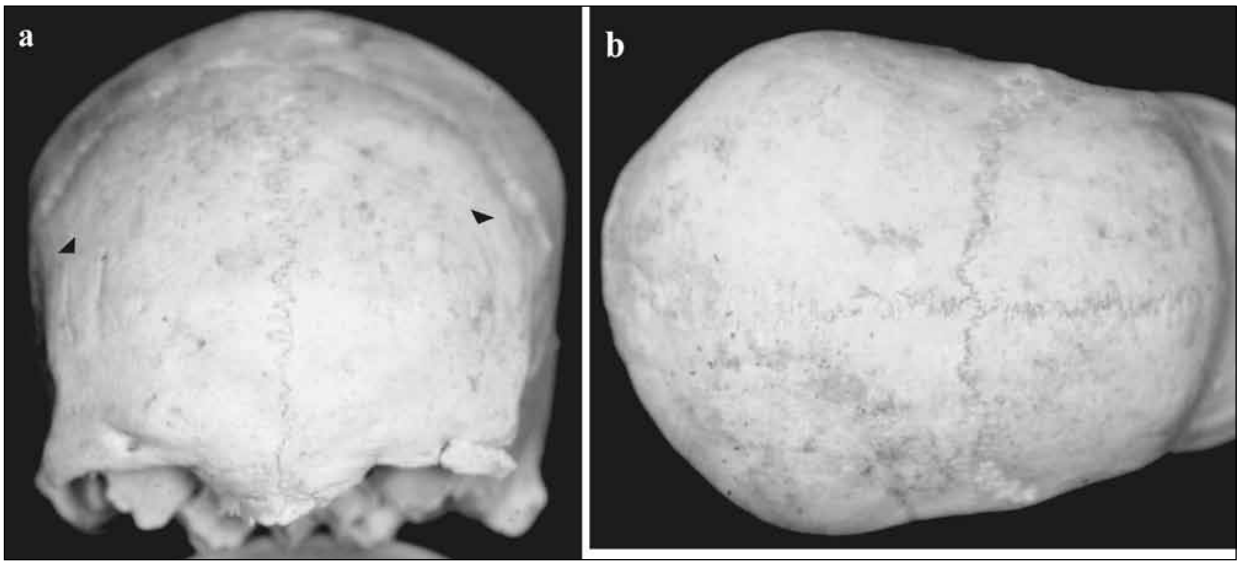
This site represents a complex of ancient structures, mainly churches, located south-east of Wādī al-Kharrār just before it flows into the Jordan River (**Fig. 1**). The 2000 excavation season resulted in the discovery of two intact human burials, or Tombs 1 and 2. The first was a single burial while the second involved multiple burials.

Excavation of the human burials was undertaken between May and September 2000. The bones were in a very fragile and deteriorated state, which called for specific treatment with a 1:4 diluted solution of water-soluble glue (Ponal™). This was applied with a soft brush to the cleaned bone surfaces. The method succeeded in preserving the bones but led to glistening bone surfaces that caused photographic problems. The skeletons were removed in blocks with the surrounding earth supporting them. Wrapped in newspaper sheets, these blocks were stored indoors and left to dry for a few months. The bone material was then clean brushed. Limited reconstructions from bone fragments were carried out in preparation for analysis.

Tomb 1 of Church 3

The tomb was discovered outside John the Baptist church 3, near the western wall at the same height as the so-called Mary's Room. The tomb had a simply built rectangular burial chamber made of a single row of natural flat and rough-cut stones arranged in a U-shape aligned perpendicular to the wall. Stones marking the western end were lost during the removal of debris around the tomb. The burial cyst was 190 cm x 80 cm, approximately 170 cm below the top of the wall and about 3 m below the modern surface level. It was partly placed on a foundation pillar (*ca* 1 m x 1 m) from an earlier construction phase. The small stones used to close the burial chamber had collapsed inwards.

Fragments of a black ceramic vase were collected from the burial chamber filling. The chamber contained the remains of single indi-

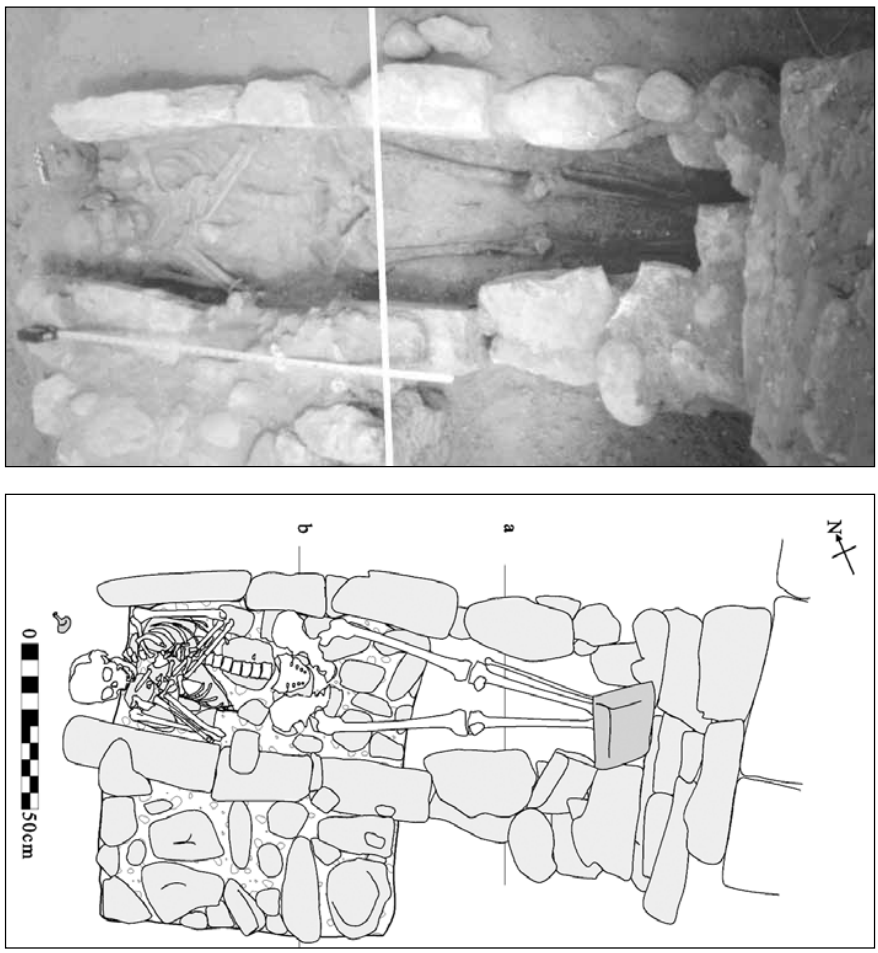


3. The skull of Bapt-006 revealing the complete metopic suture a) Cranial frontal view: the arrows indicate the location linear depressions that could be healed depressed fractures. b) Cranial top view: The "Cross" shape of the Cranial sutures.

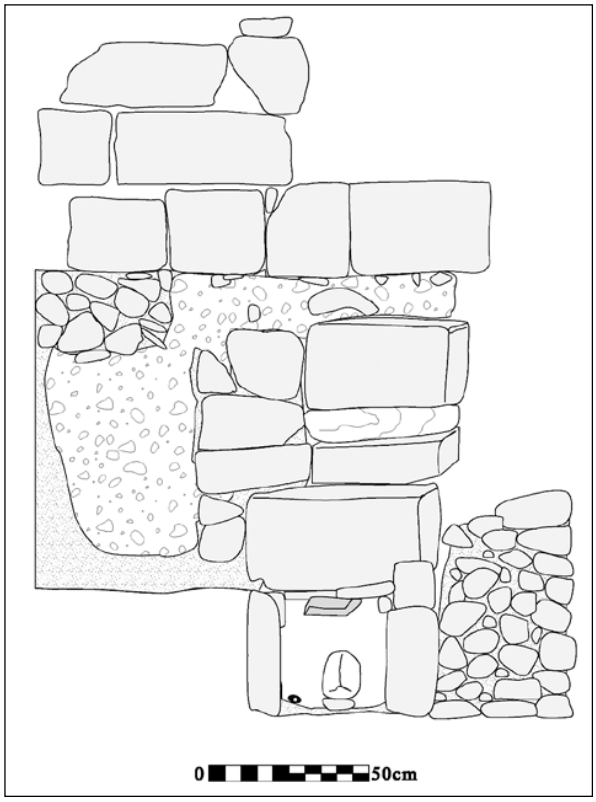
vidual buried in a fully extended position and orientated west to east with a 15° deviation to the south (as does the tomb itself and the whole church) (**Figs. 4 and 5**). The arms were placed over the chest, right hand over the left. The skull was elevated by a small stone below it. The face was lowered and turned in a south-west direction. On the left side and just above the skull a broken dark green glass goblet was found. The base of the burial had a slight east-west slope and was prepared with a relatively thin earth layer.

Though Tomb 1 was an intact single burial, excavated as described above, only about 80% of the skeletal remains (Bapt-001) were accounted for, primarily due to decay of the long bone joints, the pelvic and pectoral girdles, the vertebral arches and the loss of small hand and feet bones. The bones had a dark brown to reddish colour as a result of iron oxides in surrounding clay layer.

Observations made during excavation and macroscopic analysis of the Bapt-001 material revealed the prominence of the frontal glabellar and arcus super cilliaris areas, semi-rectangular and blunt-edged orbital margins, a relatively long mastoid process and a robust mandibular bone, as well as a general robustness of the long bones and a narrow greater sciatic notch and sub-pubic angle, all indicating that Bapt-001was a male. Tooth wear and the medial surface of the pubic symphysis, allowed an estimated age at death of 40-50 years. Some osteometric measurements were carried out on postcranial elements, most of which were reconstructed (**Table 1**). Cranial measurements were not possible owing to fragmentation, although a few were taken *in situ* and are thus unreliable. The observed epigenetic traits included the presence of a supranasal suture, bilateral supraorbital lateral and median (notch on the left) foramen, bilateral squamo-mastoid suture, asymmetry of



4. Top view of Tomb-1 Found in "John the Baptist Church" (Top are edited pictures).



5. Front view of Tomb-1.

the ventral vertebral arch of the axis, ponticulus atlantis of the first cervical vertebra (posterior right incomplete, left complete), 3 sternal foramen, 11 thoracic and 6 lumber vertebra (instead of 12 and 5 respectively), ankeloses between the medial and proximal phalanges and between the sternal body and xiphoid, the absence of costal pits on Th9 (right only) and Th10 (post-cranial anatomic variations cf. Brossmann *et al*. 2001).

Nearly all available teeth showed calculus with subsequent paradontitis and paradontosis. Eight of the 29 teeth had caries, mostly on the occlusal plane; four of these cases were advanced (grade 5-6) so that the pulp canals were opened, resulting in apical abscesses. Two other abscesses were observed on both 2nd left molars (all pathological classifications according to Schultz 1988).

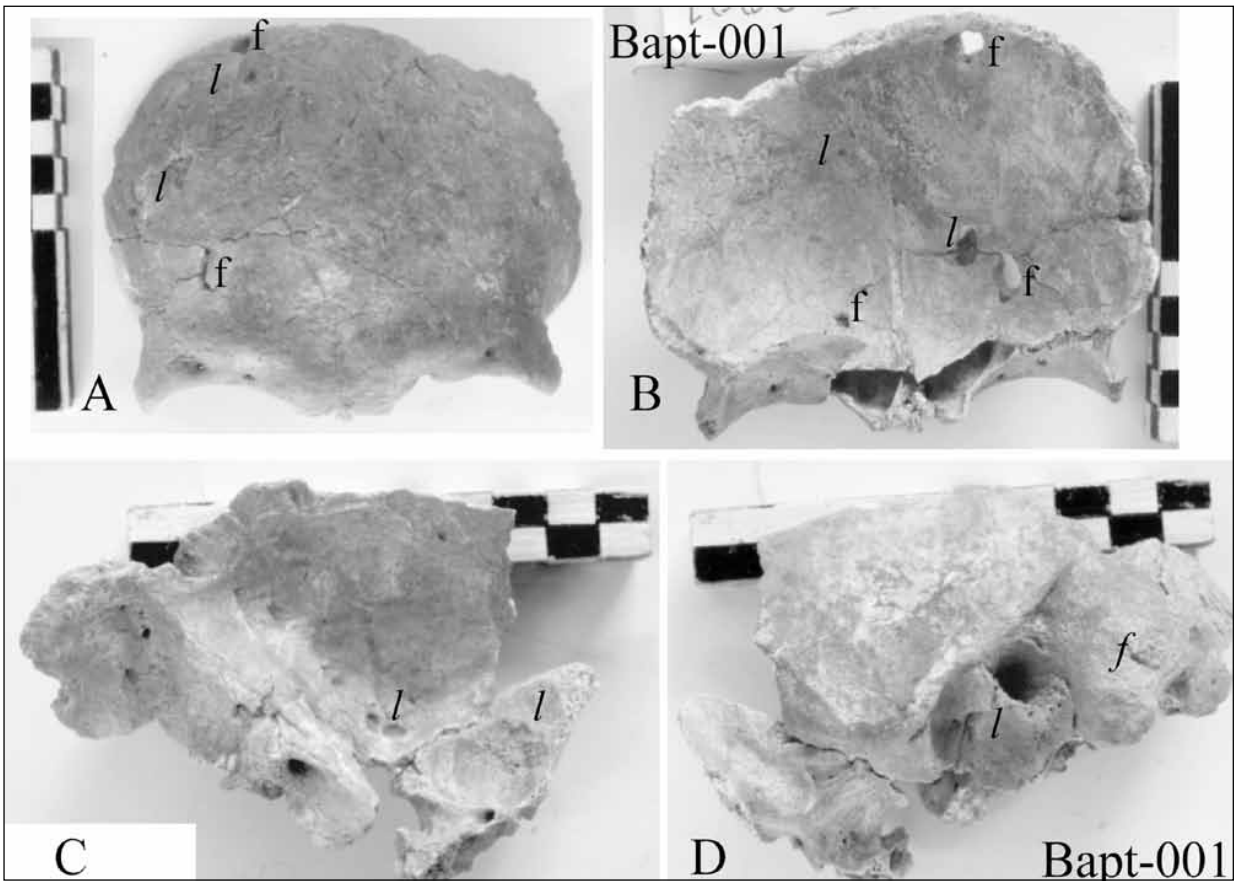
The most obvious pathological features were on the cranial bones. The inner (lamina interna) and outer (lamina externa) surfaces of the frontal, temporal and occipital bones revealed multiple lesions of variable size (3-10 mm) with smooth sclerotic borders. Some lesions extended into the diploe and developed fistulae that penetrated from one laminar side to the other (**Fig. 6**). The lamina interna of the right mastoid was completely eroded. The mastoid was opened in a 3 cm wide area with a sclerotic outer surface. The whole inner surface of the temporal bone showed proliferation of newly formed bone. The parietal bones were fragmentary and incomplete, which did not provide any further details on the nature of the observed defects. Unfortunately, neither X-ray nor histology was available, but the macroscopic aspect of the pathology suggested that an infection had probably led to the bilateral mastioditis (see Flohr and Schultz 2009) that extended to the skull base. The basal meningitis that resulted was thus lethal.

Degenerative joint diseases were less than expected for the estimated age of Bapt-001. The available joints revealed low grade values (1-2) except for part of the coastal notches I-III on the left sternal side, patella and two hand bones (grade 3-4). This may necessitate reducing the estimated age at death for Bapt-001 to 35-45 years. Other observed pathological features included Schmorl's nodes on the Th4 to Th11 and L1 to L6 vertebrae, osteophytic outgrowths on the lumber vertebrae and osteochondrosis between the left I metatarsal and I proximal phalange.

The orientation of Tomb 1 and positioning of Bapt-001 suggest a link with the church. The dating of Tomb 1 was based on the objects found in the tomb. The fragmentary black ceramic vessel and broken glass goblet belong to the Byzantine period, i.e. 5th to late 7th century AD. A structure found on a plastered floor at the church's south-west corner, about 15 m south of Tomb 1 was later identified as a tomb (Tomb 3). The material inside it had deteriorated beyond recognition. Tombs 1 and 3 belong most probably to the same period, i.e. 6th or 7th century AD. Both burials can be thus associated with the nearby religious structure.

Tomb 2, Squares D5-E6

In August 2000 new squares were opened to the south-east of the main area. In Square E5, the corner of a stone-built structure was found, upon one side of which a pile of stones was arranged so as to line the distal parts of a human burial. The square's northern and eastern sec-

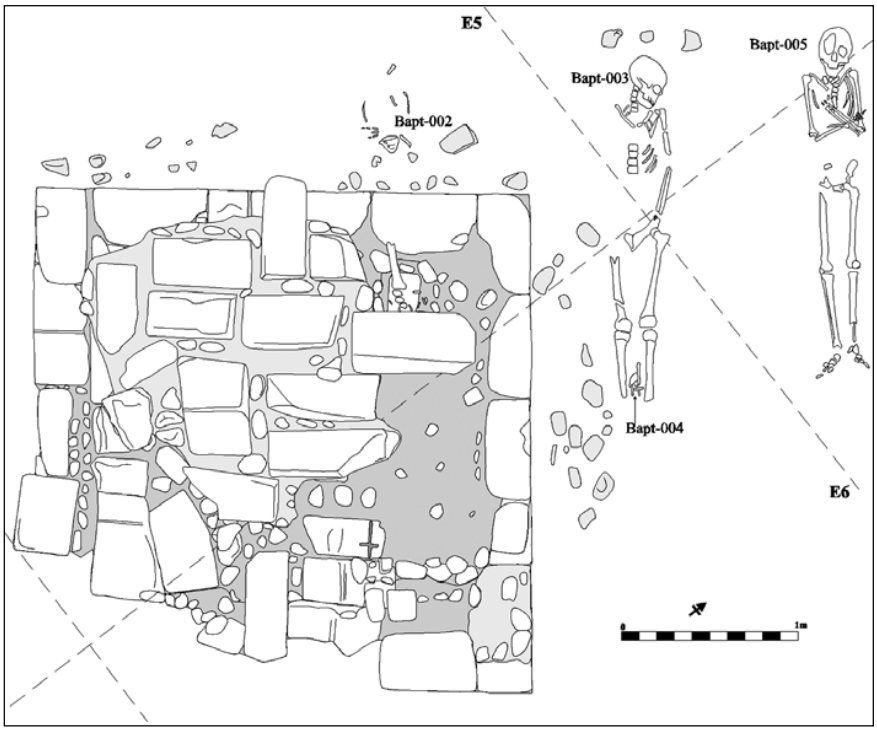


6. Lamina externa and interna of the frontal (A, B) and temporal (C, D) bones of Bapt-001: (f) fistula, (l) lesion.

tions revealed an upper (1 m thick) clay layer on top of a 100-130 cm fine sand layer, which was in turn above another clay layer. This stratigraphy differed from that observed elsewhere on the site where clay was recorded from top to bottom. Between the sand and lower clay layer were pieces of human bone, which indicated the presence of an ancient burial.

Excavation in Squares D5 to E6 resulted in the discovery of four burials: three adult and one child. The three adults (Bapt-002, Bapt-003 and Bapt-005) were buried parallel to each other in a fully extended position, with a 15° southern deviation from the west. The disarticulated remains of child (Bapt-004) were found between the legs of the middle adult (**Fig. 7**). This indicated that the tomb (Tomb 2) involved simultaneous multiple burials, despite the different positioning of the arms of Bapt-003 and Bapt-005. All burials were placed upon the clay layer and covered by sand (**Fig. 8**). In general the skeletal remains were in worse condition than those of Tomb 1, which might be attributed to the acidity and wetness of the muddy tomb floor. The material had a red-brown colour, likewise because of the presence of iron oxides. These conditions hampered recognition of the bones, which eventually led to partial material loss from Bapt-002 and Bapt-003 (**Figs. 7, 8**). The burials were excavated in the same manner as Bapt-001 described above.

Based on preliminary analysis, the extreme robustness of the right tibia and available feet bones suggested that Bapt-002 was an adult male, who died at an estimated age of less than 40 years, as indicated by ossification of the tibia. Pelvic as well as cranial features clearly identified the other three individuals as males. Tooth wear and pelvic traits suggested ages of 25-35 years for Bapt-003 and Bapt-005, while dentition and bone fusion indicated that Bapt-004 died at the age of 7-10 years. Pathological examination revealed the presence of lesions, variable in number, size and severity, on the lamina interna of the basal cranial fragments from all adult in-



7. Excavated burials in Tomb 2 with rectangular structure on left dotted line represents edge of square.

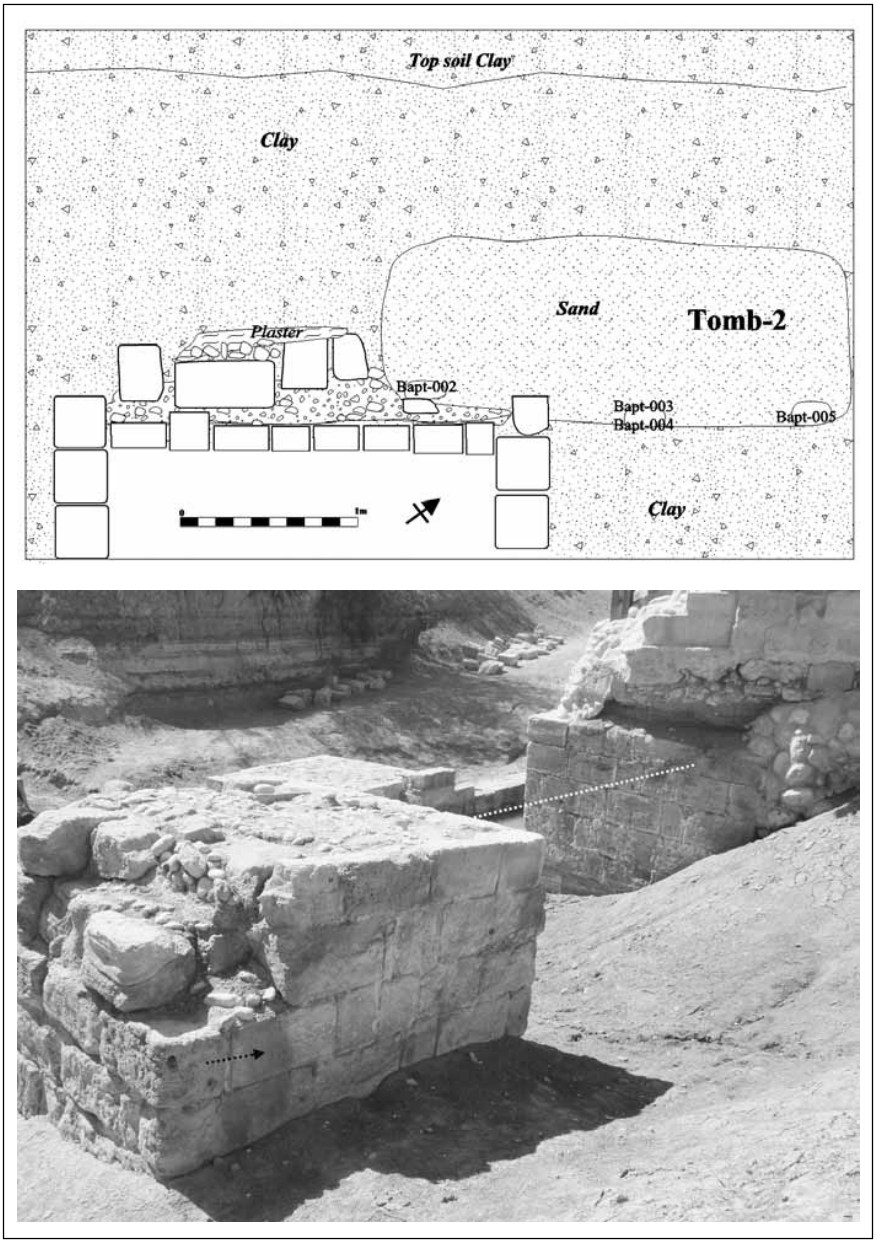
dividuals. This suggests a meningeal infection in all three, possibly similar to that of Bapt-001. However, it remains uncertain whether the infection was fatal. The remains of the child revealed lamellar bone formation on the long bone shafts and the lamina externa. Therefore, sepsis (general inflammation) was the probable cause of death in the child. The archaeological evidence suggests that all 4 individuals from Tomb 2 were buried simultaneously, while the preliminary pathological analysis suggests that all four individuals died from a lethal infectious disease.

The distal parts of Bapt-002 were located on a rectangular structure (*ca.* 280 cm) that was parallel to another similar structure located *ca.* 3 m distant in Square D4, upon which a small chapel was built with an apse on the same orientation as the burials. Both structures were solidly built of courses of dressed limestone, each course *ca.* 31 cm thick and, for some reason, tilted 5° eastwards. The cleaning of the structure in Square E5 / E6 revealed a stone with an engraved cross, 20 cm x 12 cm, and a two-word Arabic inscription (حكيم الله) on the second stone of the 7th course (now 3rd). The words were engraved in a much earlier time, before the inscription and structure as a whole was covered by meters of clay deposits. The sand layer was clean and homogenous. It extended from the chapel to the Bapt-002 grave and yielded two pottery fragments only. It appears that the sand layer was deliberately brought in to cover the burials. Pottery collected from the clay layers above and below the sand layer were similar and included Roman, Byzantine, and Fatimid fragments. This suggests that the burials in Tomb 2 date to some time between the 11th and 14th centuries AD. It also suggests a possible relationship between Tomb 2 and the nearby small church or chapel, and that both were associated with the religious site as a whole. Since 2002, the human material from this tomb has been inaccessible as it is on display in different churches throughout Jordan.

It seems clear that all of the five individuals found buried in the tombs were associated with religious structures in the area of the John the Baptist church. It appears that all were victims of infectious disease, a probable indicator of poor health conditions in the area. This may have been one of the factors that caused the site to be abandoned.

Acknowledgements

Special thanks go to Dr M. Waheeb, who headed the excavation team, and many others in the Department of Antiquities and Ministry



8. Tomb 2: North-south section drawing (top); present state of area of Tomb 2 (bottom). Dotted line marks level of burials. Arrow indicates position of Arabic inscription.

of Tourism and Antiquities. The author would like to express especial gratitude to Mr Riyadh Ghweri, site archaeologist, for his assistance during excavations, Mr Adeib Abu-Shmais, Department of Antiquities archaeologist, for examining the pottery and Eng. Dia al-Madani and Rustum Mekijian (Baptism Site Commission) for their professional assistance.

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THE GREAT FLOOD OF PETRA: EVIDENCE FOR A 4TH-5TH AD CENTURY CATASTROPHIC FLOOD

Tom Paradise

Abstract

Using palaeo-flood reconstruction techniques, it is speculated that a catastrophic flood occurred in Petra sometime in the 4th to 5th century AD. Evidence indicates that a low frequency *(p= 0.001-0.0005),* high magnitude event (4-6+ m surge, 3+ m/s velocity) would have devastated the city. Geomorphic characteristics were analysed including the (i) exacerbating channel configurations along Wādī al-Maṭāḥa, (ii) relict, extant alluvia of Disi-derived sediments along Wādī Mūsā (*in situ* exposed, and in excavations), (iii) missing pavers along the Colannaded Road that delineates the huge meanders produced during the event(s), and (iv) the location, morphology, and dimension of excavated flood-event alluvia flanking the channel of Wādī Mūsā.

Using fluvial reconstruction formulae (i.e. Manning and Chézy formulae), in conjunction with the examination of these extant features in Wadis Mudhlim, Maṭāḥa and Mūsā, palaeo-reconstructions of flood height and discharge, meander dimension, and velocity enabled the re-creation of the catastrophe. Dated strata excavated above and below the event deposits narrow its occurrence between the great earthquake of May 363 AD and the mid-5th century AD. Excavated Disi deposits along the Colonnaded Road (Rooms XXVII-XXX), indicate that the water depth and torrent extent created floodwater meanders of amplitudes exceeding 45-50m, with a related stream power of 3-3.3m/s (enough to move 1-2m boulders).

Suggestions of 'periodic' and 'episodic' flooding in Petra are common *(p: 0.1-0.01),* however flood levels that were catastrophic in nature, depth, velocity and turbulence *(p: 0.005-0.0005)* have not been addressed until today. Rushing floodwaters would have entered the Bāb as-Sīq at levels up to 2 to 3 meters in depth creating surging high water that would have found the northern channels of Wādī al-Mudhlim more suitable for flow. Water rushing down Wādī Maṭāḥa, would have accelerated from 0.5m/s to 1.1m/s to jump past the confluence at the Nymphaeum, to rejoin the waters in Wādī Mūsā, creating a fantastic 5-8m flood bore, accelerating to 3.3m/s along the Colonnaded Road. The water surged down the street leaving boulders, heaps of gravel and pebbles in its wake. The road would have been blanketed by 2 to 5m of sediments. The lower city centre along Wādī Mūsā would have been devastated, requiring months to years to remove the massive accumulations of boulders, gravel, sand, silt and clay.

Introduction

Early visitors and explorers in Petra frequently wrote accounts of indications and evidence of flooding along Petra's wadis, Mūsā, al-Maṭāḥa, and Abū 'Ullayqa. Discussions of sediments, boulders, and alluvium found outside the valley perched and out of place are prevalent and markedly similar in description. These observations apply to all of Petra but more commonly for the Wādī Mūsā and the channels of the Bāb as-Sīq, al-Madras, and in the wadis, ath-Thughra, Maṭāḥa and al-Mudhlim. Montagu (1766), Burckhardt (1822, 1835), Stephens (1840) and LaBorde (in Croker 1836) describe possible floods, later elaborated by prominent scholars and visitors, including Brünnow and Domaszewski (1904-1909), Dalman (1908: 364), Libbey and Hoskins (1905), Kennedy (1925: 88) and Robinson (1930: 495).

When the noted Swiss explorer and geogra-

pher, Johann Burckhardt entered Petra in 1812, he wrote of the possibility of Petra's floods, in addition to its flood diversion weirs, and channelised irrigation systems. However, it is his discussion of the main channels and confluence of Wādī Mūsā and al-Wādī al-Maṭāḥa that may prove the most telling. As he exited the Sīq and walked past the theater, he rounded the bend to enter the Colonnaded Road to see, for the first time, the main valley of Petra. Astonished, he wrote

"… Here the ground is covered with heaps of hewn stones, foundations of buildings, fragments of columns, and vestiges of paved streets; all clearly indicating that a large city once existed here; on the left side of the river is a rising ground extending westwards for nearly a quarter of an hour, entirely covered with similar remains. On the right bank, where the ground is more elevated, ruins of the same description are also seen. In the valley near the river, the buildings have probably been swept away by the impetuosity of the [great] winter torrents." (Burckhardt 1822: 514).

These early travellers used terms such as flood, torrents, and deluge throughout their early reports to describe what appeared to be evidence for regular, episodic, and/or catastrophic flooding across the valley and surrounding area. Burckhardt (1835) explained that only very high water or 'winter torrents', could produce such scouring and ruination as witnessed along Wādī Mūsā and in the Valley.

These past and modern accounts (Fiema 1997; Joukowsky 1998: 390) of possible flooding in Petra explained the role of periodic or high flood stages along the primary wadis; flooding with recurrences at seasonal and episodic frequencies *(p: 0.05-0.001)*. The most commonly described high-water events indicate recurrence intervals measured in decades *(<0.005)* and not centuries or millennia *(>0.005),* unless use of words like 'deluge' were in fact, references to biblical flood magnitudes like those depicted in Genesis (7:17) (Stephens 1840). However, field observations and measurements actually indicate a higher water regime than seasonal or episodic floods – not high water that fills the channels to bankfull, but floodwater levels so high that the water would rush and surpass the channels to inundate the surrounding areas by two, four or even six meters (i.e. the Colonnaded Road, the South Portico, the Temenos Gate and the Qaṣr al-Bint).

The aim of this paper is to encourage discussion on the possibility of a catastrophic flood that may have razed and inundated the Colonnaded Road during the periods between Roman stabilisation and growth, and Byzantine expansion and reconstruction (Fiema 1998; Parr 1983). This discussion of the physical evidence and field observations will not address the impact of periodic flood events in Petra, but will explore the likelihood of a *catastrophic* flood; that is, a flood having an estimated recurrence of once every 1000-2000 years *(probability: 0.001-0.0005+)* and with flood stages that exceeded the Colonnaded Road pavement by 2-4m. Geomorphic field reconstruction indicates that Petra would have experienced a flood bore up to 10 m roaring down Wādī al-Mudhlim, rushing into Wādī al-Maṭāḥa, blasting into the confluence with Wādī Mūsā, to overrun the Nymphaeum and meander cataclysmically down the road from the Nymphaeum to the Roman Street shops and Temenos Gate, to rush past the Qaṣr al-Bint and drain down Wādī aṣ-Ṣiyyagh. The rampaging water would have left massive boulders up to 1-2m in diameter, strewn along its path with pockets along its upper limits (i.e. street shops, south portico and wadi banks).

Thus, the intent of this paper is to compile evidence for catastrophic flooding in Petra and to examine these observations using fluvial calculations and measurements, combined with conventional observations in arid-land, fluvial geomorphological research today (Graf 2002: 346).

Evidence and Observations

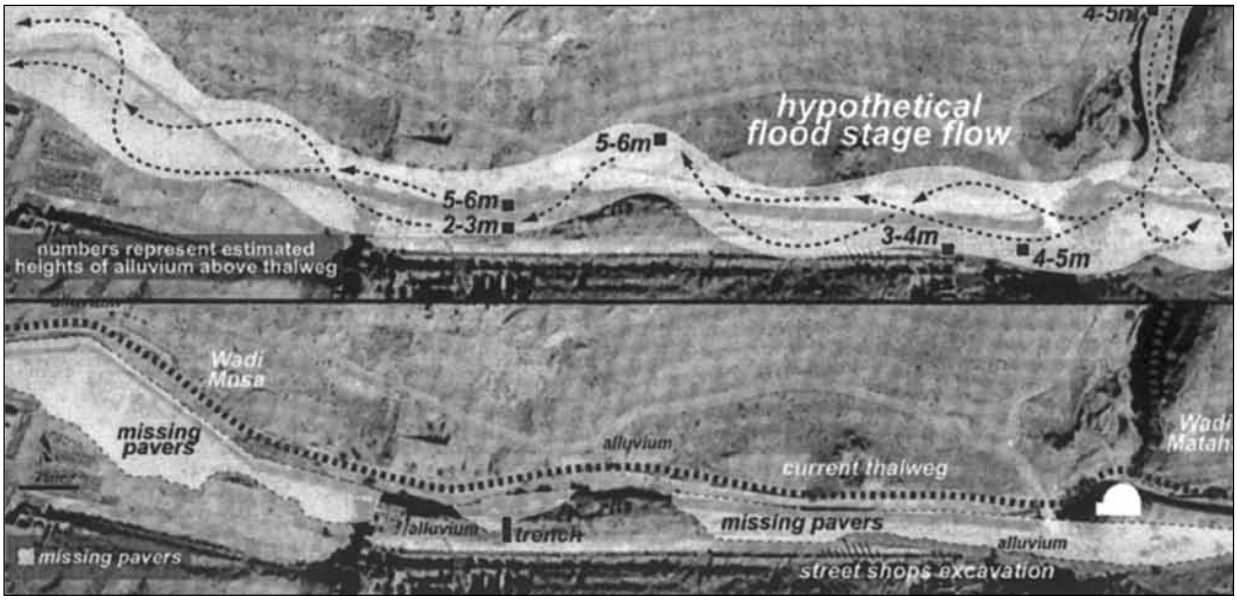
Without written records or documentation of a catastrophic flood(s) in Petra, a compilation of circumstantial evidence is needed in order to piece together the occurrence of a flood disaster hitting the city and/or the region. The work of geomorphologists (physical geographers) has been likened to 'gumshoes in natural settings' where empirical clues of past and present environments are observed, measured, compiled and integrated in the hope of better understanding natural processes and their rates, in the past and now (Mackinder 1887). One of the underlying

principles of the natural and social sciences is that natural process *rates* may change (i.e. climatic, fluvial, pluvial) but their mechanisms and influence rarely do. This concept is known as 'uniformitarianism' and is a fundamental principle of scientific method (Leopold *et al*. 1995: 544).

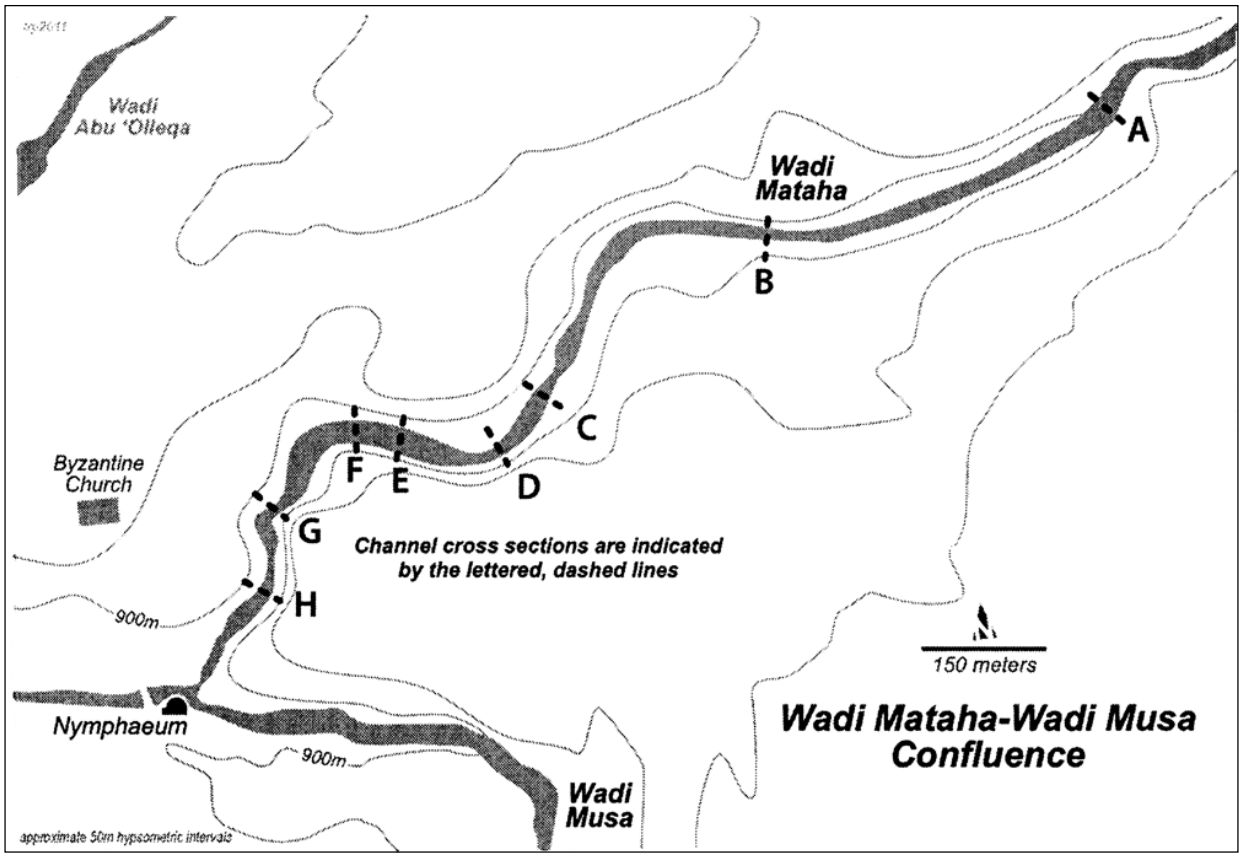
Over the past twenty years investigation of natural and anthropogenic influences responsible for the architectural deterioration in Petra (Paradise 1995, 2005, 2010) has indicated that the city centre was devastated, or at least inundated, by a flood that entered the city through al-Madras, the hewn tunnel at Bāb as-Sīq, Sīq al-Mudhlim, and Wādī al-Maṭāḥa. It appears to have entered Wādī Mūsā at its confluence at the Nymphaeum to flood the Colonnaded Road, zig-zagging along Wādī Mūsā to drain down the gorges of Wādī aṣ-Ṣiyyagh into Wādī 'Araba (**Figs. 1, 2**). The geomorphic clues to these observations include (i) channel configurations that exacerbate high-water conditions such flash floods and catastrophic events, (ii) pockets of remnant sediments found suspended high above the current wadi channels, or in excavations of alluvium contemporary to the flood, and (iii) the observation and distribution of missing pavers along the Colonnaded Road.

Channel Configurations

In order to better understand the rheology, that is, the open channel flow and hydraulic power of the water in the wadis around Petra, a number of channel profiles were measured and analysed. Fourteen channel cross-sections were made from the confluence of Wādī al-Mudhlim with Wādī al-Maṭāḥa, downstream along the reach of Wādī al-Maṭāḥa to its confluence with Wādī Mūsā (at the Nymphaeum). Eight of these channel cross-sections have been included in this paper due to their similar morphologies. Using *Trimble Juno* GPS devices, *Abney* and laser levels, measuring tapes, laser measuring devices, and *Nikon* digital photography, the channel shapes and dimensions were diagrammed to hectometer accuracy (5 cm) (**Figs. 2, 3**). In addition, the channel measurements were used in Manning's calculations to assess variations in channel flow regimes at varied flood heights. Water depths were ascertained using the heights of perched alluvial remnants along the wadi reach and calculations were made to determine high-flow stage and velocities. Ideally, the ages of this sediment deposition should have been determined to be contemporaneous, however it would have been cost and time-prohibitive to locate organic components for radiocarbon



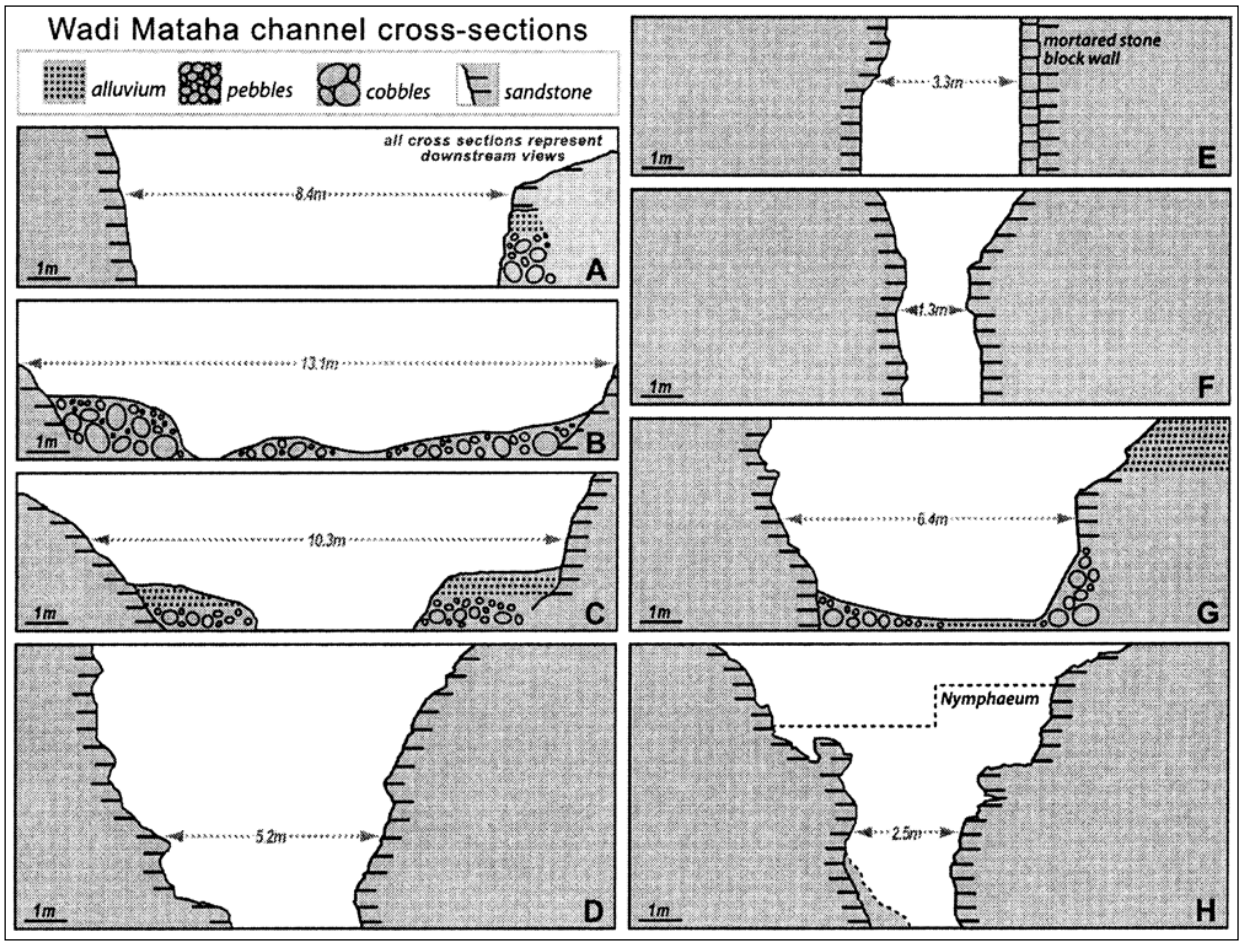
1. Aerial imagery of Wādī Mūsā from its confluence with Wādī al-Maṭāḥa and it drainage into Wādī aṣ-Ṣiyyagh. The diptych represents the duplicate images with the upper image illustrating the hypothetical catastrophic flood stage regime (6-8m stage), and relict alluvium heights noted above the channel thalweg. The lower image illustrates the area of (i) missing pavers, (ii) alluvium trench (Parr 1983), (iii) the location of the excavated street shops (Fiema 1998), and (iv) the current channel thalweg.



2. This map represents the extent and configuration of the wadi channels and confluence of Wādī al-Maṭāḥa and Wādī Mūsā. The confluence is marked by the location of the Nymphaeum (ca. 1st Century AD), where the wadi drains to the west (left). Wādī Maṭāḥa originates with the primary discharge diverted from the barrier dam and culvert at the Bāb as-Sīq into Wādī al-Mudhlim, passing into and through the hewn tunnel into Sīq al-Mudhlim and converging with Wādī Maṭāḥa to the east of Jabal al-Khubtha.

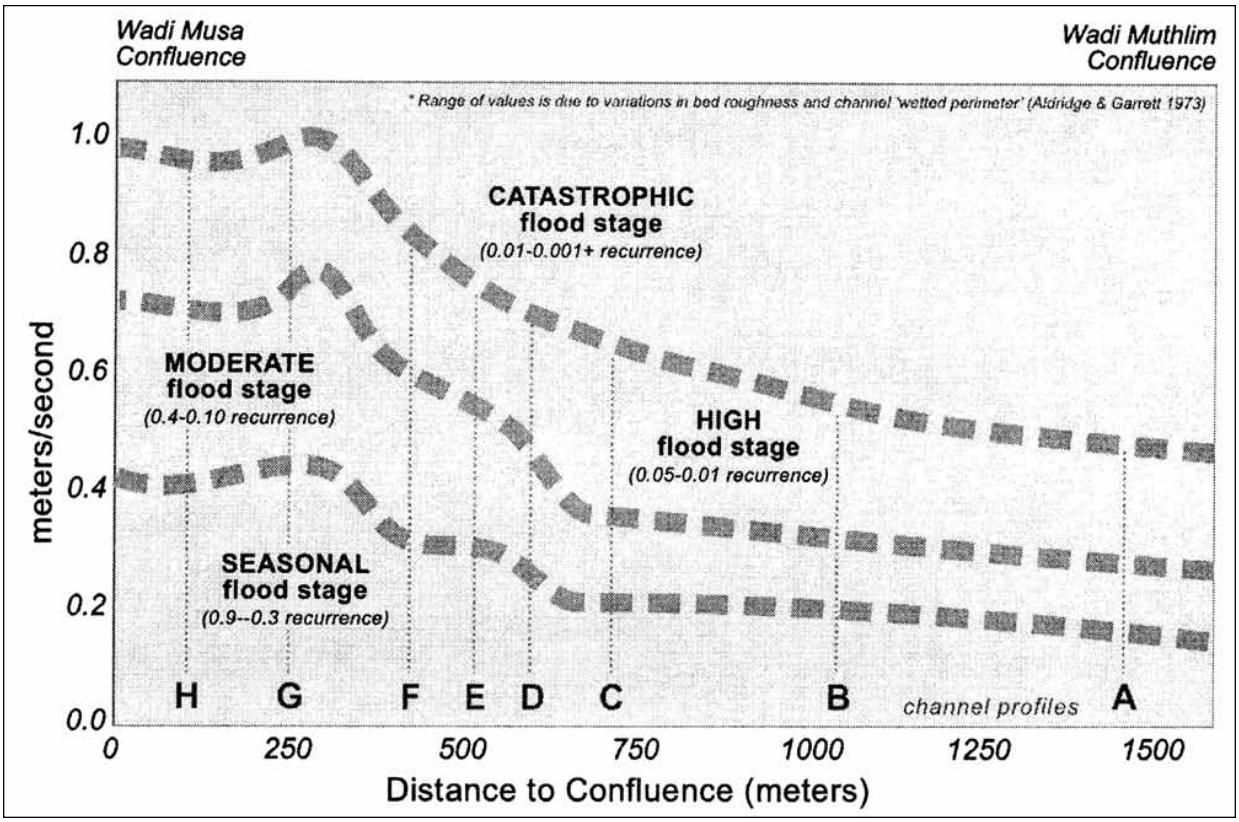
dating or optically stimulated luminescence (OSL) (Prescott and Robertson 1997). Hence, the greatest height above the channel *thalweg* (deepest portion of channel) was determined from the remnant alluvia and/or fluvially eroded features prevalent throughout Sīq al-Mudhlim and the narrow channel near the Maṭāḥa-Mūsā confluence. These heights (in metres) were used in flood stage and velocity determinations (**Figs. 3, 4**). The magnitude of the results was startling, supporting the occurrence of a catastrophic flood in this arid landscape of confined channels and sandstone banks.

The use of fluvial formulae in the analysis of palaeo-fluvial environments is conventional and proven in both prediction and reconstruction. Through the use of the Manning's Equation(s) (Leopold *et al*. 1995), calculations indicated that as water at various levels in Wādī al-Maṭāḥa moves downstream the channel narrows in width, forcing water to rise in depth and increase in velocity. To confirm this intuitive assessment, alluvium was observed and found higher and higher above the channel as the reach flows from its upper confluence with Wādī al-Mudhlim to its merging with Wādī Mūsā (**Fig. 3**). Assuming that the water source was being predominantly supplied upstream (at Bāb as-Sīq or above al-Maṭāḥa as stream input and/or rainfall), and not simply from above the channel in question (direct rainfall) we can estimate that the channel discharge (volume/time) remained relatively constant or a little-moderate increase. If this was the case, then water in the channel would have risen dramatically from channel narrowing, and would have increased in velocity – which was confirmed through the Manning's calculations (Barnes 1967). Velocity was determined to double from 0.2 to 0.4m/p/s (0.7 to 1.5kph) at the upper reaches (cross sections



3. This multiple diagram represents the various channel wall configurations between the upper reaches of Wādī al-Maṭāḥa near the opening of Sīq al-Mudhlim (A), down the wadi and passing below Dorotheo's House, Sextius Florentinus, and the Royal Tombs. Wādī al-Maṭāḥa enters a small 'Sīq' as it approaches the confluence with Wādī Mūsā (H) directly below the Nymphaeum along the Colonnaded Road. Flood stages must have exceeded 6 to 7m to 'jump' the Nymphaeum and flow across the Colonnaded Road (then and now). An additional 1-2 meters of flood stage (for a total of 7 to 9m) would be required to reach and deposit the 0.2 to 0.8m alluvial beds found in (i) the Roman Street Shops (Fiema 1998), (ii) the excavated trench at the Temenos (Parr 1983), and (iii) the remnant sediments and abrasion observed along Wadis al-Maṭāḥa, Mūsā and al-Mudhlim.
Note that the Wādī Maṭāḥa channel narrows as it nears its confluence with Wādī Mūsā. Also, fewer channel sediments are observed farther down the channel; the 'wetted perimeter' becomes increasingly slickrock and bare sandstone. This geomorphic constriction facilitates high flood risk by creating a 'hydraulic head' whereby water levels rise as discharge remains constant or increases (Graf 2002).

A, B, C) to 0.4 to 1.0m/p/s (1.4 to 3.6kph) along the lower reaches nearing Wādī Mūsā (cross section F, G, H). This increase in velocity would occur in conjunction with an increase in water depth (height), raising water levels three to four times. With a channel width nearly four times larger at A (at the Mudhlim), versus H (near the Nymphaeum), it is both verifiable and intuitive that a high to severe flood stage would breach the wadi wall at the Nymphaeum; a catastrophic flood event would not only surpass the channel bank, but would overrun the Colonnaded Road's flanking structures: the Roman Street shops, Great Temple, Pool Complex, *Propylaeum*, South Portico, Temenos Gate and onto the Qaṣr al-Bint. The flat area that we now see and walk along the lower portion of Wādī Mūsā (near the restaurants, museum and restrooms) would have been inundated with at least 2m, up to 5m of rushing water (based on Chézy, Manning models: Limerinos 1970). These fast-moving and deep currents would have created turbulence so great that it would have eroded road pavers and removed all road substrates – as currently evi-

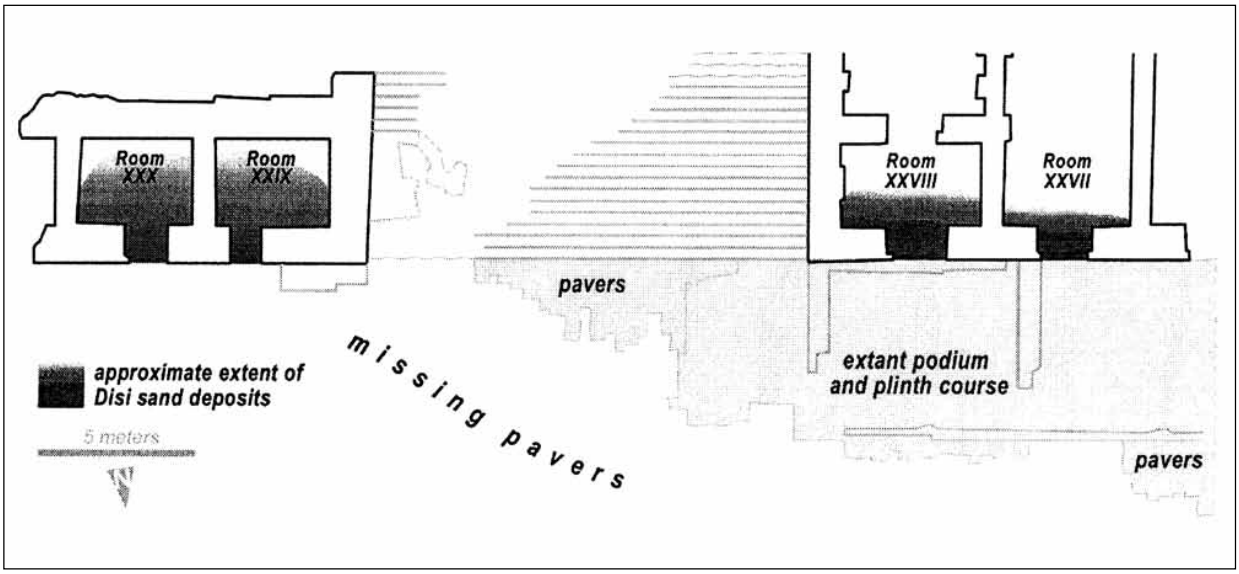


4. Manning's Equation (Leopold et al. 1995) is a conventional tool used in the calculation of stream velocity and flood levels; these were used in estimating flood stages in Petra's past. Using channel configurations, slope, and bed roughness it was estimated that water draining from Bāb as-Siq through the Tunnel, into Wadi and Sīq al-Mudhlim, and into Wādī Maṭāḥa accelerated as it reached the confluence of Wādī Mūsā and Wādī al-Maṭāḥa due to the narrowing of channel, channel wall changes from loose sand and gravel to slickrock, and a relative straightening of the channel reach. These graphs indicate that during various flood stages, the water not only increased in velocity two to three times (from 0.4 to 0.9 meters per second), but also doubled in height above the thalweg (3-5 meters) in moderate to high flood stages, but also trebled (6-9 meters) in those rare catastrophic flood events – having a flood recurrence interval of 500 to 1000 years (0.005-0.001). Moreover, meander wavelength reconstruction from the Street Shops (Fiema 1998) indicates that the floodwater velocity exiting Wādī al-Maṭāḥa would have trebled again to 3.0-3.3m/s; this would create destruction and havoc along the Colonnaded Road with up to 18-25 feet of water rushing down through Petra as it entered at the confluence of Wādī Mūsā with Wādī al-Maṭāḥa.

denced by the missing pavement stones (**Figs. 1, 5, 6, 7**). It would have also redistributed significant amounts of sediments from the upstream sediment reservoirs in channels, sandbars, and adjacent dunes, into the downstream channels and floodplains creating a lateral and distal deposition of sands, silts, and clays, to the vertical and graded relocation of clay, sand, gravel, pebbles, and boulders (**Figs. 1, 6, 7**).

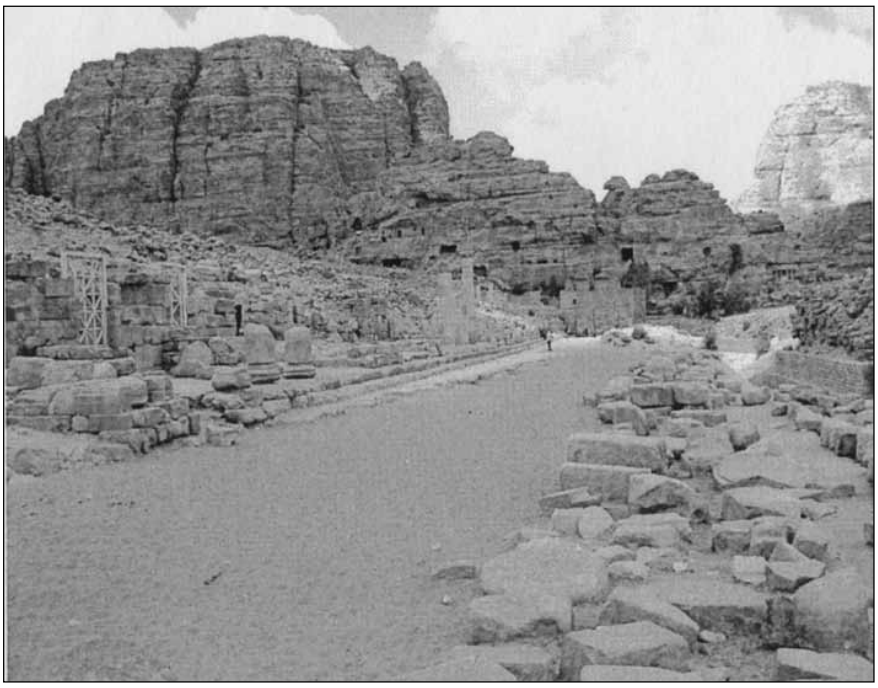
Missing Street Pavement

The most ubiquitous and yet obvious evidence of a catastrophic flood in Petra may lie beneath our feet. Aerial imagery and on-the-ground observation show huge areas of limestone pavers are missing from the surface of the Colonnaded Road from the Nymphaeum, past the South Portico, through the Temenos Gate, to the Qaṣr al-Bint. The missing paving stones are not arbitrarily missing (or stolen) but are absent in patterns that create broad arcing voids. These arcing forms undulate in configurations similar to a meandering stream channel, and in repeated, cyclic forms that further corroborate a fluvial influence. The largest swath of missing pavers occurs at the confluence of Wādī Mūsā and al-Maṭāḥa, to decrease downstream, flanking the reconstructed colonnade to its south. The pavement *lacuna* decreases towards the colonnade, to appear again near the Temenos Gate



5. This map represents the 'Roman' Street Shops excavated through the American Center of Oriental Research (ACOR) under the supervision of Dr Z. Fiema (1998). In the main room excavations of XXX – XXVII, sandy, silt and clay deposits were discovered that were all characteristic of the alluvium from the weather Disi Sandstones of Bāb as-Sīq, Jabal al-Khubtha, and Wādī al-Mudhlim. The existence of these alluvial deposits is indicative of their fluvial relocation and redistribution through the catastrophic flooding down Wadis al-Mudhim into Wādī al-Maṭāḥa, and into and across its confluences with Wādī Mūsā. Note how the arcing nature of the deposits and the missing street pavers represents the arc of a large meander. Such a large amplitude for a meander is indicative of high-flood regime discharge in these wadi channels.

6. Looking west and downstream along the Colonnaded Road and the channel and thalweg of Wādī Mūsā, the height of the alluvial sediments on both side of the channel are roughly 2 to 4 meters above the road pavement, or 4-6m above the channel thalweg. Both indicated alluvial layers would have been located on the outer bend of the flood stage meanders – the most common area for lateral and vertical flood stage deposition (Leopold et al. 1995).



7. Photograph looking west along the Colonnaded Road from the Nymphaeum to the Temenos Gate. The limestone pavers are missing between the excavated Street Shops (with green gated entries) and the wadi edge (the far right). However, the pavers are visibly in situ farther down the roadway towards the Temenos Gate (and trenched area of flood alluvium from Parr 1983). Note than the arcing form of the missing pavement follows a shape typical of a stream or wadi meander. The larger meander amplitude (width of meander arc) strongly suggests a dramatic increase in stream discharge, significantly greater than seasonal or episodic flooding.

and South Portico (**Figs. 1, 5, 6, 7**). So why do the missing Colonnaded Street pavers exhibit a pattern of *lacunae*, and not an arbitrary arrangement of missing and extent pavement stones? The proximity of the pavement *lacunae* to the wadi channel, and the characteristic arcing configuration all indicate that their removal was a function of fluvially-generated turbulence – a regular result of the violent power of high floodwaters, exceeding channels that are irregularly-shaped smoothed and weathered sandstone and confined, like those of Petra's wadis.

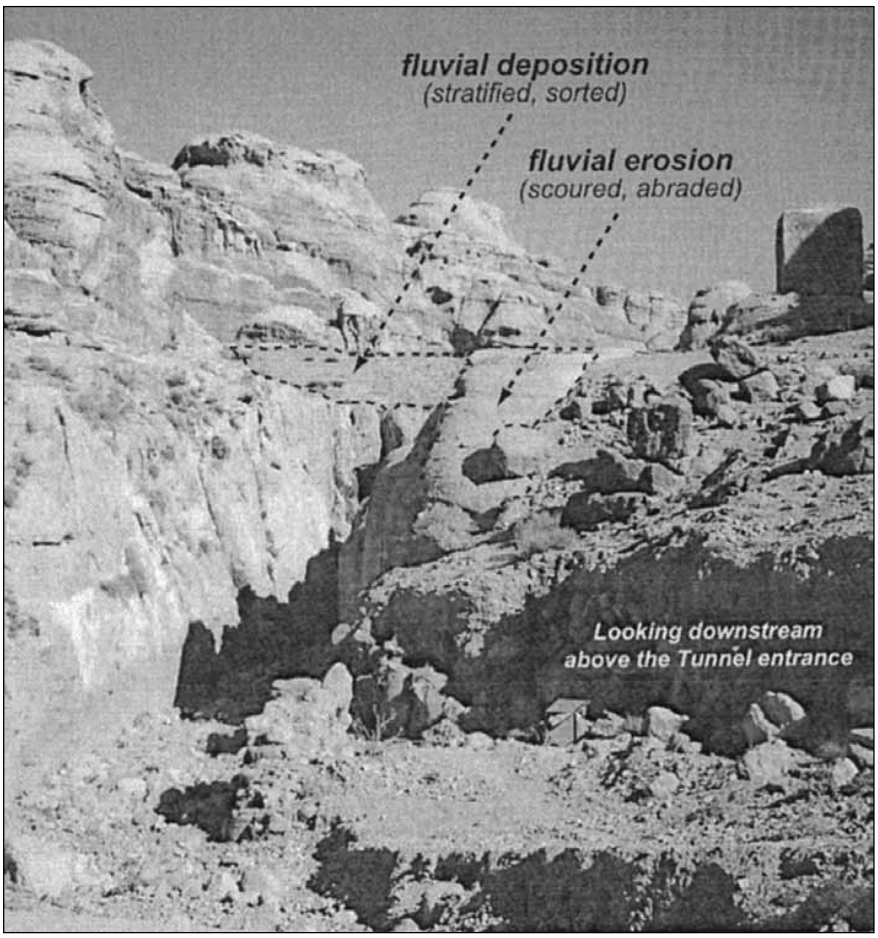
Redistributed and Relict Alluvium

During flood events, with the fluvial relocation of upstream sediments and alluvium into the downstream environments, also comes a noticeable redistribution of different sediment materials. The Disi sandstone represents Petra's overlying rock bed, easily seen across the region as the buff-coloured sandstone that comprises most of Jabal al-Khubtha, and the Djinn blocks and rounded rockforms at Bāb as-Sīq. Their buff and beige colouring marks their sharp contrast to Petra's lower reddish rocks of the Umm Ishrin Formation: dark-red, mustard, magenta, and brown tones made famous in J. W. Burgon's award-winning poem as 'rose-red'. It is these deposits of the Disi sandstone that can be found and observed across the main valley of Petra, mobilized above Wādī al-Mudhlim, to become transported into Wādī al-Maṭāḥa and into Wādī Mūsā below. Their buff-colour can be found as residual alluvium throughout the valley. As Burckhardt (1822) and Robinson (1930: 495) observed, the water channel to the north of the Sīq (through the tunnel and into Wādī al-Mudhlim) may have been a primary channel for practical purposes, as redirected and/or facilitated by early Nabataean and/or Roman engineers. Since the Sīq was the main thoroughfare into Petra, redirecting floodwaters from entering the Sīq was crucial to the well-being of Petra's commerce and society. Floodwaters draining towards the Sīq were diverted through the tunnel ultimately merging downstream with Wādī Mūsā at the Nymphaeum (ideally). However, if and when the culvert and weir diversion should fail, rushing water would (and indeed has) rushed into and down the Sīq. This was indeed the case in 1963, when 22 visitors died from flash-flooding. The floodwater depths in the Sīq were described as at least 4 to 5m (Time Magazine, April 19, 1963) yet the *Khazneh* was spared great damage and the floodwaters drained into the outer Sīq. After the disaster engineers decided to build a dam, weir, and culvert to mitigate against any flood recurrence, however they unearthed classical period structures (Nabataean?) that were used exactly for that purpose: to divert floodwa-

ters from Wādī Mūsā into Wādī al-Mudhlim at the Sīq's entrance.

Floodwaters exceeding 4 to 5m would have devastating effects anywhere in Petra, however in narrow, sandstone channels such as in Wādī Mūsā, Mudhlim, and Maṭāḥa, it would be disastrous and in confined spaces such as the tunnel, it would be especially high and dangerous. This would have been the case if a catastrophic flood(s) had devastated the main valley in the 4th to 5th century AD. Water would have been diverted past the Sīq to enter the tunnel, creating a 'hydraulic head' backing up to raise water levels behind the tunnel and subsequently over the tunnel. Slow-water areas would have experienced deposition (above), and fast-water areas would have experienced erosion and scouring (to the sides) (**Fig. 8**). Currently along Wādī al-Maṭāḥa, similar deposition may be found in areas of slower velocity upstream (broad flat, gravelly channels) and erosion and scouring may be observed in areas of high velocity flow downstream (narrow, high sandstone) (**Figs. 2, 3, 4**).

Farther downstream, perched pockets of Disi-derived alluvium can be observed along Wādī Mūsā in the main valley, indicating the fluvial transfer of sediments from upper Wādī Mūsā above the Sīq and Mudhlim above the Tunnel. At levels 3 to 6m above the channel thalweg, alluvia is found across from the Roman Street shops and Nymphaeum, and below the Byzantine Church and Temple of the Winged Lions (**Figs. 1, 5, 6**). Moreover and more importantly, is the discovery of Disi sandstone or mixed Disi-Umm Ishrin derived sediments in the excavations of Fiema (1998) and Parr (1960, 1983). In Fiema's excavations of the Roman Street shops (#40-38), buff-colored, undisturbed and non-occupation beds were found in Rooms XXVII-XXX. These were analysed and assessed by the author as part of the Roman Street Project in 1997 (Fiema 1998). Fiema describes them as 'uncleared sandy deposits' measuring 0.15 to 0.25m in depth (Fiema 1998), fronting Rooms



8. Looking towards the Tunnel at the confluence of Wādī Mūsā and Wādī al-Mudhlim, in the Bāb as-Sīq (Tunnel is beyond the shadows in the channel), you can see the remnant patches of fluvial deposition and erosion created by high water events. Discharge this great, and water stages this high represent a catastrophic event and not a seasonal or episodic flood stage. The height of both the scoured area and alluvium are the same at approximately 7-9m above the channel thalweg, indicating a flood stage similar in height to the event that created extensive deposition past the confluence of Wādī al-Mudhlim with Wādī Mūsā at the Nymphaeum. Also note the characteristic buff-color of the Disi Sandstone here, is markedly different from the dark reddish colors of the Umm Ishrin Sandstone in the Valley below.

XXV and XXVI and facing the wadi channel, decreasing in thickness with distance from the *thalweg*. The bed colour, uniformity, composition, graded structure, and particle distribution indicates that they were deposited through the bankfull flooding and fluvial deposition of the adjacent wadi (to the north) and derived from the Disi sandstone upstream and beyond the confluence of Wādī al-Maṭāḥa and Wādī Mūsā (**Fig. 9**). During the excavation period, analysis of these non-occupation beds was made for particle size, type and distribution, graded structure and colour. Fiema (1998) identified the various locations of the salt-silt deposits with the assessment by the author in 1997:

"Two columns are located in that gallery, standing directly against the north face of Wall BB… with the bases of these columns being under the uncleared sandy deposits. It appears the columns are in situ" (Fiema 1998: 411).

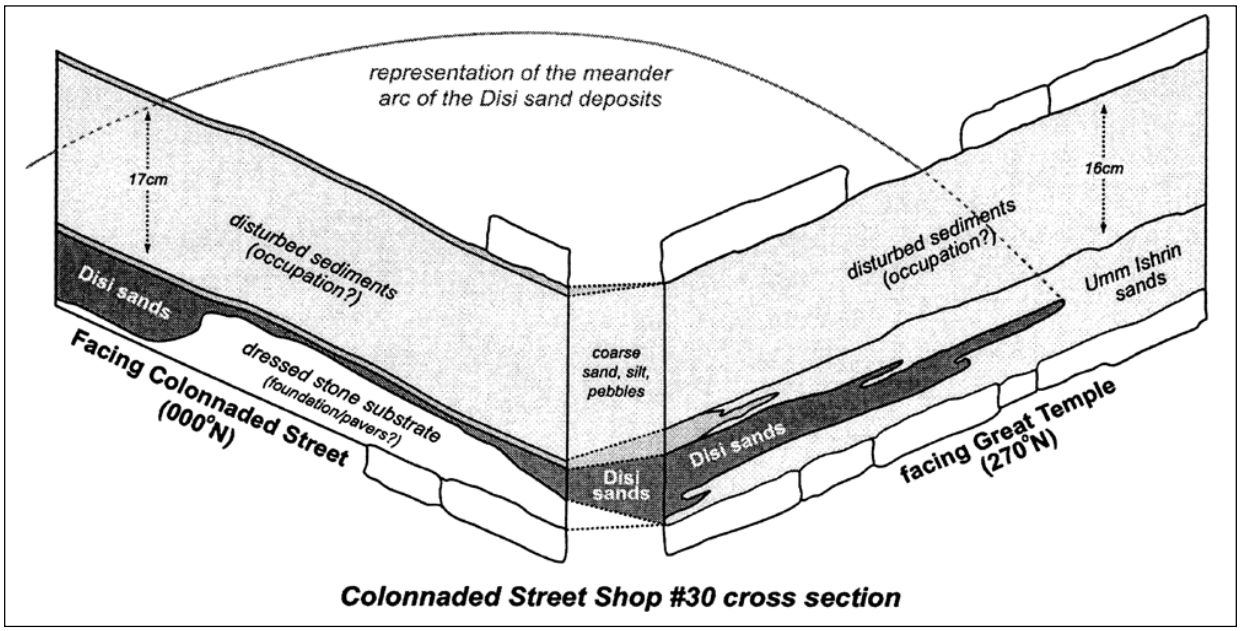
"A layered deposit of sand and coarse clayish-silt, ca. 0.15-28 m deep… characteristic of flood event morphology, contained four coins… pre-AD 363 period. This layer was covered by a very heterogenous layer of silt with an abundance of cultural material (57 coins, 13 post 363 AD issue). It is possible that the final occupation (was) before the flood… but might have happened sometime in the early to mid-fifth century AD… followed by the collapse of the arches. On the other hand, it is possible that the coins belong to two completely separate phases of occupation, isolated from each other both spatially and temporally by the flooding incident" (Fiema 1998: 413).

"… in the adjacent room, the alluvial, flood-related sand and gravel was found deposited directly over the beaten-earth floor. Out of the 44 coins, 14 were minted after AD 363" (Fiema 1998: 416).

"… the alluvial character of the lowermost deposits is common everywhere within the excavated area" (Fiema 1998: 417).

"Traces of the ancient meandering of the wadi banks were noted in Room XXVII. Post-earthquake (May 363) occupation, possibly interrupted by a flood episode, continued until the mid-fifth century AD" (Fiema 1998: 418).

Not only do Fiema's references to the Disi sandstone deposits ascertain the depth, extent



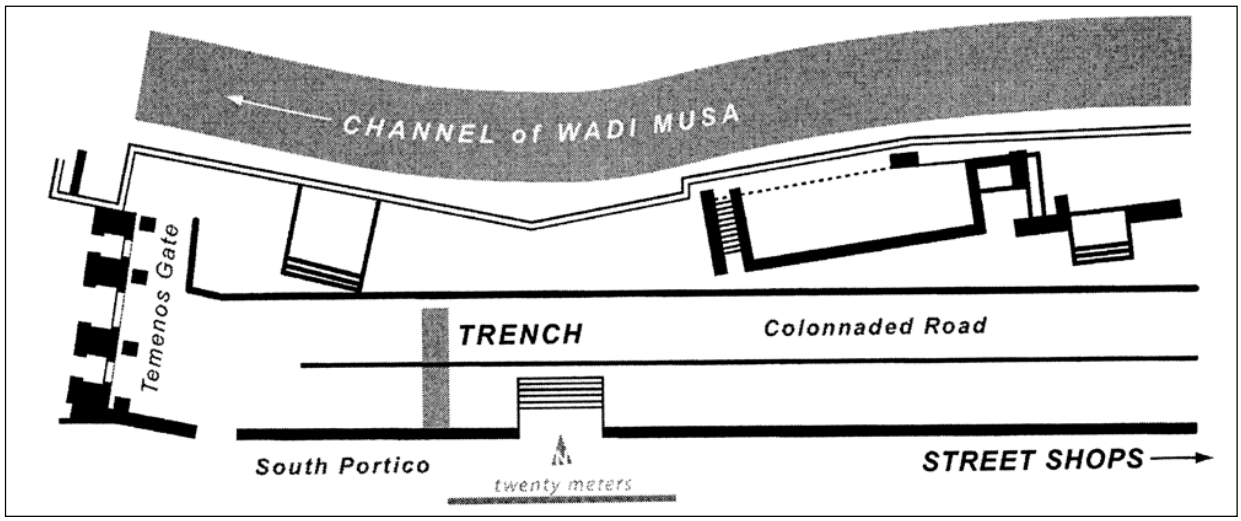
9. These two cross section profiles represent two documented excavations at the Street Shop #30 along the Colonnaded Road. The left-hand profile was excavated facing the Colonnaded Street (~000°N), while the right-hand profile was found during a sondage excavation within the shop, extent aligned with the western wall (~270°N). Note the light-colored sands from the Disi Formation (from the Bāb as-Sīq) were unearthed here and can be found decreasing in extent with distance from the street and wadi channel. Their occurrence and distribution indicate a lateral and vertical deposition from Wādī Mūsā, via Wādī al-Maṭāḥa, via Wādī al-Mudhlim. Local deposition would consist primarily of the Umm Ishrin sandstone particles; a distinctive darker red color, rather than the lighter buff colors of the Disi. These profiles were measured, assessed, and documented by the author during the excavation field season (Fiema 1998).

and locations of the relocated Disi sands, but when examining the soundings (sondage), Fiema and the author were also able to observe the arcing nature of the deposits (in Room XXVII) indicating their origin as the outside arc of an 'ancient meander' (Fiema 1998). However often the term episodic has been used to assess possible flood frequency in Petra by assorted visitors and researchers, it must be noted that a dryland flood that creates a 3-5 m over-bankfull discharge in a wadi like al-Maṭāḥa or Mūsā (relatively small, with alluvial and sandstone channels) would not be a seasonal or 'episodic' event at all, but one severe or catastrophic (Leopold *et al*. 1995). When looking at annual flood stages in Petra and the region, and talking with local B'doul and Wādī Mūsā residents, a flood bore of 3 to 5+ m is unique and most probably never seen in Wādī Mūsā. In these wadi channels such a flood event represents a disaster of epic proportions, that is, a 1000 to 2000+ year event.

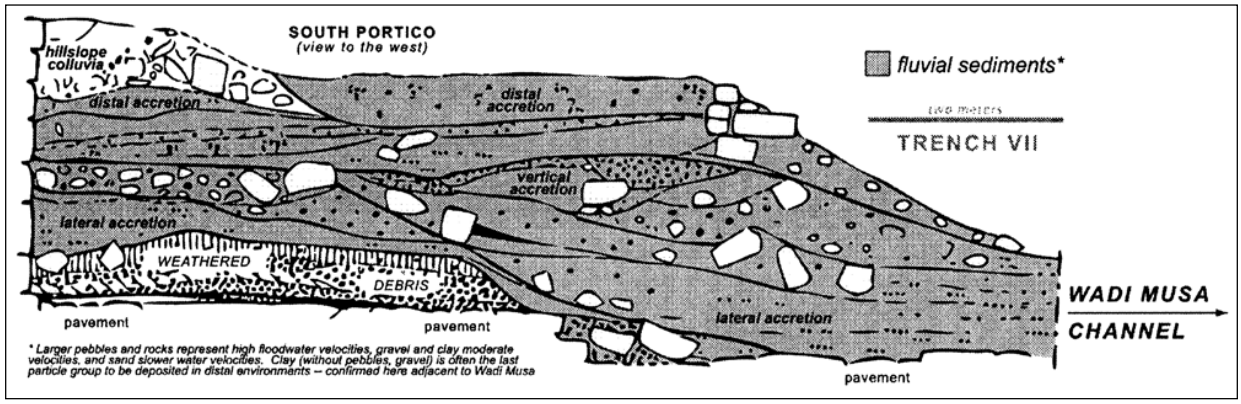
By using conventional calculations for flood morphology, stream velocity can be calculated by assessing slope, meander size, and fluvial constants. Based on modifications to Chézy and Darcy-Weisbach calculations (Bjerklie 2007), flood-level velocities that would produce such a broad meander (45-50 m wavelength) would be rushing at approximately 3.0 to 3.3 m/s, or three times greater than what would be considered a severe or catastrophic flood (Kleinhans and Van der Berg 2010) (**Figs. 4, 5**). The flood that produced the excavated meander deposits in the Roman Street shops was no episodic or high flood but rather one that was catastrophic in Petra's city and must have dramatically affected its society and economy. The turbulence produced would have lifted the pavers as well, before the decreasing floodwater depths and velocities began to deposit its bedload of boulders, gravel, sand, silt and clay from the Disi sandstone above and the neighbouring Umm Ishrin sandstone below. What is unusual in this reasoning, and creates new questions, is why the deposits found in the Roman Street shops comprised only Disi sands and not a combination of Disi and Umm Ishrin sands? Such a wall of rushing water is entraining and transporting bed materials as it rushes down the wadis. So, why are the non-occupied, sandy beds comprised of what appears to be solely the Disi sands from Wādī al-Mudhlim and upstream? One reason seems clear; that the first flood bore was filled and buoyant with the Disi sands. The calculated floodwater velocities in Wādī al-Maṭāḥa at 0.7 to 1.0+ m/s (**Fig. 4**) would have been ideal for the entrainment and transportation of sands. Once the flood bore rushed from Wādī al-Maṭāḥa, upon merging with Wādī Mūsā at the Nymphaeum, the increasing velocities (~3 m/s) would have been able to mobilize massive boulders one meter or more in diameter (Leopold *et al*. 1995), in addition to the unbridled destruction that would be sustained from such sediment, pebble, and boulder-filled rushing water. Therefore it is speculated that the first floodwave was filled with entrained Disi sands, violently rushing down Wādī al-Maṭāḥa to deposit its bedload upon its abrupt stop at the walls of the Roman Street shops across from the Nymphaeum (**Figs. 5, 9**). The sharp decrease in velocity would have been sufficient to cause the rushing water to drop its sediments of the Disi sands upstream (near Rooms XXVII-XXX).

In Parr's notable excavation of the Colonnaded Road at the South Portico and Temenos Gate (1983), his cross-sections clearly show the occurrence and particle distribution of similar fluvial deposits. Not only do these sediments indicate typical lateral and vertical fluvial deposition but they also exhibit a distance decrease from the wadi, thinning in thickness with distance from the current *thalweg* (**Figs. 10, 11**). This supports the hypothesis that these were Disi sands carried by the rushing floodwaters to be deposited along the Colonnaded Road at depths up to 2 to 4m above the paved surface, and 4 to 7m above the channel *thalweg*. The distance of these beds from the wadi *thalweg* also matches those of the deposits unearthed in Rooms XXX-XXVII. This corroborates the calculations that suggest the water was indeed rushing, turbulent, and fast moving upon exiting the narrows at the confluence of Wādī al-Maṭāḥa into Wādī Mūsā. Such a fast-moving bore may have topped the bare sandstone facing the Nymphaeum to blast over and onto the roadway to rush in sweeping meanders down the wadi channel, sloshing from the South Portico to the valley wall and back until it exited down Wādī aṣ-Ṣiyyagh.

The thickest portion of the cross section alone



10. This map represents the location along the Colonnaded Road of the trench that exhibits the flood alluvium, excavated by Parr (1983). The configuration of the current bank, drainage geomorphology, and thalweg indicate that the current channel form and thalweg are the same or close to the channel form 1500 to 2100 years ago, however channel revetments and channel walls have been reconstructed and/or constructed in recent years. Note that the trench was located at the southern edge of the outside bend in the wadi meander – the area that would experience the greatest bank breach and out-of-bank deposition (both vertical and lateral accretion).



11. This map represents a cross section of the sediments excavated along the Colonnaded Road by Parr (1983). The indicated sediments are typical of fluvially-deposited sediments (alluvium) probably due to the flood event deposition along Wādī Mūsā, from drainage into the confluence via Wādī al-Maṭāḥa. This alluvium measures 3m (10') in depth atop the pavement, and 5m to 6m (16'-19') above the wadi thalweg (deepest part of channel). At a point where the current channel is 2 to 3m below the road, these sediments represent a flood stage of up to 6m or possibly up to 7m (19'-22') – a stage that matches fluvial sediments along Wādī Mūsā, its upstream confluence at the Nymphaeum, and the Wādī al-Maṭāḥa reach upstream.
Note that lenses of clays, silt and sand are interbedded with large boulders and gravel indicating a series of pulse of high velocity (2-3m/s) and low velocity water (<1m/s). Meander amplitude reconstruction from the Street Shop excavation (XXVII-XXX) indicates that the flood velocity was able to entrain and transport boulders 1-2m in diameter.

represents a minimum depth of 3-4m above the road pavement (Parr 1983), and 5 to 6m (16-20') above the adjacent channel *thalweg*. Flood-derived alluvia only represent the lower water levels, so 6m sediment depths would mean at least 6m of water depth (possible up to 8m water stage). This means that all of lower Petra would have been inundated for hours, only to recede leaving behind 4 to 6m of clay, gravel, sand and boulders strewn and cluttered across the city. What would have followed would have been a monumental task of sediment removal, and the similarly monumental task of 'kick-starting' social order and Petra's economy following the deaths, injuries and damages sustained from such a natural tragedy.

Summary

The aspects of the (i) unusual channel configurations along Wādī al-Maṭāḥa, (ii) relict allu-

via of Disi-derived sediments along Wādī Mūsā (*in situ* and in excavations), and (iii) the missing pavers along the Colonnaded Road, all represent robust evidence, however circumstantial, of catastrophic flood(s) that have left clues and evidence across Petra. Using conventional fluvial reconstruction techniques (i.e. Manning, Chézy), in conjunction with the examination and assessment of various relict, and extant landscape features in Wādī al-Mudhlim, al-Maṭāḥa and Mūsā, palaeo-reconstructions of flood height and discharge, meander dimension, and velocity enabled the re-creation of a probable catastrophic flood in Petra's late Roman-early Byzantine history (Leopold *et al*. 1995). Suggestions of 'periodic' and 'episodic' flooding in Petra are prevalent *(p: 0.1-0.01),* however flood levels that were catastrophic in nature, depth, velocity and turbulence *(p: 0.005-0.0005)*, have not been addressed until today. It was the intent of this research to stimulate a new discussion on this probability of a significant and historic flood, with a new perspective on the occurrence of undisturbed, buff to yellow-coloured silt/sandy deposits observed and/or unearthed in areas that indicate a 4th to 6th century AD deposition. The location of the sandy lenses and layers in the Roman Street shops excavation indicates a deposition after the Great Earthquake (May 19, 363), up until the mid-5th century (363-450 AD) (Fiema 1998).

In this scenario reconstruction, the floodwaters would have accumulated upstream above the Bāb as-Sīq, most likely in the village of Elgee (Wādī Mūsā today) due to the torrential rainfall and/or rapid snowmelt. Flows of water would have joined in the main channel(s) to enter the Bāb as-Sīq at levels up to 4 to 6m in depth. Downstream accumulation of discharge would have created a torrent that entered the Sīq (to some degree), but found the northern channels of Wādī al-Mudhlim more suitable for flow. If the channel of Wādī al-Mudhlim 1500-2000 years ago was similar to the channel today, its relatively sediment-free, sandstone channel was superlative for exacerbating accumulating floodwaters. As the water rushed down Wādī al-Maṭāḥa, it would have accelerated from 0.5m/s to 1.1m/s, to jump the confluence at Wādī Mūsā, spreading across upstream, pouring across and down the street, accelerating again to 3.3m/s. This increase in floodwater velocity was probably due to the merging of water rushing through the Sīq, into the outer Sīq and into the primary channel of Wādī Mūsā at the Theater. The fast waters from Wādī al-Maṭāḥa would have been thick with Disi sand, silt, and gravel, merging with torrents flowing though the Sīq that were choked with the beige, yellow, brown, and reddish sands the lower sandstones. These surges would have reached 5 to 8m in depth, and created 50m meanders across Petra's main valley, while the water zig-zagged down the Colonnaded Road leaving boulders, heaps of gravel and pebbles in its path. Everything along the road would have been covered in 2 to 4+ m of clay and silt, jumbled and mixed clay, silt and boulders at first, then grading upward into finer and finer beds of sand, silt and clay as the floodwaters receded.

Petra's everyday activities would have come to a complete standstill. Injuries and destruction would have been widespread and depending on the time of day numerous deaths could have resulted. The evidence is clear and connected, however to better determine its date and span of occurrence further excavation and observation is required. So, why the flood does not appear in local or regional historic records is a mystery, unless it occurred as a function of the great earthquake (363 AD), or occurred so close in time, that it was lost in the blur of devastation. Dams, weirs, and flood diversion structures (Bellwald 2007) may have been so ruined that Petra's community had no means to protect itself from desert downpours. Perhaps the flood occurred within months of the earthquake devastation. It would have taken years for Petra to recover from the earthquake alone, so a torrential downpour occurring the following winter or spring (364 AD) or in the immediate years to follow, is not out of the question.

The value and importance of interdisciplinary research here is obvious; the need to link archaeological expertise, historic research, geographic geomatic work (cartography, remote sensing, and GIS) with geomorphologicial training and observation is paramount. This paper represents a beginning from which more observation, excavation, field research, and archival work may yield further information and clarity on the probability of this disaster – a first step in elucidating the likelihood of a Petra Great Flood between 363 and 450 AD. George Bernard Shaw

said it best when he wrote "Science never solves a problem without creating ten more" (1935).

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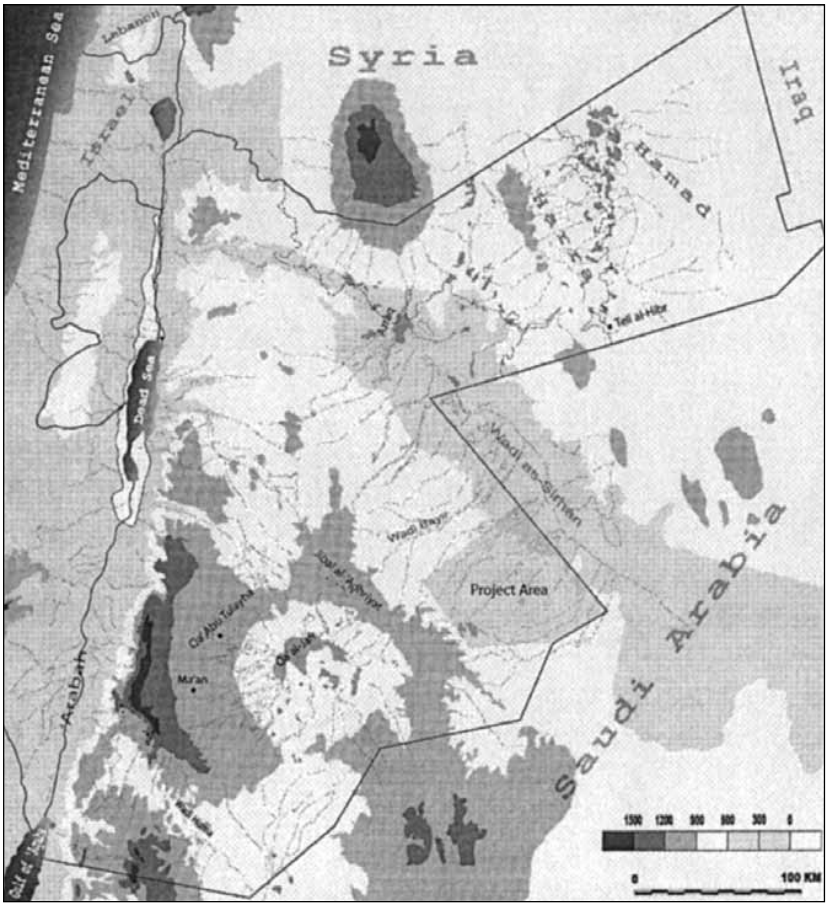
THE EASTERN BĀYIR ARCHAEOLOGICAL PROJECT: PRELIMINARY REPORT ON THE 2004, 2005 AND 2009 SURVEY SEASONS

Mohammad B. Tarawneh and Fawzi Q. Abudanah

Introduction

Until recently our knowledge of the vast area covering more than 16,000 km^2 in central and eastern Jordan between al-Jafr and Wādī as-Sarḥān was very limited. The Bāyir region is separated from al-Jafr by the surrounding al-ʻĀdhriyāt hills, and from the basalt Ḥarra region in the north by the Sirḥān depression. This harsh and hostile region has a diverse landscape, which includes mudflats, the rough and rocky region of Fkūk and flat areas strewn with flint. Most of the region is dissected by wadis which run north-east into Wādī as-Sarḥān. Throughout the Bāyir region there are surface scatters of calcareous-siliceous detritus, which are comprised predominantly of sharp flint (Bender 1974: 6). The eastern Bāyir region, where this project was conducted, is covered with flint except for small areas such as the scattered mudflats of the Qīʻān as-Sīq region. Traditionally, this region is known as *Arḍ aṣ-Ṣuwwān*, or Flint-strewn Land (**Fig. 1**).



1. Map of Jordan showing the location of the survey area.

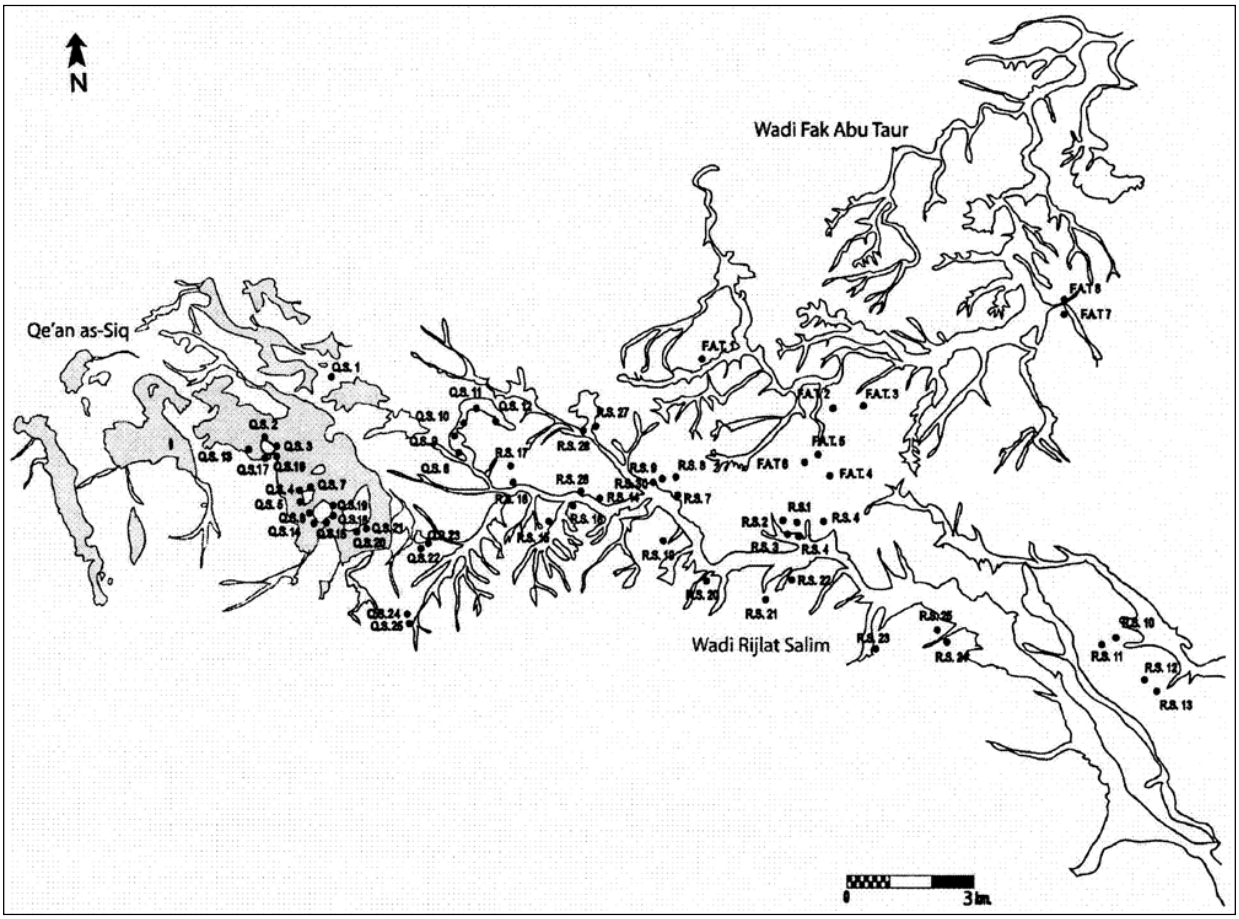
This region was chosen for the survey for a number of reasons. In the first instance, virtually no work has been conducted in the area, which has led to a gap in our knowledge of the archaeology between north-eastern and south-eastern Jordan, as well as north-western Arabia. Secondly, in a region as vast and diverse as this it is often difficult to identify archaeological potential; the suitability of the region between al-Jafr and as-Sarḥān for archaeological work thus favoured the undertaking of this project. Thirdly, recent archaeological activities in the surrounding region have brought to light substantial discoveries relating to many periods, in particular the Chalcolithic (Quintero *et al*. 2002). The final reason is that there is excellent preservation of desert sites that lie away from intensive human activities.

Fieldwork was undertaken over three seasons from late September to mid-October in 2004, 2005 and 2009. The first season was mainly concerned with an initial exploration of the region to locate and quantify concentrations of sites for further systematic survey in later seasons and for future research. The north-eastern part of the region was explored first but resulted in the discovery of very few sites. Large concentrations of sites were, however, located in the Qī‘ān as-Sīq, Rijlat Sālim and Fkūk regions (**Fig. 2**). The focus of the second season of the survey therefore, was the excavation of test squares in different sites and regions in order to obtain stratified material and carbon samples. Systematic field walking was carried out at Rijlat Sālim and Fkūk, whereas a vehicular survey was carried out at Qī‘ān as-Sīq because the area consists predominantly of dry mudflats and thus visibility in the region was good.

Sites were designated on the basis of having structural remains. These were mostly domestic and animal enclosures, *rujm* (cairn) sites and water pools.

Site Location

Sites in the eastern Bāyir were mostly located



2. Map showing the distribution of recorded sites.

on slopes or edges of terraces. One example, RS 25 was situated on the eastern side of a hill close to its summit, but even in this case it was sheltered from the prevailing westerly wind. All other eastern Bāyir sites were located on terraces above wadis in places which offered good shelter from westerly and northerly winds. The terraces provided easy access to stones for the construction of corrals and other features, making the task of building easier. There is no consistency in the distance of sites from wadis and it appears that site location depended more upon the availability of building material and terrace locations which offered good shelter. In the case of RS 28, the site is located only a few metres from the main wadi course, but in most other instances the wadi is a few hundred metres from the site.

In contrast, *rujm* sites were mostly situated on hilltops, for example several sites at Qī'ān as-Sīq, where two pools were recorded. No permanent water resources have been identified in this region today and it is likely that the rain pools or *ghudrān* were the main watering places. There appears to be no particular pattern of spatial distribution or function which would explain why sites at Qī'ān as-Sīq were situated in locations facing the westerly winds (e.g. QS 6). These sites would only have been comfortable in warm seasons when the westerly wind was not strong.

The location of sites in the eastern Bāyir region is similar to contemporary sites in other desert regions of the southern Levant. Chalcolithic sites in the Sinai Peninsula were built in sheltered areas overlooking wadis which provided them with pasture (Rothenberg 1971: 13), e.g. sites around Rahaya (Sinai 1, 4, 60, 23), Ghoweil (Sinai 14 and 16), Tabieq (Sinai 32, 37, 38, 39) and Maaleq (Sinai 51, 54, 55, 56 and 57) (Eddy and Wendorf 1999), and sites 1180 and 1133 in south-central Sinai (Beit-Arieh 2003, 376). Most of these sites consisted of single or several large semi-circular structures with additional smaller internal or external annexes. These structures are similar in size to those from eastern Bāyir, which range from a few meters up to 40 meters in some cases. The larger of these structures were suggested to be animal enclosures and the smaller ones domestic spaces, while the annexes have been interpreted as storage facilities because of their small size. Similar internal partitions have been recorded at sites in Sinai (Bar-Yosef *et al*. 1986; Beit-Arieh 2003: 376; Eddy and Wendorf 1999: 121).

Equally, a number of sites in the Negev have been identified which are similarly located in sheltered areas overlooking the wadi beds and comprise similar structural remains, consisting of large and small semi-circular structures with small annexes. These have been interpreted as seasonal activity sites used by pastoral nomads (Alon and Levy 1980; Gilead 1992; Gophna 1979; Levy 1983; Rothenberg 1971). Examples of these are Nahal Sekher 102 and 104 (Gilead 1992, 33) and the Nahal Besor sites (Gophna 1979; Levy 1983). Other sites similar to those identified in the survey have been recorded in the Ḥismā region of southern Jordan. These were also located in sheltered areas and were characterised by circular structures and enclosures, for example al-Jill (Henry 1995). Quintero *et al*. (2002) recorded sites comprising semi-circular structures with some upright slabs and some divisions in the region of al-'Ādhriyāt. These were located in sheltered areas overlooking the wadis. The authors linked them to the flint mining industry in the same area. Similarly, Qā' Abū Ṭulayḥa is also located near the wadi course (Fujii 1998: 124).

Surveyed Areas

Wādī Fak Abū Ṭur begins its course north of Wādī Rijlat Sālim and a few kilometres to the northeast of Qī'ān as-Sīq. The wadi continues toward the north-east with tributaries such as Wādī Umm Laḥm branching off from both sides. The wadi crosses the border with Saudi Arabia towards the as-Sarḥān depression. Eight sites (AṬ 1- AṬ 8), were recorded in the Fak Abū Ṭur (FAṬ) locality. All were located at the base of a low terrace or plateau and face a wadi tributary or the main wadi.

Wādī al-Abyaḍ runs south-west to north-east, beginning its course in the area between Fak Abū Ṭur and Rijlat Sālim in the south-west, and continuing its course towards as-Sarḥān depression. The wadi starts one kilometre north of Rijlat Sālim as a smallish flow of water, gradually increasing in width further north after meeting with tributaries flowing in on both sides. Wādī al-Abayyaḍ is one of the main tributaries for Wādī al-Abyad. Wādī al-Abayyaḍ is shorter in its course than al-Abyaḍ

and joins al-Abyaḍ approximately 13 kilometres from the border with Saudi Arabia. The area surrounding Wādī al-Abyaḍ, particularly in the north, is flat and easy to move across, in contrast to the harsh area of Fkūk. Occasional small hills found in this region are visible from a distance because of the flat landscape. The al-Abyaḍ sites lie between the wadi in the west and the international borders in the east and south. Three sites have been recorded near Wādī al-Abyaḍ. One of them is of an indeterminate period and consists of a line of small *rujum* separated from each other and making a 'pendant' shape. These have been described as burial cairns in Arabia (Abu Duruk *et al*. 1983: 111) possibly for the inhumation of high status individuals (**Fig. 4**). Indeed, a burial was found in a large *rujm* in the 2009 season. In contrast, the diagnostic sites were similar to other sites which were recorded during this survey in the area between Fak Abū Ṭur and Rijlat Sālim.

The area of Qi'ān as-Sīq lies approximately 40 kilometres west of the Desert Police fort at Mushāsh Ḥudruj, west and south-west of Rijlat Sālim and north of Wādī Ḥudruj near its source in the west. Small Qī'ān are scattered in many different places. The area also contains many low hills or *qwairat*, which break up the flatness of the Qī'ān. The area of Qī'ān as-Sīq is higher in altitude than the other surveyed sites, ranging between 866 to 889m above sea level.

Twenty five sites (QS 1-QS 25) were recorded in the Qī'ān as-Sīq locality in the eastern area near Rijlat Sālim in the centre of the Qī'ān. All of the sites discovered in this region are located on the edge of hills or terraces, as are other sites in the region. Interestingly, some of these sites face west and north and are exposed to the wind, while in other regions they were built mostly in sheltered areas. These sites are similar to the sites discovered at Rijlat Sālim and the other surveyed regions. They consist of circular and semi-circular structures which were used apparently as animal enclosures by pastoral nomads. No pottery was discovered at these sites during the survey.

The area of Rijlat Sālim is important because of the Wādī Rijlat Sālim, which has attracted bedouin since the late Ottoman period and was a camping destination for the Abu Tayih tribe of the Ḥwaitat. The great sheikh 'Awdah Abu Tayih camped at Rijlat Sālim most years. This leader and his large tribe were attracted to the area because of its pasture and green wadis. In recent years bedouin have been seen camping at Wādī Rijlat in late summer to take advantage of the dew which supports the wadi shrubs and early rainfall. Wādī Rijlat Sālim is one of the few wadis which run in a west to south-east direction in the region. Wādī Rijlat Sālim is supported by small tributaries especially from the south. The Rijlat Sālim region does not have a rough landscape, although it is not as flat as the Qī'ān as-Sīq area.

A total of thirty sites were recorded, all lying on the wadi banks in the south and north. These sites were located close to edges of terraces or hills, taking advantage of shelter from the wind. All sites overlook the Wādī Rijlat Sālim apart from RS 15, which lies on the western bank of the largest tributary of Rijlat Sālim. Site RS 16 is a water pool from the historical period which lies in the western part of Rijlat Sālim.

Descriptions of Selected Sites

Fak Abū Ṭur 2

This site is located about two kilometres from the northern edge of Wādī Rijlat Sālim in one of the main tributaries of Wādī Fak Abū Ṭur to the south-west. The site is sheltered from northerly winds and partly from the westerly winds by a high hill to the west.

Two structures were recorded at this site: Structure 1, to the west, is semi-oval in shape and measured 12 m east-west x 21 m north-south. Structure 1 is preserved because of its large stones and also because of its location away from the wadi channel. Structure 2 is situated approximately 35.5 m east of Structure 1 and is rectangular in shape. This structure is smaller in size than Structure 1 and measures about 15 m north-south x 12 m east-west. A small annex was attached to the internal side of the eastern wall. Parallel to Structure 1 and to the north on the other side of the slope, another small circular structure (Structure 3) was noted.

Two test trenches were excavated and a sample of charcoal was collected at a depth of 0.7 m. This sample and the dark compact soil are good indications that this area was an occupation layer. On the other hand, it is clear from the thickness of the layer and the general absence of finds that the site was used for a

relatively short period of time. Daily activities probably took place outside the main structures. The charcoal sample from the second trench which was found in the occupational deposits gave the date of 7,018 ± 41 BP.

Very few finds were collected from within the two structures. However, retouched large thermal flakes were found 2 m to the east of Structure 2. A total of 41 artefacts were recorded. These included 33 retouched thermal flakes, one multi-platform core, two single-platform cores, three retouched flakes and two chunks. No pottery was found on the site. No stratified flint was recovered from the test trenches except for one large scraper and a blade. Flint tools at this site were mostly on thermal flakes which were heavily patinated and some tools possibly were used in earlier periods. The site is thus unique in that the finds consist predominantly of retouched thermal flakes and chunks. In addition, there were no tabular scrapers which characterise the other sites in this wadi and the sites in the surrounding wadis.

Qī'ān as-Sīq 6

This site is located less than 1 km south-east of QS 5 near the western edge of a low hill and facing a flat area to the west. Structures at this site were situated about 15 m west of the edge in a flat area.

This site consists of three structures separated from each other by channels and distinguished by *rujum* near the structures on the cliff edge. Structure 1 is situated 130 m south of the other two, and 8 m from the cliff edge. It is semi-triangular in shape and its internal dimensions were 16 m x 13.5 m. Two small annexes were attached to the main wall of this structure: the first was attached to the northern exterior face of the wall and measured 1.5 m x 0.6 m, the second was an internal annex measuring 3 m x 1.5 m. To the north-east of this structure, about 13 m distant, a small *rujm* was found on the hill edge measuring approximately 2.5 m in diameter. Structure 2 is situated to the north and is separated from structure 3 by another small channel. Structure 2 is situated 13 m west of the edge of the hill and 10 m from the second *rujm*. It is semi-circular in shape with an internal diameter of 8 m. Neither any small rooms nor a hearth were found in either structure and so it is difficult to determine whether they were domestic facilities, or used as animal enclosures.

Structure 3 lies 13.5 m north of the Structure 2 and 15 m from the hill edge. It is circular in shape and its internal diameter is 21 m. Three annexes were attached to this structure: the first was attached to the internal face of the main wall from the south-east and measures 5.5 m x 3 m; the second annex measures 5 m x 3 m and was also attached to the internal side of the wall in the north-east corner; the third annex is smaller in size and measures approximately 1.70 m x 1 m and was attached to the exterior face of the wall to the north.

A small trench was excavated in the western part of Structure 3, near the south-western corner. A hearth was exposed in the southern part of the trench (**Fig. 3**). Two charcoal samples were obtained from the hearth and from the layer itself, which date the structure to 6,617 ± 34 BP. The shallow depth of the occupation deposit indicate a short season of use and suggest that only limited activities could have taken place at the site.

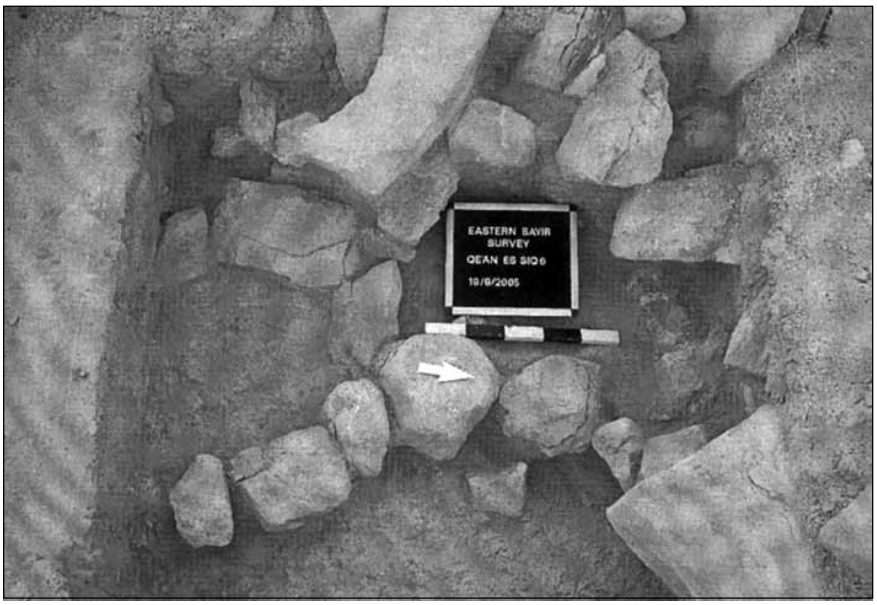
Only a few flint artefacts were collected at this site, possibly because of the channels which have washed away the surface artefacts. The recorded artefacts comprise five tabular scrapers, two cores, two retouched thermal flakes and one retouched flake.

Qī'ān as-Sīq 11

This site is located on the northern edge of the hill facing a small mudflat to the north. It is situated about 12 m from the terrace edge. The site is somewhat sheltered from the westerly winds and is also partly eroded by a small channel running north from the hill edge.

This site consists of a single, large semi-triangular structure parallel to the edge of the hill with an internal measurement of approximately 40 m x 25 m. The lower part of the wall in the north was severely eroded, leaving two large holes in it. Three interior rooms were attached to the face of the main wall to the north, south and east. These have an internal diameter of between 1 m and 4 m. An external annex was attached to this structure on the eastern side. It had an internal dimension of 1.20 m x 4 m.

Four *rujum* were recorded on the upper part of the hill near to its edge in the south-west corner of the site. These were built of stone piles taken from the edge of the hill. One of these is located 8 m to the east of the others. The other three *ru-*



3. Qī'ān as-Sīq 6, small hearth next to main wall.

jum are connected by small lines of stones with tail-like walls at each end. The connected *rujum* range between 2 m and 4.80 m in diameter. Graffiti was discernable on a few of the stones; some of these were probably made by bedouin while others were early Arabic. Finds at this site consisted of flint artefacts. 12 flints were recorded, including four tabular scrapers, five retouched flakes, one blade, one core, one retouched thermal flake and five retouched flakes.

Qī'ān as-Sīq 25

This site is located in the southern part of Qī'ān as-Sīq on the edge of a plateau overlooking the Qī'ān area which lies to the north. The site is a composite *rujm*, being comprised of three graves of unknown date. It is constructed of stones and rocks covered with long slabs over 1 m in length (**Fig. 4**). The walls surrounding the graves rise above the level of the covering slabs and may indicate modern disturbance. Future excavation at this site may help to date them.

Rijlat Sālim 1

This site is located on the northern bank of Wādī Rijlat Sālim between RS 2 and RS 4. The site measures approximately 210 m in length between the farthest two structures making it one of the largest

4. Rujum site of Qī'ān as-Sīq 25.

sites recorded during the project, both in terms of area and the number of structures it contains.

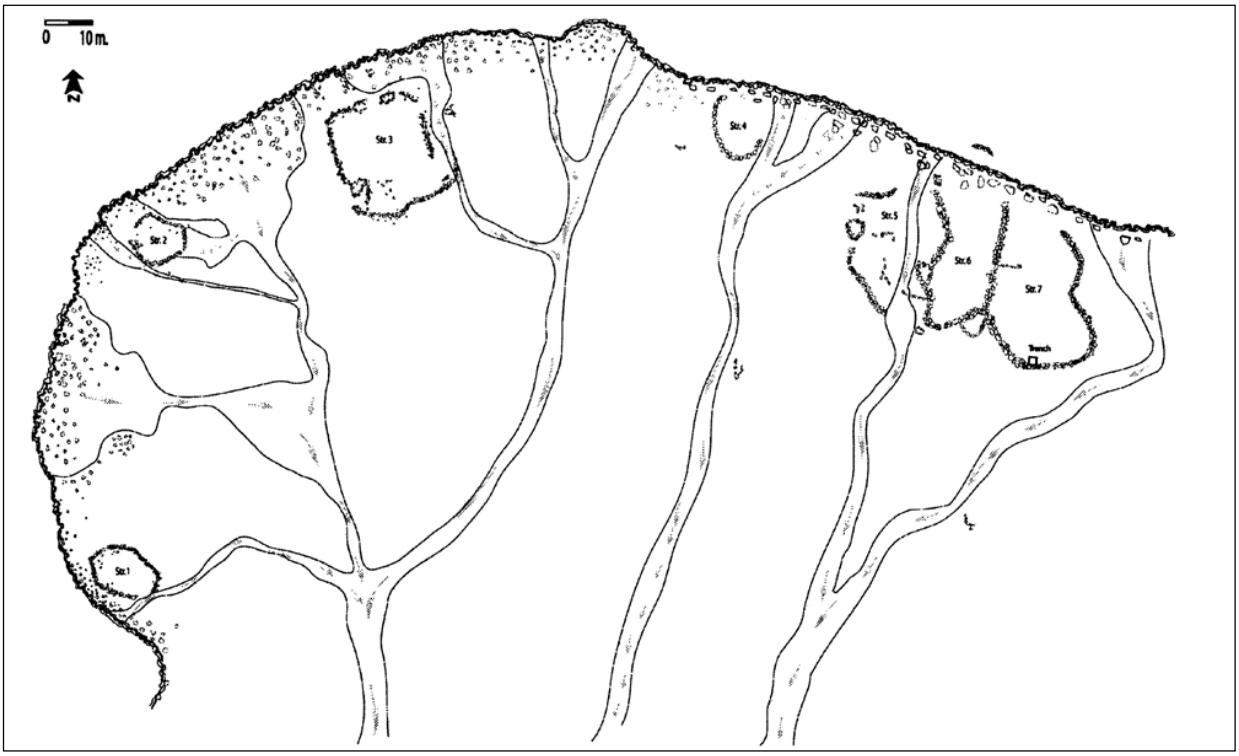
There are five constructed features at this site: three are small individual structures, one is a larger individual structure and one a large compound structure consisting of three connected structures and some attached annexes. These structures are separated from each other by seven channels which run from the upper part of the terrace towards the main wadi after joining each other in different locations (**Fig. 5**). Structure 1 to the south-west is a small structure which lies on the farthest side of the site and faces the rest. It is situated beside the terrace edge on an area of higher ground. It is oval in shape and its internal dimensions are 14 m x 8 m.

Structure 2 is also small and is located about 58 m to the north of Structure 1. Structure 2 is situated between two channels which have undermined its wall. It is approximately 5 m from the terrace edge and has a maximum internal diameter of approximately 10 m.

Structure 3 is larger in size and is situated approximately 33 m north-east of Structure 2. A channel has eroded part of the northern and eastern sides of the wall. The structure is semi-rectangular in shape, with internal measurements of *ca*. 27 m east-west x 20 m north-south. Two small internal annexes, measuring less than 2 m in diameter, were located in the northern quadrant of the structure. Another small annex was also attached to the outside edge of the southern wall near its lower corner and has an internal measurement of 3.5 m x 2 m.

Structure 4 is a smallish feature situated *ca*.49 m east of Structure 3 and 21 m west of the Eastern Compound (see below). This structure was severely disturbed and has lost a large portion of the north-eastern part of its wall. It is oval in shape with an internal diameter of 12 m.

The largest built feature of RS 1 is the Eastern Compound, which is situated beside the terrace edge and comprises Structures 5, 6 and 7. The construction of this structure is unique as its builders used the terrace edge on the northern side of the structure instead of building another wall. The compound consists of three large, elongated structures and has some straight walls, particularly the shared walls in the middle. These structures measure 58 m east-west x 33 m north-south. Structure 5, the most western feature of this compound, has an internal measurement of 30 m x 21 m. Two small internal annexes were noted within Structure



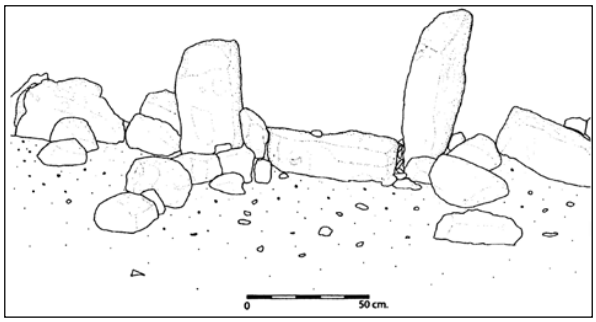
5. Rijlat Sālim 1, plan showing distribution of architecture and topography.

5. The first was attached to the western wall, where the stones showed later disturbance. This feature has a maximum internal measurement of 3 m. The second annex had an internal measurement of 2 m. A doorway was also recorded in the western wall of Structure 5 (**Fig. 6**). Structure 6 is situated in the middle of the compound and is elongated and semi-rectangular in shape. It measured 33 m between the terrace edge and the southern wall and about 13 m east-west at its widest point. A small doorway was recorded in the southern wall beside an annex. Structure 7 is situated on the eastern side of the compound and measured approximately 35 m between the terrace edge and the southern wall and is about 20 m east-west at its widest point.

A test trench was excavated in the southern part of Structure 7. Two charcoal samples were obtained from this square at a depth of about 0.5-0.6 m and yielded dates of 6,315 ± 44 BP and 6,256 ± 48 BP. 105 artefacts were recorded from the survey and excavation. These finds include ten tabular scrapers, 16 cores, 35 retouched flakes, nine blades, 27 retouched thermal flakes, one borer, one bifacial tool, one t-shaped tool, one chunk and one chopper.

Rijlat Sālim 20

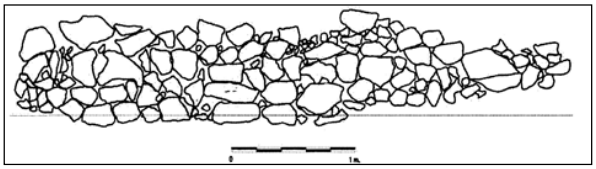
This site is located on the southern bank of Wādī Rijlat Sālim. A water channel has significantly disturbed the northern part of the site. Two structures were identified. The first is situated to the north, close to the channel and is severely disturbed. It is circular in plan. The second structure is located about 11 m to the south of Structure 1 and further away from the channel. Although better preserved than the first, its upper, south-western part has been destroyed by erosion. Structure 2 has an internal diameter of 6.5 m. It is circular in shape with an extant five-course wall to the north that is preserved to a maximum height of *ca*. 0.85 m (**Fig. 7**). A small doorway was built on the eastern side of the wall. An internal division can be seen in the middle of this structure where two walls were built in the southern and northern side (**Fig. 8**). A small trench was excavated beside the wall, both to establish its depth and in an attempt to recover stratified material. Two charcoal samples were obtained from this layer which yielded dates of 6,626 ± 46 BP. and 6,428 ± 40 BP. Thus, it was contemporary with the other dated sites in the region. 22 artefacts were collected from the site, including five cores, one blade, two chunks, three retouched flakes and 11 retouched thermal flakes.



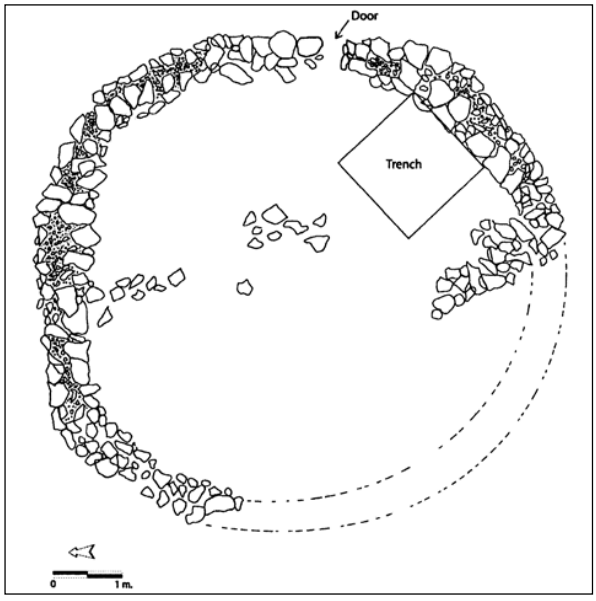
6. Rijlat Sālim 1, doorway to Structure 5.

Artefacts

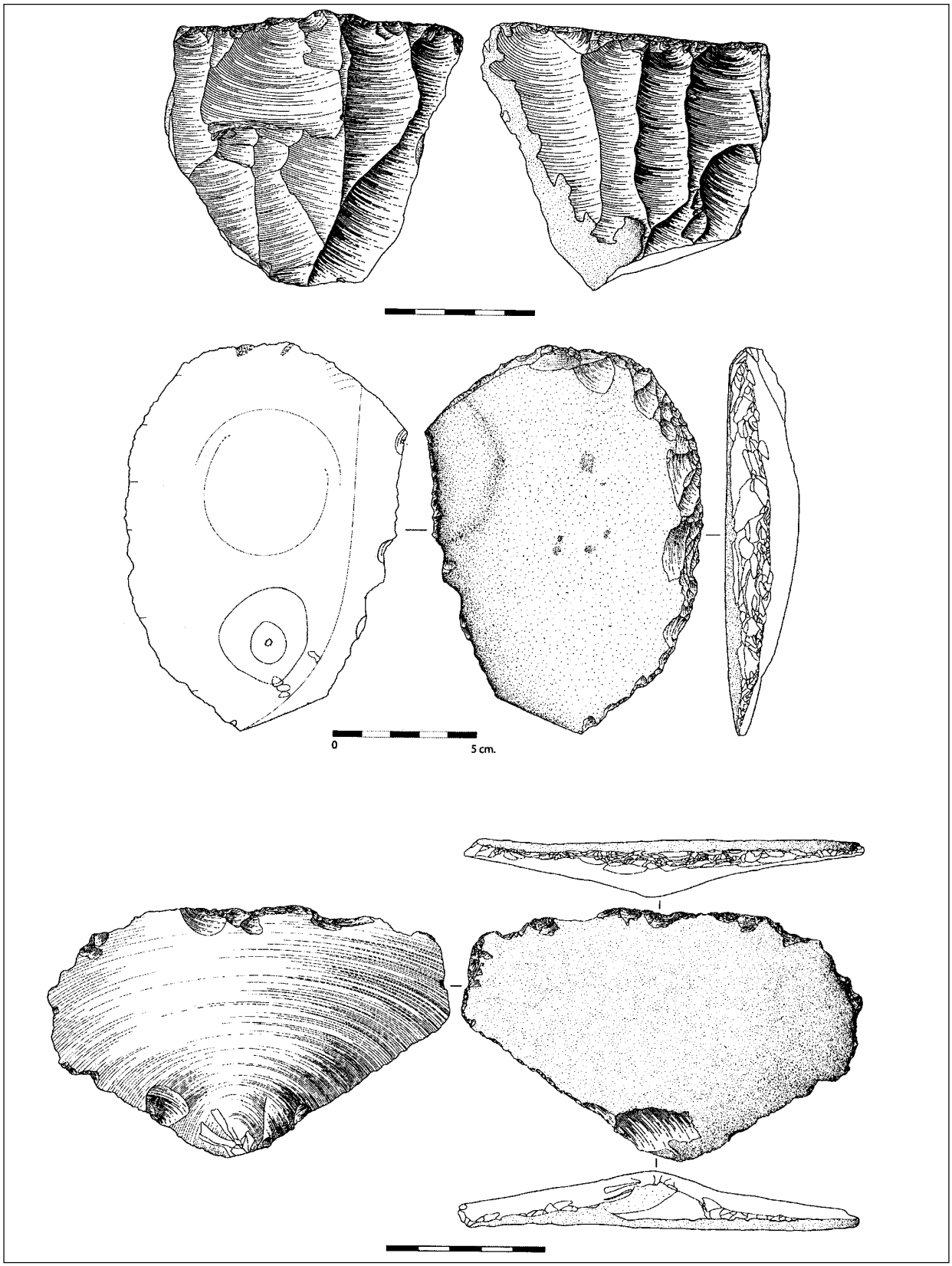
Artefacts were collected inside the structures and in their immediate vicinity. At some sites, such as FAṬ 2, tools were mainly concentrated in areas outside the structures. The larger flint assemblages were collected from the larger sites, such as Rijlat Sālim 1 and 15 (**Fig. 9**). Very small quantities of chipped stone were found at the smaller sites, particularly the individual small structures (**Fig. 10**). This suggests that



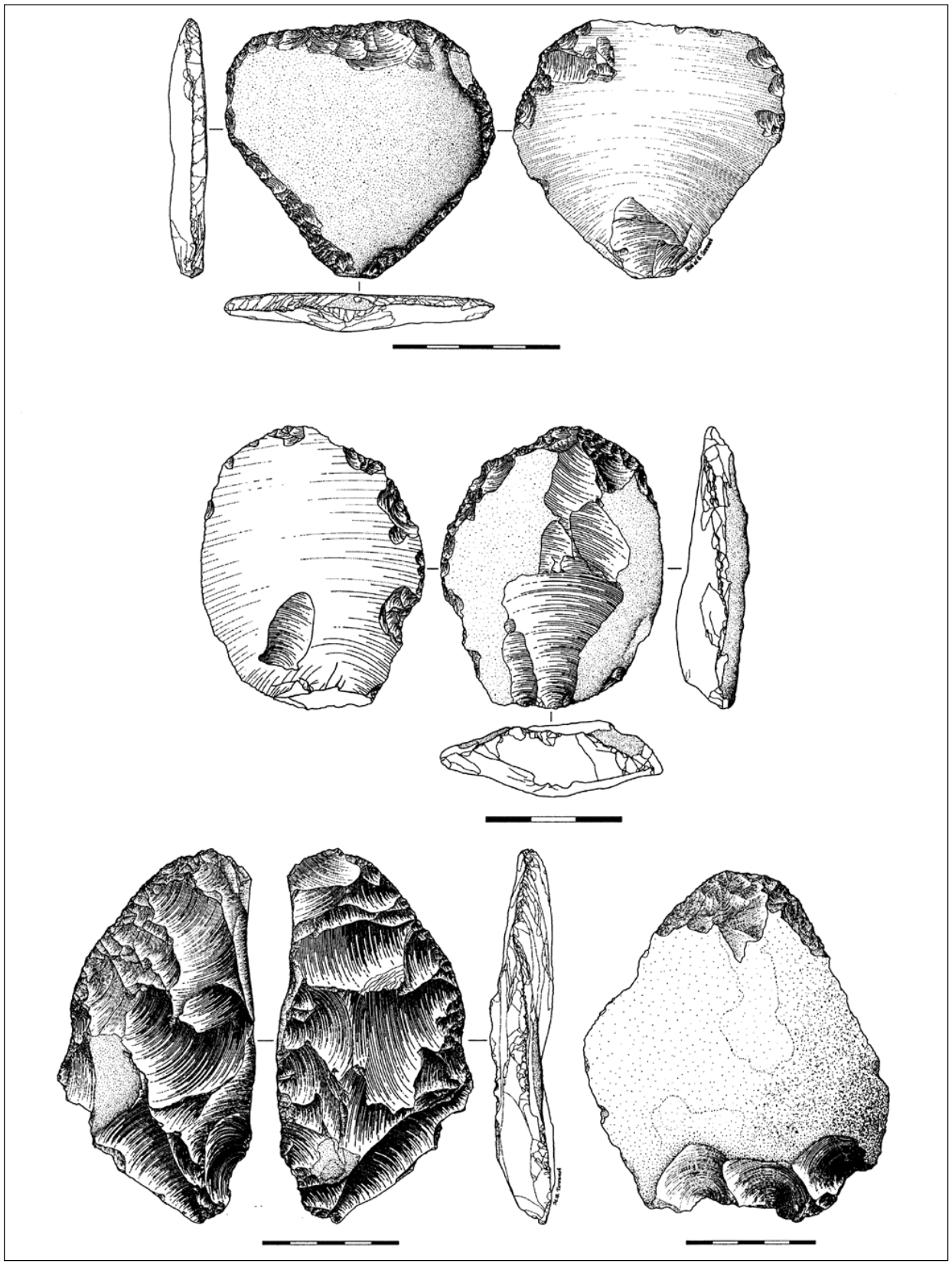
7. Rijlat Sālim 20, south wall of Structure 2.



8. Rijlat Sālim 20, plan of Structure 2.



9. Qi'ān as-Sīq, chipped stone artefacts.



10. Rijlat Sālim and Fak Abū Ṭur, chipped stone artefacts.

these sites had a short period of occupation and that a limited ranged activities took place there.

Conclusions

The sites discovered in the eastern Bāyir region can be attributed to pastoral nomads for several reasons. First, they sites occur in large numbers in a region which is used by modern nomads. Second, the distribution of these sites in separate areas, yet similar locations, indicates the importance of regular movement to areas with better resources. Third, the simplicity and limited size of the larger structural remains suggests that they were used primarily as animal enclosures. Smaller structures found together with these large ones suggest their use for domestic activities and storage. The size of these irregular structures in many cases indicates that they were used for small numbers of people. Fourth, and most importantly, these sites consist of shallow occupational deposits, in some cases less than 0.4 m. Fifth, chipped stone tools at these sites tend indicate their use by pastoral nomads because they consist mainly of scrapers, which were probably used for butchering and shearing. Finally, this part of the Levant does not support permanent settlement because of its harsh, dry environment.

Acknowledgments

This project was made possible through the generous financial support of the University of Sydney, Carlyle Greenwell Bequest, Near Eastern Archaeology Foundation and al-Hussein bin Talal University. We wish to thank the Director General of the Department of Antiquities Prof. Dr Ziad al-Saad for his support of the project. We greatly acknowledge the great effort of Khalid Q. Tarawneh, ‘Aayed Abu Tayeh, Snyan Abu Tayeh Ahmed and Mohammad Tarawneh. We are deeply indebted to our hosts in the desert, the Officers of the Royal Desert Police fort at Mushāsh Ḥudruj.

Table 1: List of sites located during the 2004, 2005 and 2009 seasons.

Site Name	Date Recorded	UTM Grid	Height a.s.l.	Interpretation	Finds
al-Baniya	12.9.2004	37 R 0320146 UTM 3382450	816	C.S. Chalcolithic	Concave rotator, tabular scrapers and flake industry *
Qī‘ān as-Sīq 1	12.9.2004	37 R 0332603 UTM 3368066	876	C.S. Chalcolithic	Tabular scrapers and flake industry
Qī‘ān as-Sīq 2	12.9.2004	37 R 0330109 UTM 3366943	879	C.S. Chalcolithic	Tabular scrapers, small blades, core and flake industry *
Qī‘ān as-Sīq 3	13.9.2004	37 R 0330281 UTM 3366905	878	C.S. Chalcolithic	Tabular scrapers, blades and flake industry *
Qī‘ān as-Sīq 4	13.9.2004	37 R 0331580 UTM 3365050	888	C.S.Chalcolithic	Flake industry *
Qī‘ān as-Sīq 5	13.9.2004	37 R 0331630 UTM 3364953	878	C.S .Chalcolithic	Flake industry *
Qī‘ān as-Sīq 6	13.9.2004	37 R 0331847 UTM 3364725	868	C.S. Chalcolithic	Basalt grinder fragment, tabular scrapers and flake industry *
Qī‘ān as-Sīq 7	13.9.2004	37 R 0331733 UTM 3365121	889	C.S. Chalcolithic	Flake industry
Qī‘ān as-Sīq 8	14.9.2004	37 R 0335807 UTM 3366640	872	C.S. Chalcolithic	Single platform blade core and flake industry
Qī‘ān as-Sīq 9	14.9.2004	37 R 0336045 UTM 3366805	889	C.S. Chalcolithic	Flake industry

Qīʻān as-Sīq 10	14.9.2004	37 R 0336077 UTM 3366843	877	C.S. Chalcolithic	Grinding stone fragment
Qīʻān as-Sīq 11	14.9.2004	37 R 0336342 UTM 3367198	873	C.S. Chalcolithic	Flake industry
Qīʻān as-Sīq 12	14.9.2004	37 R 0336676 UTM 3367009	884	C.S. Chalcolithic	Grinding stone fragment, tabular scrapers, small blade core and flake industry
Qīʻān as-Sīq 13	25.9.2004	37 R 0329705 UTM 3366708	866	Pool, Indet.	
Qīʻān as-Sīq 14	20.9.2005	37 R 0331882 UTM 3364226	875	C.S. Chalcolithic	Tabular scrapers and flake industry
Qīʻān as-Sīq 15	16.10.2009	37 R 0331894 UTM 3364347	884	Rock shelter. Chalcolithic	Tabular scrapers, t- and y- shaped tools and flake industry
Qīʻān as-Sīq 16	17.10.2009	37 R 331899 UTM 3364256	888	Rujm	
Qīʻān as-Sīq 17	17.10.2009	37 R 0330686 UTM 3366302	900	Rujm	
Qīʻān as-Sīq 18	17.10.2009	37 R 0330888 UTM 3366430	892	Small Rujum	
Qīʻān as-Sīq 19	18.10.2009	37 R 0332105 UTM 3364564	886	C.S. Chalcolithic	Notched pieces and flake industry *
Qīʻān as-Sīq 20	18.10.2009	37 R 0333037 UTM 3364022	875	C.S. Chalcolithic	Blade core and flake industry *
Qīʻān as-Sīq 21	19.10.2009	37 R 0333110 UTM 3364045	876	C.S. Chalcolithic	
Qīʻān as-Sīq 22	20.10.2009	37 R 0334545 UTM 3363676	881	Small Rujm	
Qīʻān as-Sīq 23	21.10.2009	37 R 0334630 UTM 3363730	879	C.S. Chalcolithic	Notched pieces and flake industry *
Qīʻān as-Sīq 24	22.10.2009	37 R 0334512 UTM 3362216	880	C.S. Chalcolithic	Tabular scrapers, t- and y-shaped tools, notched pieces and flake industry *
Qīʻān as-Sīq 25	22.10.2009	37 R 0334604 UTM 3362207	884	Rujum - Burials	
Fak Abū Ṭur 1	14.9.2004	37 R 0342709 UTM 3367927	852	C.S. Chalcolithic	Tabular scrapers notched pieces and flake industry
Fak Abū Ṭur 2	15.9.2004	37 R 0345898 UTM 3365021	839	C.S. L. Neolithic	Large thermal flake industry
Fak Abū Ṭur 3	15.9.2004	37 R 0346091 UTM 3365106	848	C.S. Chalcolithic	Tabular scrapers and flake industry
Fak Abū Ṭur 4	15.9.2004	37 R 0346009 UTM 3364141	851	C.S. Chalcolithic	Flake industry
Fak Abū Ṭur 5	15.9.2004	37 R 0345591 UTM 3364332	842	C.S. Chalcolithic	Flake industry
Fak Abū Ṭur 6	15.9.2004	37 R 0345411 UTM 3364298	849	C.S. Chalcolithic	Flake industry
Fak Abū Ṭur 7	16.9.2004	37 R 0353178 UTM 3368570	776	C.S. Chalcolithic	Flake industry

Fak Abū Ṭur 8	16.9.2004	37 R 0353271 UTM 3368949	762	C.S. Chalcolithic	Tabular scrapers and flake industry
Rijlat Sālim 1	12.9.2004	37 R 0345052 UTM 3363403	840	C.S. Chalcolithic	Tabular scrapers, small blade core and flake industry
Rijlat Sālim 2	16.9.2004	37 R 0344771 UTM 3363452	831	C.S. Chalcolithic	One bifacial knife, tabular scrapers, small blade core and flake industry
Rijlat Sālim 3	16.9.2004	37 R 0344622 UTM 3363246	826	C.S. Chalcolithic	Tabular scrapers and flake industry *
Rijlat Sālim 4	17.9.2004	37 R 0345476 UTM 3363223	837	C.S. Chalcolithic	Single platform core and flake industry *
Rijlat Sālim 5	17.9.2004	37 R 0344769 UTM 3363215	844	C.S. Chalcolithic	Flake industry *
Rijlat Sālim 6	17.9.2004	37 R 0344643 UTM 3363131	838	C.S. Chalcolithic	Tabular scrapers and flake industry *
Rijlat Sālim 7	17.9.2004	37 R 0341803 UTM 3364213	852	C.S. Chalcolithic	Flake industry
Rijlat Sālim 8	17.9.2004	37 R 0341707 UTM 3364461	870	Rujm, Indet.	Grinding stone fragment *
Rijlat Sālim 9	17.9.2004	37 R 0341505 UTM 3364460	846	C.S. Chalcolithic	Flake industry
Rijlat Sālim 10	18.9.2004	37 R 0352127 UTM 3360152	791	C.S. Chalcolithic	Tabular scrapers and flake industry
Rijlat Sālim 11	18.9.2004	37 R 0351997 UTM 3360107	830	C.S. Chalcolithic	Grinding stone fragments, tabular scrapers, blades and single platform core
Rijlat Sālim 12	18.9.2004	37 R 0353565 UTM 3358182	795	C.S. Chalcolithic	Flake industry *
Rijlat Sālim 13	18.9.2004	37 R 0353895 UTM 3358222	797	C.S. Chalcolithic	Tabular scrapers, single platform core and flake industry *
Rijlat Sālim 14	18.9.2004	37 R 0339555 UTM 3364334	864	C.S. Chalcolithic	Tabular scrapers and flake industry *
Rijlat Sālim 15	18.9.2004	37 R 0338416 UTM 3363954	864	Chalcolithic? Hellenistic	Tabular scrapers, blades, t- and y-shaped tools and flake industry
Rijlat Sālim 16	18.9.2004	37 R 0337305 UTM 3364957	873	Neolithic?	Bowel rim, blades and flake industry *
Rijlat Sālim 17	18.9.2004	37 R 0337432 UTM 3365102	867	Neolithic-Chalcolithic	Flake industry *
Rijlat Sālim 18	19.9.2004	37 R 0338960 UTM 3364280	859	Neolithic?	Tabular scrapers, t- and y-shaped tools, and flake industry *

Rijlat Sālim 19	19.9.2004	37 R 0340753 UTM 3362783	855	C.S. Chalcolithic	Rotator fragments and flake industry *
Rijlat Sālim 20	19.9.2004	37 R 0342459 UTM 3361941	846	C.S. Chalcolithic	Grinding stone fragments, scrapers and flake industry
Rijlat Sālim 21	20.9.2004	37 R 0343372 UTM 3360861	854	C.S. Chalcolithic	Rotators, tabular scrapers and flake industry *
Rijlat Sālim 22	20.9.2004	37 R 0344129 UTM 3361341	847	C.S. Chalcolithic	Blades and flake industry *
Rijlat Sālim 23	22.9.2004	37 R 0346170 UTM 3359403	742	C.S. Chalcolithic	Flake industry
Rijlat Sālim 24	22.9.2004	37 R 0348042 UTM 3359957	822	C.S. Chalcolithic	Flake industry *
Rijlat Sālim 25	22.9.2004	37 R 0347903 UTM 3360124	805	C.S. Chalcolithic	Flake industry *
Rijlat Sālim 26	25.9.2004	37 R 0339558 UTM 3366027	864	Pool, Indet.	
Rijlat Sālim 27	25.9.2004	37 R 0339722 UTM 3366059	856	Rujm, Indet.	
Rijlat Sālim 28	14.9.2005	37 R 0339230 UTM 3364445	856	C.S. Islamic?	T- and y-shaped tools and flake industry
Rijlat Sālim 29	18.9.2005	37 R 0345681 UTM 3363654	871	Rujm, Indet.	
Rijlat Sālim 30	22.10.2009	37 R 0341162 UTM 3364252	848	Cemetery	T- and y-shaped tools and flake industry
Abayyaḍ 1	11.9.2004	37 R 0373872 UTM 3371148	686	Rujm, Indet.	One scraper, bedouin *wasm*
Abyaḍ 1	24.9.2004	37 R 0378805 UTM 3365537	677	Cairn, Indet.	Pottery shards and flake industry
Abyaḍ 2	24.9.2004	37 R 0379061 UTM 3365995	664	C.S. Chalcolithic	Tabular scrapers and flake industry *
Abyaḍ 3	24.9.2004	37 R 0379395 UTM 3365588	666	Rujm, Indet.	Blade core and flake industry
* Flake industry includes retouched thermal flake.					

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THE 2011 EXCAVATIONS AT WĀDĪ ḤAMARĀSH 1 AND 4, AṢ-ṢĀFĪ, JORDAN

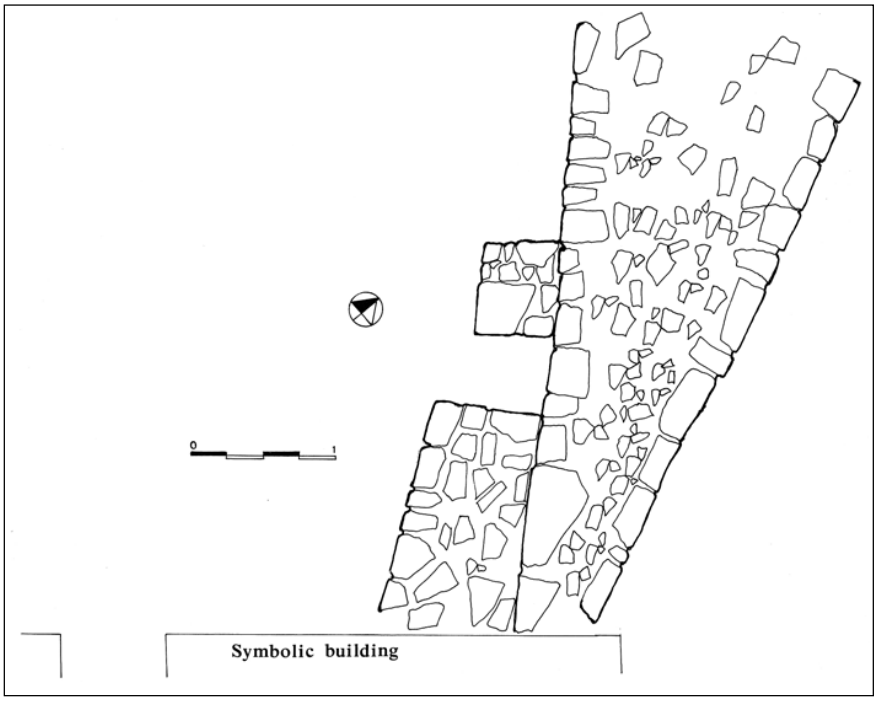
Adamantios Sampson

During the 2011 field season, research at the PPNB site of Wādī Ḥamarāsh 1 continued (Sampson 2011a, 2011b). Additionally, a test excavation was started at the nearby PPNA site of Wādī Ḥamarāsh 4, which overlooks the Wādī al-Ḥasā river.

Wādī Ḥamarāsh 1

Initially, the excavation was extended north-west from the large symbolic building investigated last year (Sampson 2011a), in order to examine whether more buildings or an open space existed in front of it. At the depth of 0.20m, a wall was exposed extending to the north-west, which had an extraordinary trapezoidal ground plan (**Fig. 1**). It is a low construction which had been added to the western wall of the building at a late stage. More importantly, a small wall with a rectangular niche was subsequently added to this construction. The presence of a standing stone, 1.33 m high, in the area probably explains this unusual construction and the niche in which it was probably placed (**Fig. 2**). The excavated sections demonstrated that, with the exception of the trapezoidal structure, an open area or courtyard measuring *ca.* 15 x 20 m existed in front of the main building. A pavement of stone slabs was observed in the south-west corner of the building. The presence of a courtyard is of particular importance and emphasises the significance of the symbolic building (**Fig. 3**).

Later, Area V on the south-west side of the settlement was investigated. Area V, which measures 22 x 18 m, is the largest area to be



1. Structure in front of the symbolic building.

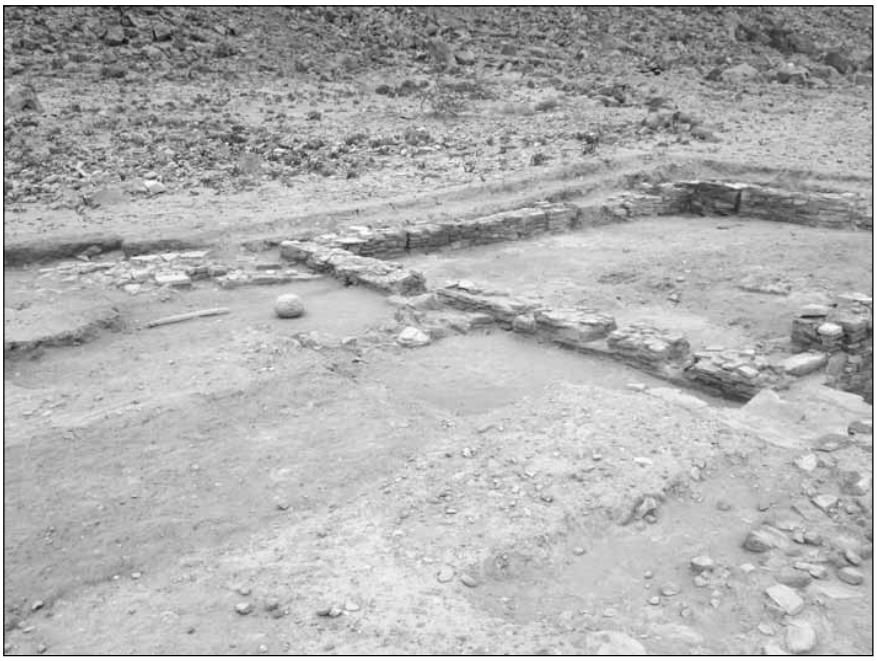
2. Structure and standing stone.

exposed so far (**Figs. 4 and 5**). The excavation began with the exposure of walls 1 to 3, which together form a street of considerable width (locus 1). Just below the ground surface, a few ground stone tools, animal bones and traces of burning were found. The street extends to the east, where it is somewhat constricted by a protruding, small, round construction (36), which in turn gives access to a large space (21).

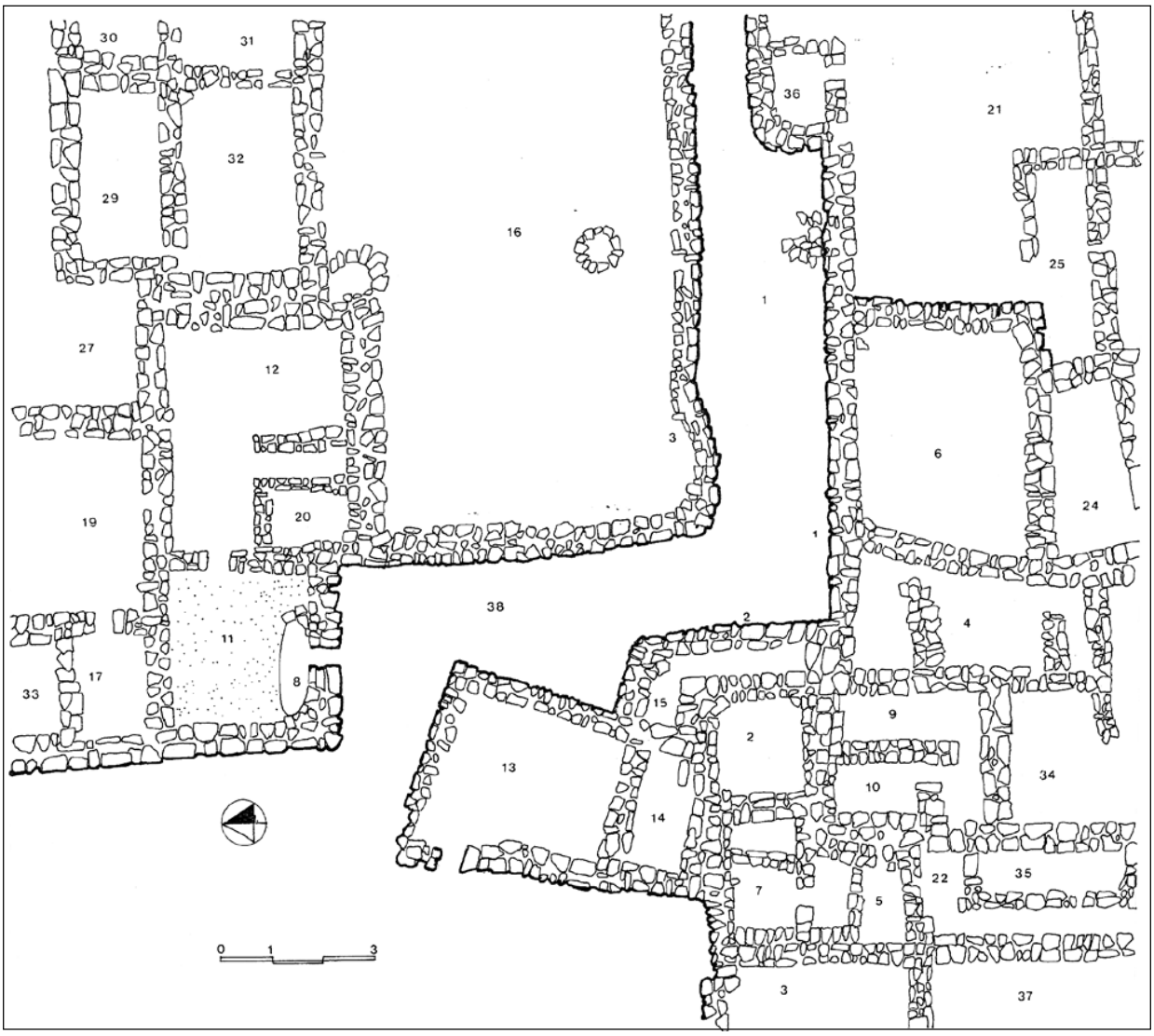
At the north side of the area, a densely built cluster of medium-sized loci and very small storage spaces were exposed. Of particular interest is locus 11, which has a pavement of slabs covered by lime plaster (**Fig. 6**). The plaster probably extended up the walls, which only survive to a low height. This particular area has access to an extraordinary narrow, ellipsoid locus (8) with an entrance in the southern side (**Figs. 4 and 6**). This locus has a depth of 2.10 m and, because it was plastered, could have been used as a cistern. The door opened on its southern side, where a street (38) was located. This demonstrates that other loci in the same general area also had access to locus 8. Locus 11 communicates eastwards with another large room (12), which had a small storage space and niche. To the south was a large open area (16) where a hearth was found. Further excavation in due course may expose more walls at greater depths.

South of the street, a number of buildings were found. The largest room is trapezoidal locus 13, with a door in its western side. In locus 2, at a depth of 0.15 m, traces of burning were exposed. In its northern side, at a depth of 0.50 m, several ground stone tools were recovered. Locus 4 is divided in two smaller areas by a later internal west -east wall. Lithics and animal bones were found in both areas. In the northern part of the locus, at 0.40 m depth, a concentration of cores, blades and animal bone fragments were found.

In locus 5, right from the modern ground surface, abundant finds were recovered from a layer of ash and burning (**Fig. 7**). In the first spit, caprine bones were recovered. At 0.25 m depth,



3. Open area in front of the symbolic building.



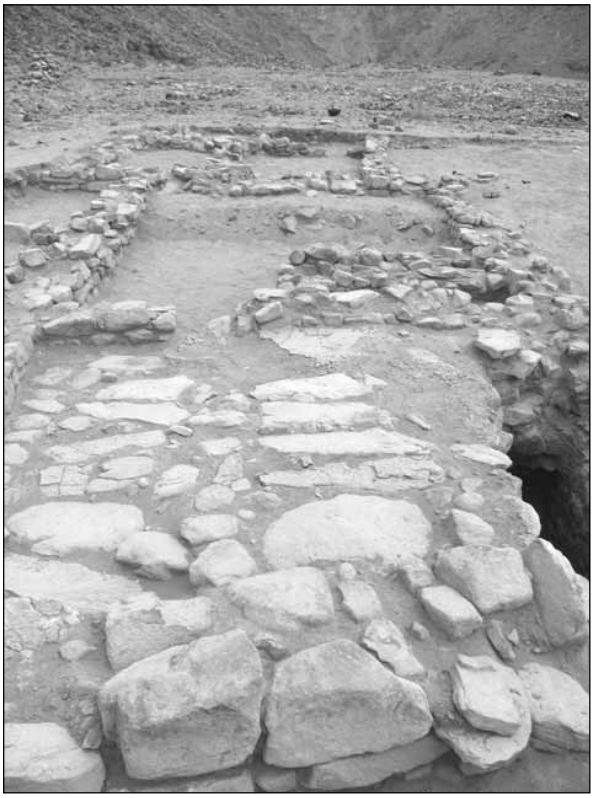
4. Plan of Area V.

a medium-sized stone ball with a groove on its upper part (**Fig. 8**) was recovered. At 0.30 - 0.35 m depth, a grinder, mortars and bone fragments were found. In the northern wall, at 0.35 m depth, there is an opening 0.45 m high and 0.38 m wide which communicates with locus 7. At 0.50 m depth, the traces of burning were more intense. A narrow east - west wall divides the room into two smaller areas. At 0.70 m depth, lithics, animal bones and a shell pendant were found.

In the southern part of Area V, a dense habitation unit exists with small areas which were excavated to a depth of between 0.40 and 0.70 m. Two larger areas (6, 21) are located at the southeast corner of Area V. In locus 21, just below the surface, an unusual find was recovered: a sandstone slab with two rows of cup marks and relief decoration around them that may be characterized as a game board (**Fig. 8**). Two years ago, two sandstone slabs with cup marks were found in Locus 18 of Area I (Sampson 2011b). These may have been associated with the stone bowlets found in all areas of the site. Similar items have been found at the PPNB site of Ein Suhun (Kaliszan *et al.* 2002: 16) and at Wādī Abū Ṭulayḥa (Fujii 2007: fig. 31, Fujii 2008: fig. 30.11).

Approximately 350 ground stone tools and several dozen stone vases were recovered from Area V. During the 2011 field season more than one thousand ground stone tools - excavated

5. Area V from the west.



6. Locus 11: pavement and lime plaster.

from 2008 onwards - were registered. To date, more than 1600 square meters have been excavated at the site.

Wādī Ḥamarāsh 4

The site of Wādī Ḥamarāsh 4 is a small PPNA settlement situated on the top and slopes of a hill overlooking the Wādī al-Ḥasā river (**Fig. 9**). Illicit excavation and severe erosion have partly destroyed its round structures. Seven loci were cleaned and investigated on the hilltop. Most

7. Area V: locus 5.

8. Sandstone slab with cup marks and relief decoration.

important was Locus 1, built on a small plateau and disturbed by looters (**Fig. 10**). The building is 3.50 m in diameter and was constructed of large blocks and small stones. The soil was dark

9. Wādī Ḥamarāsh 1: site grid.

10. Wādī Ḥamarāsh 4: PPNA round structure.

with traces of burning; it contained, down to a depth of 0.90 m, many lithics, animal bones, a few shells, a green stone bead and a single cylindrical pestle. At 0.90 m depth on the north side of the locus a quern with cup mark, animal bones and flint tools were found. At a depth of 1.10 m, a floor was exposed upon which human and animal bones were scattered. Under the floor in the eastern part of the locus, more human and animal bones, a turquoise bead and lithics were found, among them an arrowhead of al-Khiam type (Gopher 1994).

At 1.35 m depth there was an earlier floor which did not extend over the whole surface of the locus. The human bones probably belong to two burials, one adult and one juvenile. At a depth of 1.40-1.50 m and lower down, part of a skull and other human remains were recovered. Disturbed soft soils with scattered bones existed down to the natural soil, which was found at a depth of 2.00 m.

Locus 2 is situated approximately 25 m to the west. The soil was dark from burning all the way down from the modern ground surface. To a depth of 1.50 m, stone artefacts and a few ground stone tools were found. At 1.70 m depth, in the western part of the locus, part of a human skull, small bone fragments and three stone pestles were discovered. The excavation reached natural soil at 1.90 m depth, although the northern part of the locus went down to 2.00 m. Part of the wall consisted of well-placed small stones, but in its northern part the building walls were constructed of large blocks. To the south, the wall does not extend down as far as the floor. The same pattern was observed in all buildings exposed at the site, suggesting that the short walls served to support the wooden roof of the structure. This type of architecture also occurs at the PPNA settlement of Wādī Faynān in southern Jordan (Finlayson and Mithen 2007).

The rectangular constructions in Area 3 (**Fig. 11**) at the top of the settlement are, by PPNA standards, somewhat peculiar. Two narrow walls of small stones form a corner. Wall 1 heads north and nearly reaches circular locus 4, whereas wall 2 is heads up to the top of the hill. Just to its west, another wall (3) on the same orientation defines what appears to be a narrow alley, 1 m wide. Another wall (4), now destroyed, stood on a very steep slope. Two big querns with cup marks were incorporated into the walls. A large concentration of flint tools was found in this area, among them an arrowhead of al-Khiam type.

Locus 4, which was circular with a diameter

11. PPNA rectangular structure.

of 3.05 m, is situated next to locus 2. Large and small stones formed a short wall on its southern side. Dark soil appeared at a depth of 0.30 m and continued down to 1.50 m.

Locus 5 is located north of locus 1 and is ellipsoid in shape with a length of 4 meters. The soil from the upper layers was very dark. The entrance was on its northern side, where a threshold was found *in situ*. The excavation reached a depth of 1.20 m, but was not completed.

Locus 6, on the top of the hill, had suffered extensive destruction. It had an ellipsoid shape, with a wall dividing it into two parts. On the eastern side, at a depth of 0.60 m, a thick layer containing a large amount of charcoal was discovered, which extended down to 1.20 m. An enormous quantity of carbonized figs was recovered from this deposit. Even though the current environment of the region is not conducive to fruit trees, it seems clear that this particular tree existed in central and southern Jordan during the PPNA. Seeds of carbonized figs (*Ficus* sp.) have also been found at Dhahrat adh-Dhrā‘ near the Dead Sea (Edwards *et al*. 2002; Sayej 2004).

Locus 7, next to locus 6, is also ellipsoid in shape. A floor appeared at 1.00 m depth and, under this, a crouched burial was discovered (**Fig. 12**). On the southern side of the locus, not far from the burial, two upright stones were found with lugs resembling bull horns on their upper parts (**Fig. 13**). These could be of symbolic significance, but their similarity to standing stones in an ellipsoid building at PPNA adh-Dhrā‘ (Kuijt 2001), which are thought to have supported the beams of floor, suggests a more functional use. Next to the standing stones, a large pestle (length 0.22 m, basal diameter 0.14 m), was found. Another burial was found under the floor on the north side of the locus. The excavation reached a depth of 1.40 m, where a hard floor was exposed, but remains to be completed next year.

In addition to the excavated loci, the whole surrounding area is scattered with querns bearing cup marks (**Fig. 14**) and pestles (**Fig. 15**) similar to those known from other PPNA sites in the southern Levant, e.g. Wādī Faynān (Shaffrey 2007: fig. 11.7), Hatoula (Samzun 1994), Gesher (*Paléorient* 1989: pl. I, 2), adh-Dhrā‘ (*Paléorient* 28: 137) and Gilgal I (Noy 1979: fig. 2-6). Many of the pestles found at Wādī Ḥamarāsh 4, usually conical in form, seem more standardized than those from Wādī Faynān (Shaffrey 2007) or adh-Dhrā‘ (Kuijt 2001). A grooved stone, characteristic of Natufian and PPNA sites, was found in locus 7 (**Fig. 16.38**). Similar objects found at other sites in the Near East and Anatolia have been interpreted as shaft straighteners (Wright 1992: 73).

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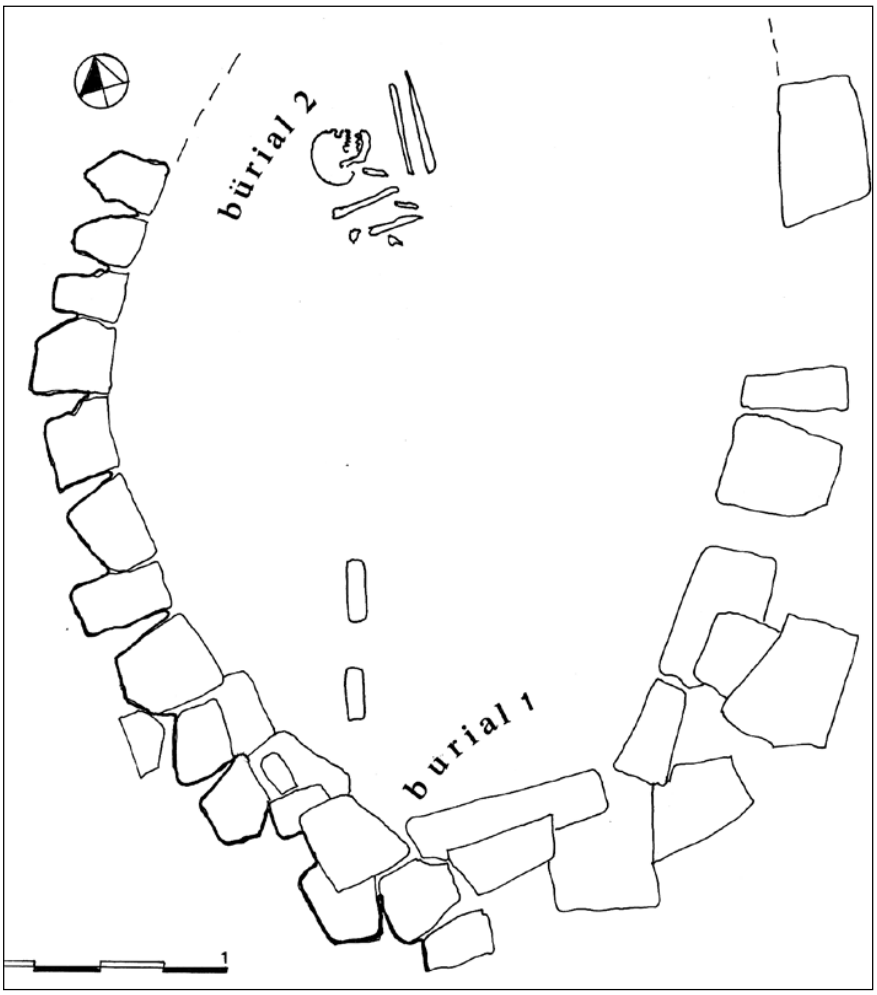
12. Human burial in locus 7.



13. Plan of locus 7.

14. Quern with cup marks.

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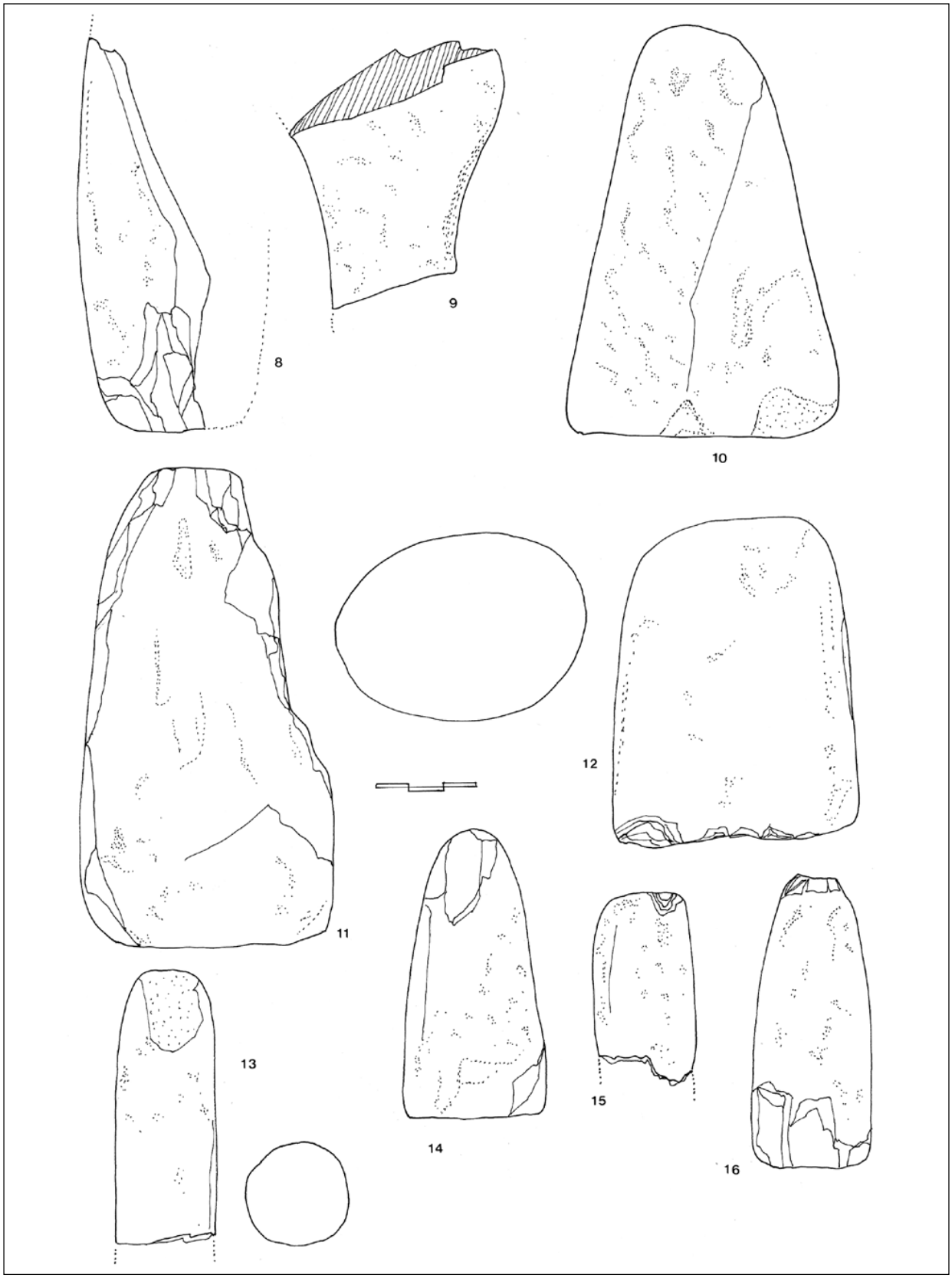

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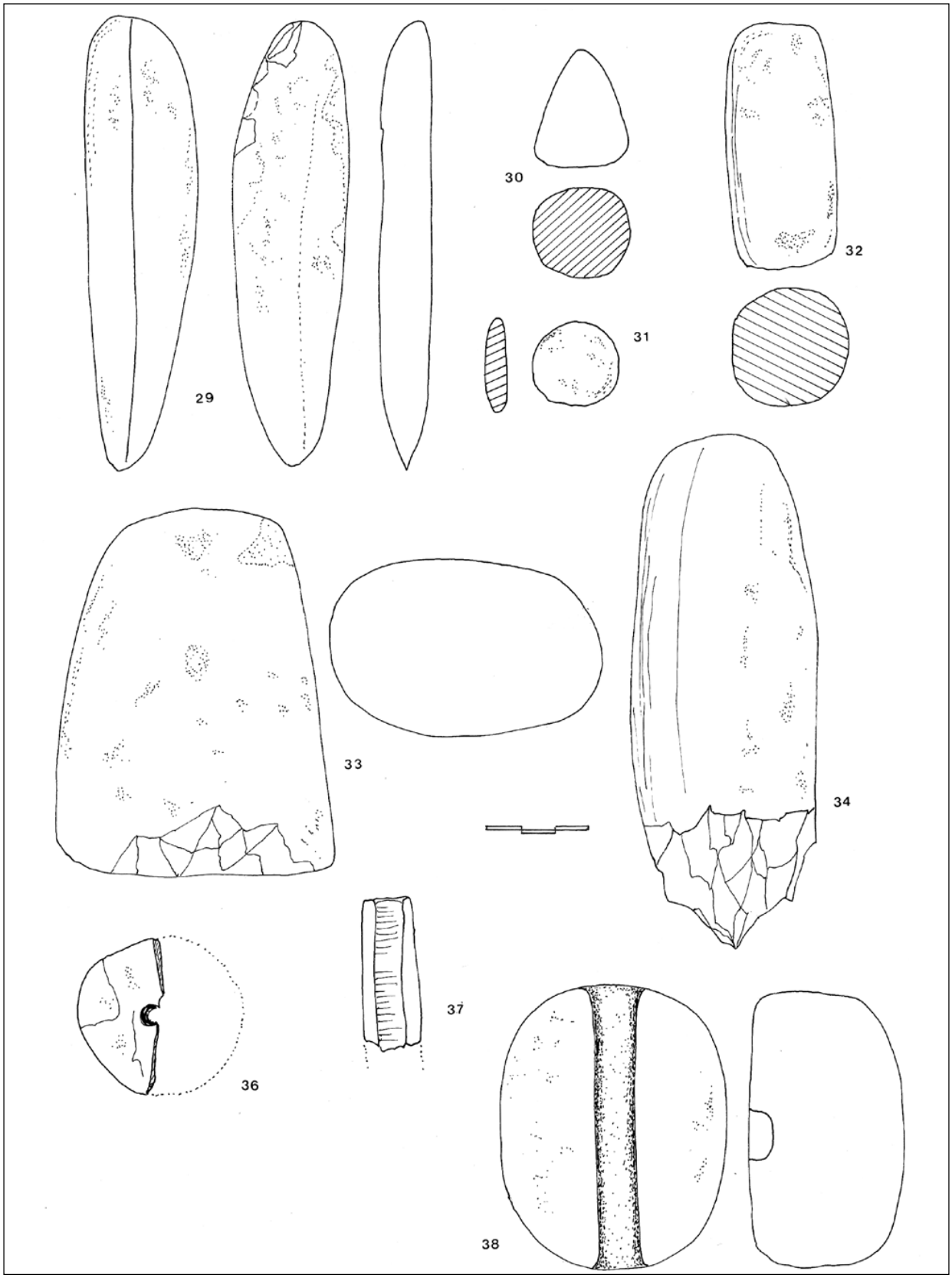

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PRELIMINARY REPORT ON THE SIXTH (2010) SEASON OF EXCAVATION BY "LA SAPIENZA" UNIVERSITY OF ROME AT KHIRBAT AL-BATRĀWĪ (UPPER WĀDĪ AZ-ZARQĀ')

Lorenzo Nigro and Maura Sala

1. Introduction

The sixth (2010) season of archaeological excavation and restoration was carried out at the Early Bronze Age site of Khirbat al-Batrāwī[1], on the northern edge of the modern city of Zarqā', by the "La Sapienza" University of Rome expedition to Jordan[2] in May-June 2010[3]. Financial support was provided by Rome "La Sapienza" University, the Italian Ministry of Foreign Affairs[4] and the Italian Ministry of University and Scientific Research.

The site of Khirbat al-Batrāwī was a major fortified town of the EB II-III, acting as the central place of upper Wādī az-Zarqā' at a strategic crossroads connecting the desert and steppe with the Jordan Valley (Nigro 2009, 2010b).

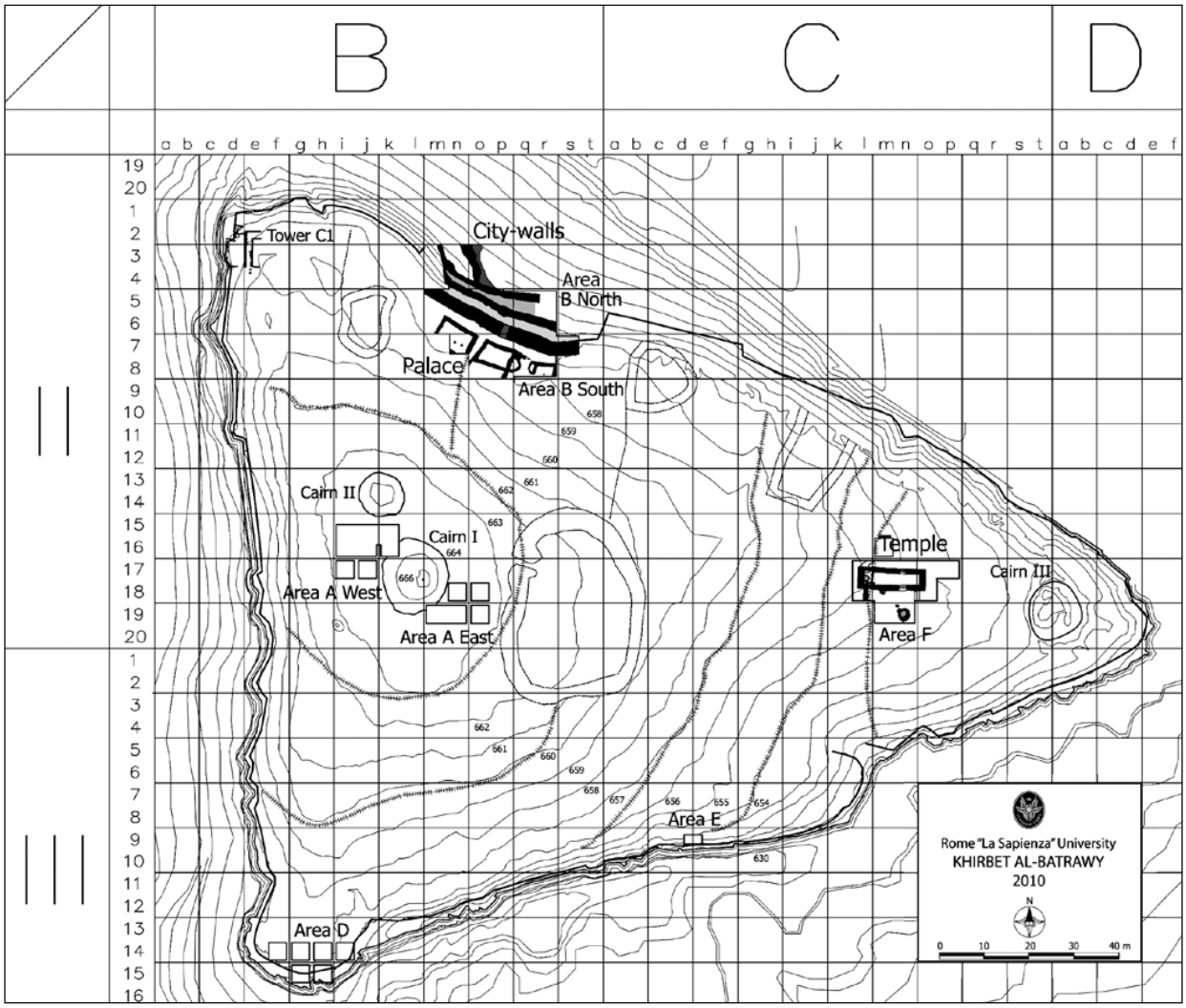
In 2010[5], excavation and restoration activities were concentrated on the EB II-III main city-wall on the northern slope of the khirbat in Area B North, and on the substantial public building within it in Area B South, namely Palace B (**Fig. 1**).

2. Aims of the Sixth (2010) Season

The main objectives of the sixth (2010) season of archaeological investigation and restoration at Khirbat al-Batrāwī were as follows:

- Excavation in the EB IIIB (2500-2300 BC) Palace B and overlying EB IVB (2200-2000 BC) rural village in Area B South;
- Restoration of House B2 in Area B South-East, along with annexed semi-circular plastered installation W.135, and to start restoration of the eastern pavilion of Palace B (Building B1 with oven T.413), excavated during the 2006-2009 seasons;
- Installation of information panels along the tourist path in Areas B and F (the EB II-III temple).

1. Lat. 32°05' N, Long. 36°04' E; JADIS site no 2516.011, p. 2.172 (Nigro 2006: 233-235, fig. 1; Nigro ed. 2006: 16-22, maps 1-6, plan I).
2. The Rome "La Sapienza" team during the sixth (2010) season included L. Nigro (director), M. Sala (field director), L. Caiafa, D. Ghigi, A. Massafra. G. Merli and V. Tumolo. The representative of the Department of Antiquities, whose support to the Expedition in the field was much appreciated, was Inspector Ahmed Shorma.
3. The Expedition wishes to express its gratitude to former Director General of the Department of Antiquities of Jordan, the late Dr Fawwaz al-Khraysheh, and to the present Director General, Prof. Ziad al-Saad, and to all the personnel of the DoA for their invaluable support, as well as to the academic authorities of Rome "La Sapienza" University, the Rector, Prof. Luigi Frati, the Dean of the Faculty of Humanistic Sciences, Prof. Roberto Nicolai, the former Director of the Department of Sciences of Antiquity, Prof. G. Bartoloni, and the present Director, Prof. G. Gregori, who provided enormous support to the Expedition.
4. The authors would also like to thank the Italian Embassy at Amman, in the persons of the Ambassador of Italy, H.E. Francesco Fransoni, Dr Stefano Stucci and Dr Natalia Sanginiti, and the Italian Ministry of Foreign Affairs for their co-operation.
5. In previous seasons (2005-2009; Nigro 2006; 2007; 2009; 2010b; Nigro ed. 2006; 2008; Nigro and Sala 2009; 2010), the main chronological, topographical and architectural reference points of the site were established (Nigro 2006: 233-236; Nigro 2007: 346-347, tab. 1; Nigro ed. 2006: 9-36, fig. 1.2; 2008: 7-8; Nigro and Sala 2009: 373) and seven areas opened, i.e. on the Acropolis (Area A; Nigro 2006: 236-240; Nigro 2007: 347-349; Nigro ed. 2006: 63-102, plan II; 2008: 9-63); on the northern slope (Area B North and B South; Nigro 2006: 240-246; Nigro 2007: 349-354; Nigro ed. 2006: 153-196, plans III-IV; 2008: 65-240, plans I-II; Nigro and Sala 2009: 373-377); in the north-western and south-western corners (respectively Area C (Nigro ed. 2006: 25-27, figs 1.27-1.31) and Area D (Nigro 2007: 355-357; Nigro ed. 2006: 32-33, figs 1.38-1.41; 2008: 241-244)); on the southern side (Area E; Nigro 2007: 357-358; Nigro ed. 2008: 245-268); and on the easternmost terrace of the *khirbat* (Area F; Nigro 2007: 358-359; Nigro ed. 2006: 22, fig. 1.25; 2008: 269-316, plans III-IV; Nigro and Sala 2009: 377-383).



1. Topographic map of Khirbat al-Batrāwī, showing the areas and main monuments excavated during the 2005-2010 seasons.

3. Chronology and Stratigraphy of Area B

The sixth (2010) season of excavation in Area B South allowed us to refine the stratigraphic and constructional phases of the EB IVB village that was built over the collapsed remains of the EB IIIB city during the final centuries of the 3rd millennium BC (Batrawi period IVb; 2200-2000 BC). It also clarified the stratigraphy and layout of the public building known as Palace B (Buildings B1 and B3), which was erected inside the EB II-III main city-wall in Early Bronze IIIB (Batrawi period IIIb; 2500-2300 BC), at which time the defences in Area B North were strengthened and enlarged with the addition of a third line of fortifications (W.165). Palace B was destroyed by a fierce fire at around 2300 BC. This was the same violent conflagration, attested to by burnt layers of ash, charcoal and collapsed mud-brick, which destroyed the triple line of fortifications in Area B North and marked the demise of the 3rd millennium BC city (Nigro 2009: 670).

4. Area B South: EB IIIB (2500-2300 BC) Palace B and the EB IVB (2200-2000 BC) Rural village

Excavation in Area B South, just south of the EB II-III main city-wall and street (L.1060) running inside it, continued during the sixth (2010) season, expanding the area towards the west in squares BmII5 (southern half), BmII6, BmII7 and BnII7. The aim of the season was to continue exploration of the dwellings and installations of the EB IVB (Batrawi period IVb)

Chronology, stratigraphy and architecture of Khirbat al-Batrāwī.

Archaeological Period	Absolute Chronology	Site Period	Area B North		Area B South	
			Phase	Structures	Phase	Structures
EB I	3400-3000 BC	Batrawi I	-	-	-	-
EB II	3000-2700 BC	Batrawi II (fortified town)	Phase 5b-a	Main city-wall; city-gate L.160; street L.144b	-	-
EB IIIA	2700-2500 BC	Batrawi IIIa (fortified town)	Phase 4b-a	Main city-wall; staircases W.181 and W.1067; blocking wall W.157; street L.144a / L.809a; outer wall W.155; outwork W.185	Phase 4	Street L.148 + L.458
EB IIIB	2500-2300 BC	Batrawi IIIb (fortified town)	Phase 3c-b	Main city-wall; staircases W.181 and W.1067; outer wall W.155; scarp-wall W.165; bastion W.825; protruding wall W.177	Phase 3d-a	House B2; installation W.135; courtyard L.936; oven T.413; Building B1 (L.430 + L.1046); Building B3 (L.1040); passage L.1050; street L.133 + L.424 + L.1060
EB IVA	2300-2200 BC	Batrawi IVa (abandonment)	Phase 3a	-	-	-
EB IVB	2200-2000 BC	Batrawi IVb (rural village)	Phase 2d-a	Embankment W.811; retaining wall W.815	Phase 2g-e	Campsite and domestic installations; child burials D.1020 and D.1026
					Phase 2d-a	Rural village: house L.910, L.354; yard L.1004; house L.480; L.1010, L.1080; lane L.1062; yard L.1058
Later Periods	2000 BC-1950 AD	Batrawi V	-	-	-	-
Contemporary	1950 - 2010 AD	BatrawiVI	Phase 1	-	Phase 1	-

rural village, and to uncover the western pavilion (Building B3) of what turned out to be an EB IIIB (Batrawi period IIIb) palatial complex known as Palace B.

4.1. Stratigraphy of Area B South

The 2010 excavations in Area B South substantially confirmed the stratigraphic sequence established in 2009 (Nigro and Sala 2010, § 5.1), extending from the modern erosion layer (Phase 1), through two different stages of the EB IVB village (Phase 2), and down to the strata beneath the EB IIIB buildings (Phase 3) which were erected inside the EB II-III main city-wall at the time of its final reconstruction (Nigro 2009: 668-669).

Phase 1 is represented by the topsoil, a hard, shallow layer which attests to the long period of abandonment at the site following the end of the 3rd millennium BC.

Under the topsoil, Phase 2 includes different episodes (Episodes 2a-2g), reflecting the two occupational phases of the Batrawi IVb village, both dating to EB IVB (Nigro 2007: 352-353; Nigro ed. 2008: 127-136). First, the later rural village, consisting of clusters of dwellings equipped with curvilinear storage and domestic installations (Episodes 2a-d); this represents the final permanent settlement on the khirbat. Second, the earliest occupational phase, consisting of a campsite with groups of huts (Episodes 2e-g); this marks the re-occupation of the site following a short period of abandonment in EB IVA (2300-2200 BC; Nigro ed. 2006: 37-40) and a return to a rural domestic economy by small groups of farmers after the destruction of the EB II-III city (Nigro 2009: 670-672).

The underlying Phase 3 strata illustrate a series of stages and episodes related to the construction, use and destruction of the Batrawi IIIb buildings, all dating to EB IIIB. Episode 3a represents the final abandonment of the ruins of the EB IIIB city. Episode 3b consists of thick layers of destruction, showing clear signs of the violent conflagration (burnt layers of ash, charcoal and collapsed mud-brick) which destroyed the entire EB IIIB fortified settlement at around 2300 BC. Episode 3c illustrates the use of and some rebuilding within the buildings during EB IIIB. Episode 3d represents the construction of these buildings at the beginning of Batrawi period IIIb.

4.2. Domestic Architecture of the Batrawi Period IVb (Early Bronze IVB) Village

Excavations in Area B South continued to investigate the EB IVB (2200-2000 BC) rural village, which was constructed on the ruins of the EB II-III city during the last centuries of the 3rd millennium BC. Two main EB IVB constructional phases were identified, showing the gradual transformation of the earlier campsite into a stable rural village.

The earliest phase (Episodes 2e-f) was reached in squares BmII5, BmII6 and BnII7, where it was represented by ephemeral stone structures and installations for temporary storage and food preparation, e.g. stone-lined circular bins, slab-paved platforms and stone benches.

The upper phase (Episodes 2a-d), investigated in squares BmII5, BmII6 and BmII7 (in square BnII7 this phase had already been excavated in 2009; Nigro and Sala 2010: § 5.2), illustrates the establishment of a more substantial village. This consisted of juxtaposed domestic compounds, each represented by a main rectangular house opening on to a courtyard with installations for food processing, (usually) curvilinear storage features, animal pens and other facilities for storage of grain and other agricultural products. Houses had an elongated rectangular plan, with various installations along their inner walls and in the corners, e.g. benches, paved and raised platforms, troughs, stone-lined bins etc. Auxiliary rooms were simply built on to the main one, always with an independent entrance. Two such compounds were investigated during the 2010 season.

The excavation of House L.1010, started in 2009 in squares BnII6 and BnII7, was completed. It was a large, elongated north-west-south-east oriented rectangular house, opening to the north and to the south on to lane L.1062, with two semi-circular stone-lined bins (S.1075, S.1077) on its western side.

To the west (in squares BmII5 and BmII6), a second rectangular domestic unit (L.1080) was built on to the western wall of House L.1010, which also opened on to lane L.1062. To its north, an adjacent square room (L.1070), butting directly up against the inner edge of the embankment created by the collapse of the EB II-III northern city-wall (Nigro 2007: 349, fig. 7; Nigro ed. 2008: 102-103, figs 3.54-3.55; Ni-

gro and Sala 2009: 374), probably represented an auxiliary storeroom with an independent entrance.

South of these houses, in square BmII7, there was an open courtyard paved with small pieces of limestone. The corner of another stone structure was partially exposed in the south-west corner of square BmII7. Both occupational phases yielded a broad assemblage of ceramics, all dating to the middle and final stages of Batrawi period IVb (EB IVB, 2200-2000 BC), as well as objects and tools including flint blades, stone pestles, basalt grinders, mortars, stoppers and spindle whorls. These reflect the subsistence strategies of household economies completely different to the complex, organized economy of the previous EB II-III city.

4.3. The Early Bronze IIIB Palatial Complex Inside the Main City-Wall

Continued exploration of EB IIIB (2500-2300 BC) buildings in Area B South revealed that Building B1 (excavated during the 2006-2009 seasons; Nigro 2007: 353, 2010a: 67, figs on Pp. 76-78; Nigro (ed.) 2008: 151-159; Nigro-Sala 2010: § 5.3) and Warehouse B3 (Nigro and Sala 2010: § 5.3) were actually part of the same palatial complex of Palace B (**Fig. 2**). This was constructed inside the main city-wall in Early Bronze IIIB and consisted of two main wings, each with at least two rows of large rectangular rooms (roughly 5 x 8 m), delineated by stone walls 0.8-0.9 m in thickness. These rows of rooms, referred to as the eastern and western pavilions, were separated by a central passageway (L.1050) which served as the entrance to this wing of the palace. During the 2010 season, attention was focused on the western pavilion, which was covered by a 1.2 m deep layer of collapse which had buried layers of smashed pottery vessels and other more valuable items (Nigro 2010a: 71-110).

4.3.1. The Pillared Hall

The northernmost room of the western pavilion was a rectangular hall, 4.9 x 7.5 m, with a series of four pillars aligned on the main east-west axis. The pillar bases consisted either of limestone slabs set on circles of small stones, or the natural bedrock cut and worked to create a substantial base for a wooden post (**Fig. 3**). The second pillar was made of stones up to ca 1 m in size and was found collapsed towards the west (**Fig. 4**). The northern half of the room was paved with beaten clay/ earth, while in the southern half the floor was made of the emerging bedrock coated with lime plaster. The stone walls were preserved up to a height of 1.2 m, with an inner plastered surface consisting of a mixture of yellowish clay and lime. The main entrance to the hall (L.1080) was in the south-east corner and opened towards corridor L.1050, while a second door (L.1070)-apparently blocked during the final attack on the city-was in the opposite north-

2. General view from the west of the western pavilion (right) of the EB IIIB (2500-2300 BC) palace of Khirbat al-Batrāwī; (left) street L.1060 running parallel to the EB II-III main city-wall; (background) passageway L.1050 and the eastern pavilion.

3. General view from the south of the western pavilion of the EB IIIB (2500-2300 BC) palace of Khirbat al-Batrāwī; note the two bases for wooden posts (roof supports) aligned along the main east-west axis.

4. General view from the west of the western pavilion of the EB IIIB (2500-2300 BC) palace of Khirbat al-Batrāwī during excavation of destruction layer F.1054, with the remains of a collapsed stone pillar and in situ storage jars and pithoi.

western corner of the room (**Fig. 2**).

The ceiling of the hall fell in when the central pillars collapsed as a result of a fierce fire. However, as the ends of the roof beams spanning its width were partially embedded in the walls, vessels and other items around the perimeter of the hall were protected and, in several cases, were found more or less *in situ*.

The whole hall, except for its south-western corner (which is still waiting to be excavated), was filled with a 1.2 m thick layer of destruction, which included broken and heavily burnt mud-brick and plaster fragments, ash and charred beams, along with a large number of ceramic vessels and other objects grouped mainly around the pillars and along the side walls. The nearby main city-wall protected Palace B from erosion on the northern slope of the hill, which explains why its contents managed to survive in a reasonably good state of preservation for more than four millennia.

4.3.2. The Pithoi

A series of pithoi was found along the perimeter walls of the hall (**Figs. 5 and 6**). These pithoi were all of the same type, apparently produced for palace storage with the same fabric and identical construction, i.e. two coil-built halves joined together, with an applied wheel-made neck (see below § 4.3.5). Though of varying height (0.9-1.2 m), each pithos had a regular capacity of 100-120 litres. Most contained winnowed barley (Hordeum vulgare L.; **Fig. 7**), although one (KB.10.B.1040/9) on the southern side of the hall contained red ochre. Seventeen

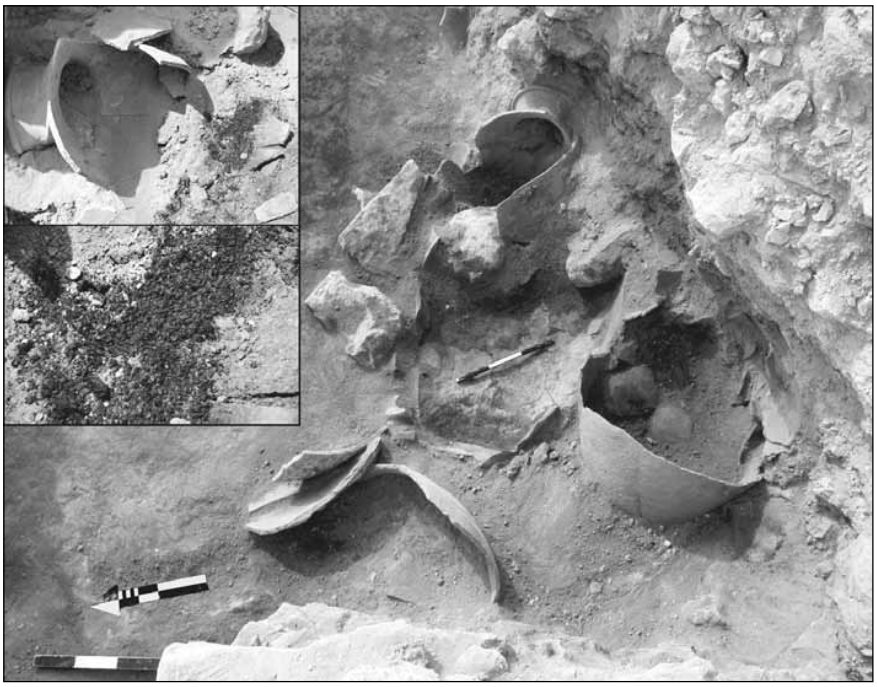
5. Khirbat al-Batrāwī: smashed storage pithoi in the north-east corner of the western pavilion of the EB IIIB Palace from the south-west; (right) northern jamb of door L.1080.

6. Khirbat al-Batrāwī: detail of pithos 1040/17 from the north-east, next to blocked door L.1070 in the north-west corner of the western pavilion of the EB IIIB palace.

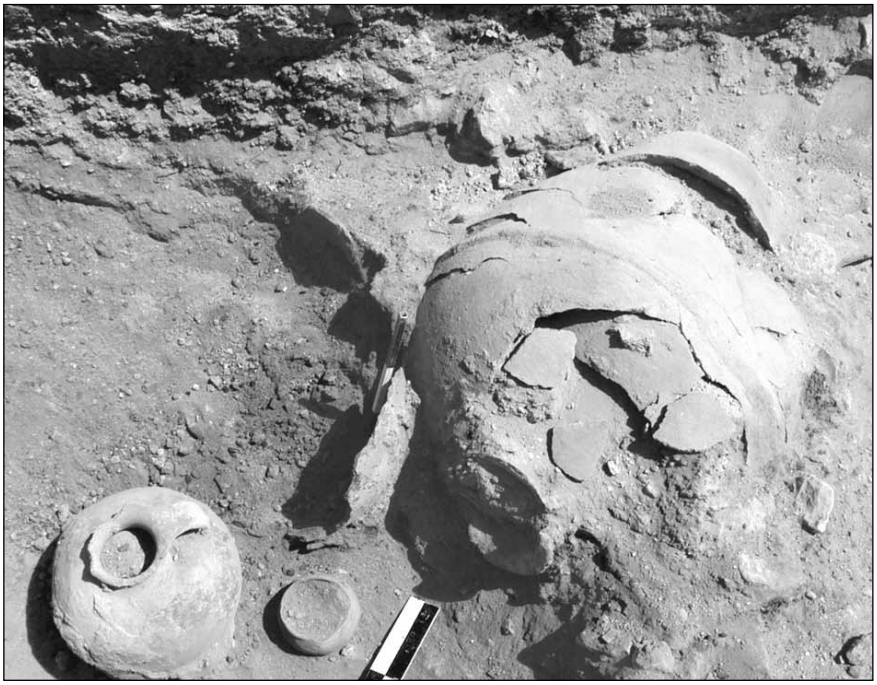
pithoi have been uncovered so far, suggesting an overall storage capacity for the storeroom of around two tons of barley. Distortions and dark reddish burning were visible on the shoulders of the pithoi, no doubt as a result of the violent conflagration which marked the end of the palace.

4.3.3. The Table Vessels

Medium and small pottery vessels, as well as other precious items, were concentrated around the pithoi and pillars (**Fig. 8**). Pottery included a variety of shapes, mainly jugs, juglets and small jars, but also amphoriskoi, vats and miniature vases (**Fig. 9**; see below § 4.3.5). A pattern-combed metallic jar, found north of the collapsed stone pillar, was of a type common in the EB III Batrawi ceramic assemblage and may have been linked to olive oil distribution within the palatial economy (Nigro 2009: 669-670, 2010b:440-441).



7. Khirbat al-Batrāwī: smashed storage jars and pithoi in the north-west corner of the western pavilion of the EB IIIB palace, with detail of the carbonized seeds inside them.

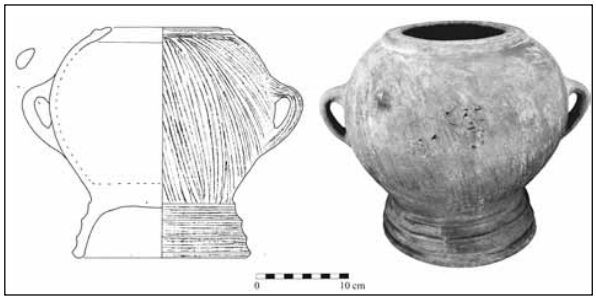


8. Khirbat al-Batrāwī: smashed pithos KB.10.B.1040/7 in front of door L.1080, with a water jug and beaker at its base.

4.3.4. Finds Around the Second Pillar: the Ceremonial Vessel and Other Valuable Items

In the north-western central part of the hall, adjacent to the second pillar from the west, a number of interesting finds were discovered. First, a globular, double-handled, carefully red-burnished vessel (KB.11.B.1054/11; **Fig. 10**) was found; its unusual shape, with a ribbed horizontal rim, vertical handles and high grooved pedestal, may have been imitating some aspects of Khirbat Kerak ware (Greenberg *et al.* 2006: figs 3.13, 3.27:9, 3.46:5, 5.90:14, 5.91:22, 6.31:16, 6.34:11). It may have been a krater or large chalice, clearly imitating a metal (perhaps copper) prototype. It has been interpreted as a ceremonial vase, apparently conveying a sym-

9. Khirbat al-Batrāwī: smashed medium jars, vats and amphoriskoi in the north-west corner of the western pavilion of the EB IIIB palace.



10. Khirbat al-Batrāwī: double-handled, red-burnished ceremonial vessel KB.10.B.1054/11.

bolic meaning associated with its palatial context.

Nearby, the remains of a bear paw (two right metatarsal fragments) have been interpreted as part of a bear skin, with the paws still attached, that was deposited among the goods in the palace. These remains of *Ursus arctos syriacus*, a sub-species of brown bear known mainly from northern Syria during the Bronze Age, but very rare at other contemporary sites in the region, would undoubtedly have been exotic at Batrāwī and are indicative of the symbolic or luxurious character of the palatial context. Many centuries later, a bear was represented among the tributes offered to the Pharaoh by the Syrians in paintings in the tomb of Rekhmire, vizier of Thutmose III (ca 1479-1425 BCE) and Amenhotep II (ca 1427-1401 BCE). Several cut marks caused by metal tools were detected on the paw fragments; this is interesting because stone tools were still used during this period for most day to day domestic butchery activities.

Alongside the pottery vessels, worked bone represents another category of precious objects, which includes nails, pens and a kind of miniature knife or palette. Stone tools and implements were also recovered from the hall, including blades, pestles and two large tabular fan-scrapers (**Fig. 11**).

Among the charred remains recovered from the debris, a wooden cylinder represents a quite unique find, as it may be a seal, carefully prepared and ready to be decorated with incisions.

The Tournette

Another find from the western pavilion is interesting for its economic implications, namely a carefully worked basalt stone disk with a central conical hollow (KB.10.B.87). This would have been used as the upper disk of a potter's wheel, i.e. a tournette, of which the limestone base was

11. Khirbat al-Batrāwī: objects and luxury goods from the western pavilion of the EB IIIB palace, including four copper axes, a bone knife and several bone tools, pierced sea-shells, ochre, polishing pebbles, stone tools, flint blades and fan scrapers, and a basalt potter's wheel.

also recovered (KB.10.B.82; Nigro 2010a: 74, figs on Pp. 108-109; **Fig. 12**). The basalt disk has a diameter of 28 cm and thickness of 3.3 cm. In a recent study of the finds from Palace B1 at Khirbat Yarmouk (Tel Yarmouth) in Palestine, it was pointed out that such tournettes were associated with palatial economies (de Miroschedji and Roux 2009: 171) and that they were introduced for the production of pottery vessels such as big storage pithoi. This fits very well with the scenario envisaged for Palace B at Khirbat al-Batrāwī, where not only was the wheel included among the precious items gathered together in the pillared hall during the final attack to the city, but was also most likely used in the production of the necks of the many pithoi found in the palatial complex. As well as the two specimens found at Khirbat Yarmouk, a similar tournette was also found at Tell es-Sultan / Jericho in Square HII (phases xiii-xiv; Dorrell 1983: n. 2904, 559-560, fig. 231:2, pl. 21b) in the narrow units (? storerooms) immediately east of EB IIIB Palace G.

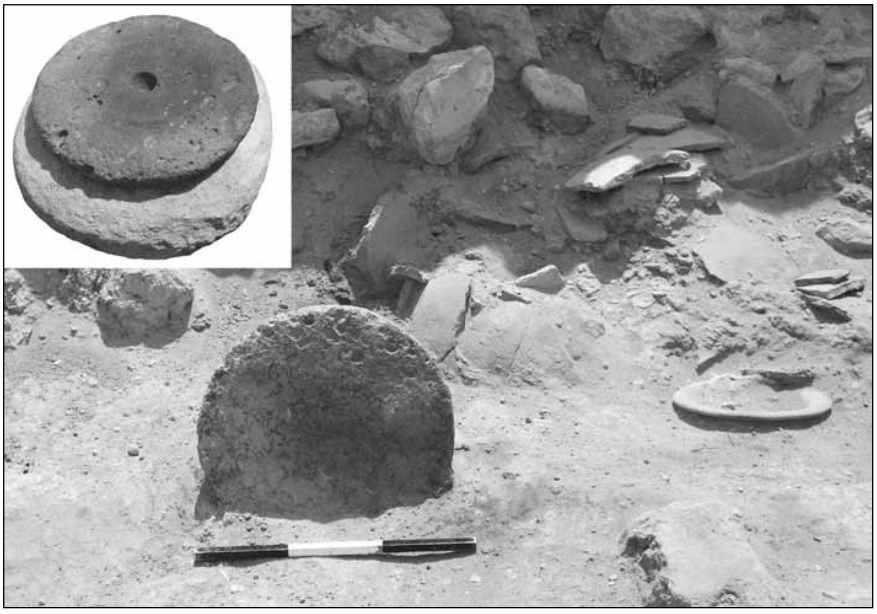
The Four Copper Axes

The most spectacular finds from the hall were concealed in a small cachette, dug into the bedrock floor immediately south-west of the pillar bases, where four copper axes were apparently laid in a bag or chest (Nigro 2010a: 69-70, 119-120, figs on pp. 106-107, 123-124; **Figs. 13 and 14**). The largest of the four is a copper flag axe (KB.10.B.131) of 713 grams and a thickness of 1.1 cm, with a square hollow for binding the handle; it is the only one of the four with clear traces of use, namely two indentations at its upper and lower tips. The longest specimen (KB.10.B.130, 272.66 grams) belongs to a well-known type with an expanded tang for fastening the handle and a fan-shaped blade, carefully hammered and sharpened on one side. This type is also known from a series of moulds excavated by the University of San Diego expedition to Khirbat Ḥamrat Ifdān in Wādī Faynān (Levy 2007: fig. 7.3), where the copper ores used during EB III were identified, i.e. those contemporary with the floruit of the palace of Batrāwī.

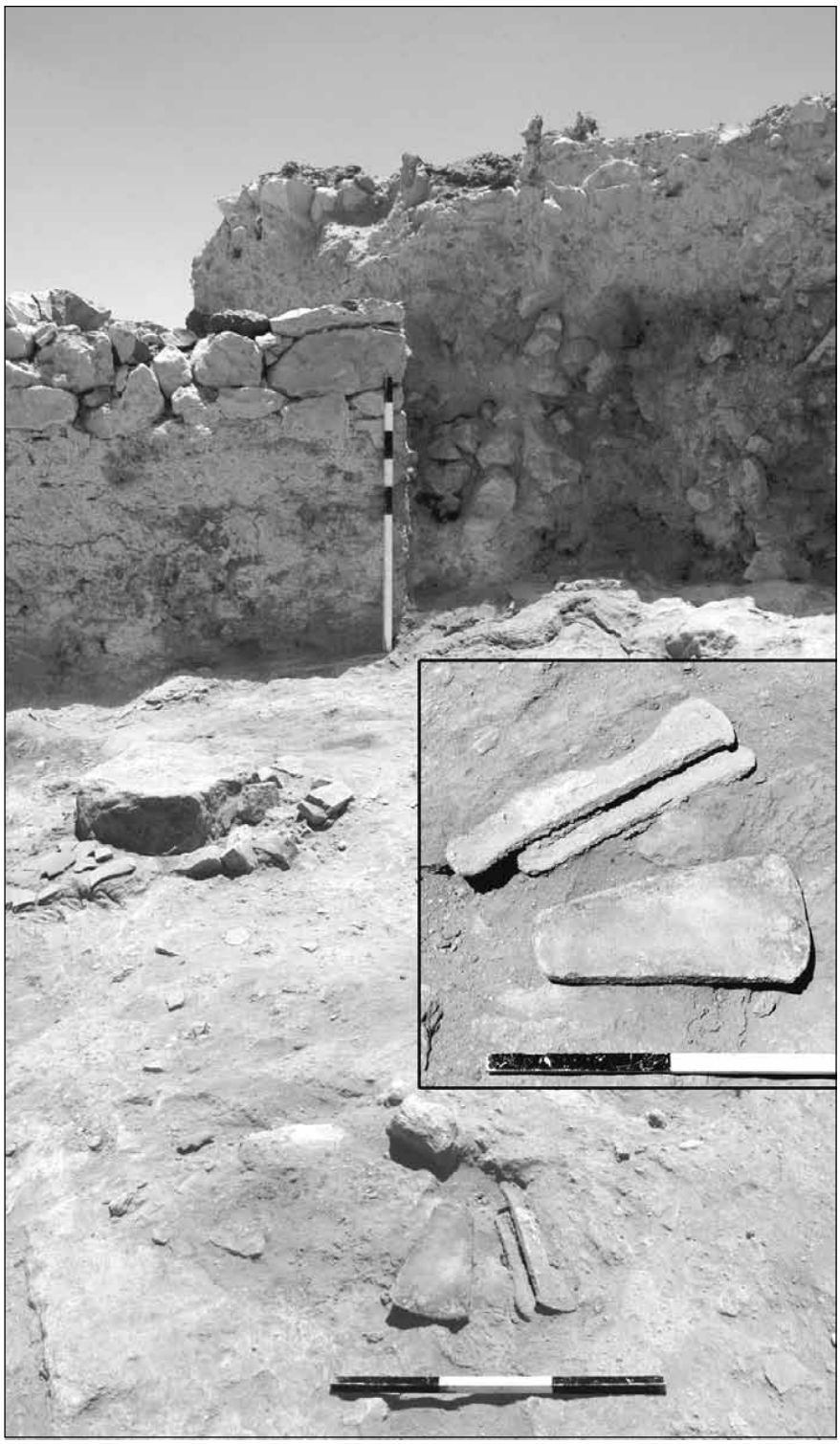
A third copper axe (KB.10.B.132, 160.56 grams), though slightly smaller, is of the same type with a fan-shaped blade and expanded tang. The fact that no traces of use were detected on the blade suggests that this axe, like KB.10.B.130, was never used and conveyed a symbolic meaning instead.

The fourth specimen (KB.10.B.133, 210.36 grams) is also of the elongated type, though without the expanded tang, and has a particularly fine blade.

The discovery of four copper axes in a palatial context is particularly noteworthy for Early Bronze Jordan, since only a few copper weapons have previously been found (around 20 for EB II and EB III in Palestine and Transjordan combined; only 7 of these are EB III, of which five



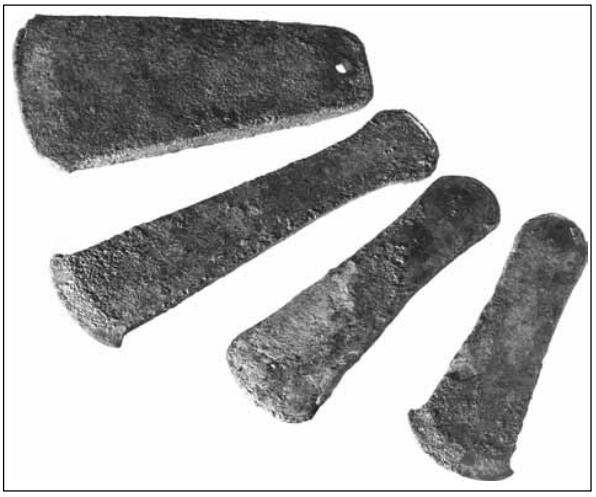
12. Khirbat al-Batrāwī: the basalt potter's wheel recovered from the northern part of the western pavilion of the EB IIIB palace; (left corner) detail of the potter's wheel and its finely worked limestone base.



13. Khirbat al-Batrāwī: the cachette of four copper axes in the floor of the western pavilion of the EB IIIB palace.

came from an uncertain context at Tall al-Ḥisi: Bliss 1984: 39, figs 69, 73-77). The presence of these metal items is evidence of the important economic role played by the palace of Batrāwī during the third quarter of the 3rd millennium BC.

Thanks to the generosity of the Department of Antiquities of Jordan, the four copper axes were brought to Italy for restoration and analyses by the Istituto Superiore per la Conservazi-



14. Khirbat al-Batrāwī: the four copper axes from the EB IIIB (2500-2300 BC) palace.

one e il Restauro (ISCR) in Rome (conservator Stefano Ferrari), where they were exhibited at Rome "La Sapienza" University and at the Musei Capitolini.

4.3.5. The Palatial Ceramic Assemblage

The EB IIIB palatial ceramic assemblage (Nigro 2010a: 67-110) is characterized by a significant leap in the direction of standardisation and centrally controlled production. Wheels were commonly used to make the upper part of medium and large storage containers (i.e. necks and rims of jars and pithoi), as well as to fashion and refine small vessels for daily use. All this occurred within the context of a general standardization in terms of shapes and fabrics. Relatively coarse, low-fired red, reddish-brown and brown wares were usually used for medium and small vessels intended for daily use, while large storage containers, such as the big pithoi, were all produced from a well-fired brownish-pink fabric (sometimes with a reduced grey core).

The closest parallels to the Batrāwī palatial ceramic assemblage come from the EB IIIB layers of northern Palestinian and Transjordanian sites, primarily Khirbat az-Zayraqūn ("späten Horizont", or "Letztbenutzungsphase"; Genz 2002: 120) and Khirbat Karak (late Period D), but also Beth Shan (stratum XI / phase R7a). It also has parallels at central and southern Palestinian and Transjordanian sites such as 'Ayy / at-Tall (phases VII-VIII), Tell es-Sultan (Sultan phase IIIc2), Khirbat Yarmouk (strata A6-A7 in Area A, BII-BI in Area B, CII-CI in Area C; de Miroschedji 2000: tab. 18.1), Tell Beit Mirsim (phase J; Dever and Richard 1977) and Tall al-'Umayrī (IP 19; Field D, phase 4; Harrison 2000; Herr 2000).

The plain-ware assemblage includes a few deep bowls (20-25 cm diameter) with flat bases, oblique walls and in-turned rounded rims (in one case with two small knobs / ledge handles applied below the rim), two medium vats with flat bases, in-turned rims and pushed-up ledge handles, and a third vat without handles.

Small jars (15-25 cm high), with short everted necks and elongated or squat ovoid bodies are relatively common in the palatial assemblage. At present, there are about 10 examples of medium sized ovoid jars (35-45 cm high), with flaring necks, everted rims and a couple of pushed-up ledge handles applied at the girth of the body; these are sometimes decorated with an incision at the base of the neck in order to hide the junction between the wheel-made neck and coil-built body.

A couple of big amphoriskoi or, more properly, double-handled jars was also found; comparable examples are known from Khirbat az-Zayraqūn (Genz 2002: 27, pls. 4:4-5, 54:3, 83:4), Khirbat Karak (Greenberg *et al*. 2006: figs. 5.81:7, 5.88:1, 5.91:12, 8.69:3, 8.77:3, 8.89:9, 8.100:8), Tall al-'Umayrī (Harrison 2000: fig. 19.3:7-8) and Tall ad-Duwayr (Tufnell 1958: pl. 59:168-169).

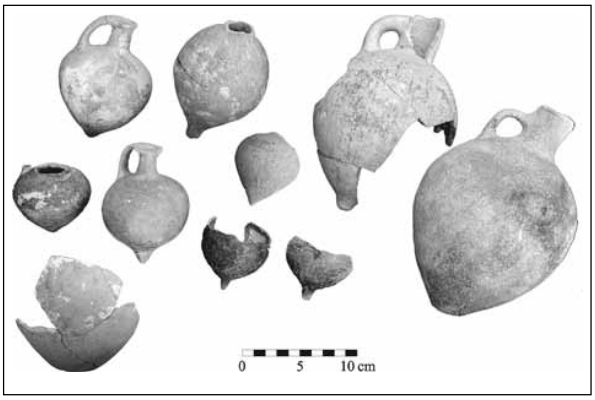
A wide range of jugs and juglets, possibly containers for olive oil, grape juice and / or other liquids, were also recovered. They have both piriform and globular bodies, flat or pointed bases, and wide or narrow mouths. A large water jug with two pushed-up ledge handles (KB.10.B.1054/26; c.f. EB IIIB examples from Khirbat Yarmouk (Ben-Tor 1975: pl. 31:4, figs. 8:4, 11:2; de Miroschedji 2000: fig. 18.9:10-11), Tall ad-Duwayr (Tufnell 1958: pls. 15:3, 69:285-286, 288), 'Ayy / at-Tall (Marquet-Krause 1949: pl. 65:11.1565) and Tell es-Sultan (Sellin and Watzinger 1913: pl. 21:C.i; Kenyon 1960: fig. 47:3)) was found next to a beaker, which seems to be a forerunner of the later EB IV beakers. Pointed or spike-base juglets are diagnostic of the late EB III (as pointed out in Dever and Richard 1977: 7, 10; Mazar, Ziv-Esudri and Cohen-Weinberger 2000: 267) and were mainly

produced in red- or black-burnished ware.

Red-burnished and polished wares were the principal fine-wares of Batrawi period IIIb, and were of high quality. A variety of jugs and juglets, mostly red-slipped and burnished, are present in the palatial assemblage. Of these, seven small, pointed base red- and black-burnished jugs and juglets with globular bodies are a distinctive marker of the period (**Fig. 15**). These are typical of the final EB III assemblages from other stratified Palestinian sites, e.g. Beth Shan (Mazar, Ziv-Esudri and Cohen-Weinberger 2000: 267), Tall ad-Duwayr (Tufnell 1958: pls. 59:159, 164, 60:210-212, 61:247), Tell es-Sultan (Garstang 1932: pl. II:19-20; Kenyon 1960: figs 35:35-38, 37:48, 39:10-11, 52:52-55, 61:30, 68:19) and Tall al-'Umayrī (Daviau 1991: fig. 6.41:26).

Two red-burnished and polished juglets (KB.10.B.1054/9 and KB.10.B.1054/34) deserve more careful examination, as they may belong to a ceremonial assemblage. The first (KB.10.B.1054/9) has a globular body with a flat, slightly concave base and cylindrical neck, with a carefully applied thick red slip and shiny vertical burnish. The second (KB.10.B.1054/34) has a vertical ovoid body with flat, slightly concave base and flaring neck, with a complicated pattern of burnishing that divides the vessel into zones (vertical on the lower half, net-pattern around the middle and horizontal on the neck).

An almost unique form was that of a globular, double-handled, red-burnished krater (KB.11.B.1054/11), possibly inspired by Khirbat Kerak ware prototypes (see above 4.3.4).



15. Khirbat al-Batrāwī: red-burnished jugs and juglets, and black-burnished juglets from the EB IIIB (2500-2350 BC) palace.

Palatial storage vessels principally consist of pithoi, i.e. large containers for long-term storage made of two joined coil-built halves, with a distinctive wheel-made neck. These huge containers always have a narrow, flat base, elongated ovoid body and a flaring / cylindrical neck (c.f. contemporary contexts from the palace at Khirbat az-Zayraqon (e.g. Genz 2002: pls. 26, 33)). To hide the joins, rope-like decoration was applied to the middle of the body and at the base of the neck. The decoration at the base of the neck is often characterised by stick impressions[6], while that applied to the middle of the body is usually represented by a plain raised band, as in specimens from EB IIIB layers at Khirbat Yarmouk (de Miroschedji 2000: fig. 18.6:10), Tall al-'Umayrī (Harrison 1997: figs 5.20:1, 5.21-5.22; 2000: fig. 19.5) and Tall ad-Duwayr (Tufnell 1958: pl. 62:302). Several surface treatments are attested to, including a thick white coating and 'grain wash' decoration, now also known in a 'smeared wash' variant in white or red (also found at Khirbat az-Zayraqūn (Genz 2002: 32-35, pls. 28, 30, 33, 86, 97, 108:3, 153:D, 155:B-C) and Khirbat Karak (late Period C; Greenberg *et al*. 2006: figs 8.78:3-4, 8.80:4)).

Just a few hole-mouth jars with swollen, flattened or rounded rims were recovered, as these are usually the typical storage containers of EB II-III houses (Ilan 2001: tab. 18.6-18.7), rather than from palatial contexts.

An example of a pattern-combed, metallic transportation jar was found in the palace storeroom. It was produced in a highly fired, but rather coarse grained orange fabric, and has an ovoid body with flaring neck, everted rim and vertical handles, refined with alternating horizontal and vertical combing on the outside (according to a typology well-attested to at, for example, Khirbat az-Zayraqūn (Genz 2002: pls. 5:1-2, 25:1, 29:1-2, 4, 32:1, 3-4, 34:3, 56, 61:2, 70:5, 83:1, 3, 95, 108:4, 113:2, 131:1) and Khirbat Karak (Greenberg *et al*. 2006: figs. 8.69:5, 8.80:7)). This jar also has a potter's mark. It is of a type known from all over the Levant during

6. Comparable examples of this kind of rope decoration around the neck can be found at contemporary Khirbat az-Zayraqūn (Genz 2002: pls. 25:3, 26, 31:2, 36:1, 37, 84, 87, 98), Khirbat Karak (Greenberg *et al*. 2006: fig. 5.88:13), Tall al-'Umayrī (Daviau 1991: fig. 6.40:20; Harrison 2000: fig. 19.5) and Tell es-Sultan (Kenyon and Holland 1983: fig. 157:7).

the mid-third millennium BC (Mazzoni 1987), that was mainly associated with the transportation and storage of olive oil.

Further study of this EB IIIB assemblage of more than 120 complete vessels recovered from the western pavilion of the palace will undoubtedly shed further light on the EB II-III pottery sequence of Khirbat al-Batrāwī, as well as defining Batrāwī as a key site for the study of northern Palestinian and Transjordanian Early Bronze Age pottery.

5. Restoration in Area B South

During the sixth (2010) season, restoration work was carried out in Area B South from east to west. The eastern, northern and western walls of House B2 were restored with mortar similar to the original (**Fig. 16**). The semi-circular silos (W.135) abutting the western side (W.921) of the house was also refurbished, as was oven T.413 abutting the eastern side of Building B1 (i.e. the eastern pavilion of Palace B). The latter was carefully restored, during the course of which the north-west corner, which was partly cut by a later pit, and the stone foundations (W.421) of a staircase set into the inner face of the eastern wall (W.389) were also reconstructed.

16. Khirbat al-Batrāwī: general view from the east of the EB IIIB (2500-2300 BC) quarter of houses and public buildings in Area B South after the restoration works carried out in 2010.

6. Conclusions

The sixth (2010) season of excavation and restoration at Khirbat al-Batrāwī focused mainly on the excavation of Building B3 in Area B South, i.e. the western pavilion of the palatial complex known as Palace B. This contained a rich assemblage of pottery vessels and objects, apparently gathered together during the final attack on the city at the end of Early Bronze IIIB (around 2300 BC). This extraordinary archaeological context yielded more than 100 complete ceramic vessels (including pithoi, storage jars, hole-mouth jars, vats, amphoriskoi, jugs and juglets, miniature bowls and a near-unique double-handled, red-burnished ceremonial vase), a potter's wheel, several worked bones and a cachette of four copper axes. The latter represents an outstanding find of its type for EB III Jordan and Palestine. Since several pithoi and storage jars still contained seeds and other materials, chemical and physical analyses will undoubtedly provide valuable data for the interpretation and absolute dating of this building, which can now definitively be interpreted as a public structure within an Early Bronze Age city. Further investigations and studies are of course needed for the continued exploration of Palace B and a more complete evaluation of its finds. This will be pursued in forthcoming seasons, thanks to the kind co-operation and support of the Department of Antiquities of Jordan.

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THE INTERNATIONAL UMM AL-BIYĀRA PROJECT (IUBP) PRELIMINARY REPORT ON THE 2010 SEASON

Stephan G. Schmid and Piotr Bienkowski

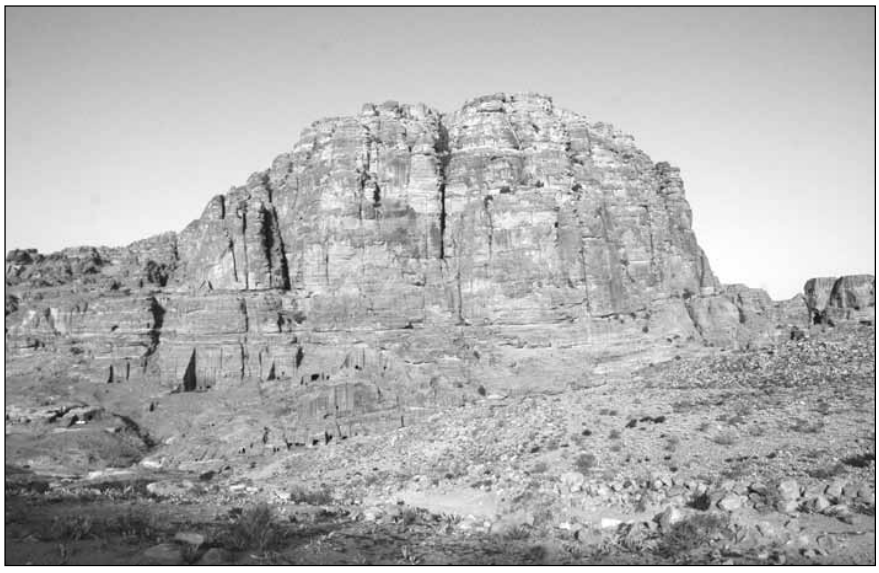
Acknowledgments

The 2010 field season of the International Umm al-Biyāra Project (IUBP) lasted from March 18th to April 8th. The IUBP 2010 was funded by the Council for British Research in the Levant (CBRL), the German Research Foundation (DFG) through the German-French project "Early Petra" directed by Michel Mouton (Paris) and Stephan G. Schmid (Berlin), the cluster of excellence "Topoi" (Berlin), Humboldt-University (Berlin) and the Association for the Understanding of Ancient Cultures (AUAC, Basel). We would like to thank the director general of the Department of Antiquities, Dr Fawwaz Al-Khraysheh, for his support and for granting the working permit, as well as Dr Eimad Hijazeen, commissioner of the Petra Park Authority, for the kind logistic support. We would also like to thank the Deutsches Evangelisches Institut (DEI) at Amman as well as the Institut Français du Proche-Orient (IFPO) Amman for lodging the team during its stay in Amman.

The following persons participated in the 2010 season of the IUBP: Piotr Bienkowski (co-director, Manchester), Stephan G. Schmid (co-director, Berlin), André Barmasse (Basel), Elzbieta Dubis (Krakow), Maxie M. Haufe (Berlin), Will Kennedy (Sheffield/Berlin) and Guido Teltsch (Berlin). The representative of the Department of Antiquities was Mohammed Zahran. During the team's sojourn at Nazzal's Camp in Petra, Suleiman Mohammed al-B'dool, Saher Mohammed al-B'dool, Aziza Suleiman al-B'dool, Dishwasher Rweij al-B'dool and Ali Khalaf al-B'dool were a very efficient and helpful camp team.

Introduction

Umm al-Biyāra, the huge rock massif dominating the centre of Petra (**Fig. 1**), can be considered the most important elevation connected to the city of Petra, irrespective of whether it is

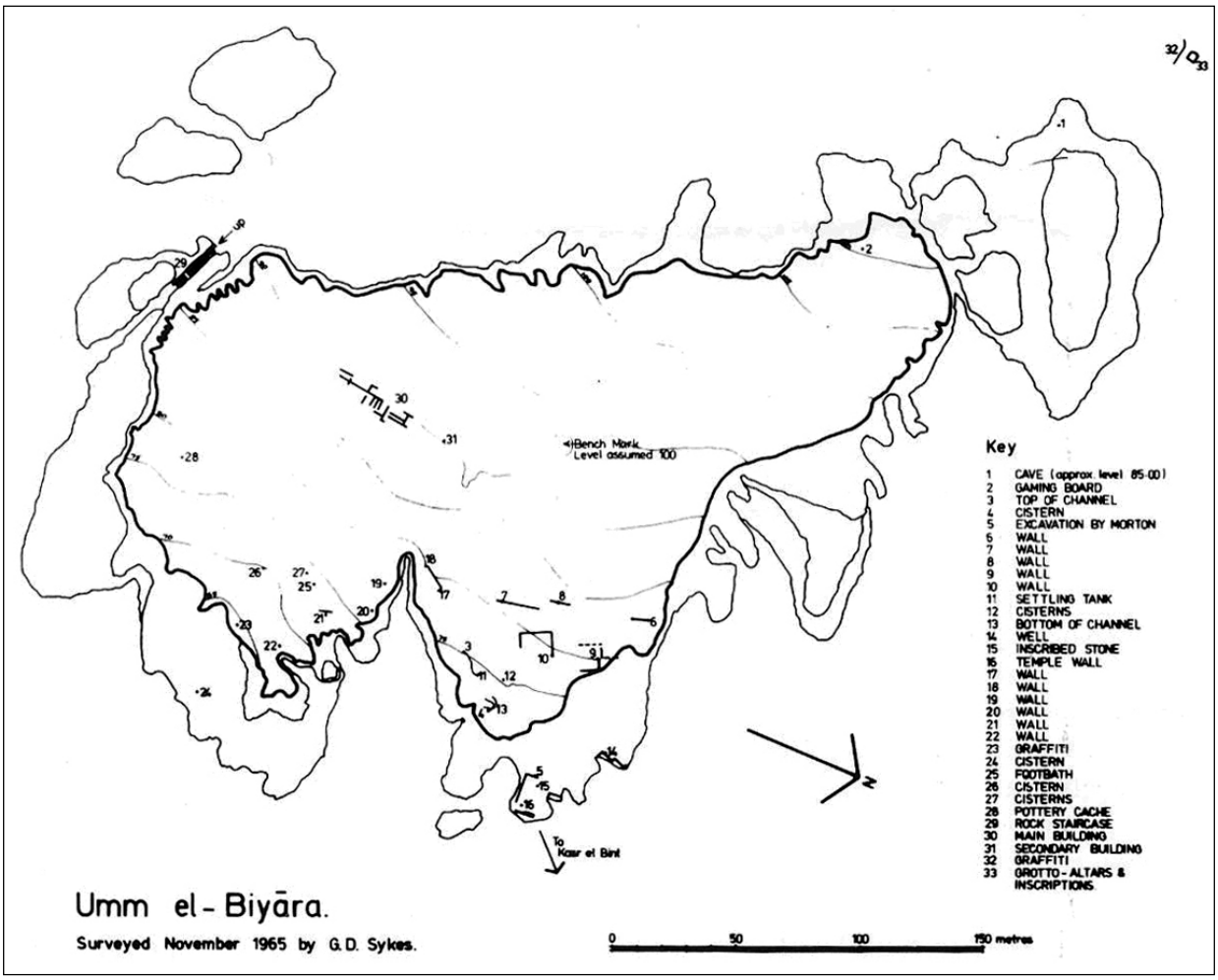


1. Umm al-Biyāra from W (Schmid).

to be identified with biblical Sela or with "the rock" referred to by Diodorus Siculus for the events of 312/11 BC (Diod., Geogr. 19, 94, 1 – 100, 3; for the text and a commentary see Hackl, Jenni and Schneider 2003: 439-453). Previous archaeological work at Umm al-Biyāra was undertaken in the 1950s and 1960s, preceded by some observations already in the 1930s. Most of these activities were focussed on Edomite structures. In general terms, Nabataean structures on top of Umm al-Biyāra received little attention before the mid-twentieth century. For example, Brünnow and von Domaszewski only consider rock-cut structures on the east flank of Umm al-Biyāra (Brünnow and von Domaszewski 1904: 295 nos. 355-357 [misleadingly named 'el Habis']). The same is true for G. Dalman who treats three "sanctuaries" below Umm al-Biyāra in a more detailed way, but, as is clearly indicated by the subtitle of the chapter and by the descriptions, these are structures on the terraces beneath the plateau and not on top of it (Dalman 1907: 226-229; these structures on the so-called northern terrace have been dealt with in detail by Lindner 1997: 293-303). It was with Nelson Glueck's visits to the site in the 1930s that the plateau of Umm al-Biyāra became more intensively dealt with, although not so much for the Nabataean remains but rather for the Iron Age pottery that was collected there (Glueck 1934-35: 82). From that moment on, the question of whether Umm al-Biyāra was the rock of Edom became a major issue mostly for Iron Age archaeologists (for detailed information see Bienkowski in press).

In 1955, an expedition organised by the American Schools of Oriental Research at Jerusalem conducted, among other activities, a detailed survey and a few soundings on top of Umm al-Biyāra (Morton 1956). William Morton was able to make some valuable observations regarding Nabataean structures on the site. For example, he observed that Nabataean pottery was mainly to be found on the north-eastern sector of the plateau and he already concluded that 'this is the area commanding the best view of the city enclosure below and in which are concentrated practically all of the foundation lines of Nabataean buildings' (Morton 1956: 29). Morton counted about 13 different buildings on several terraces in that specific area, that he considered being of Nabataean date (Morton 1956: 29). His attention was particularly caught by a huge rectangular structure on the very edge of the north-eastern promontory of the plateau (cf. **Fig. 2**) (Morton 1956: 30-31). He described three steps at the end of that building, obviously leading into nowhere right across the cliff (cf. ST 26 on **Fig. 3**), and proposed that the structure initially extended further in that direction, using foundational walls that had broken away in the meantime. A substantial block with architectural decoration led to the presumption of a richly decorated building going far beyond 'a temporary refuge for the aged and for women and children as reported in the account of Diodorus' (Morton 1956: 31). Finally, Morton suggested a date within the first century AD and a function as an 'officially staffed stronghold and observation post, perhaps with provision for ritual observance' (Morton 1956: 31).

From 1960 to 1965, Crystal-M. Bennett spent considerable time and energy in exploring the peak of Umm al-Biyāra (the final publication of these excavations has been prepared by Piotr Bienkowski, in press; on the life and career of Bennett see now Prag 2010). Although the Iron Age settlement was clearly her focus, on several occasions Nabataean remains are dealt with in preliminary reports. For instance, in an article in 1966, the huge structure described by Morton is illustrated and referred to as 'a building that may have been a small temple, but has been amputated from its fore part by a earthquake or some other catastrophe' (Bennett 1966, '[…], y compris un bâtiment qui peut avoir été un petit temple, mais qui a été amputé de son avant-corps par un tremblement de terre ou quelque autre catastrophe'; in the caption to her fig. 4, a picture of the rock-cut steps leading nowhere as described by Morton, the structure is called 'a Nabataean temple'). In 1980 Bennett published a short report on Nabataean Umm al-Biyāra, where the structures observed by Morton are published as ground plans (see here **Fig. 2**) and interpreted as connected with the Qaṣr al-Bint and, therefore, ascribing the building a religious function; 'Its dominating position, overlooking the main street of Petra and the Temenos of the Temple of the so-called Qaṣr al-Bint, suggest that it might have had some connection with the latter, which was the major Graeco-Nabataean

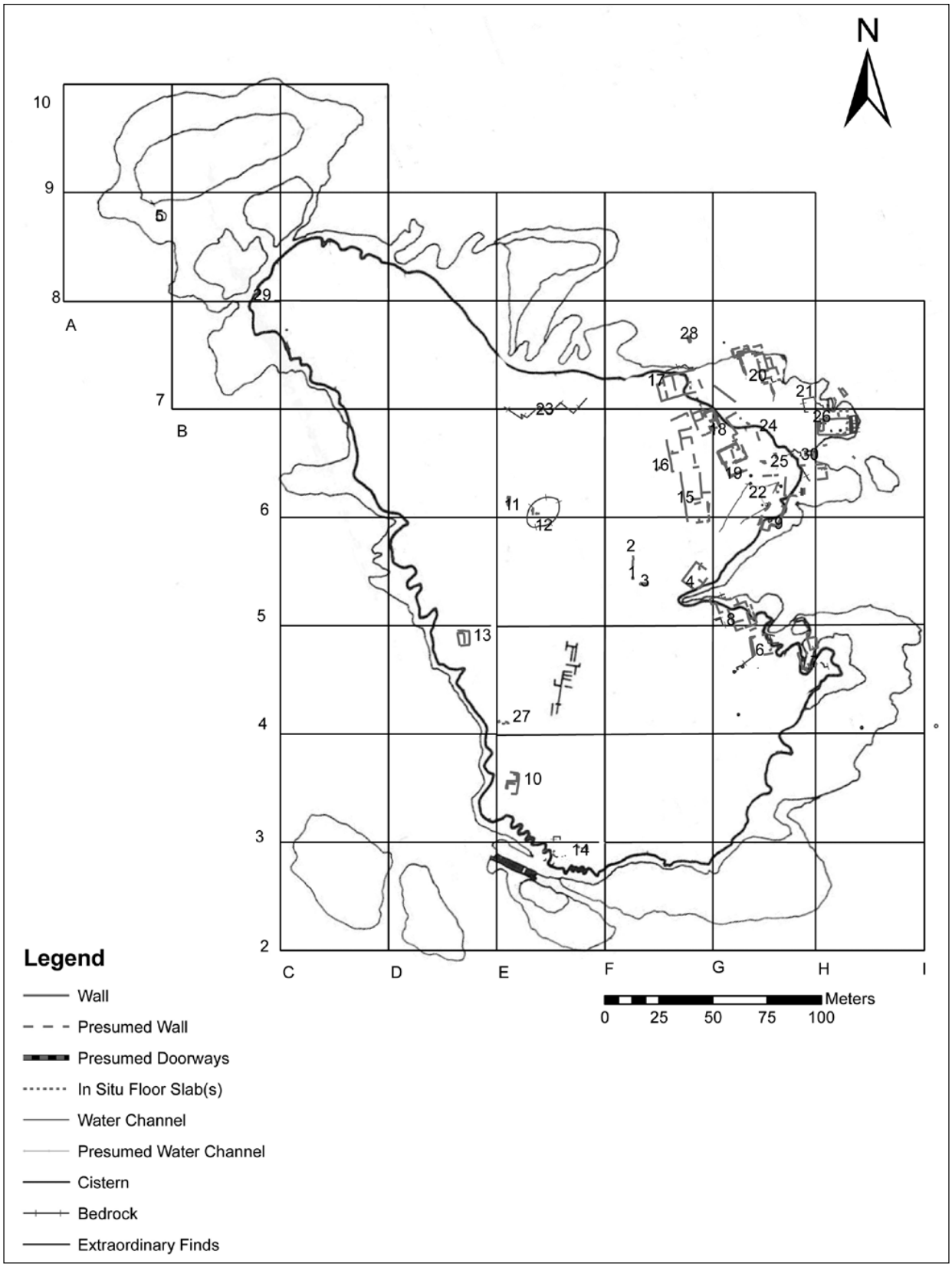


2. Umm al-Biyāra, British plan of 1965 (Sykes).

temple in Petra' (Bennett 1980: 211). In the caption to Bennett 1980, fig. 3, the building is called 'a possible important Nabataean temple'. Strangely, there is no mention of Morton's article although his trench is even indicated on the respective plan.

More recently, scholars have mostly abstained from a too precise interpretation of the Nabataean structures on the north-eastern edge of Umm al-Biyāra. For example, Ian Browning remains cautious as to any identification of the aforementioned Nabataean ruins; 'It has been suggested that this was the site of a temple (…). Until the site has been excavated it would be vain to speculate on why these steps were so perilously sited' (Browning 1989: 185). Manfred Lindner, one of the most intimate connoisseurs of the topography of Petra, had in mind a temple or a palace when looking at the Nabataean structures on top of Umm al-Biyāra (Lindner 1997: 44). As a matter of fact, the only element that was mentioned in favour of the interpretation as a Nabataean temple was its presumed orientation towards the city's main sanctuary of Qaṣr al-Bint. Upon verification it turned out, however, that the Qaṣr al-Bint is not at all visible from the spot of the presumed temple, since the hill of al-Ḥabīs obstructs the view (for some preliminary arguments dealing with the issue cf. Schmid 2009, and in press). During the past five years, it became clear that both writers of the present report had similar questions and interests regarding Umm al-Biyāra and, as a result, the present project was born, aiming at a better overall understanding of the plateau of Umm al-Biyāra, mainly regarding the Nabataean period.

For the time being, two main objectives for that project can be formulated:



3. Umm al-Biyāra, new plan with structures surveyed in 2010 (G. Teltsch and W. Kennedy).

- finding out more about the exact plan, date and function of the Nabataean structure(s) observed by previous research and mostly concentrating on the north-eastern edge of the plateau;
- verifying whether there is continuity or not between the Iron Age occupation and the known Nabataean structures that seem to date no earlier than the later first century BC (see below).

For that purpose, in 2010 a first season of roughly three weeks was devoted to a survey of the summit of the mountain. Using the British plan of 1965 as a starting point (**Fig. 2**), one of the first tasks consisted in connecting the summit of Umm al-Biyāra to an existing and referenced mapping system of the Petra area. Therefore, we measured four points from the city centre to the eastern ridge of the plateau of Umm al-Biyāra using a Leica total station TS 02 power – 7. As reference we used the grid established by the Swiss surveyors in the late 1980s, which was itself referenced to the Palestine Grid (Glutz 1996, insisting that the Swiss system is in itself very accurate but the correspondence to the Palestine Grid is less accurate due to the lack of precision of previous mapping activities.). Using the four fixed points, the plateau was then subdivided into 50m square grids. Each corner of a grid being named by a letter and a number, the grids themselves are named according to the distance between all four corner points (for example C-D/6-7 or G-H/4-5 and so on). These were subsequently surveyed in two ways: first, the surveyors walked along the middle line of each grid in a W-E direction, picking up all surface pottery and other objects in their line. Second, all visible structures within every grid such as walls, cisterns, quarries etc. were reported and sketched on specific sheets. A mapping team using a Leica GNSS 09 satellite positioning system measured and mapped all the structures in order to determine the dimensions, extent and orientation of the built structures (cf. **Fig. 3**). Further, the most clearly visible and discernable structures were made the object of intensive surveys, picking up all diagnostic pottery in and around them. Last but not least, the trench dug by Morton, as well as one clearly visible illicit excavation, were cleaned in order to document the structures uncovered by them. We deliberately did not survey the area of the Edomite settlement excavated by Bennett, as well as the clearly visible dumps and potsherd deposits from that excavation, since these are covered by the final report (Bienkowski in press).

Although this was a survey season with a rather small team, a certain infrastructure was necessary in order to work efficiently on the summit of Umm al-Biyāra. A specially constructed solar collector transferring sunlight into electricity was necessary in order to charge the batteries of equipment such as the satellite measuring system, the outdoor notebooks, mobile phones and so on. As a base we used a rock cut structure on the E corner of the main plateau (no. 29 on **Fig. 3**). All of the infrastructure, as well as the daily necessary goods (water, food), were brought up by donkeys that also took down the collected pottery and other objects as well as the garbage. In general terms we tried to make use of the summit in the most responsible way, leaving no traces behind us.

First Results

General Observations

In terms of chronology one striking observation is the almost complete lack of evidence for any other periods than the Edomite (7th-6th century BC) and the Nabataean (1st century BC – 1st century AD) periods. While the city centre and surrounding areas have evidence for occupation and structures for the Roman, the Byzantine and the Medieval periods, no traces whatsoever of these periods were found on top of Umm al-Biyāra, with the exception of a very small number of African Red Slip wares and some Medieval sherds of the so-called Ayyubid-Mamluk type (on Medieval pottery from the Petra area see now the concise overview by Sinibaldi 2009). Also, there was no evidence of occupation in the period between *ca.* 500 BC and the 1st century BC (at Busayra, for example, the Iron Age occupation continued to *ca.* 300/200 BC, see Bienkowski 2002; but there is no such evidence of later Iron Age and early Hellenistic occupation on Umm al-Biyara so far). The survey further clearly revealed a concentration of activities during the Nabataean period focussed on the eastern ridge of the plateau, i.e. the part of the summit that offers the best view towards the

city centre while at the same time being the best visible from the surrounding area, especially the city centre. These are the sectors of the plateau densely occupied by monumental buildings (**Fig. 3**). However, the collected pottery shows that during the Nabataean period the areas towards the NW part of the plateau must also have seen some activities although no visible remains survived on the surface. Compared to the British survey of 1965 we were able to identify many more structures and to correct the position of some previously mapped structures (cf. **Fig. 2** with **Fig. 3**). In total 30 structures were reported and mapped, eight being cisterns and their connected water channels, 19 being substantial buildings. For the time being, until proper excavation is undertaken, it cannot be decided in all cases whether we are dealing with individual structures or whether some or even all of them belong to one overall structure. At the very least the common orientation of structures 17 to 20 or structures 15 and 16 etc. might indicate an overall building plan.

It is not the aim of this preliminary report to describe at length every structure. We will focus on some specific ones to provide an initial insight into the Nabataean occupation of Umm al-Biyāra.

A Watchtower?

Structure 10 (ST 10) was identified on the western half of the plateau, more or less on the SW angle of the plateau (cf. **Fig. 3**). Its exposed situation on an outcropping rocky promontory, as well as its rectangular, almost square plan, might indicate that it was a watchtower. This would very well fit with its apparently carefully chosen position. The structure stands at a point with a perfect view all around the area, and especially towards all the springs supplying the long distance water supply of Petra: from ʻAyn Dibidba in the Bayḍā area to ʻAyn Brāq on the road to aṭ-Ṭaybah, including ʻAyn Mūsā and the ancient settlement of Iljī/ el-Ji (Gaïa). The view from that spot is even more extensive, including the prominent hill of Dilāgha at the very SE, itself occupied by a huge watchtower and giving access to the track leading to Gharandal, Jabal Hārūn to the SW and the Wādī ʻArabah to the W as well as Jabal Qārūn to the N. From some spots on the NW tip of Umm al-Biyāra one can even see Qaṣr Umm Rattām, a major guard post controlling the access to the region around Petra from Wādī ʻArabah (on Umm Rattām and its strategic importance see Lindner *et al*. 2000; Lindner *et al*. 2007). Although built directly on the visible rock surface, a certain amount of pottery was picked up on the surface in and around ST 10. With the exception of a very few Edomite sherds, the vast majority of pottery belongs to the Nabataean period, indicating a Nabataean date for ST 10. In general terms, the summit of Umm al-Biyāra offers an excellent strategic view around the area, being in a sense the key to the functioning and existence of Petra in the Nabataean period. As pointed out elsewhere (Schmid in preparation), the city centre of Petra is actually built in a very illogical and uncomfortable spot. There is absolutely no view from the city centre to the surrounding areas, which was a major strategic disadvantage. Further, there is no regular natural water supply for a substantial population. In other words, a more logical place for developing a settlement would seem to be the area along the above mentioned springs, allowing the supply of a bigger population, offering a good view and being in the vicinity of possible agricultural areas. In order to settle permanently and to develop a substantial population in the city centre of Petra, immense efforts in constructing an effective infrastructure are necessary. Water management was surely one of the main concerns (see for instance Bienert 2002; Bellwald 2008; Muheisen 2009; Schmid 2008). Therefore, the Nabataeans invested an extraordinary amount of time, energy and finance in the creation of dams, channels, cisterns etc., both for protecting the city from flash floods and bringing fresh water into it. While these efforts in terms of water management mainly concern a kind of a half circle towards the E of the city centre, in terms of strategic concerns one has to control a much wider area in order to be able to live sustainably at Petra. Since from the city centre no view and therefore no communication with the wider area is possible, the Nabataeans needed to make sure they controlled the surrounding hills. By far the best view towards all important strategic points and the city centre is offered by the plateau of Umm al-Biyāra, linking the city centre to the outer world. Not only is the view from Umm

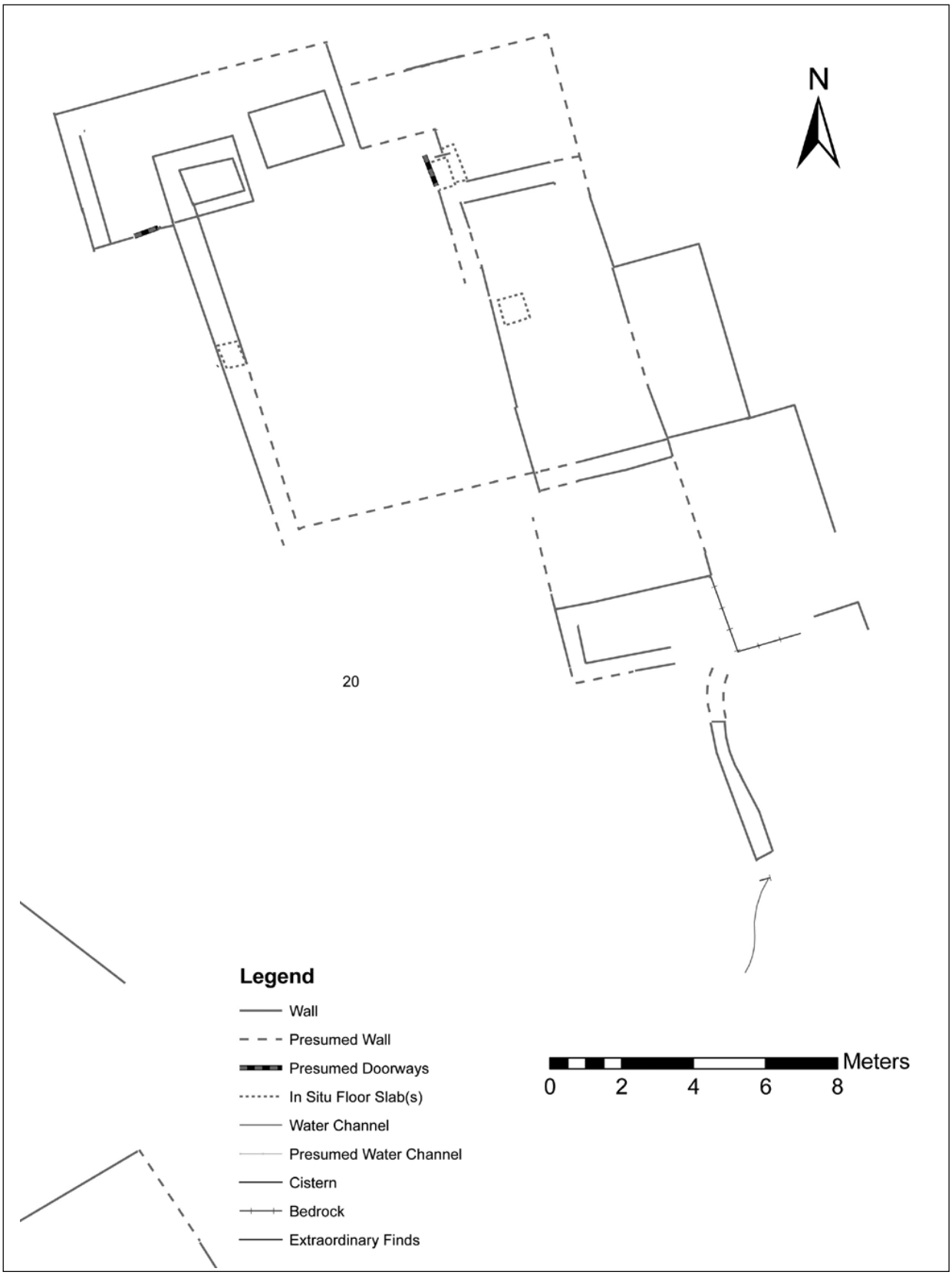
al-Biyāra imposing, also the acoustic connection to the surrounding area is truly impressive, as can still be verified today. For example, from the summit of Umm al-Biyāra donkeys can be heard from all over the city centre up to Umm Ṣayḥūn, cars can be heard from Umm Ṣayḥūn, Wādī Mūsā, and the road to aṭ-Ṭaybah as far as the hospital and even people shouting within the city centre can be heard.

In conclusion, whoever wanted to dwell in the city centre of Petra on a permanent basis needed to be in control of Umm al-Biyāra. This premise is important when it comes to interpreting the structures from the plateau belonging to the Nabataean period. That in general terms such reflections as to strategic views and long distance communication played an important role for the Nabataeans is confirmed by Diodorus Siculus who, when reporting on the events of 312/11 BC, indicates that the Nabataeans had guard posts on elevated spots controlling the routes towards Arabia which communicated with each other using signal fires until the message reached "the rock" (Petra) (Diod. 19, 96, 3. 97, 1). It is likely that this kind of strategic and spatial organisation was still in use some years later, though in a more developed way. This may be concluded from an episode dating to about 27 AD when the daughter of Aretas IV, who was married to Herod Antipas, fled to Petra, travelling from one Nabataean *strategos* to the next (Jos., Ant. 18, 112).

A luxurious Bathing Installation

Some of the structures identified so far can be interpreted in a more precise way, always bearing in mind that these are the results of a survey, without any excavation. Such is the case, for example, with structure 20, standing on the NE edge of the plateau, prominently overlooking the city centre (**Figs. 4, 5**). The structure consists of several clearly visible rooms: more are most probably buried under substantial amounts of rubble and debris. From the S end of the building, a partially rock-cut and partially built water channel brings in water to the structure (**Fig. 6**; on the water management of Umm al-Biyāra, see below). The water is collected in a substantial basin, identified thanks to the greyish hydraulic mortar containing charcoal fragments which improved its waterproofing qualities (on Nabataean hydraulic mortars see Shaer 2004). On a slightly lower level, but on the same alignment within the building, is a huge room from which come a large number of hypocaust and *tubuli* fragments (**Figs. 7a, 7b**), distributed all across its extent. Since no such fragments have been found elsewhere in the area, we can assume that it was precisely this room that was equipped with a complex floor and wall heating system. This is confirmed by the modest but clearly visible remains of two hypocaust pillars still *in situ* (**Fig. 8**). Since the entire installation is built on the very edge of the cliff, erosion and slippage have exposed and destroyed the easternmost parts of it, and thus at some spots even the floor levels are visible without any additional cleaning. We can therefore identify a room with floor and wall heating systems directly connected to a water tank. In other words, we can interpret at least part of this structure as a bathing complex on top of Umm al-Biyāra!

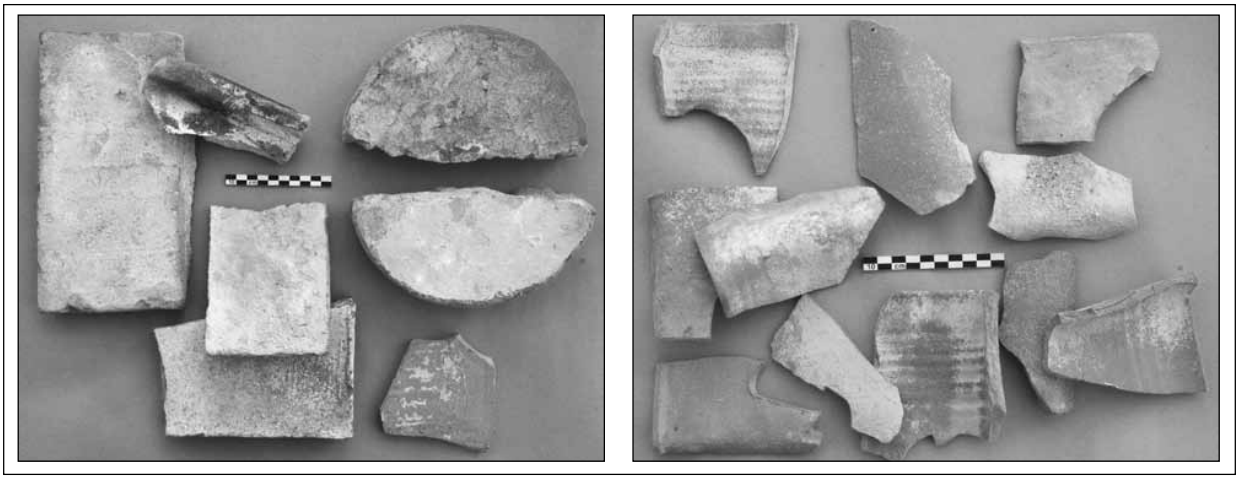
Further elements are likely to confirm this view. At the N end of the building, two rectangular structures measuring 90 x 140cm and 160 x 220 cm respectively were clearly visible on the surface (cf. **Fig. 4**). The smaller one showed signs of previous excavation, so we decided to clean it and indeed, numerous fragments of plastic bottles were found all the way to its base. Within the structure, several fragments of huge slabs belonging either to a roof or to a floor were found. These had partially destroyed the inner walls of the structure, which consisted of very thin vertically placed sandstone slabs (**Fig. 9**). These were bedded into a layer of the same greyish hydraulic mortar (**Fig. 10**) mentioned above in connection with the water tank, indicating that this structure must have contained water. This hypothesis was confirmed by an outflow at the bottom of the structure as well as a fragment of a very fine water pipe made of clay (**Figs. 11, 12**). This belongs to the same type of water pipe as used for the distribution of water within Nabataean houses, for example in the huge Nabataean mansion of az-Zanṭūr. The two structures, therefore, can be identified as bathtubs, the smaller one probably for one person, the bigger one offering space for several persons. In the same area small fragments of alabaster decoration and marble slabs were collected, indicating that the structure was lavishly decorated inside (**Fig. 13**). To the W of the smaller bathtub is a



4. Umm al-Biyāra, detail of plan showing ST 20 (G. Teltsch and W. Kennedy).

5. Umm al-Biyāra, overall view of ST 20 with Wādī ʻArabah on centre right (Schmid).

6. Water channel bringing water into ST 20 (Schmid).



7a, b. Fragments of hypocausts (left) and tubuli (right) from ST 20 (Schmid).

8. Hypocaust pillars in situ in ST 20 (Schmid).

9. Small bathtub within ST 20 with dumped floor or roofing slabs (Schmid).

10. Hydraulic mortar from small bathtub (Schmid).

11. Small bathtub within ST 20 after cleaning with outflow (Schmid).

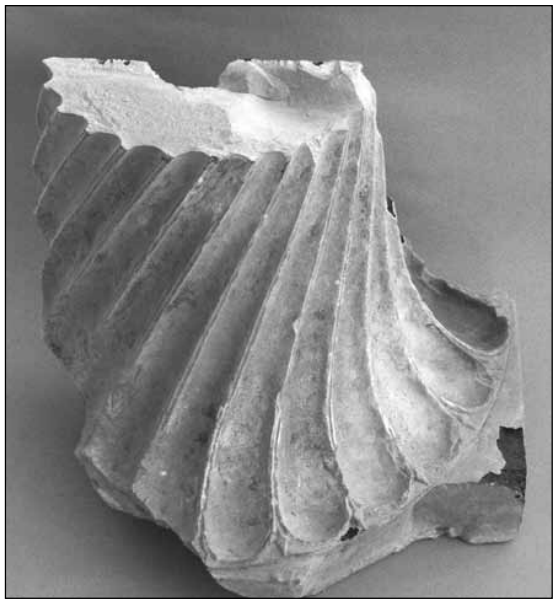
12. Fragments of clay water pipes from small bathtub (left) and hypocaust room (right) (Schmid).

13. Fragments of suspensurae, mortar, alabaster and marble from ST 20 and ST 26 (top right) (Schmid).

narrow room showing one identifiable doorway *in situ*. Next to this doorway, the fragment of a twisted column of very fine craftsmanship was collected, made of hard dark gray, almost black limestone and showing traces of fine whitish plaster (**Figs. 14a, 14b**). In the middle of the column a vertical rounded hole goes through the entire preserved length of it, posing problems of interpretation but maybe also offering a possible solution. Given the specific context, one could imagine the object not as a column but as a stand of a table or a basin (in general terms on basin stands see Pimpl 1997, although that author does not list any twisted basin stand nor stands with holes). In that case, the round hole would have been used to pump water from the bottom into the basin, simply using pressure provided by gravity flow; all that is needed is a water tank on a slightly higher level than the basin. That in general terms basin stands in the shape of small columns were a common feature by the 1st century AD can be shown by several such objects from Pompeii, although there too no twisted stands seem to be known (Pernice 1932: 38-54). Also from several Pompeian examples comes the confirmation that spectacular water installations such as fountains and pools belonged to the usual features for decorating gardens and thermal installations of the contemporary upper class (see some examples in Farrar 1998, 64-96). Finally, in the Casa del Camillo at Pompeii, a table shaped fountain on a column stand is used in exactly such a way, forcing the water through a central hole of the column stand (cf. Andersson 1990: 234f. with fig. 19).

A Room with a View

Another structure that attracted our attention

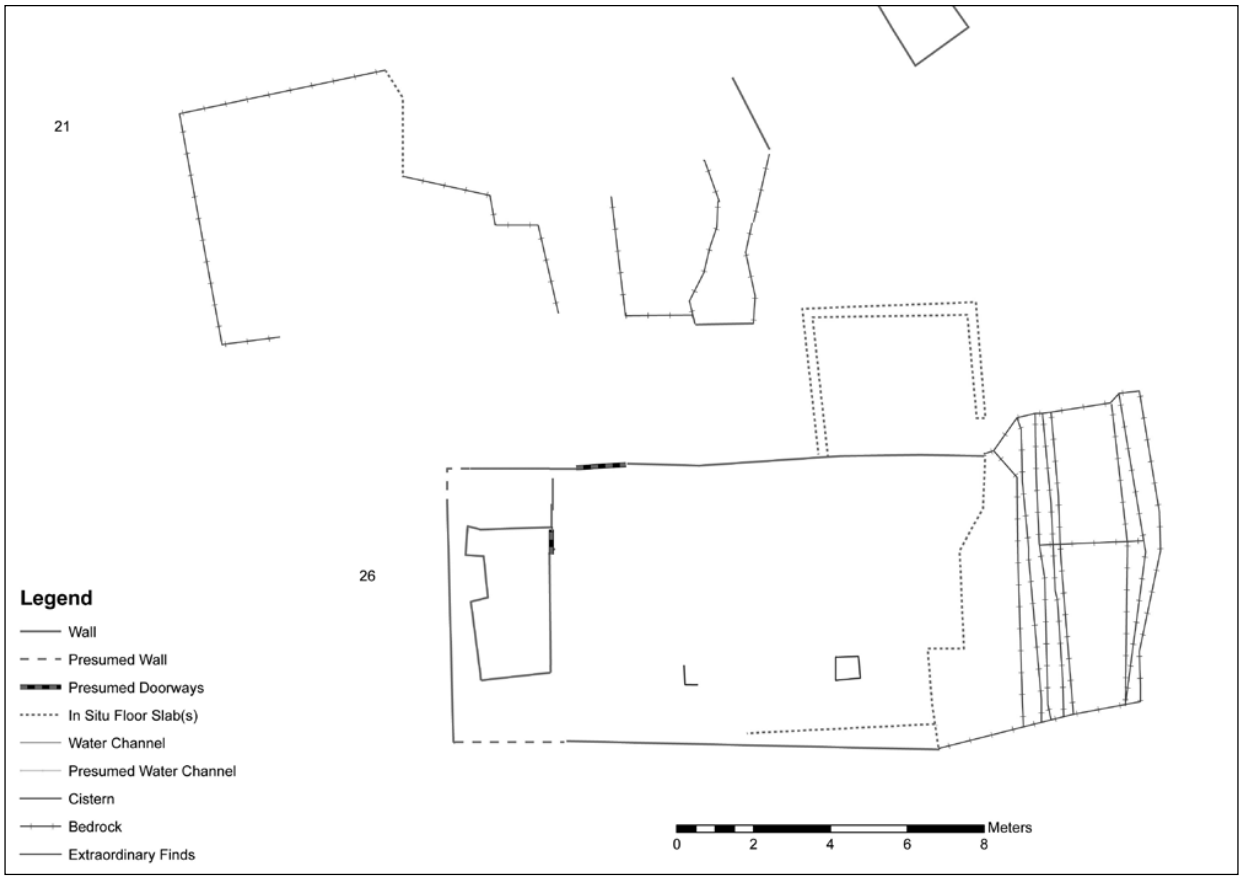


14a, b. Twisted base of a stand from ST 20 (Schmid).

was ST 26, built at the very edge of a promontory protruding towards the city centre (**Figs. 15, 16**). This is the structure that was partially excavated by Morton in the early 1950s and, therefore, the same that had been interpreted by Bennett as being a Nabataean temple. After verification it turned out that the rectangular structure previously recorded is only part of a more substantial building, continuing on at least three sides (N, S, W), while towards the E the steep cliff made a further extension impossible. However, the regularly cut off rock that was previously interpreted as steps suggests instead the positioning of a major wall, using the classical Nabataean technique of a zigzag-like contact between the built and the rock-cut parts of walls. Within the main structure, i.e. the one already mapped by the British in 1965, parts of the original floor slabs still are visible *in situ*. In the SE part of that room, a rectangular structure built of two ashlars and measuring 66 x 80 cm stands directly on the floor slabs (**Fig. 17**). This structure is likely to be the lowest layer of a rectangular pillar. Perfectly aligned to it but a few metres to the W stands an ashlar of a similar construction. Within this structure several fragments of Nabataean horned pilaster capitals were found; another one of the same type and with the same dimensions (21cm of height) was collected from the rubble of the same building sloping down the cliff on the S side (**Fig. 18**). The pilaster capitals are likely to have decorated the back walls of the supposed courtyard. It would be very interesting to know whether this courtyard was left open towards the city centre (E), and, therefore, making it a terrace with a truly spectacular view, or whether it was surrounded on all four sides with walls. Needless to say, this kind of structure has nothing whatsoever to do with a Nabataean temple. Like the previously discussed structure 20, from ST 26 too come some hints regarding its ancient interior decoration. Several fragments of a yellowish limestone with small shell inclusions were found, belonging to very carefully cut slabs (**Fig. 19a**). These slabs are of excellent quality and show a nice natural decoration pattern once they are wet, due to the shell inclusions. From the area of Morton's trench several fragments of marble slabs were collected (**Figs. 19a**, **19b**), belonging to different white and coloured marbles, indicating a luxurious interior decoration for ST 26 as well.

Water Management

What may seem surprising, at least at first sight, is the presence of installations making use of channelled water, such as the above described bathing installation (ST 20). Further work indicates that ST 20 is not the only building on the summit of Umm al-Biyāra that is supplied by channelled water. For instance ST 7, built on a protruding rocky promontory on the south-



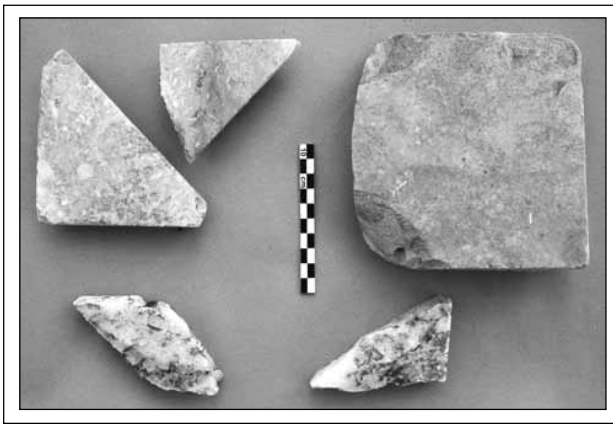
15. Umm al-Biyāra, detail of plan showing ST 26 (G. Teltsch and W. Kennedy).

16. Overall view of ST 26 (bottom) with view over Petra and Wādī Mūsā (Schmid).

ern part of the eastern ridge and offering again a splendid view over the city centre (**Fig. 20**), was most probably also connected to a water channel. This is suggested by the presence of a fragment of a stone cut water channel (**Fig. 21**). Although a surface find and not *in situ*, this item most likely was connected to ST 7. In the case of the above described ST 26, the supposed temple of Morton and Bennett, it is a rock-cut water channel (**Fig. 22**) that brings water into the area,

17. Floor slabs with pillar in ST 26 (Schmid).

18. Nabataean horned pilaster capital from ST 26 (Schmid).



19a, b. Lime stone and marble slab fragments from ST 26 (Schmid).

20. Overall view of ST 7 (Schmid).

so that we can suppose a rather luxurious water supply for that building as well.

All of these water channels, as well as others, are connected to the system of cisterns on top of Umm al-Biyāra which give it its Arabic name. With the exception of one cistern, situated on a much lower terrace on which so far no structures have been identified, all other seven cisterns on the plateau are part of a thoroughly sophisticated water management system. Ev-

21. Stone cut water channel from ST 7 (Schmid).

22. Rock-cut water channel SW of ST 26 (Schmid).

ery cistern is supplied by at least two incoming channels, sometimes as many as six. From every cistern at least two channels bring the overflow either to another cistern or lead into rock-cut or built channels which take water to the above mentioned structures. This system of multiple connections clearly reminds one of the Nabataean water management attested all over the city of Petra. The cistern system and its close connection to the clearly Nabataean buildings on the eastern ridge of the plateau makes it very likely that it should be dated to the Nabataean period. Diodorus Siculus describes typical Nabataean cisterns as '(…) big holes with small mounds; in depth they enlarge the shaft continuously until it reaches one *plethron* at every side' (Diod. 19, 94, 7), a description that fits rather well the eight piriform cisterns of Umm al-Biyāra. However, dating the eight cisterns exclusively to the Nabataean period creates problems in explaining where the Edomite settlement got its water from. In the final report on the excavations of the Edomite settlement, Bienkowski (in press) admits that the cisterns cannot be convincingly dated to either the Edomite or Nabaatean period. In the current state of knowledge, it cannot be excluded that the cisterns are originally Edomite in date and reused during the Nabataean period. How efficient that ancient system of water collection still is could be observed during two days of rainfall during our 2010 spring campaign. After only five minutes of rain, water started gushing into the cisterns, although only a very small percentage of the water collecting system is still extant and it is working at a vastly reduced capacity.

Parallels and Interpretation

Although we can describe and explain how water reached the different buildings, it still remains surprising that somebody could have built an entire bathing installation on top of the most prominent and isolated elevation of the area. An identification as a public bath can presumably be excluded by its location, very difficult to access for just a short bathing experience. If we try to sum up some of the known characteristics of this installation, it becomes clear that it must have been an outstanding one in several respects. It is situated not only at one of the most prominent spots of the hill, offering a splendid view over the city centre of Petra, but it must also have been visible from all over Petra. Further, it is at the most distant point of the entire plateau in relation to the steps giving access to it. Irrespective of whether there were other paths leading up Umm al-Biyāra, the one followed by the modern steps, which are a restoration of the Nabataean steps, surely was the most "official"

access to the plateau during the Nabataean period. Therefore, the bathing installation is both very prominent and at the same time very private, since access to it was strongly reduced and controlled. Since the installation made not only use of water, already a luxury item in this specific location, but also of wood or other fuel needed to heat the floor and wall heating systems described above, we are facing an almost provocative display of wealth and luxury. Despite the fact that heated rooms *per se* were not necessarily considered a specific luxury item by the time of their construction, the fact that they are situated on top of the highest elevation in the region makes them outstanding, since every single twig that was burned in their *praefurnia* needed to be carried up the hill.

That this has to be a building out of the ordinary is further suggested by the general geostrategic situation of Umm al-Biyāra as described above. It is irrelevant whether Umm al-Biyāra is the "rock" of the Nabataeans reported for the year 312/11 BC by Diodorus: by the late 1st century BC and the 1st century AD, Umm al-Biyāra must have been sufficiently important that not everybody was allowed to build there. It is precisely this combination of strategic importance and ostentatious demonstration of wealth that places these Nabataean buildings in close relationship with some of Herod the Great's hilltop palaces. In Masada, Herodeion, Kypros and Machaerus (Machairous), heated rooms, usually as part of Roman style *thermae*, are an outstanding characteristic (on the hilltop palaces of Masada, Herodeion, Kypros and Machaerus, see Japp 2000; Lichtenberger 1999; Nielsen 1994: 181-208; Netzer 2001b; Roller 1998; and especially on their bathing installations see Netzer 1999). Beside the pools etc. of major bathing installations, individual bathtubs are common to most of the mentioned Hasmonean and Herodian structures (cf. Netzer 1999) however, no bathtubs for two or three persons such as the one mentioned above in ST 20 seem to be attested from Herodian buildings.

We can assume that these Herodian installations were not only known to the Nabataean upper class (cf. Schmid 2009) but especially the palace at Machaerus, situated on the eastern shore of the Dead Sea, must have been in many ways a sort of provocation for the Nabataeans. It seems, therefore, perfectly appropriate to suggest that the building on top of Umm al-Biyāra consisted of something like the Nabataean response to the Herodian hilltop palaces. Probably the best overall comparison is offered, for the time being, by the Herodian palaces at Masada (specifically on Masada see Netzer 1991). The general situation is the same, i.e. the Herodian buildings are displayed all over the plateau of the massif rock elevation that is Masada, and, as on Umm al-Biyāra, there is no common orientation for all buildings, rather they form smaller groups according to their successive date of construction. There, too, the most luxurious and at the same time the most private structures, the ones known as the North palace, are placed at the spot opposite to the main access to the hill. As at Umm al-Biyāra these Herodian structures are playing with visibility, incorporating the splendid panoramic view into the architectural display, as is especially true for the three levels of the northern palace. Likewise, they feature lavishly decorated bathing installations.

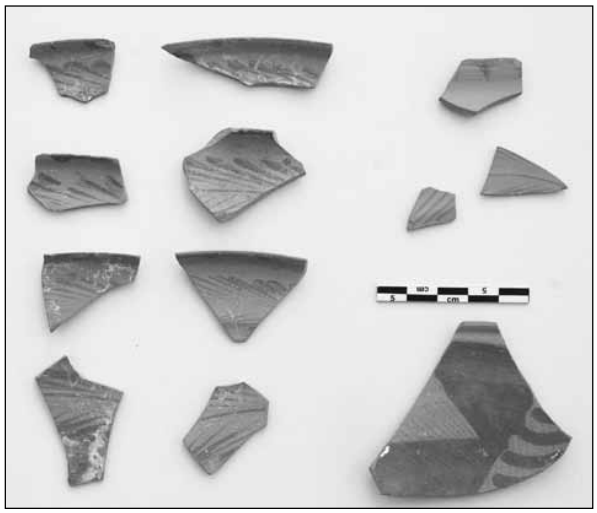
Despite the fact that Masada offers the best overall comparisons to our structures from Umm al-Biyāra, in details most of the other Herodian residences can be compared as well. For instance, the deliberate playing with visibility and the view is very prominent within Herod's third palace at Jericho (Netzer 2001: 231-286). The triclinium B70 (Netzer 2001: 239) and the courtyard B55 (Netzer 2001: 251-254) from Jericho can be compared to our ST 26 with its extreme position built literally over the cliff. Since the southern wall of courtyard B55 in Jericho fell into the Wadi Qelt and cannot be reconstructed securely, as is the case with the eastern wall of our ST 20, in both cases a direct opening to the natural view would be possible.

In terms of chronology we can already make a few observations. Of course, a precise chronology and dating of the structures referred to above will only be possible after systematic stratigraphic excavation. For the time being the earliest Nabataean element consists of one single painted rim sherd of a drinking bowl dating to *ca*. 50-25 BC (phase 2a after Schmid 2000) (**Fig. 23** top left). It was found on ST 12 (cf. **Fig. 3**), being the highest elevation on the plateau consisting of an outcropping rock that was incorporated into a built structure, as is attested

by a few remaining stone blocks from a wall, as well as by the carefully carved stone "steps" onto which the walls were set. A few metres to the W of the rock a built wall is visible, indicating that the structure was probably bigger than just the part built on the rock. The rest of the pottery related to ST 12 consists of several sherds belonging to the last quarter of the 1st century BC (**Fig. 23** bottom) and others belonging to the 1st century AD. The last quarter of the 1st century BC (phase 2c of Nabataean pottery according to Schmid 2000) is the earliest date present within most areas, except of course the Edomite pottery. The latest pottery that is present to some extent in most areas belongs to phase 3c of Nabataean pottery (according to Schmid 2000) and dates, therefore, to the early 2nd century AD. Within the major Nabataean structures sometimes a difference in chronology seems to occur. For instance, on the steep slopes immediately to the N of ST 26 a large amount of very well preserved, although broken Nabataean pottery was found. Beside a few fragments of coarse ware, most of that pottery consisted of Nabataean fine ware and especially of fragments of painted bowls. Within these, phases 2b and 2c (last quarter 1st century BC and first quarter 1st century AD) are the most prominently represented, followed by phase 3a (second and third quarter of the 1st century AD). Phase 3b (last quarter 1st century AD) is very discreetly represented, phase 3c (early 2nd century AD) completely absent. Quite different is the picture in and around ST 20, the bathing installation pointed out above. There, painted pottery strays from phases 2b (last quarter of 1st century BC) to 3c (early 2nd century AD), the most prominent group being the one of phase 3b (last quarter of the 1st century AD). Although one should not come to hasty conclusions, it would seem, then, that the major phase of occupation of ST 26 should date to the turning of the eras, while ST 20 probably saw its apogee in the late 1st century AD. The latter would also fit well both with the greyish hydraulic mortar using charcoal additive (on the chronology of the different hydraulic mortars see Graf *et al*. 2007: 225-227) as well as with the *tubuli* introduced to the Nabataean realm towards the end of the 1st century AD. (on this see Kolb and Keller 2001: 2000). Maybe there is even a way for a more precise dating of the heated room within ST 20. In the area of the above mentioned hypocaust construction, several fragments of hydraulic mortar were found, showing the reddish variant using crushed pottery additions on one side, the greyish variant with charcoal fragments on the other side (**Fig. 24**). While the reddish variant was in use from the 1st century BC onwards, the greyish one was introduced towards the end of the 1st century AD; therefore, the combination of both would indicate a date at the very beginning of the use of the greyish variant.

Conclusions and Perspectives

The Nabataean structures on Umm al-Biyāra



23. Painted Nabataean sherds from ST 26 (left), ST 12 (top right) and ST 20 (bottom right) repectively (Schmid).

24. Mortar fragments from hypocaust room in ST 20 (Schmid).

occupy the most extreme locations on the very edges of the summit overlooking the city of Petra, positioned so as to both maximise the view over Petra and the visibility of the buildings from Petra. There are clear indications of luxury within the buildings, such as water supply, heated rooms, baths, alabaster and marble slabs, decorative capitals and other architectural ornaments. Other structures on the summit suggest that a comprehensive view over all routes into Petra was a concern. Moreover, the best parallels to the positioning and layout of the buildings are to be found in the Herodian hill-top palaces. All these considerations suggest that we are dealing here with royal or elite installations, whose function was both control over the hinterland of Petra and routes into it, and an ostentatious display of wealth and domination.

Nevertheless, only actual excavation can reveal further details of these intriguing buildings. The preliminary season of survey work has provided some indication of the nature and date of these structures, as well as highlighted the logistical issues to be overcome in undertaking more extensive fieldwork on Umm al-Biyāra. The authors are now planning a campaign of several seasons of excavation, with the objective of determining the precise nature, date and function of the Nabataean structures, and their role in the geo-politics of Petra and in the Nabataean realm.

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THE GREAT ARAB REVOLT PROJECT 2008 AND 2009 FIELD SEASONS

Neil Faulkner, Nicholas J. Saunders and John Winterburn

Introduction

The Great Arab Revolt Project (GARP) (**Fig. 1**) is planned as a ten-year project to investigate the history and archaeology of the Great Arab Revolt (1916-1918). A general introduction to the project, its organisation and methods appears in our report on the 2006 and 2007 field seasons, published in *ADAJ* 52.

The main focus of our first two field seasons was (a) the late Ottoman trench-fortress around Ma'ān and (b) the late Ottoman defences in and around Wādī Rutm station, which lies approximately 60 km south of Ma'ān on the Ḥijaz railway.

This report details work on two further sites investigated in detail in 2008 and 2009: (a) the late Ottoman defences in and around Baṭn al-Ghūl station, approximately 55 km south of Ma'ān on the Ḥijaz railway, and (b) the late Ottoman redoubts and Hashemite tribal army base at al-Wuhayda, approximately 15 km west-south-west of Ma'ān on the 'Aqaba road.

The academic directors of the project are Neil Faulkner and Nick Saunders (both Bristol University). They are supported by a field team comprising the following: David Thorpe (field director), Hani Falahat (Department of Antiquities), Zeyad al-Salameen (al-Hussein bin Talal University), Mansour Shqiarat (al-Hussein bin Talal University), Susan Daniels (project administrator and planner), Ali Baldry (photographer), Cat Edwards (site supervisor), Jules Evan-Hart (metal-detectorist and finds specialist), Anna Gow (finds assistant), Martin Plumer (metal-detectorist), David Spencer (site supervisor), Roger Ward (metal-detectorist and IT specialist) and John Winterburn (landscape archaeologist).

The 2008 field season ran from 12 to 26 November and involved 29 British fieldworkers and three Jordanian. The 2009 field season ran from 17 November to 1 December and involved 32 British fieldworkers and three Jordanian. This report covers both seasons, just as our previous report covered both 2006 and 2007.

Fieldwork Methods

Work takes place at four distinct but overlapping levels:

Level 1

Archive research to locate military sites within the southern Jordan study area.

Level 2

Field reconnaissance in vehicles and on foot and GPS-based surveying to identify and plot sites and features within specific militarised landscapes identified at Level 1. In 2009, we completed a comprehensive survey of all late Ottoman military sites on the Ḥijaz railway between Ma'ān and Wādī Rutm stations (to be discussed in detail in a future report).

Level 3

Metal-detector and measured ground surveys to map and characterise (a) groups of features forming coherent sites and (b) spreads of diagnostic artefacts within the specific militarised landscapes surveyed at Level 2. In 2008 and 2009, we carried out Level 3 investigations at Baṭn al-Ghūl, 'Aqabat-Ḥijaz, Makins' Fort and Wuhayda.

Level 4

Surface clearance, excavation, standing building survey, detailed recording and system-

1. Map showing sites investigated by GARP. Baṭn al-Ghūl and ʻAqabat-Ḥijāz are just north of Wādī Rutm, while al-Wuhayda is between Maʻān and Abū Lisān.

atic artefact recovery to characterise and phase typical and / or significant features within the areas surveyed at Level 3. In 2008 and 2009, we carried out Level 4 investigations of selected features at Baṭn al-Ghūl, Aqabat-Ḥijāz, Makin's Fort and Al-Wuhayda (work on Aqabat-Ḥijāz and Makins' Fort will be discussed in detail in a future report on the wider Ḥijāz railway survey.)

Baṭn al-Ghūl: A Defended Station and Escarpment on the Ḥijāz Railway

Baṭn al-Ghūl station (**Fig. 2**) lay approximately 55 km south of Maʻān, between Aqabat-Ḥijāz station 4 km to the north and Wādī Rutm station 6 km to the south. The particular significance of the site is that at this point the railway negotiates the difficult descent down the Baṭn al-Ghūl escarpment, which separates the limestone and basalt plateau to the north from the sand desert represented by Baṭn al-Ghūl and Wādī Rutm to the south. The descent involves a wide double loop in the line.

This point had great strategic significance in 1916-1918. Curving rails were much harder to replace than straight ones, so damage to the line here was more effective than elsewhere. The top of the escarpment commands extensive views across the plateau to the north and west, extensive views down the wadis to the south and fair views to the east. It is therefore a key position for observation of the line and for command and control.

Our investigations have identified a number of distinct sites that appear to form an integrated complex of defence, logistics and accommodation.

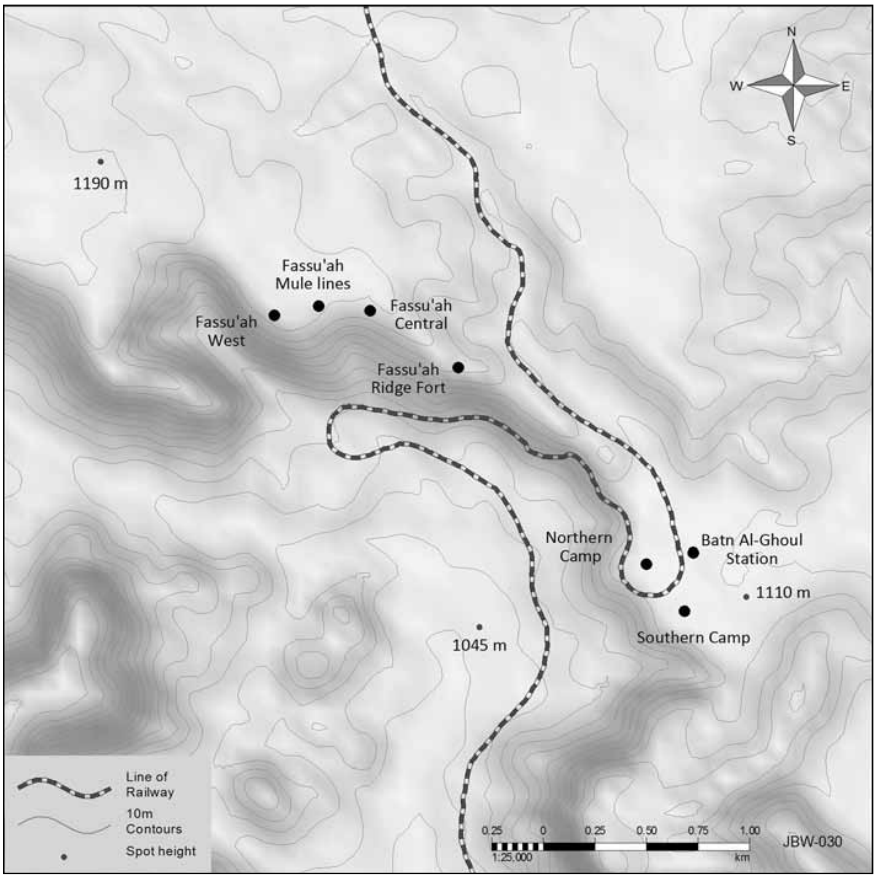
Baṭn al-Ghūl Station

This station appears to have comprised only one building. It has been comprehensively levelled, probably when the line was re-laid in relatively recent times as an industrial railway, with only one wall part-standing amid heaps of bulldozed rubble. It is therefore impossible to determine the extent and form of any improvised defences at the station.

The Northern Camp

This is a late Ottoman tent-ring encampment

located inside the loop of the Ḥijāz railway as it begins the descent of the Baṭn al-Ghūl escarpment close to Baṭn al-Ghūl station. It comprises 17 tents, mainly circular, but some sub-rectangular. A number of these rings were excavated (**Fig. 3**) and all spoil sieved to recover complete finds assemblages. The entire site was also comprehensively metal-detected. Finds were numerous, varied and well-preserved, including paper, cardboard, canvas, wood, uniform fragments and organic ecofacts, though identification of the site as late Ottoman depended, as usual, on



2. Map showing related late Ottoman military sites in the ʻAqabat-Ḥijāz / Baṭn al-Ghūl / Wādī Rutm area.

3. Late Ottoman tent-rings under excavation at Baṭn al-Ghūl.

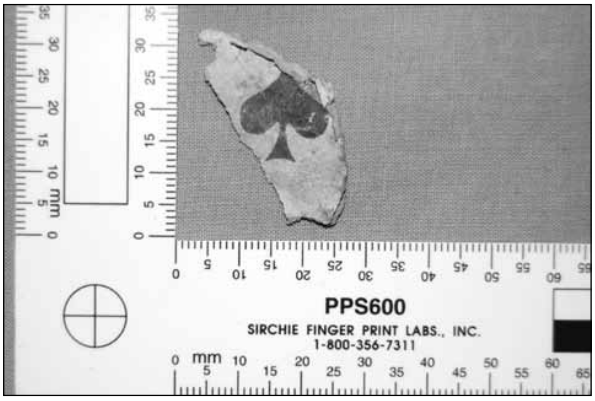
diagnostic metalwork (**Fig. 4**). Detailed analysis of the finds assemblage is proceeding.

The Southern Camp

This is also a late Ottoman tent-ring encampment, but it is located outside the loop of the Ḥijāz railway. It comprises 16 tents, mainly circular, but some sub-rectangular. The layout of the tents was generally very regular, most of them forming an 'avenue' with a line of tents on either side of a wide central pathway. A number of these rings were excavated and all spoil sieved to recover complete finds assemblages. The entire site was also comprehensively metal-detected. Finds here were more sparse than in the northern camp. Detailed analysis of the finds assemblages, and comparison with those from the northern camp, may indicate different uses for the two sites. One possibility is that both camps were originally construction camps used by workers (perhaps militarised labour battalions) during the construction of the Ḥijāz railway, with only the former, the northern camp, being re-used by soldiers during the war.

Faṣṣū'ah Ridge Fort

This fort (**Figs. 5 and 6**) was located on the Baṭn al-Ghūl escarpment approximately 1.4 km north-west of the ruined station. It comprised the following distinct elements: (a) a large central blockhouse with a loopholed outer wall, a central courtyard traversed by stone-lined pathways and various rooms opening onto this, (b) a small loopholed blockhouse and various breastwork-trenches forming an inner defended complex around two sides of the central blockhouse and (c) an outer perimeter wall comprising a breastwork-trench, several sentry-posts, a main



4. Part of a playing card. One of many finds from Baṭn al-Ghūl indicative of everyday life in the late Ottoman Army on the Arab front during 1917-1918.

6. An Ottoman sniper's view through a loophole in the wall of the small blockhouse. The outer perimeter wall can be seen in the middle ground.

5. General view of Faṣṣū'ah ridge fort from just inside the perimeter wall looking roughly north-west towards the large central blockhouse on the highest point.

gateway and four secondary entrances (not all necessarily contemporary). Associated subsidiary features included a small square building in the middle of the enclosure, an extramural bread-oven and what may have been extramural latrines. It is possible that the fort may represent late Ottoman re-use of an earlier structure; it is certain that more than one phase of building is represented. The size and complexity of the fort, combined with its prominent and central location, argues for it being the command and control centre for the ʻAqabat-Ḥijāz / Baṭn al-Ghūl / Wādī Rutm sector.

Faṣṣūʻah Central

Approximately 525 m north-west of Faṣṣūʻah ridge fort on the Baṭn al-Ghūl escarpment, this group of features comprises two blockhouses, a possible machine-gun position facing north, observation posts facing south and various tent-rings.

Faṣṣūʻah Mule Lines

Approximately 250 m further west on the Baṭn al-Ghūl escarpment, this group of features comprises a large rectangular area of stone-clearance (possibly for tethering two lines of mules), a feeding trough (**Fig. 7**), other features of unknown purpose and various tent-rings. The character of the features and associated finds of mule-shoes have allowed identification of the site as an area for tethering, feeding and watering mules, perhaps used to carry water from ʻAqabat-Ḥijāz approximately 3.5 km to the north-east.

7. The feeding trough at Faṣṣūʻah mule lines.

Faṣṣūʻah West

Approximately 230 m further west again on the Baṭn al-Ghūl escarpment, this group of features comprised 17 tent-rings, two observation posts and a bread-oven.

Al-Wuhayda: Late Ottoman Redoubts and Hashemite Arab Army Base

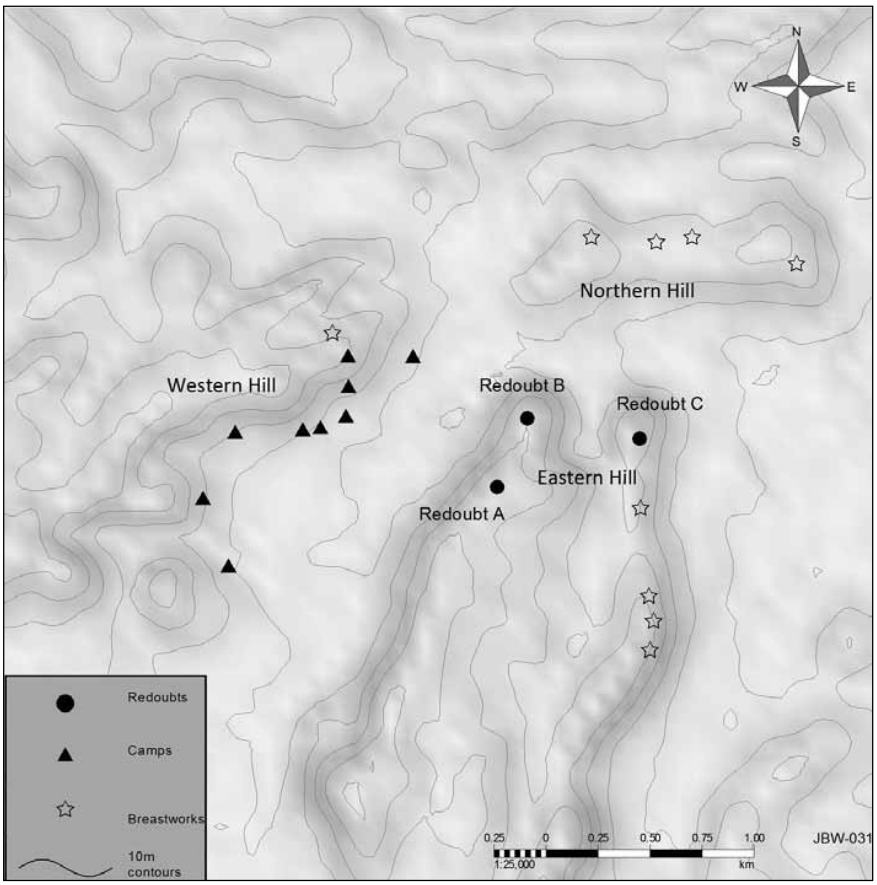
Al-Wuhayda (**Fig. 8**) lies approximately 15 km west-north-west of Maʻān on the Aqaba road. The area was heavily fortified by the late Ottomans, presumably to cover the main approach from ʻAqaba to Maʻān after the former's capture by Arab forces in July 1917. The position was captured by the Arabs in January 1918, and from then until September 1918 it served as one of the principal bases of Prince Feisal's Northern Army.

The site had been identified and located in desktop research by John Winterburn. Preliminary field reconnaissance then confirmed the archaeological potential of the site, and detailed field investigations began during the 2009 season. As well as three large late Ottoman hilltop redoubts and extensive late Ottoman hilltop breastwork-trenches, fieldwork revealed astonishing and wholly unexpected evidence for the Hashemite Arab military occupation, making al-Wuhayda site of the utmost importance.

The site is defined by three major ridges and two large wadis. We have called these the eastern hill, northern hill, and western hill, and the central wadi and northern wadi. Our investigations identified and recorded the following distinct elements:

Redoubt A on the Eastern Hill

One of three large redoubts at the northern end of the eastern hill at al-Wuhayda, redoubt A (**Fig. 9**) comprises the following elements: (a) an outer trench with firing bays and traverses on the western side only, (b) a breastwork-trench around the entire perimeter of the hilltop redoubt and (c) up to 13 small, square or sub-rectangular sunken-floored structures (**Fig. 10**), each part cut into rock, part built up with dry-stone walling, each containing a small hearth. Not all buildings are of the same size. The majority are ranged around the edge of the enclosure. One larger square building is located in the centre, and is interpreted as officers' accommodation and / or



8. Map showing late Ottoman and Hashemite Arab military sites at al-Wuhayda.

9. General view of redoubt A at al-Wuhayda looking west.

a command and control centre for the redoubt. Extensive damage to the site, apparently by industrial quarrying, leaves some details in doubt.

Redoubt B on the Eastern Hill

With redoubt A, redoubts B and C formed a triangular arrangement of mutually supporting fire-bases at the northern end of the eastern hill. Neither B nor C could be explored in detail. B has been subject to severe damage; much of it is now effectively levelled. It appears to comprise a perimeter breastwork-trench and probably a roughly similar number, style and arrangement of interior buildings as redoubt A.

10. Detail view of one of the sunken-floored structures inside the perimeter at redoubt A.

Redoubt C on the Eastern Hill

Redoubt C has also been extensively damaged, but survives rather better than B. Though not explored in detail, it was possible to identify the following elements: (a) two lengths of exterior breastwork-trench, one to the south and one to the north-west, (b) a breastwork perimeter wall forming a complete oval-shaped enclosure, (c) numerous interior buildings, mostly built onto the inside of the perimeter wall, but including two substantial free-standing structures (perhaps pre-dating the main build), (d) an underground, rock-cut, two-chamber feature and (e) two main entrances guarded by sentry-posts. It is notable that each of the redoubts, though similar in size and clearly forming an integrated defensive complex, was slightly different in design. Different officers and NCOs presumably directed the work according to their own conceptions.

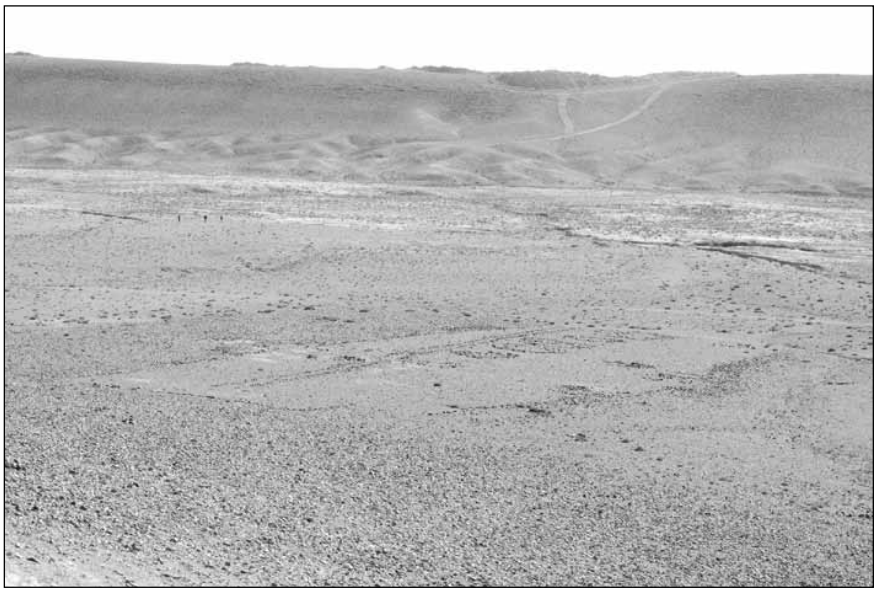
Breastwork-Trenches on the Northern Hill

This ridge appears to have functioned as an outwork for the main position represented by the redoubts on the eastern hill. At ten points around the circumference of the northern hill, which is relatively flat-topped, there are lengths of breastwork-trench, sometimes with associated blockhouses, plus occasional observation posts. There are also the ragged remains of tent-ring camps and stone-lined paths in places. Many, but not all, of the defensive positions are mutually supporting.

Tribal Encampments in the Central Wadi and on the Western Hill

On the slightly raised western side of the central wadi and on the northern and eastern slopes of the western hill, there is a series of ten complexes formed of stone alignments (which we have designated A-J) (**Figs. 11 and 12**). Each complex comprises various enclosures of irregular shape and size, smaller circular or rectangular 'rings' presumed to represent tents, stone-lined pathways and possible occasional stone cooking fires / hearths. While there is some evidence for regular tent-rings and careful alignment in places (perhaps representing Hashemite regulars using British Army tents), most of the complexes lack any degree of regularity in layout or standardisation of features. In addition, each complex appears to be separated from the others by what might be regarded as 'liminal' space. The entire series of complexes stretches along approximately 1.5 km of wadi; at its widest, towards the northern end of the western hill, it forms a belt about 200 m deep. Metal-detector survey has confirmed this site as the camping ground of an Anglo-Arab military force of First World War date. We are therefore confident that we have located the main base of Prince Feisal's Northern Army between April and September 1918. We believe this to be a unique discovery: the only archaeological imprint of an Arab tribal

11. General view of the central wadi at al-Wuhayda, showing the location of the Hashemite Arab army base in 1918.



12. View of one of the tribal encampments forming the Hashemite Arab army base at al-Wuhayda.

army ever found. This site is therefore of huge potential importance for Jordan's national identity, for heritage tourism and for conflict archaeology.

Conclusions

In our first report, we concluded that the Great Arab Revolt Project had confirmed the huge potential of modern conflict archaeology in southern Jordan by revealing the survival in desert areas of an extensively militarised landscape dating from 1916-1918. We argued that the remains indicated a military response to a threat that was, on the one hand, dispersed and low-intensity, but on the other, chronic and pervasive. We further argued that this contrasted sharply with the experience of the First World War on the better known Western Front.

Work during 2008 and 2009 has confirmed the intensity of the late Ottoman militarisation of the landscape. In particular, detailed work at Baṭn al-Ghūl has shown that the density of military remains earlier revealed at Wādī Rutm is not exceptional. Moreover, wider survey work (not reported in detail here) has confirmed that comparable densities exist along the entire stretch of Ḥijāz railway between Ma'ān and Wādī Rutm, and that other areas, such as the approaches

to Ma'ān from 'Aqaba, likewise bear a strong late Ottoman military imprint. The impression grows of a large-scale counter-insurgency operation in southern Jordan between July 1917 and October 1918 — testimony to the effectiveness of the Arab military effort.

The discovery of the Arab army base at al-Wuhayda has, however, introduced a whole new dimension to the project. The sharp contrast between the late Ottoman military imprint and that of the Hashemite Arab army underlines the extreme 'asymmetry' of the conflict. The difference between the hilltop redoubts, breastwork-trenches and regular tentage of the Ottoman Army and the sprawling tribal encampment of the Arab irregulars in the base and sides of the wadi could hardly be more extreme.

GARP is therefore contributing substantial new information and ideas to at least three distinct archaeologies: that of modern conflict, that of southern Jordan and that of desert movement and warfare. It is also revealing the potential which exists for the development of major new heritage tourism attractions in the region.

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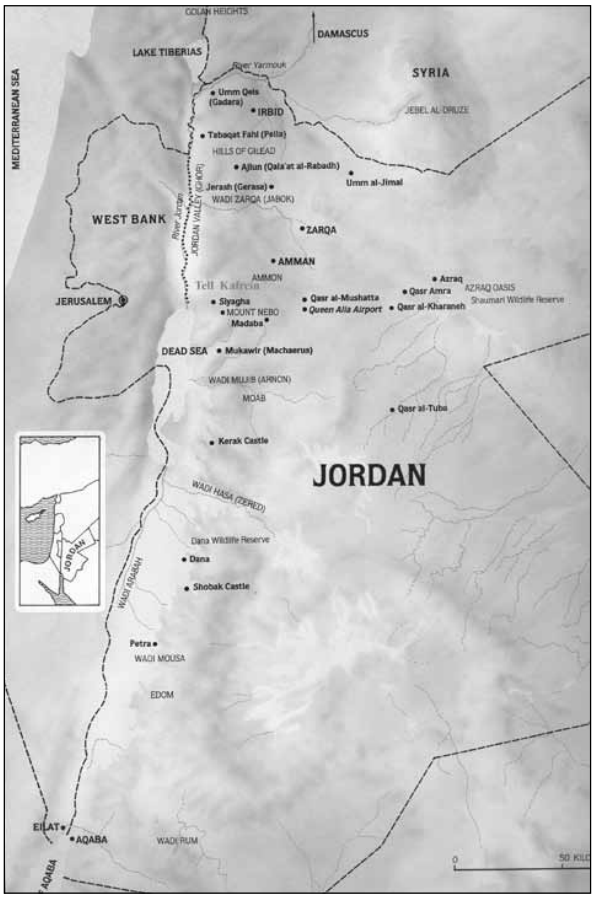
TALL AL-KAFRAYN: THE UNIVERSITY OF IOANNINA HELLENIC - JORDAN EXPEDITION, PRELIMINARY REPORT ON THE NINTH EXCAVATION SEASON (2009)

Thanasis J. Papadopoulos and Litsa Kontorli - Papadopoulou

Introduction

Excavations were carried out at Tall al-Kafrayn, situated in the Jordan Valley about 5km north-east of the Dead Sea and 3km south-south-west of the al-Kafrayn dam, between 15 March and 12 April 2009 (**Figs. 1 and 2**). As in previous seasons, the directors of the expedition were the authors, based at Ioannina University in Greece. Khaled Ahmad al-Hawawrah, from Madaba, represented the Department of Antiquities of Jordan (DoA).



1. Map of Jordan

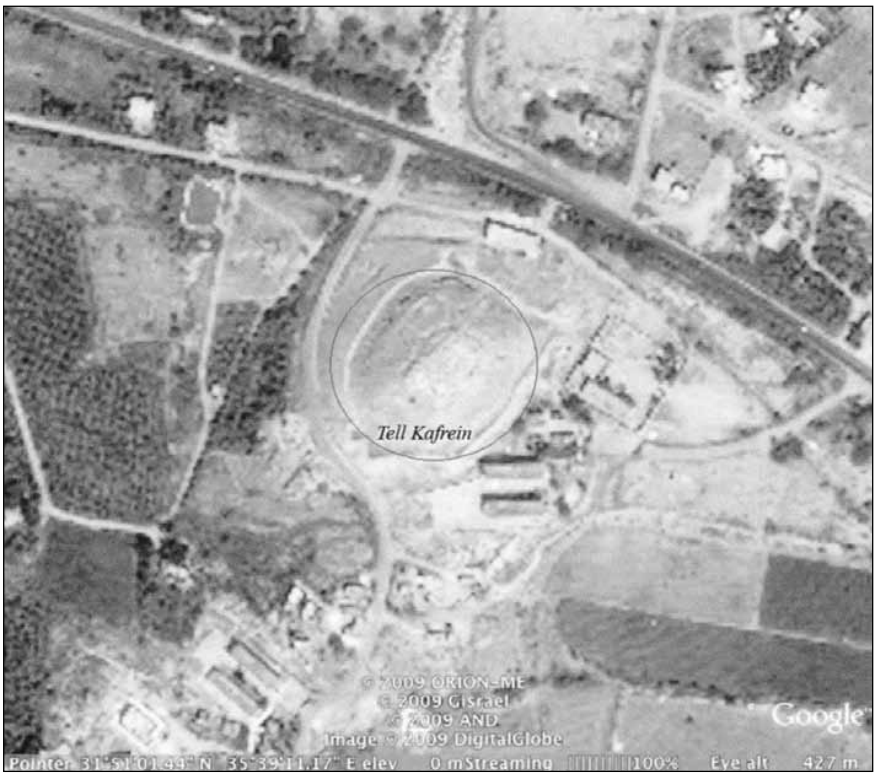
Trench supervisors were post-graduate archaeology students from the University of Ioannina: Kostas Paschalidis, Kostas Theodoridis, Spyros Thermos, Dimitris Mengidis, Panagiotis Palates, Kalliopi Lambri and Theodora Alevra. Stavros Oikonomidis and Anagnos - Konstantinos Tsonos from the same University were draftsman and pottery specialist respectively. Other team members included Aris Frantzwskakis, Myrisi Choira (Archaeologists), Alexandros Lagopoulos (University of Thessaloniki) as architect, Suleiman al-Jamal and Tawfiq al-Hunete (DoA) as surveyors, Kleio Zervaki (MA University of London) as conservator, Efstathia Margaritis (PhD University of Cambridge) as Archaeobotanist, Artemis Oikonomou (EKEFE, Dimokritos C14 Laboratory, Athens) as archaeometrist and Dimitris Papaeliou as photographer. A number of other archaeology students from the University of Ioannina assisted in the field (**Fig. 3**).

Financial support was provided by the University of Ioannina and Greek Ministries of Foreign Affairs and Culture and Tourism.

Results of the 2009 Season

The main objectives of the 2009 excavation season (for location of trenches see **Fig. 5**) were as follows:

1. To investigate the east and south-west slopes of the *tall*, it's most vulnerable sectors, for further remains of the fortification walls already discovered to the west and north (Trenches P14 - 15, O16 - 17 and J16 - 18).
2. To continue excavating in the south, east and north parts of the *tall* where, among other finds, important remains of (?) LBA / Iron Age houses and towers were exposed in pre-



2. Tall al-Kafrayn (Google Earth).

3. University of Ioannina excavation team, 2009.

vious seasons.

3. To extend the large exploratory trench cut into the north slope of the *tall* in order to reveal the entire occupational sequence from the bulldozer cut to the summit of the *tall*.

Information about the recording system can be found in the preliminary report of the 2005-2008 seasons, published in the Annual of the Department of Antiquities of Jordan (*ADAJ*).

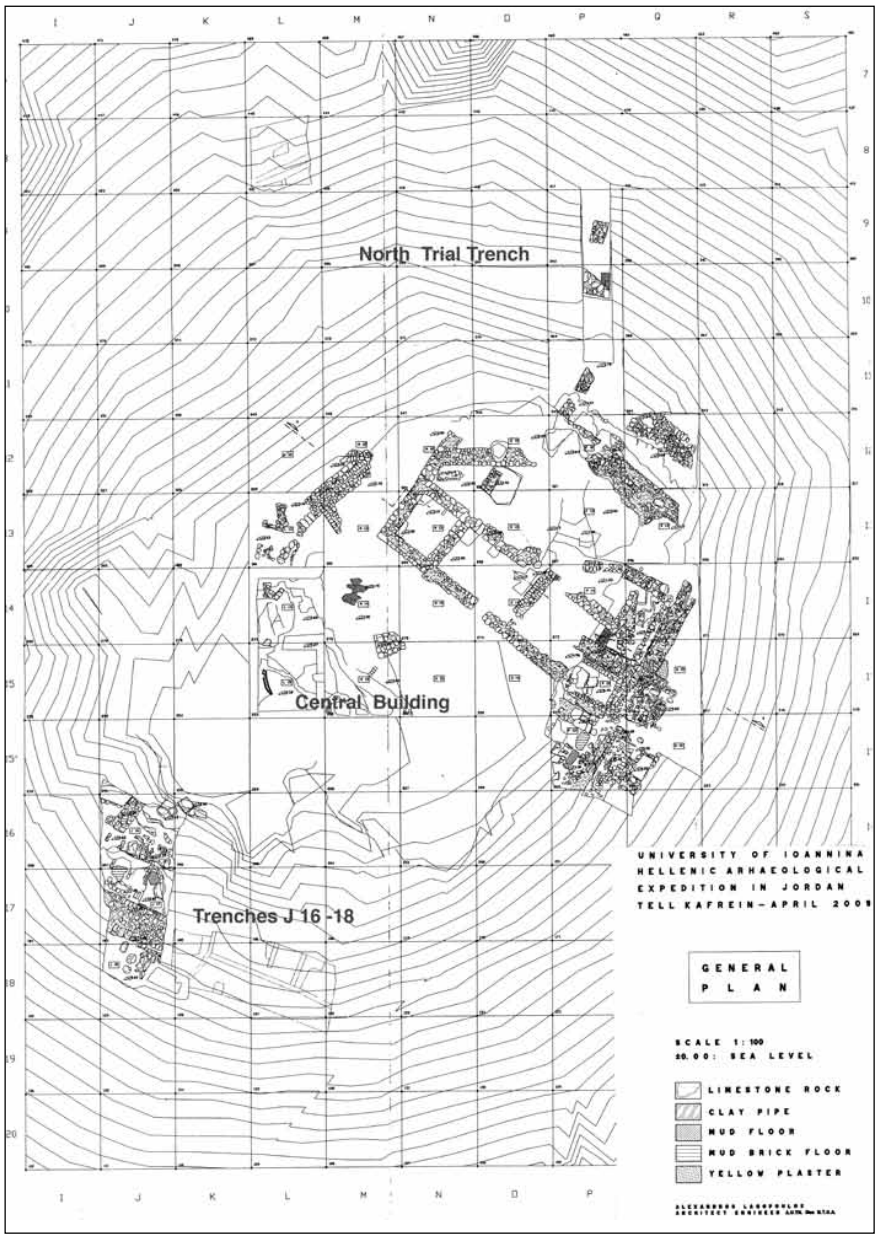
To start with, work resumed in trenches J16 and J17, where important finds have been made in previous seasons, including a 'column base' with a well-preserved charred wooden upright indicating that the space was roofed, a fine Attic red-figured sherd of the Classical period (fifth century BC) and a krater sherd with a stamped

4. Trench J17.

cultic scene. During this season, Trench J17 was excavated to a depth of 3.15m below ground surface, revealing more charred wooden beams (depth 2.80m) and architectural remains. The latter included part of the original floor (2.90 x 2.70m) of a domestic structure, consisting of a layer of beaten earth that was covered by a series of carefully laid symmetrical, solid, yellowish mud-bricks of roughly equal size (25 x 45cm) **(Figs. 4 and 5)**. In the northern corner of the trench, a roughly circular structure (1.40m diameter), with its base lower than the surrounding floor of the trench (depth 3.45m), was discovered. It was partly made of stones and mud-plaster, and partly cut into the rock with visible traces of burning (**Fig. 6**). Its use is not entirely clear, although it may be suggested on the basis of its shape, associated assemblage of broken Iron Age I - II cooking pots, evidence for burning, ash and charcoal, and the presence of botanical remains including wheat and barley grains, olives and grapes, that it was a hearth or – more likely – an oven of Steen's 'dug-in' type (van der Steen 1991: 140), making the space a kitchen or 'bakery'. Two narrow mud-plastered openings in the adjacent natural rock, at a height of *ca*. 1.15m from the floor, have been interpreted as the chimneys of this oven.

Further north, towards the top of the *tall*, Trench J16 was re-examined with a view to increasing our understanding of its association - if any – with the structures previously uncovered in Trench J17. It seems that the robust wall, oriented east-west and built of large stones intermixed with mud-bricks, which was discovered during the previous season at the edges of the two trenches was a retaining wall. Although one is tempted, in view of the krater fragment, to suggest a cultic function for the space represented by Trenches J16 and 17, other factors, such as the presence of an oven, are more indicative of domestic activities. Therefore, the function of and relationship between the two trenches are not yet clear.

Between Trench J17 and the new Trench J18, a modern east - west retaining wall was demolished in order to extend the dig southwards with a view to finding some answers to the problematic occupational history of this area, by uncovering parts of the fortification wall and additional building remains. After removing the modern wall and digging a few centimeters below the ground surface, a spread of medium and large cobbles appeared (**Fig. 7**), similar to those discovered at Tall ash-Shūna North (Baird and Philip 1992: 72, figs. 2 and 4, pls. 1 and 2). These seemed to cover an area of at least 5 x 2.40m, were orientated east-west and sloped north-south. The northern face of this probable large wall, consisting of large stones, is clear,



5. Plan of trench J17.

but the southern face has been destroyed by a modern terrace. The exposed structure suggests a function other than that of domestic habitation, so it has provisionally been interpreted as part of the fortification wall. Such wide (2.40m) wall foundations must have had a substantial superstructure, but unfortunately no trace of it survives. Most probably this wall is part of the *tall*'s defenses, but this is speculation and further excavation may clarify its form and function.

Extra muros, in the south-eastern part of Trench J18, a peculiar free-standing bench-like structure (dimensions 2.10 x 1.16 x 0.66m) was uncovered (**Figs. 8 and 9**). It is carefully built of mud-bricks laid in five courses (each 0.12cm in height). Its interior was filled with earth, small stones and a few sherds, with its slightly sunken top being sealed with a thick layer of mud. At first we thought it was an Islamic tomb, but its shape and construction were different to other tombs found on the *tall*, in that its interior was solid and contained no bones. Its alternative interpretation as an altar was also rejected, as objects and pottery definable as 'cultic' were absent. Its unique shape and the absence of any dateable finds at present make its function dif-

6. Trench J17: circular hearth or oven.

7. Substantial stone wall between Trenches J17 and 18.

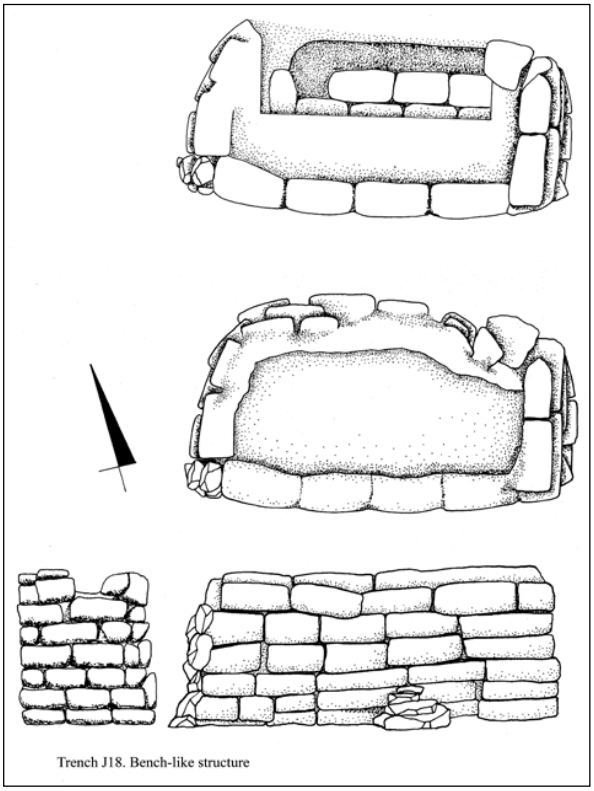
ficult and its date impossible to determine.

Turning now to the east slope of the *tall*, which had so far provided the best stratigraphic sequences and most important finds (e.g. abundant Iron Age pottery, metal-working furnace, textile-weaving workshop), we decided to continue with work in this location, especially in Trenches P16, Q14 and Q15. Trench P16 is a southwards extension of the previously excavated Trench P15; Q14 - 15 extended Trenches P14 - 15 to the east.

The uppermost layer of Trench P16 showed signs of erosion and modern disturbance which complicated study of the stratigraphy. Nevertheless, we managed to expose three massive stone walls (present dimensions of Wall 1 3.06 x 1.67 - 2.10 x 0.72m, Wall 2 5.10 x 1.69 x 1.37m and Wall 3 1.63 x 0.75 x 1.10m) (**Fig. 10**) and distinguished at least three distinct occupational layers, broadly dated to Iron Age I - II period. A

8. Trench J18: bench-like structure.

10. Trench P16.



9. Plan of bench-like structure.

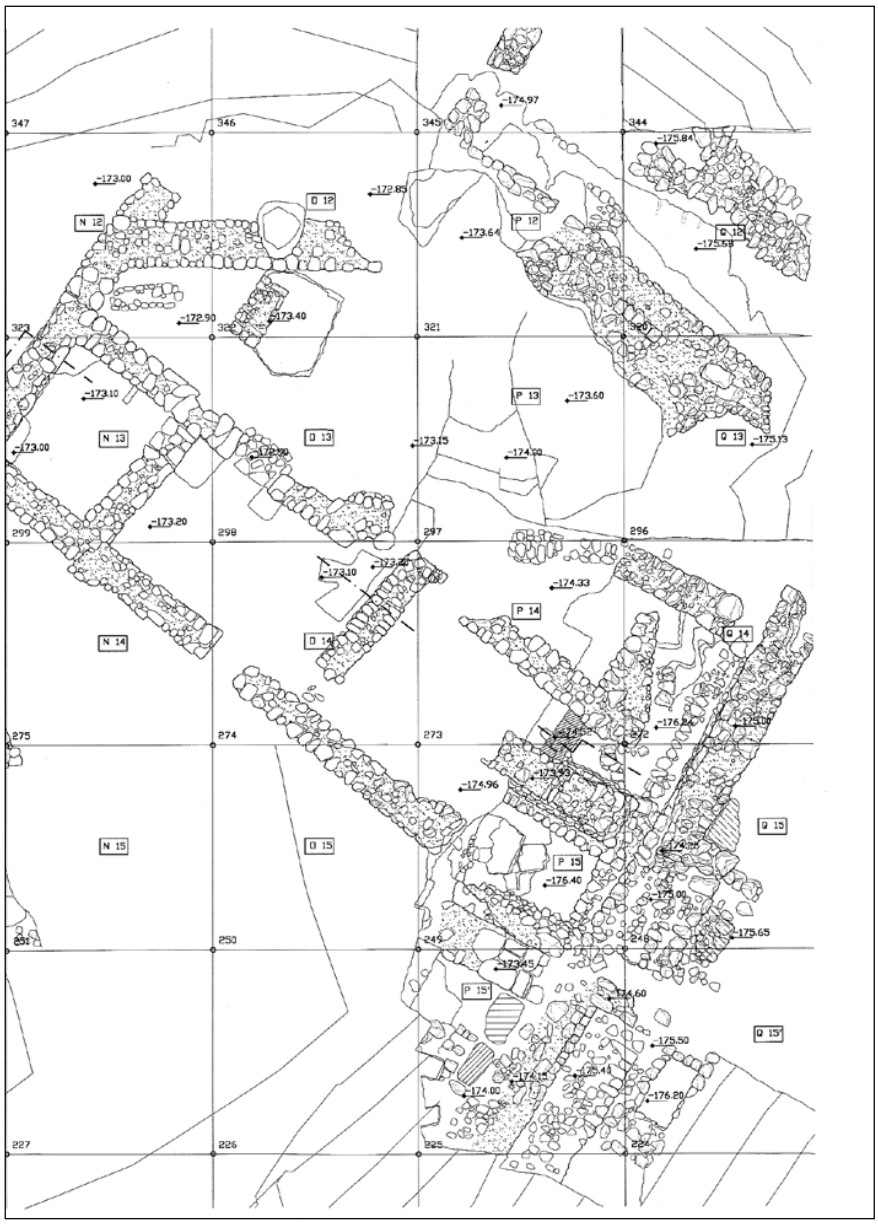
11. Trench P16: large rectangular pit.

large rectangular pit cut into the ground (1.57 x 0.71 - 0.79 x 1.67m), its interior carefully lined with stones of various sizes, was discovered at the lowest, eastern part of this trench (**Fig. 11**). It was filled with soil, some boulders and a few sherds, but no dateable objects were found thus making it impossible to determine its date or function with confidence.

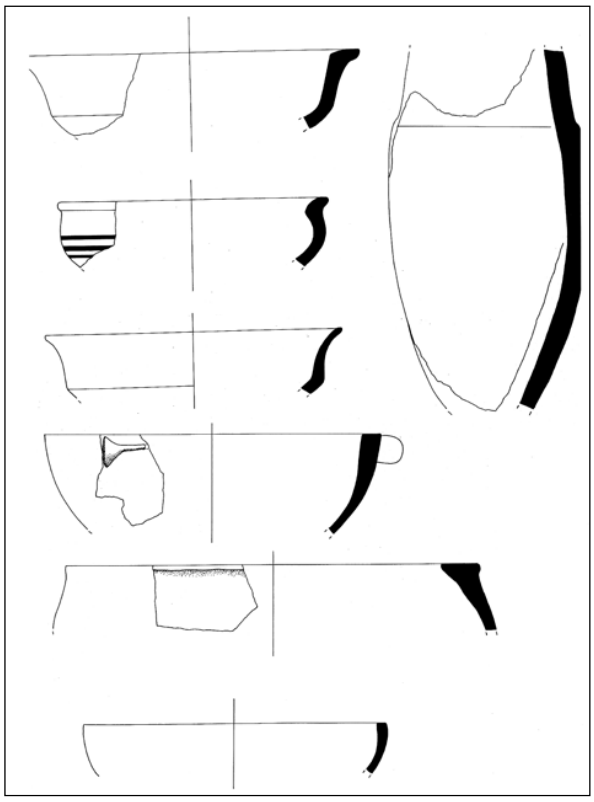
In Trenches Q14 - 15, a long, massive, north-east-south-west wall (present dimensions l 15.2m, w 1.30 - 1.50m, h 1.7m) was exposed. Roughly mid-way along its length, a pronounced rectangular projection to the east (present dimensions 4.95 x 2.3 - 2.5m) interrupts the wall's long façade, giving the impression of a tower-like structure (**Figs. 12, 13 and 14**). Work immediately in front of the eastern face of the long wall revealed two floor layers, the uppermost consisting of stones covered with mud - clay and the lower of beaten earth. Finds include Iron Age I - II pottery (**Fig. 15**), stone tools and implements, animal bones and sea-shells.

12. Trenches Q14 and 15.

13. Trenches Q14 and 15.



14. Plan of Trenches Q14 and 15.



15. Iron Age I - II pottery from Trenches Q14 and 15.

Above Trench P16, close to the summit of *tall*, two new trenches, O16 and 017, were opened and partially investigated. Part of a massive, double-faced, north-south wall (l 4.32m, w 1.45m) (**Fig. 16**) was provisionally interpreted as either a retaining wall, or as a part of the upper defensive wall, part of which was exposed in 2007 on the north-west slope. Excavation immediately south of this trench is needed to establish the size, date and function of this wall.

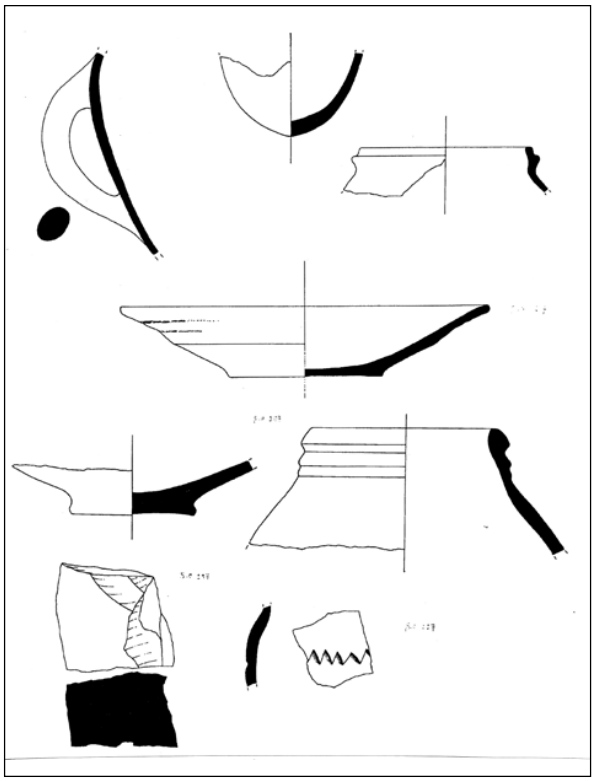
Moving to the eastern part of the *tall*'s summit, Trench N16 was entirely unproductive, as flattened bedrock appeared just a few centimeters below the ground surface (**Fig. 17**).

Regarding the north slope of the *tall*, work was resumed in both Trench L8 and the long exploratory trench. Trench L8 was partly examined in 2005, but its full investigation was interrupted by the discovery right in its centre of an Islamic tomb. Last season, the well-built wall unearthed at that time (2005) was cleared and re-examined, as was the area of the Islamic tomb (**Fig. 18**). With the exception of a few Iron Age I - II sherds (**Fig. 19**), no dateable objects were found. It seems likely, however, in view of

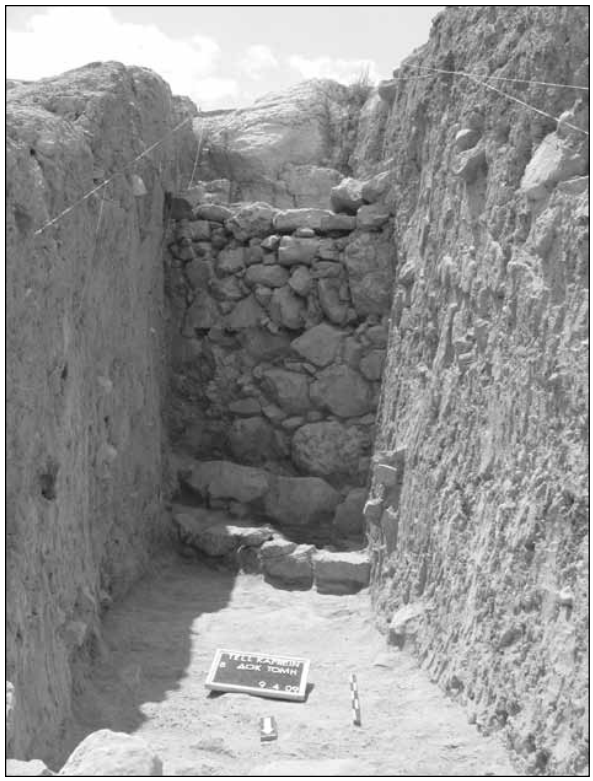
16. Trenches O16 and 17.

17. Trench N16.

18. Trench L8.



19. Trench L8: Iron Age I - II pottery.



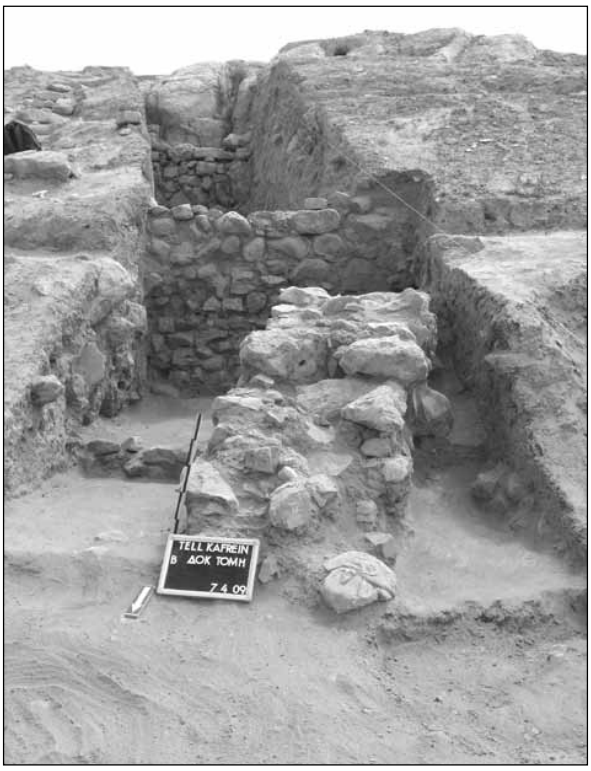
21. Exploratory trench: Wall A.

the presence of some lenses of ash and charcoal, that the wall and clay-plastered floor in front of it to the north were used for everyday domestic activities. Further work is needed on this part of the *tall* and it is hoped that new trenches will be opened here next season.

Finally, continued work in the exploratory trench opened last season (2008) (**Fig. 20**) exposed new architectural remains, as well as important finds. Expansion of the narrow, vertical cut (present dimensions 18 x 2.1 x 5.5m) confirmed that the massive and impressively high Wall A (h 2.4m) (**Fig. 21**), is most probably part of the settlement's defensive wall and can be dated, on the basis of associated pottery, to the Iron Age IC period.

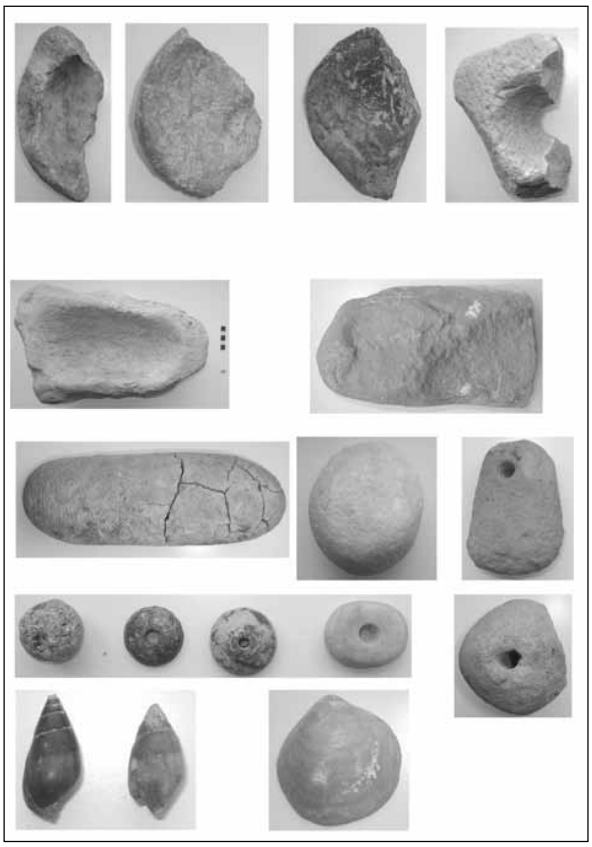
20. Exploratory trench: view from north.

Further to the north, parallel to and at a distance of 5.25m from Wall A, a new wall (Wall B, h 0.5m, w 0.87m) was discovered, with a third wall (Wall C, present dimensions h 0.87m, w 0.85, l 3.6m) joining it (**Fig. 22**) at a distance of 1.17m from Wall B. In the space between Walls B and C, an unusual structure appeared below a thin mud layer at a depth of 0.77m from the top of Wall B. It consists of a horizontal line of holes (1.10 x 0.2m) (**Fig. 23**), the function of which is not entirely clear but may be the remnants of a reed and mud roof. These new walls were probably parts of *extra muros* dwellings. This hypothesis is supported by the discovery in the corner formed by these walls of the remains of a mud-plastered floor, ash, burned mud-bricks and wooden beams, and cereal seeds, which were sampled for further investigation. Other finds include a sandstone quern (cf. Edwards *et al*. 2001: 141, fig. 5), stone vase fragments, flint blades, loom-weights, shells (**Fig. 24**) and Iron Age I - II pottery (**Fig. 25**) (cf. Amiran 1969: 191ff, pls 60-63; Fredericq and Franken 1986: 154ff; Hendrix *et al*. 1996: 158ff).



22. Exploratory trench: Walls B and C.

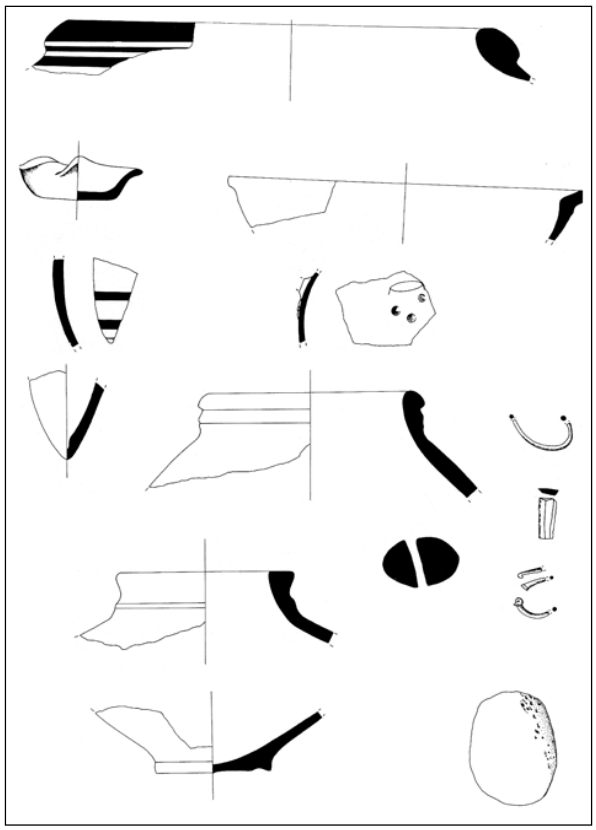
23. Exploratory trench: structure with series of holes.



24. Exploratory trench: selected finds.

Of special importance is the discovery of a scaraboid made of blue, non-glazed faience (frit), with a three-sign inscription (**Figs. 26, 27 and 28**) (Kell 1995: 243). According to Dr Nir Lalkin, "on the top and right side there are two variants of the letter S, on the left side there is a debased W3S scepter. The scaraboid doesn't look Egyptian, maybe Phoenician or Greek, and probably dates to the Iron Age (8th-7th centuries BC)". However, different suggestions about the identity, provenance and date of this artifact have been put forward by Dr V. Crysikopoulos and Dr Jacke Phillips, both of whom agree about its Egyptian origin but differ about its date, with the former assigning it to the 22nd Dynasty (*ca.* 950 - 900BC) and the latter to the early-middle 18th Dynasty. Jacke Phillips also says that "it seems not to be a moulded piece but is instead individually carved, which is interesting". In the meantime, Dr Kay Prag has informed us that an unpublished XIX Dynasty seal - plaque, incised on both sides and bearing the human-headed Re, was picked up in ar-Rawḍa and brought to her while she was digging at Iktānū; it may have come from a site in the near vicinity, perhaps Tall al-Kafrayn[1].

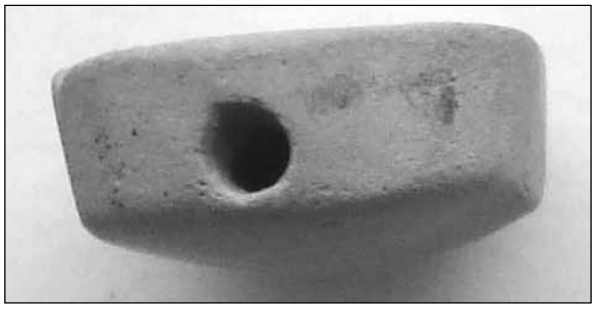
1. We cordially thank Drs Lalkin, Crysikopoulos and Phillips for their valuable help and suggestions, and Dr Prag for kindly providing us with a photo of the scaraboid from ar-Rawḍa.



25. Exploratory trench: Iron Age pottery and small finds.

26. Blue faience scaraboid.

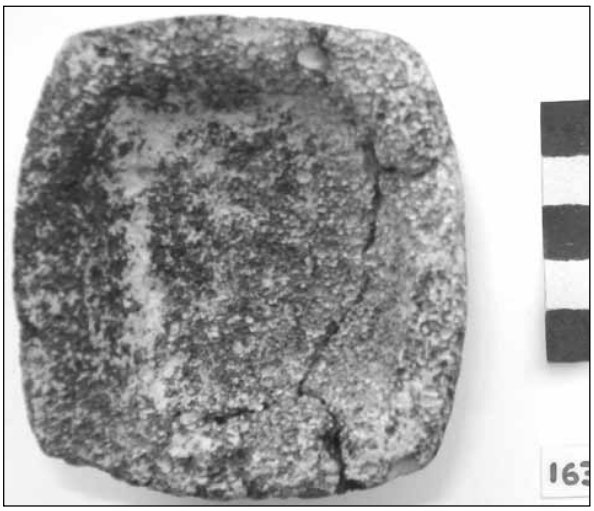
27. Blue faience scaraboid.



28. Blue faience scaraboid.

Another noteworthy find is a miniature cube-shaped 'altar' made of grey pumice (**Figs. 29 and 30**).

As well carrying out field work, the team has been busy with post-excavation work and the preparation of finds for publication (**Figs. 31, 32 and 33**), as well as with the conservation of exposed architectural remains. Also, during the excavation local inhabitants drew our attention to two EBA vases (**Figs. 34, 35 and 36**) and a stone statuette of a bearded man, possibly Early Babylonian in date (**Fig. 37**) (cf. Müller-Karpe 1974: Taf. 242). Most likely they come from a robbed local cemetery and, with the kind permission of the owner, they will soon be published.

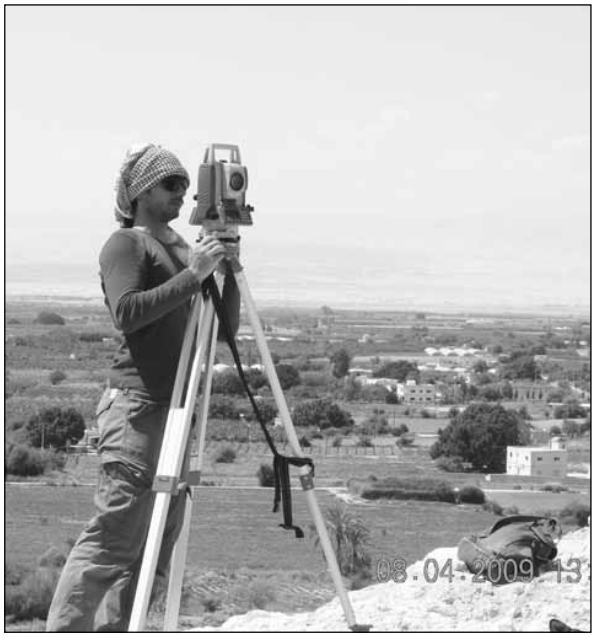


29. Miniature cube-shaped altar.

30. Miniature cube-shaped altar.

31. Study of finds at the dig-house.

32. Conservator Kleio Zervaki at work.

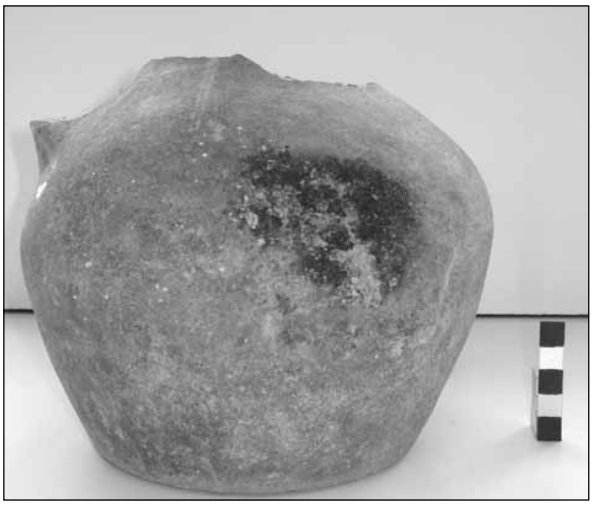


33. Architect Alexandros Lagopoulos at work.

Charcoal Samples from Wooden Beams

Charcoal samples from different wooden beams were collected by archaeometrist Artemis Oikonomou for radiometric dating by Dr I. Maniatis at the Dimokritos C14 Laboratory (EKEFE) in Athens. The sample from Trench J17 returned a calibrated date of 725 - 395 BC and the sample from the exploratory trench a date of 750 - 400 BC.

34. EBA vase.

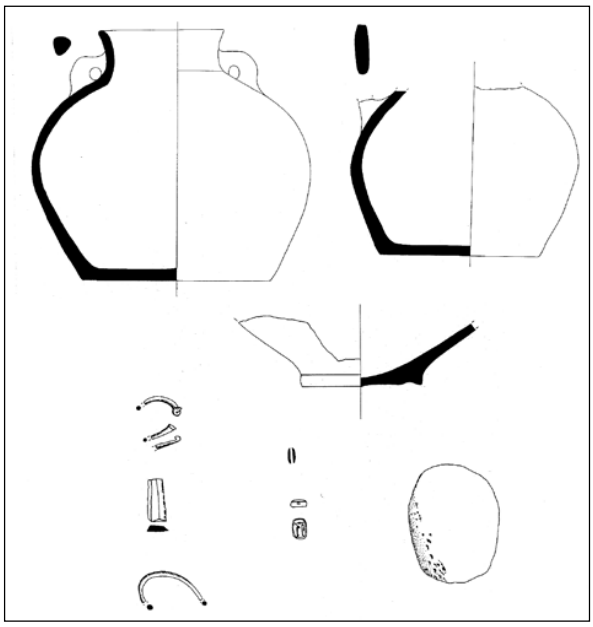


35. EBA vase.

Botanical Remains

As laboratory analysis of the paleobotanical remains from stratified contexts is still being undertaken by Dr Efstathia Margaritis, a short interim report is presented here:

The plant remains discussed here were collected by hand during the 2009 excavation. Prior to 2009, flotation was used to recover charred material from soil samples, but these have not yet been processed and will be the subject of a subsequent report. The plant remains under discussion here consist of barley grains, lentils, peas, olives, grapes and a very interesting find of *Carthamus* sp.



36. EBA vases and small finds (drawings).

37. Early Babylonian statuette (front and back).

Hordeum sp. (barley)

Identification of hulled barley grains was based on their wide, shallow ventral groove, convex ventral surface and lack of any dorsal

ridge. Additionally, they taper at the ends, resembling a rugby ball. They are furthermore characterized by an angular cross-section and have lines on both ventral and dorsal surfaces. The identification of naked barley (var. *nudum*) is based on its shriveled skin and narrow apex. Grains with horizontal wrinkles on the dorsal surface, a rounded cross section, slightly rounded ends and an absence of hulls were therefore identified as naked barley. Both varieties were present in the assemblage, although their separation was problematic owing to poor preservation, with the result that most were recorded simply as *Hordeum* sp.

Domesticated barley falls into two main types, two-row and six-row, on the basis of the morphology of the rachis internodes. In two-rowed barley, all kernels are straight and symmetrical and each ear contains only two vertical rows of fertile spikelets. In six-rowed barley, the lateral grains are "often slightly bent and somewhat asymmetrical" (Zohary and Hopf 2000: 60f.) and the ears have six vertical rows of fertile spikelets.

In the current assemblage, both asymmetrical (*Hordeum vulgare vulgare*) and symmetrical grains were present. The symmetrical grains might indicate the presence of *Hordeum vulgare distichum*, without excluding the possibility that these straight grains represent the medial spikelet of six-rowed triplets. In the absence of rachis fragments, the only method of determining whether a sample of barley containing twisted grains is pure six-row or whether it also contains two-row is by statistical analysis of the ratio of symmetrical to asymmetrical grains.

Lens culinaris (lentil)

Lentil seeds had a flattened, circular shape, with a small hilum on the rather sharp margin. Cultivated and wild species are morphologically very similar; their distinction is based on size, as wild lentils are likely to be smaller.

Pisum sativum (pea)

Seeds with a spherical or cylindrical shape with a short, ovate hilum were categorised as *Pisum sativum*.

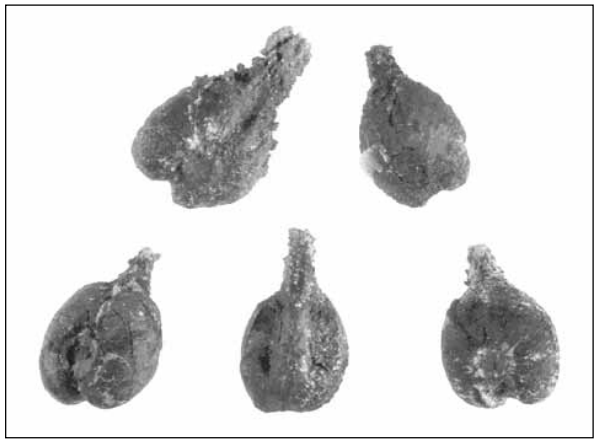
Olea europaea (olive)

Olive stones were identified on the basis of their structure and morphology, which strongly resembles modern examples. They had the distinctive features of an apex, hole at the base (at the point of attachment with the stem), suture line on the lateral side and distinct carpellar fascicles (**Fig. 38**).

Vitis vinifera (grape)

Grape pips were identified by comparison with modern material. The grape pips have a variety of shapes and sizes, ranging from 1.5-5 mm in length and 0.09-3.5 mm in width (**Fig. 39**). It has been suggested that the shape of the pips in cross section depends on the number of pips in each grape. Some pips were broken. Most of the breaks are modern as a result of damage

38. Olive stones (Olea europaea).



39. Grape pips.

during excavation, recovery and handling. Several researchers have carried out metrical and experimental studies on pips in an attempt to come up with a formula by which to differentiate between wild and domesticated populations. The grape pips under examination here were not systematically subjected to this type of analysis, but will be in future.

Carthamus sp.

The remains of *Carthamus* sp. recovered from Tall al-Kafrayn may derive from *Carthamus* cf. *tinctorius* (safflower). Only small fragments of the flower-heads and some seeds are preserved. The flower head-fragments have a quadrangular apex bordered with a distinct collar; the upper part of the fruit has transverse grooves. In general, archaeobotanical remains of *Carthamus* sp. are poorly preserved owing to the high oil content of the plant.

The main area of cultivation for this plant is central Syria, near the Euphrates river (Weiss 2000). The earliest archaeobotanical evidence of *Carthamus* sp. comes from Middle PPNB Syria (*ca* 7500 BC). In Jordan, it is known from the PPNB site of Wadi Jilat 7 and Early Bronze Age Khirbat az-Zayraqūn (Marinova and Riehl 2009).

The plant may have been used for its oil seeds or for its flowers. Numerous *Carthamus* flower-heads were recovered from the Early Bronze Age site of Tell Hammam in northern Syria, in contexts that suggest its use as a vegetable dye. Two types of dye can be produced from the flowers: a water-soluble yellow dye for flavoring food and an insoluble safflower carmine that produces a red dye used to colour textiles. Chemical analysis of textiles from 12th Dynasty Egypt has suggested that safflower carmine was used for this purpose. Safflower was also used in Egypt for making the garlands that adorned mummies (van Zeist and Waterbolk - van Rooijen 1992).

In their extensive research on the archaeobotanical remains of *Carthamus* sp., Marinova and Rielh (2009) have examined the use of the plant as dye and also as a source of oil. Unfortunately, the material from al-Kafrayn is very limited and it is therefore not currently possible to determine for what purpose *Carthamus* was used at the site. However, this situation might change after the systematic recovery of plant remains during the next season of excavation. The goals of the next field season are not only to retrieve more archaeobotanical material, but also to examine and interpret the remains in their archaeological context.

Conclusions

The 2009 excavation season at Tall al-Kafrayn has been successful in identifying the extent of the multi-period occupation on the *tall*. Further architectural remains and important finds have been discovered, and questions remaining from previous seasons clarified. Future seasons should help to answer new questions through more extensive excavation of the structures exposed to date, as well as completion of the deep probe (exploratory trench) which will document the entire history of occupation at Tall al-Kafrayn. It is reasonable to suppose that further investigation of the slopes of Tall al-Kafrayn will continue to produce stratified material dating from the prehistoric to the Hellenistic - Roman periods.

Acknowledgements

We would like to thank the following institutions and people for their support and assistance: the late Dr Fawwaz al-Khraysheh, former Director General of the Department of Antiquities, for granting permission to carry out this fieldwork, Khaled Ahmad al-Hawawrah, representative of the Department of Antiquities, and Hussein al-Jarrah of the Dayr ʻAllā office. Tawfiq Salameh al-Huneiti and Suleiman al-Jamal, surveyors, are thanked for their valuable assistance in the field. We are much indebted to the Director of City Planning and Irrigation in the area of South Shūna for making the basement of his office available for the study of finds and temporary storage of excavation tools. Special thanks are also due to the University of Ioannina and the Greek Ministries of Foreign Affairs and Culture and Tourism for their financial support, as well as to the Greek Ambassador in Amman, H. Asteriadis, and Secretary of the Embassy, I. Mallikourtis, for their assistance, and to Archimandrite Innocentius, representative of the Greek Orthodox Patriarchate of Jerusalem, for providing us with safe and secure stay in the Pilgrims' House at the Monastery of Saint George in Madaba. Fi-

nally we are grateful to all of the Greek expedition team members mentioned above, as well as to Dr V. Chrysikopoulos, Dr Jacke Phillips, Dr Nir Lalkin and Dr Kay Prag for their help and scientific collaboration.

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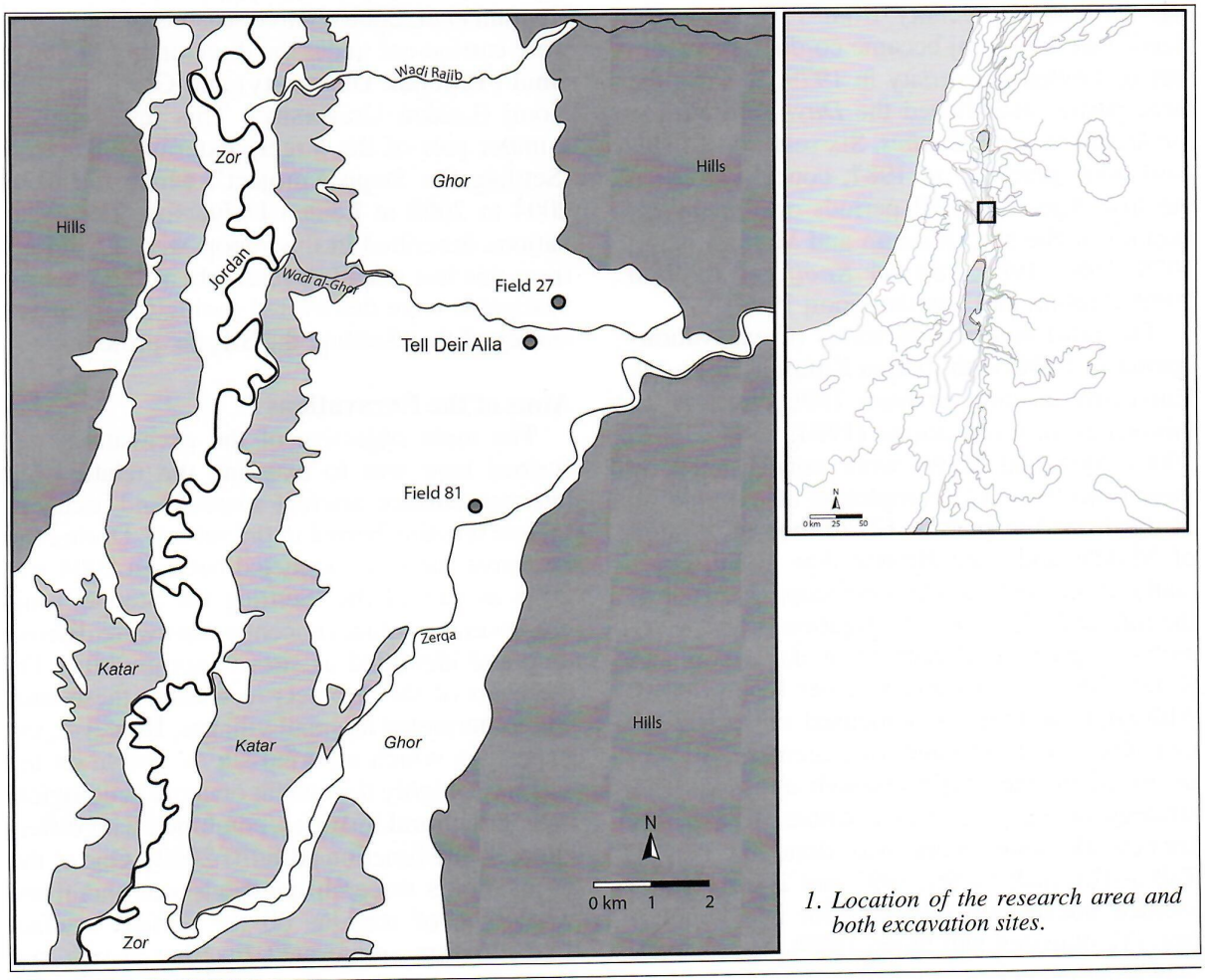
PRELIMINARY RESULTS OF THE DAYR 'ALLĀ REGIONAL PROJECT EXCAVATIONS OF A LATE CHALCOLITHIC SETTLEMENT, IRON AGE BURIALS AND SOME EARLY BRONZE AGE I REMAINS

Eva Kaptijn[1], Zeidan Kafafi[2] and Gerrit van der Kooij[3]

Introduction

Between 20th April and 20th May 2010 excavations were carried out in the Jordan Valley near the hamlet of ad-Dayyāt, in the Dayr 'Allā municipality, and at a second location situated in the fields north-east of Tall Dayr 'Allā (**Fig. 1**). This fieldwork was part of the Dayr 'Allā Regional Project involving Leiden University, Yarmouk University and the Department of Antiquities of Jordan, under the directorship of



1. Location of the research area and both excavation sites.

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2. Yarmouk University.
3. Leiden University.

Zeidan Kafafi (Yarmouk University) and Gerrit van der Kooij (Leiden University). Day-to-day field supervision was in the hands of Eva Kaptijn, with the assistance of Ali Omari (surveyor) and Yousef Zu'bi (photography). Mr Ziad Ghnaimat was the DoA representative.

History of the Tall Dayr 'Allā project

The Tall Dayr 'Allā excavations have a long history, being started in 1960 by Leiden University under the direction of Henk Franken. In the first five excavation seasons, 1960-1964 and 1967, the project concentrated on the Late Bronze Age and Iron Age I periods (Franken 1969, 1992).

Work resumed in 1976 as a joint expedition with the Department of Antiquities of Jordan. Moawiyah Ibrahim was co-director, representing Yarmouk University from 1980 onwards. Gerrit van der Kooij became co-director on behalf of Leiden University in 1979. In 1982 the three parties established the *Dayr Alla Station for Archaeological Studies*. Six seasons of fieldwork took place up to 1987, concentrating on the Iron Age II and III periods on the eastern summit of the site (Ibrahim and Van der Kooij 1979, 1983, 1986; *Van der Kooij* and Ibrahim 1989; Ibrahim and Van der Kooij 1997).

The third and current series of excavations started in 1994, with Zeidan Kafafi as Yarmouk University co-director from 1996 onwards. In this series of excavations (1994, 1996, 1998, 2000, 2004 and 2009) work concentrated on three objectives: (1) completion of exploration of the Iron Age phases, (2) further excavation of Middle and Late Bronze Age strata, especially at the south-south-west slope and foot of the *tall*, and (3) some investigation of the wider archaeological landscape (Van der Kooij and Kafafi 2008; Kafafi and Van der Kooij 2009). Although the latter was focused on rescue archaeology and heritage management, it was informed by the wider research questions and strategy of the project as a whole. Within this framework some work was done on nearby Tall al-Ḥimmah (1996, 1997 and 2000), which yielded unexpected evidence for iron production (Veldhuijzen and Steen 1999). Minor work was done elsewhere, including damage assessments of some sites.

The results of this research demanded more intensive regional investigations. One example was the study of iron production at Tall al-Ḥimmah undertaken by Alexander Veldhuijzen, with the initial involvement of Yoshua al-Amri. This included renewed excavations at Tall al-Ḥimmah in 2009 by 'The Iron Track of Jordan' project' (2007 - 2009) (Veldhuijzen 2009).

Wider regional investigations started in 2004 in the form of intensive surveys by Eva Kaptijn (Kaptijn 2009) of the so-called 'Zarqa triangle', located between Wādī Rājib and the az-Zarqā' and Jordan rivers, and small-scale excavations at the neighbouring sites of Tall Dāmiyah, Tall 'Adliyah and Tall 'Ammata by Lucas Petit (Petit 2009). Within this project geomorphological and archaeobotanical investigations were carried out by Fuad Hourani and Ellis Grootveld respectively (Kaptijn *et al.* 2005; Petit *et al.* 2006; Hourani *et al.* 2008). Three seasons of fieldwork were carried out under the directorship of Omar Ghul (Yarmouk University) and Gerrit van der Kooij (Leiden University). This research was a major part of the largely externally financed 'Settling the Steppe' project', which ran from 2004 to 2008 at Leiden University. The excavations described in this report were a spin-off from this last strand of research, as the sites investigated were discovered during the intensive survey of the 'Settling the Steppe' project.

Aims of the Excavations

The main objective of the excavations described here was to examine the relationship between surface artefact scatters and archaeological remains buried in the subsoil. During the intensive surveys conducted between 2004 and 2008 as part of the 'Settling the Steppe' project, several artefact concentrations were discovered and identified as sites (Kaptijn 2009). On the basis of the artefacts recovered, these sites were interpreted as small villages. However, the manner in which a buried site is visible on the surface is highly dependent on local pedological and agricultural histories, combined with differences in site function (Bintliff 2000). One of the excavation's research questions was therefore: what type of remains do the surface artefact concentrations represent? In other words, are the hypothesised origins of these artefact concentrations correct? The results of these excavations will have a bearing on the interpretation of

other sites identified by the 'Settling the Steppe' survey.

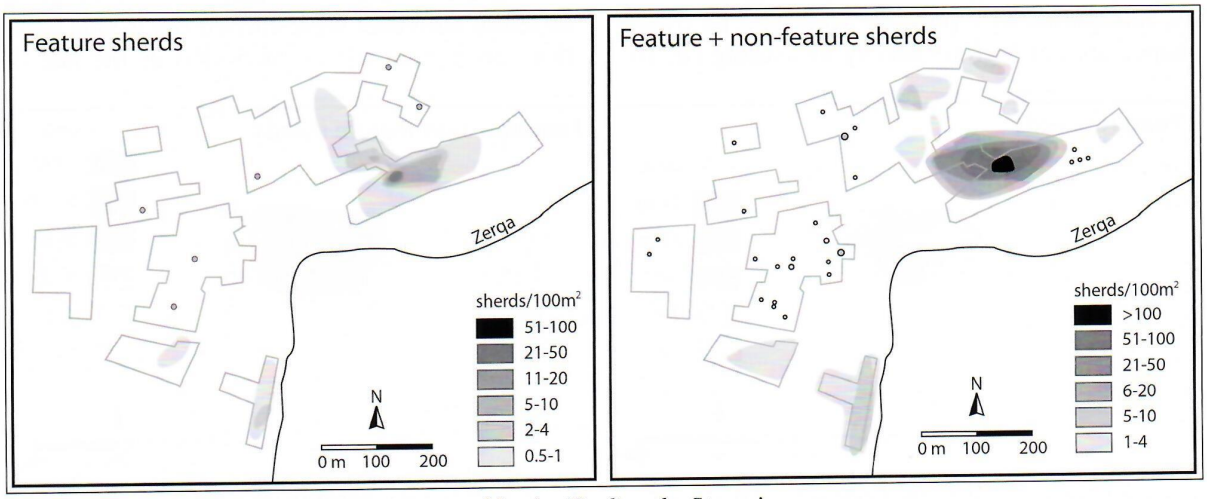
It was envisioned that excavation would provide new insights into the poorly understood Late Chalcolithic - Early Bronze Age transition and, to a lesser extent, the shift from EB I villages (3600-3100 BC) to EB II urban communities. Furthermore, a better understanding of EB I village society would facilitate subsequent study of the transition to early urbanisation visible in the EB II period. The survey results suggested that the site discovered in Field 81 has parallels with pottery dated to the earliest part of the EB Ia period, or possibly the Late Chalcolithic - EB I transition (Gustavson-Gaube 1985, 1986; Wright *et al.* 1998; Brückner *et al.* 2002). Only a few sites dating to this early part of the EB I period are known and none of these are located in the central Jordan Valley. More information on settlement and subsistence during this little-known period would be extremely valuable for our understanding of this transition.

The location of the Late Chalcolithic and EB I sites discovered during the 'Settling the Steppe' survey, together with the results of related geomorphological research carried out by Fouad Hourani, suggested that EB I communities in this area relied on agriculture made possible by floodwater irrigation of the seasonally innundated floodplains of the Zarqā' and other wadis (Kaptijn 2009: 411f; Hourani 2010). One of the aims of this excavation was to acquire more information on the mode of subsistence of these communities. For example, were these communities indeed farming societies, was floodwater irrigation practiced, and to what extent did these communities rely on animal herding?

Expectations

The artefact concentrations in Field 81 and Field 27 were both discovered during the 'Settling the Steppe' survey. Field 81 was initially discovered in 2004 and was re-surveyed in 2006 to recover a larger sample of diagnostic pottery sherds. As can be seen in **Fig. 2**, the concentration consisted of a central cluster surrounded by concentric rings of decreasing artefact densities. The pottery sherds recovered represent a range of different vessel types, including cups, V-shaped and hemispherical bowls, holemouth jars and necked jars. These vessels are similar to ones found at the transitional Late Chalcolithic / EBA site of Ḥujayrat al-Ghuzlān near 'Aqaba (Brückner *et al.* 2002; Khalil *et al.* 2003; Khalil and Eichmann 2006). Furthermore, the presence of abundant parallels at Shunah N, even for apparently rare vessels, is another indication of a possible early EB I date for the concentration (Gustavson-Gaube 1985, 1986). Shunah N is one of the few sites in the Jordan Valley that was occupied during Late Chalcolithic - EBA transition and earliest part of the EB I period (Blackham 2002: 99). These and other parallels with excavated pottery assemblages suggest that the majority of the Field 81 assemblage dates to the EB Ia period, with some continuation into EB Ib (Kaptijn 2009: 118-139).

The distribution of chipped stone at this loca-



2. Artefact concentration in Field 81, discovered by the 'Settling the Steppe' survey.

tion suggested a slightly different picture (Kaptijn 2009: 137-139). First, typical EBA tools such as Canaanean blades were discovered in Field 81. The distribution of these tools is a perfect match with that of the pottery concentration. Second, flint tools from earlier periods were also discovered. These include a so-called Harpassa point from the Pottery Neolithic, a Late Neolithic chisel and Late Neolithic / Chalcolithic backed sickle blades. However, these earlier tools have a slightly wider distribution and cluster slightly to the south-west of Field 81, suggesting the co-location of two sites of different periods.

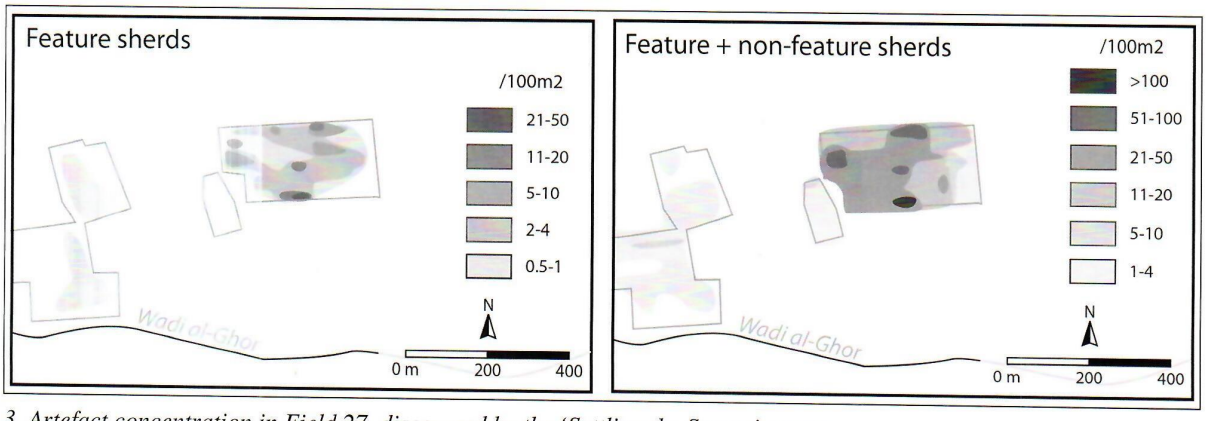
Basalt grinding stones, a fine grained basalt bowl and two stone discs, probably spindle whorls, were also recovered (Kaptijn 2009: 119-120). Together, these finds suggested that the concentration represented a site at which a range of domestic activities were carried out. The site was therefore interpreted as a small village of the EBA I period.

In 2009, geophysical investigations were carried out at Tall al-Ḥimmah as part of the 'Iron Track of Jordan' project. During these investigations, which were conducted by TNO (Toegepast Natuurwetenschappelijk Onderzoek / Applied Scientific Research), the artefact concentration in Field 81 was examined as well. Both electroresistivity (ground penetrating radar) and magnetometry were used. As it turned out, the character of the soil was not conducive to ground penetrating radar. Magnetometry yielded more promising results, with the identification of a long linear area of high resistivity, interpreted as a possible wall, and an oval-shaped area of high resistivity measuring *ca.* 10 x 15m. The latter was interpreted as a possible floor, or perhaps a concentration of sherds (internal report by M.A.J. Bakker, TNO Built Environment and Geosciences).

The artefact concentration in Field 27 was also discovered in 2004 and consisted of a large spread of mainly Late Chalcolithic artefacts (**Fig. 3**). The concentration measured approximately 200 x 300m and included several clusters of extremely high artefact densities. The variation in artefact density can be attributed to the fact that this area, which is farmed by the Muasher family, was until recently a citrus plantation. In some areas the removal of trees has disturbed the soil to a considerable depth, whereas in others it is undisturbed.

The pottery recovered at this location consists of V-shaped bowls, holemouth jars, necked jars and the typical Jordan Valley jar (Kaptijn 2009: 84-89). Good parallels were found in the excavated Late Chalcolithic assemblages from Tulaylāt al-Ghassūl, Abū Ḥāmid, Gīlāt, Wādī ar-Rayyān and Pella (Dollfus and Kafafi 1986; Bourke *et al.* 1994; Lovell 2001; Commenge *et al.* 2006; Lovell 2007). A few Late Roman/ Byzantine and Islamic period sherds were also recovered. Other finds included several fragments of basalt grinding stones, a basalt pestle and a possible basalt macehead fragment (Kaptijn 2009: 84). The flint artefacts also suggested a Late Chalcolithic date and included several backed sickle blades, some small chisels and a few tabular scraper fragments (Kaptijn 2009: 92-94).

Together, these finds suggest that a range of different activities were carried out at this location, prompting its interpretation as the site of



3. Artefact concentration in Field 27, discovered by the 'Settling the Steppe' survey.

a Late Chalcolithic village. The presence of *in situ* remains was suggested by the presence of large yet fragile pottery sherds. This was corroborated by geomorphological soundings made by Fuad Hourani as part of the 'Settling the Steppe' project, in which he exposed fragments of a stone wall associated with occupation layers containing Late Chalcolithic pottery (Hourani *et al.* 2008: 429).

Results of the Excavations

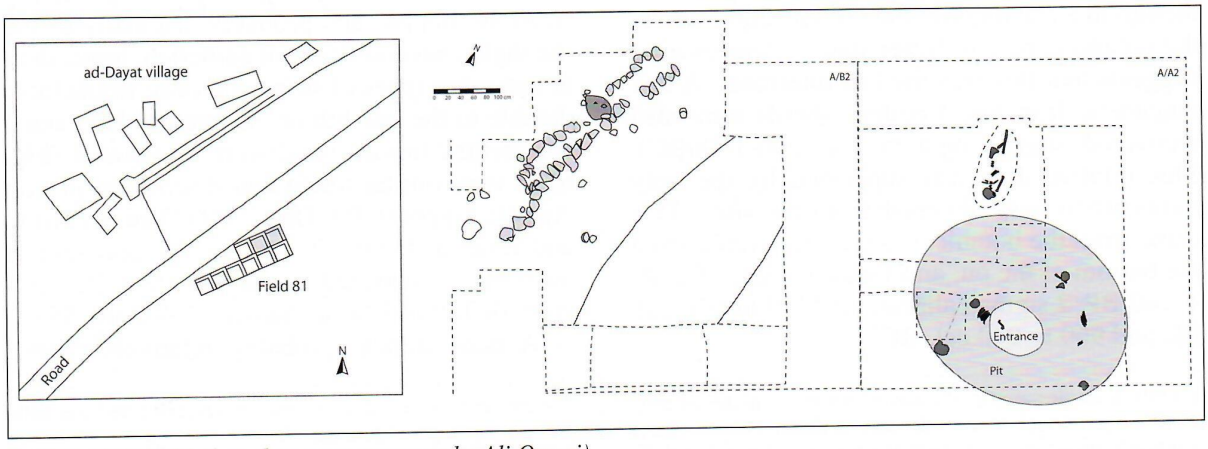
Field 81

Excavation in Field 81 started on 20th April 2010. The site is located between the villages of Sawālḥa and Abū Nu'aym, immediately south of the road and opposite the village of ad-Dayyāt. The land is registered as Estate 307 (Basin 23 of the Dayr Alla - Atwal municipality; central coordinates: 745890 / 3562575 UTM). An agreement was signed with the owners of the land, represented by Mr Saleh Abd el-Fatah Shehab of the village of Mu'addī.

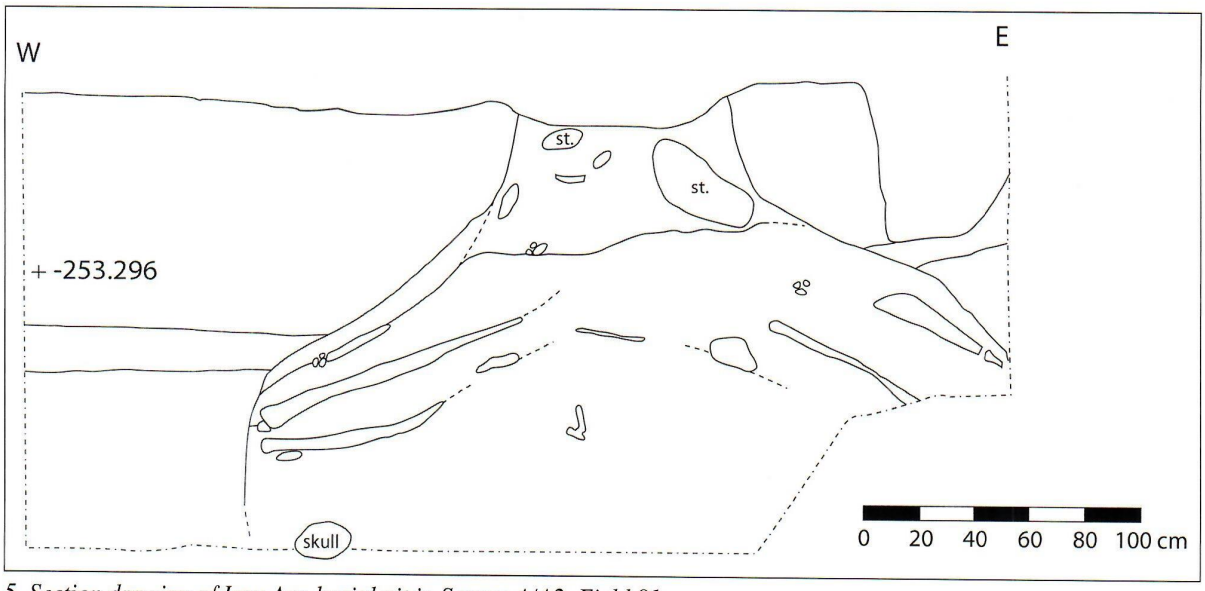
A total of eight 5 x 5m squares were laid out in the field. The squares were laid out in a row following the contour lines as well as the south-west — northeast plough furrows in the field. A/F1 and A/A1 were the south-west square and north-east squares respectively (co-ordinates of south-east corner of square A/A1: 0745861 / 3562412 UTM) (see **Fig. 4**). To the east, a second line of three squares was added north of squares A/C1, A/B1 and A/A1, being A/C2, A/B2 and A/A2.

The field is currently used for agriculture and has been for many years. At the time of excavation, courgettes were being cultivated. The agricultural use of the field means that the upper layer of soil has been heavily disturbed by ploughing and plant roots. This layer of disturbed topsoil was *ca.* 40 cm thick and contained many Early Bronze Age sherds and flint artefacts. Below the topsoil, however, clay and gravel layers were exposed that contained neither man-made structures nor pottery. These layers were interpreted as natural riverine deposits laid down by the Zarqā' River. They were excavated to a depth of at least 1-1.3m below ground surface in all squares, and down to 1.9m in square A/B1. The lack of archaeological remains in six of the nine squares prompted a shift of the excavation area. As it was not possible to open more squares in Field 81 owing to cultivation and the presence of buildings and a road to its north, after the first week of excavation part of the team moved on to another artefact concentration, i.e. Field 27 (see below).

In the northernmost squares, A/A2 and A/B2, *in situ* archaeological remains were exposed. In the north-eastern square A/A2, a bell-shaped pit was discovered underneath the topsoil that widened out to a diameter of more than 3m and reached a depth of almost 2m (**Fig. 5**). Its fill was dark brown in colour, suggesting a high organic content. A small sample of charred plant remains was recovered from the bottom of the pit but, although it evidently contained cereal grains, the high level of fragmentation meant that these could not be more precisely identified. The pit may at some point have been used for storage, but the fact that it had been thoroughly cleaned out means that this cannot be established with certainty.



4. Plan of Field 81 (based on measurements by Ali Omari).



5. Section drawing of Iron Age burial pit in Square A/A2, Field 81.

Other finds in the pit suggest a rather different, secondary function. Fragmentary human skeletal remains of at least four individuals were recovered. Although the skeletal remains were mostly very incomplete, their position suggests that these were articulated primary burials. Three of the skeletons consisted only of the skulls and a few associated long bones. They were found near the edge and close to the bottom of the pit. As the pit has not yet been completely excavated, it is likely that parts of these skeletons remain unexcavated. The fourth skeleton was found higher up in the pit and more or less in its centre, directly below the entrance. In contrast to the others, this skeleton was relatively complete. Parts of the pelvis, vertebrae, some ribs, clavicle, mandible and skull were recovered, though in a fragmented state. Its position within the pit and generally better state of preservation suggests that this was the last interment. A few diagnostic Iron Age I pottery sherds were also recovered, suggesting a date of 1200-1000BC). This relative date was supported by the only radiocarbon date obtained from the site[4]. This came from the botanical sample recovered from the bottom of the pit, and yielded a date of 2890 +/- 40 BP, 2 sigma calibration: 1210 to 970 cal. BC and 960 to 940 cal. BC[5].

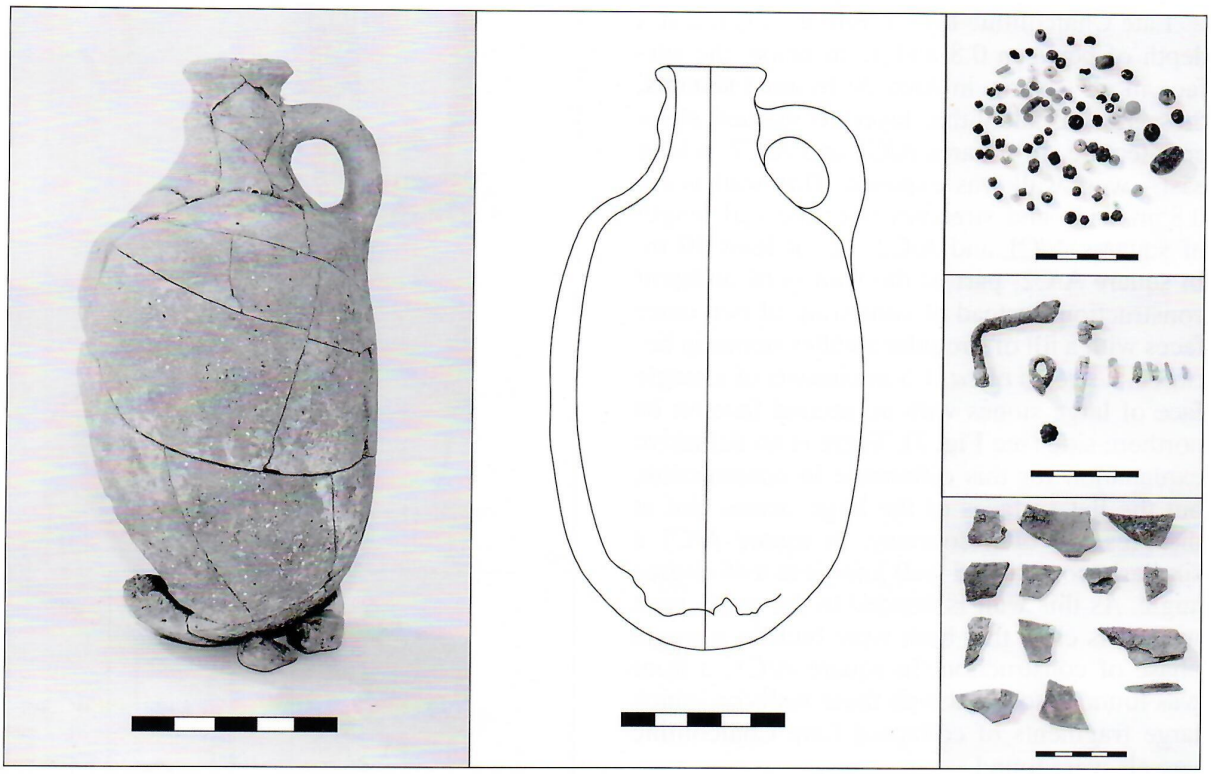
Beyond the pit, a fifth burial was discovered just under the topsoil. Again, its state of preservation was poor. The body was lying on its side facing east to north-north-east. No artefacts were discovered in association with the skeleton. Both the entrance to the pit and this fifth skeleton were dug into natural soil immediately below the topsoil, making stratigraphic correlation impossible. This skeleton therefore remains undated.

In the neighbouring square immediately to the west, i.e. A/B2, a stretch of probable EBA walling was exposed. Two small EBA vessels were discovered on a floor associated with this wall. In a later phase, a small pit was dug through the wall, which yielded a small juglet of the late 8th or 7th century BC (Iron Age IIc period). In this pit, and probably originally inside the juglet, several beads of carnelian, bone, metal and other types of stone, a bronze fibula (also datable to the late 8th or 7th century BC) and a fragmented bronze bowl were also found (**Fig. 6**). A very similar fibula was discovered in Iron Age IIc layers at Tall Dayr 'Allā (Van der Kooij and Ibrahim 1989: 37, 55-56, 108) and several have been excavated at the Iron Age IIc cemetery of Tall al-Mazār (Yassine 1984: fig. 55).

A deep trench, probably relatively recent,

4. Only a single sample of charred botanical material proved large enough to be radiocarbon dated. Additionally, uncarbonized bone samples from Field 81 and Field 27 were sent in for analysis, but these contained too little collagen to provide a date.

5. The INTCAL04 curve was used to calibrate the dates.



6. Finds from small pit in Square A/B2, Field 81 (photographs by Yousef Zu'bi).

was also discovered. The function of this trench, which was excavated to a depth of 2.8m without reaching the bottom, is unknown. The homogenous fill suggests that it was backfilled relatively quickly with material derived from the trench itself.

In sum, archaeological features have only been discovered in the northernmost squares of this area. To the south, further into the agricultural field, archaeological remains were only found in the disturbed topsoil. The remains that were present on the northern edge of the field were located very close to the surface (20-30cm) and only survived because this area had not been ploughed. The survey data suggest that the EBA site continues under the road and the hamlet of ad-Dayyāt to the north. Unfortunately, the presence of buildings prevented further investigation. The presence of Iron Age I burials was completely unexpected and remains unique in the Jordan Valley.

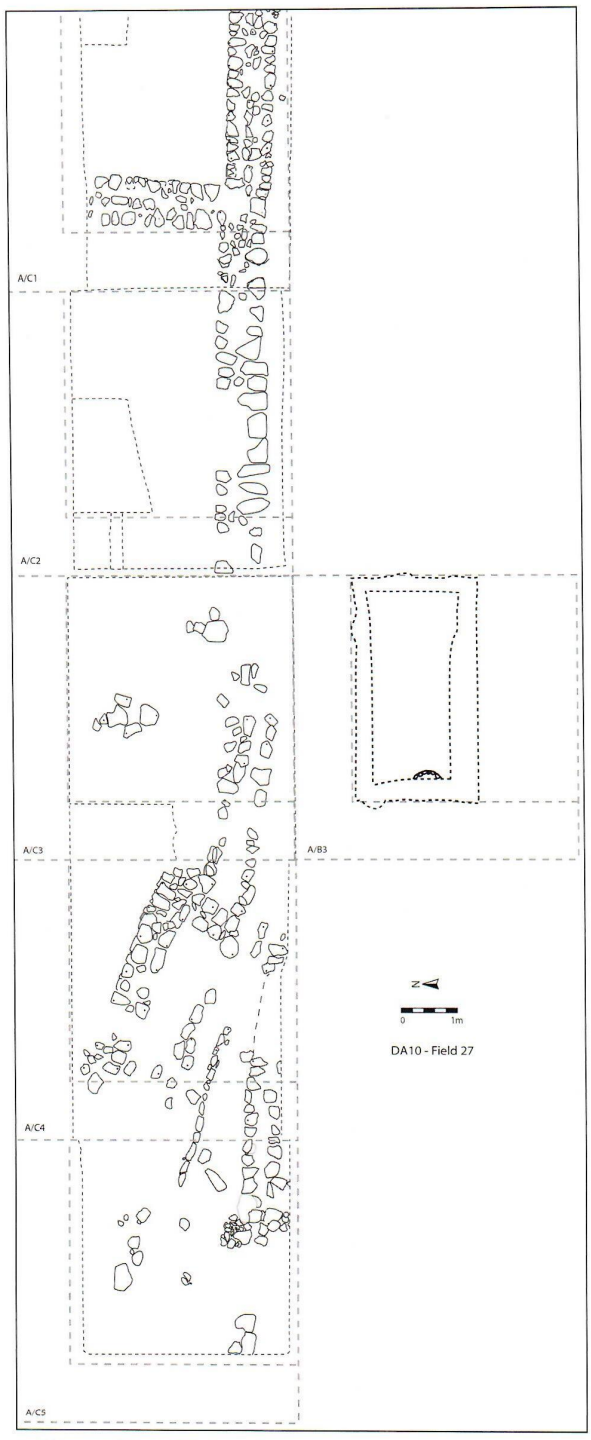
Field 27

As the six southern squares of Field 81 turned out to be devoid of archaeological remains, with the exception of artefacts in the disturbed topsoil, a second series of squares was opened 2nd May 2010 in Field 27. Field 27 is located *ca.* 1km north-east of Tall Dayr 'Allā and is owned by the Muasher family, who kindly allowed us to excavate on their land. The 'Settling the Steppe' survey had previously discovered a concentrated scatter of Late Chalcolithic artefacts in this location (see above). Excavations in this area were aimed at establishing the character of the site, previously interpreted as a village on the basis of surface finds, and to ascertain whether or not floodwater irrigation was practised.

Two areas, consisting of three squares each, were opened 50 m apart, i.e. D/D3, D/D4 and D/D5 and A/C2, A/C3 and A/C4. The squares were oriented on an east-west axis in both areas. None of the three squares in Area D yielded any archaeological remains. When excavation had reached a depth of 1.5 - 1.7m beneath the surface it was decided to stop work at this location and focus further attention on Area A, where archaeological remains were starting to appear. This resulted in the addition of squares A/C1, A/C5 and A/B3.

Late Chalcolithic layers were uncovered at a depth of between 0.8 and 1.1m below the surface in all squares in Area A. In most squares, these Late Chalcolithic layers contained stone architecture. In squares A/C1 and A/C2, a long east - west wall was exposed. This wall is *ca.* 0.85m wide and stretches over the full length of squares A/C1 and A/C2, i.e. at least 10 m. In square A/C2, part of the wall is of different construction. Instead of consisting of two outer faces with a fill of irregular smaller stones in between, a stretch of *ca.* 1.5 m consists of a single face of large stones with no second face on its northern side (see **Fig. 7**). There is no definitive explanation for this difference in construction, but the flat surfaces of the large stones hint at the presence of a doorway. In square A/C1 a similarly constructed wall joins it at a 45 degree angle. As this wall is bonded to the east - west wall, it is clear that both were built in a single phase of construction. In square A/C1, a floor was found associated with these walls on which large fragments of collapsed Late Chalcolithic vessels were found.

In the three western squares, i.e. A/C3 to A/C5, several unrelated wall fragments were exposed. Judging by the finds in the debris and on a floor associated with one of the walls, all date to the Late Chalcolithic period. In addition to Late Chalcolithic pottery, several spindle whorls were discovered in these layers (**Fig. 8**). In square A/C4, a considerable length of a north-west - south-east wall was exposed. This is smaller (*ca.* 0.6m wide) than the robust wall in squares A/C1 and A/C2, but is well constructed and preserved to a height of two courses. Traces of what might have been a mudbrick superstructure were visible in the section. A floor was associated with this wall, but as it was only exposed in a small area its relationship with the other walls remains unclear. A small wall abuts this wall at a 45 degree angle. In view of the fact that it abuts the first wall and is not bonded to it, this small wall is probably associated with a secondary phase of construction. Along the southern edge of squares A/C4 and A/C5 another wall was found. Only the top of this wall was exposed, and is slightly lower than that of the other wall in A/C4. Like the other walls, it consists of two faces of stones with a central fill of compact soil and smaller stones. This wall seems



7. Plan of Field 27 (based on measurements by Ali Omari).

to have a side wall running off to the south, which almost immediately disappears into the south section of square A/C5. As only the top of this wall was exposed, its relationship with the other walls and floor remains unclear. A single

8. Selection of finds from Field 27 (photographs by Yousef Zu'bi).

line of long stones, seemingly too thin to have been a wall but which may represent some sort of partition, runs from square A/C4 into A/C5. Again, its stratigraphic relationships can only be established by further excavation. Other stones in squares A/C5 to A/C3 appear to be disturbed, or represent tumble from badly preserved walls.

In square A/B3 no architectural features were found, but a sequence of debris and occupation layers were excavated that extended below the levels reached in the other squares. Late Chalcolithic pottery was also discovered in these lower layers, suggesting several phases of occupation at the site.

In the upper levels of squares A/C2, A/C3 and A/C4, highly disturbed remains of the Iron Age III (two bronze arrowheads from topsoil and a wash layer in square A/C2), Roman / Byzantine (small fragment of floor with a scattered late Roman cooking jar and remnants of a small jug) and Islamic (large fragment of the bodies of two probable Mamluk jars, one found next to a lower grinding stone) periods were uncovered. The stratigraphic context of these finds was badly disturbed owing to the uprooting of modern citrus trees, which resulted in 'floating islands' of archaeological deposits of different periods surrounded by areas of recent disturbance. It is therefore difficult to associate these deposits with each other or with the underlying Late Chalcolithic occupation.

Conclusions

These excavations have generated a good deal of new information about subsistence in the Late Chalcolithic and Early Bronze Age I periods. However, the scarcity of botanical samples means that it will be difficult to shed further light on agricultural practices or floodwater irrigation on the basis of the samples recovered to date. Further excavation in Field 27 will hopefully lead to the recovery of better preserved material. The faunal assemblage should provide information about the pastoral side of the subsistence economy.

The relationship between the surface artefact scatters identified in the survey and the remains buried beneath the surface is much better understood as a result of these excavations. Broadly speaking, the excavations in Field 27 confirmed the expectations of the survey, i.e. significant remains of a Late Chalcolithic village. In Field 81 the results were slightly different. The EBA I village that had been expected proved to have been largely destroyed by later erosion and agriculture. Instead, quite unexpected remains of the Iron Age I and IIc periods were discovered. No indication of Iron Age remains had been identified in the survey. This is unsurprising, as the Iron Age IIc remains were extremely ephemeral, leaving little trace when ploughed out on to the ground surface. Similarly, the chance of identifiable pottery from the burial pit ending up on the surface was very small. It is therefore unlikely that this type of Iron Age burial would ever have been identified on the basis of surface indications. This may explain Franken and Kirkbride's lack of success in locating the Iron Age cemetery of Tall Dayr 'Allā during the first two seasons of excavation at that site in 1960 and 1961

(Kaptijn in prep.). Discovery of such features will probably remain a matter of chance, as geophysical methods proved similarly unsuccessful in identifying them. More positively, surface survey was able to identify the presence of the now largely destroyed EBA I village. Although excavation has demonstrated that most of the village is destroyed or buried under the road, the survey generated a good deal of information about its character and date. This demonstrates that survey not only complements excavation, but also that it is a relatively cheap method of recovering information from sites which have lost their stratigraphic integrity.

Because both fields are used for agriculture, the excavations were backfilled. The Late Chalcolithic remains in Field 27 are sufficiently deep to be in little danger of agricultural destruction. In contrast, the remains in Field 81 that are located immediately under the topsoil are threatened by ploughing, as demonstrated by the relative absence of sub-surface finds in comparison to the dense artefact concentrations visible on the surface. Further excavation in this location would be worthwhile. The Iron Age burials in Field 81 are so unique that it would be valuable to check whether any more are preserved in the area. Further excavation in Field 27 would provide a much better understanding of the Late Chalcolithic village which, to judge by surface indications, extends over a large area. The remains uncovered to date are extremely promising and a better level of preservation can be expected for those that are buried at a greater depth.

Acknowledgements

We would like to thank the following institutions for their support and assistance: the Department of Antiquities, especially former Director General the late Dr Fawwaz al-Khraysheh and departmental representative Mr Ziad Ghnaimat, the Faculty of Archaeology and Anthropology of Yarmouk University, the Faculty of Archaeology of Leiden University and the Leiden University Fund that awarded us a 'Byvanck Grant'. We would like to thank the landowners for allowing us to excavate in their fields, especially Saleh Adb el-Fattah Shehab and the Muasher family, who have shown great hospitality and support to the Tall Dayr 'Allā excavations ever since Franken first arrived in 1960. Thanks are also due to all team members, without whom this excavation would not have been possible: Ali Omari (survey), Yousef Zu'bi (photography), Mariette Grimbergen-Driessen (housekeeping and administration), and Hana' Bani Ata, Clasine van Doorn, Sterre van Heemst, Lise den Hertog, Jeroen Rensen, Judith Schoester, Jade Schoon and Salam al-Waked (field supervisors and trainees). Many thanks also to Mr Ahmed Jude, custodian of the Dayr 'Alla Station for Archaeological Studies, the Yarmouk drivers and all of the inhabitants of the Dayr 'Alla region who were kind enough to let our team members excavate on their lands.

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WĀDĪ GHUWAYR 17: A NEOLITHIC OUTPOST IN THE NORTH-EASTERN AL-JAFR BASIN

Sumio Fujii, Leslie A. Quintero and Philip J. Wilke

Introduction

The Jafr Basin Prehistoric Project (JBPP), headed by the first author, was organized in 1995 with a view to tracing the process of pastoral nomadization in southern Jordan on the basis of archaeological evidence. The first and second phases of the project took place for twelve years from 1997 until 2008, focusing on the establishment of a chronological framework in the north-western part of the basin. The reason we chose this area for research was that it was nearer to the Neolithic farming communities to the west and, therefore, allowed easier tracing of the relationship between the desert and the sown. To this end, we investigated more than a dozen archaeological sites varying in date and nature. This series of investigations has enabled us to trace the cultural sequence from the appearance of pastoral transhumance in the Pre-Pottery Neolithic B (hereafter PPNB) until the establishment of full-fledged pastoral societies in the Early Bronze Age (hereafter EBA) (e.g. Fujii 2003: Fig. 23, 2004: Fig. 23, n.d.b: Figs 7 - 8).

Recent efforts have centered on the comprehensive investigation of the PPNB agro-pastoral outpost of Wādī Abū Ṭulayḥa (Fujii 2006a, 2006b, 2007a, 2008a, 2009a; Fujii and Abe 2008). A total of six excavation seasons showed that the small settlement was sustained by a mixed economy consisting of small-scale pastoral transhumance, probably from the west, hunting mainly of gazelles and hares, and cereal cultivation in a flooding area associated with a stone-built barrage attached to the settlement (Hongo 2008; Nasu *et al*. 2009, n.d.). Discovery of this remote agro-pastoral outpost lent support to the suggestion that small-scale pastoral transhumance in the Neolithic paved the way for the emergence of full-fledged pastoral nomadism in subsequent periods (Köhler-Rollefson 1992; Rollefson and Köhler-Rollefson 1993; Quintero *et al*. 2004). Of significance is the fact that the outpost was equipped with a well-organized water catchment system comprising a large cistern, basin-irrigation barrage and two minor wadi barriers (Fujii 2007b, 2007c, n.d.a). Evidence suggested that climatic deterioration, culminating in the so-called 8.2 K event, resulted in a shortage of pondage at the cistern and instability of agricultural production associated with the basin-irrigation barrage, and that this eventually led to the abandonment of the neighboring outpost. It was suggested that a small group may subsequently have camped at the disused, half-buried cistern. This group may be defined as the first pastoral nomads in the Jafr basin, in the sense that they abandoned management of a fixed outpost and water catchment facilities and, instead, made temporary visits to the disused cistern (Fujii n.d.b). It thus appears that the dysfunction of the water catchment facilities led to the abandonment of the fixed outpost and a consequent shift to pastoral nomadism. In this sense, we can argue that the rise and fall of a water system associated with a remote outpost holds a key to understanding the process of pastoral nomadization.

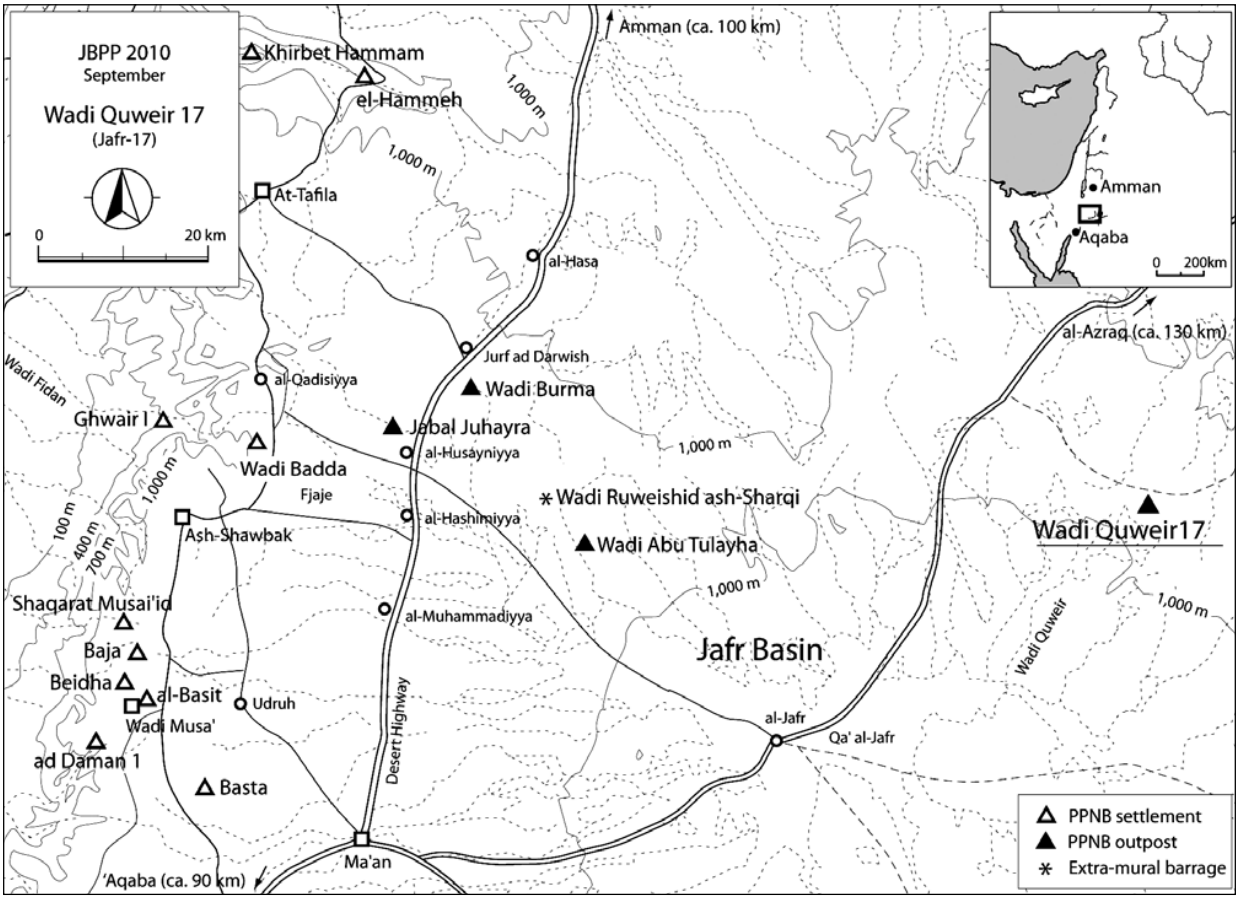
The third phase of the research project was designed to test this challenging hypothesis. The first field season was conducted in the summer of 2009, being devoted to a comprehensive review of Neolithic water catchment facilities and associated agro-pastoral outposts. It turned out that this combination extended far into the basin beyond Wādī Abū Ṭulayḥa (Fujii 2010a, 2010b).

The second field season took place over approximately three weeks between 14 September and 2 October 2010, and was devoted to rescue excavations at the sites of Wādī Ghuwayr 17 and 106, both located in the north-eastern part of the basin (**Fig. 1**). The excavation at Wādī Ghuwayr 17 aimed to collect further information about the type of PPNB agro-pastoral outpost first found at Wādī Abū Ṭulayḥa. The investigation at Wādī Ghuwayr 106, on the other hand, was intended to provide further insights into the Jafr PPNB barrage system first located again at Wādī Abū Ṭulayḥa and Wādī ar-Ruwayshid ash-Sharqī. This report focuses on the former site; the latter site is covered elsewhere in this volume.

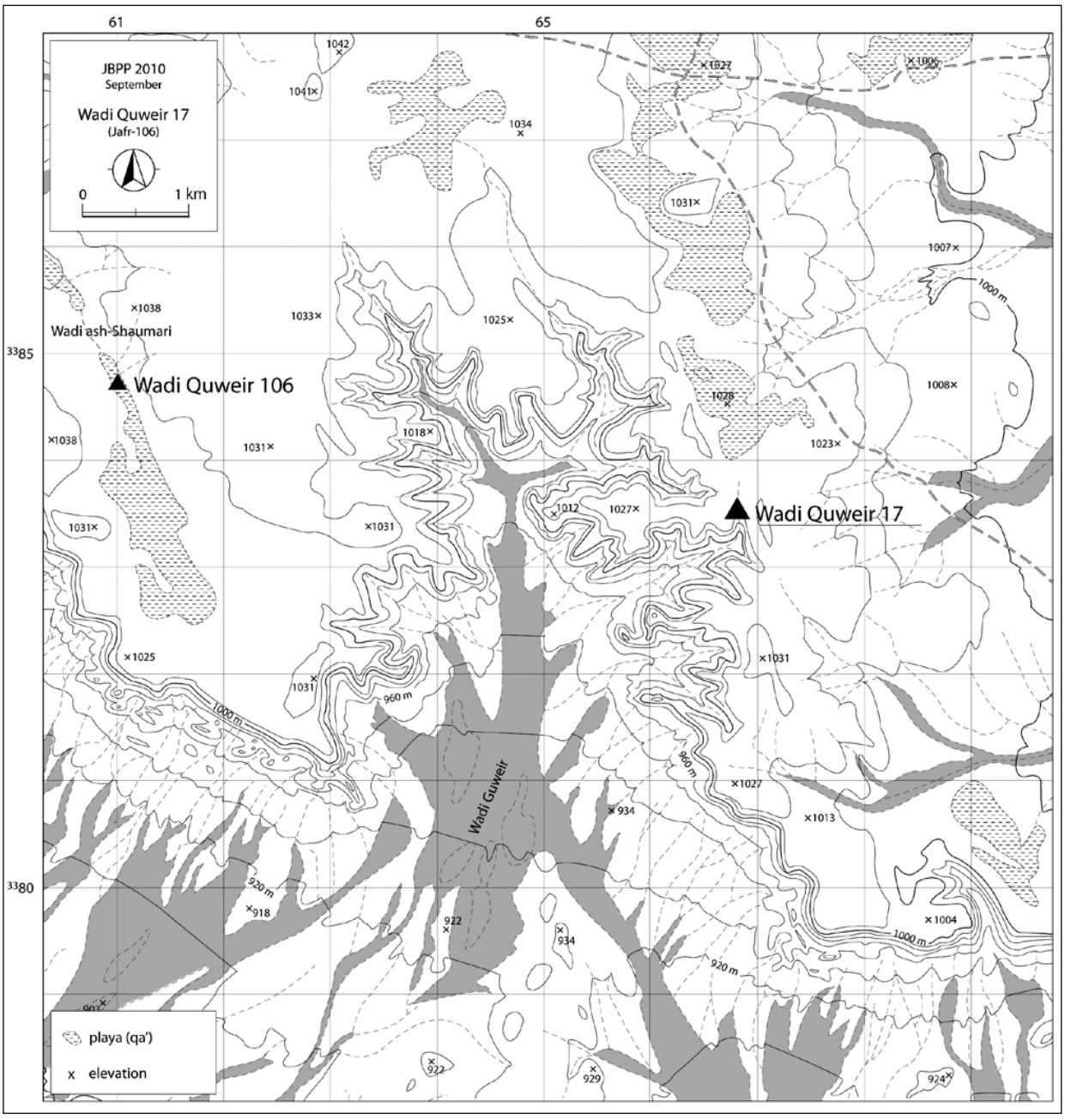
The Site and its Setting

The Jafr basin is a large-scale depression in southern Jordan, forming an inland, closed drainage system covering the vast majority of the Ma'ān Plateau. Numerous *awdiya* (sing. *wadi*) drain into Qā' al-Jafr, the enormous playa occupying the center of the basin. Among them is Wādī Ghuwayr, which descends the steep escarpment fringing the northern edge of the basin and meanders southwards for *ca*. 30km to flow into the north-eastern part of the dry lake. The site of Wādī Ghuwayr 17 is located at the head of one of several forks of this wadi where sloping terrain and exposed bedrock suggest the former existence of a spring (**Fig. 2**). The surrounding landscape is characterized by a gently undulating flint pavement desert (Ar. *al-Ḥamād*) and dotted playas (Ar. *Qā'*). Owing to the hyper-arid environmental conditions, no settlements currently exist nearby and local land use is limited to seasonal pasturing. The existence of a small Neolithic settlement was unexpected; its presence suggests that, during the early Holocene, the Jafr basin witnessed a short episode of climatic amelioration (Issar and Zohar 2007: 60-65).

The site of Wādī Ghuwayr 17 was first located by two of us (LAQ and PJW) in 1997, in



1. PPNB sites in the Jafr basin and surrounding areas.



2. Research area and location of Wādī Ghuwayr 17.

conjunction with the Jafr Basin Archaeological Project. It was identified as a PPNB pastoral encampment and recorded as Jafr-17 (Quintero and Wilke 1998a: 3, 1998b: 120, Wilke and Quintero 1998: 3; Quintero *et al*. 2004: 205-206). Investigation of Jafr-17 became urgent in 2005 when two of us (LAQ and PJW) discovered that the site had been severely disturbed by illicit digging. These thoughtless activities destroyed large portions of the site but left enough intact deposits, including subterranean architectural features, to allow scientific investigation. In light of the discoveries made by the work in the western Jafr desert described above, a more thorough investigation of Jafr-17 (and Jafr-106) was proposed to the lead author of this paper in order to provide an enhanced view of the PPNB in this remote region. For the subsequent rescue excavation, Jafr-17 was re-designated Wādī Ghuwayr 17.

The Investigation

The illicit excavation exposed a few masonry wall segments and numerous artifacts (**Fig. 3**), which raised expectations that the site might represent a second example of a PPNB agro-pastoral outpost, as at Wādī Abū Ṭulayḥa. Ahead of the rescue excavation, we relocated several features noted in the initial survey, including a large enclosure *ca*. 12m in diameter (**Fig. 4**), two small enclosures *ca*. 4-5m in diameter (**Fig. 5**) and a concentration of five petroglyphs a short distance down the drainage (**Fig. 6**). Dating the enclosures is problematic owing to a lack of datable *in situ* finds. Proximity of the large enclosure to the PPNB deposits may suggest affiliation with the Neolithic, but a post-Neolithic date is also a possibility. Numerous Chalcolithic / EBA sites with structures are known in the region, although all of these also contain lithic artifacts dating to that period, and most are associated with flint quarries or mines for the production of cortical 'tabular scraper' flake blanks (Quintero *et al*. 2002; Wilke and Quintero n.d.). Meanwhile, most of the petroglyphs depict a horseman holding a long spear, indicating that they are not related to the PPNB settlement.

Subsequently, we produced a 20cm contour

3. Wādī Ghuwayr 17: disturbed state before excavation (facing east).

4. Wādī Ghuwayr 17: large enclosure on western slope of gully (facing south-west).

5. Wādī Ghuwayr 17: two small enclosures on eastern slope of gully (facing south).

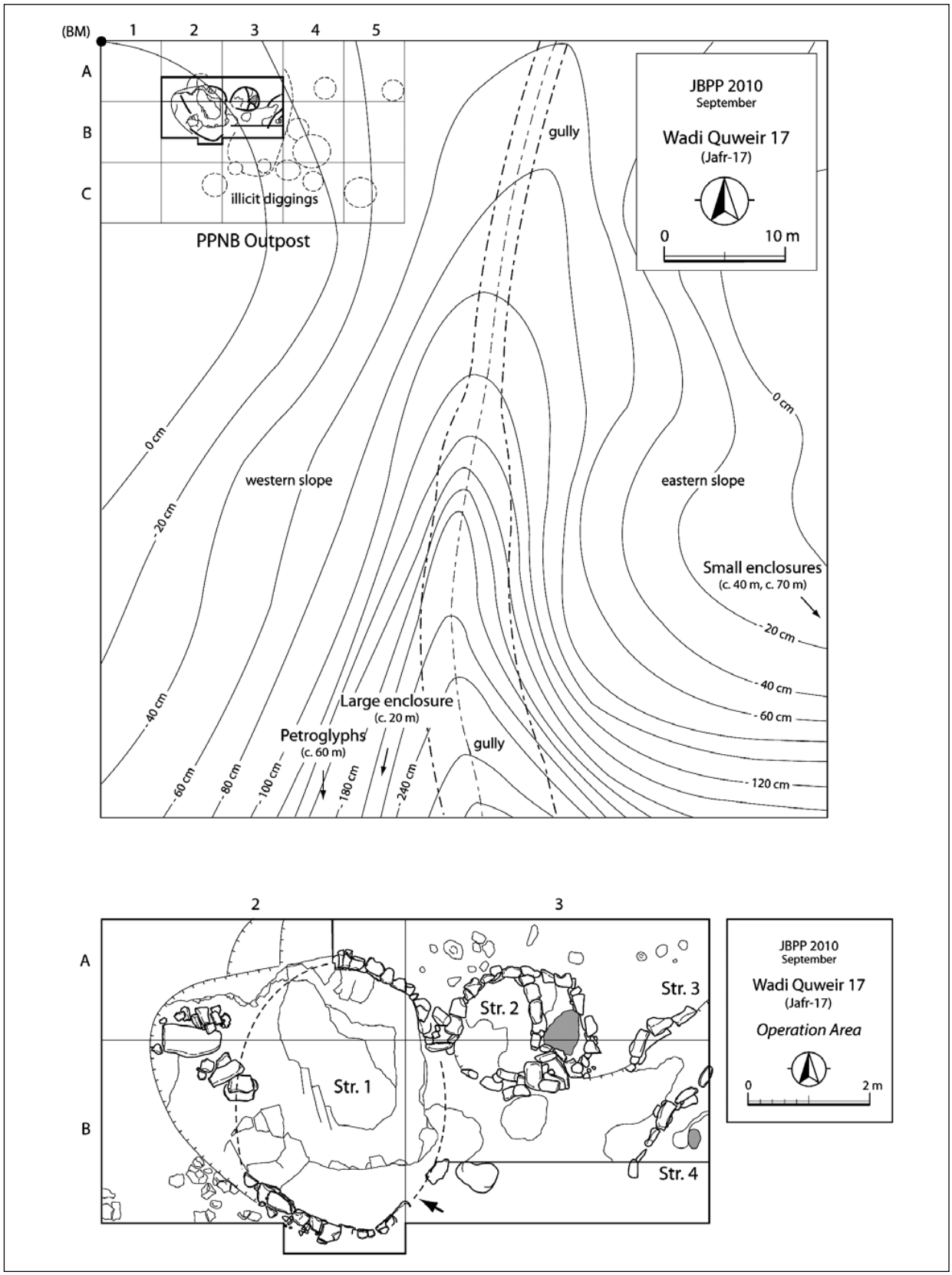
6. Wādī Ghuwayr 17: concentration of petroglyphs along a gully (facing north-west).

map and established a 5m by 5m grid over the supposed extent of the settlement (**Fig. 7**). Since no reliable triangulation point was available, we set up an arbitrary benchmark (elevation *ca*. 1,020m) at the north-western corner of the grid. Then we opened a 10m by 5m excavation area, covering the exposed masonry walls in the disturbed area of the site. The excavated area (including an extension to take in the southern wall of Structure 1) totalled 51 square meters, with the excavated deposits (including disturbed soil) amounting to *ca*. 30 cubic meters. No sieving was done owing to time constraints, but *ca*. 67 liters of floor deposits and hearth contents, largely from the well-preserved Structure 2, were wet-sieved in an attempt to recover botanical remains. The results of this analysis are not yet available.

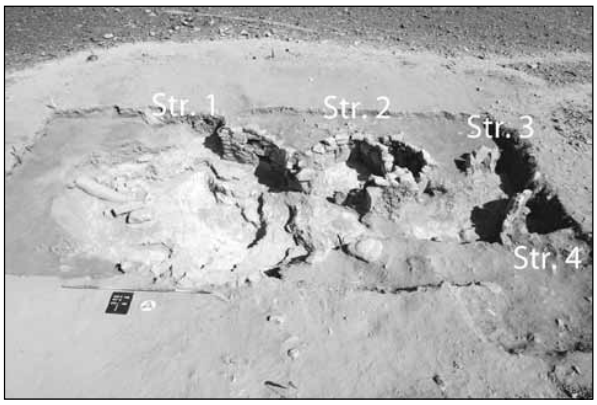
The excavation exposed the following stratigraphic sequence. Layer 1, or the surface layer, was *ca*. 5-8cm thick and contained light buff, slightly compact, silty sand deposits and a large quantity of heavily abraded flint pebbles forming the *al-Ḥamād* surface. Layer 2 was *ca*. 10cm thick, containing light brown, less compact, silty sand deposits and a small number of *Hamād* flints. Layer 3 is a general term for fill deposits left inside the semi-subterranean structural remains described below and, therefore, varied in thickness and nature depending on locus. Though heavily disturbed by illicit digging, this layer was still preserved in a few loci, including the interior of Structure 2 and the floor deposits of Structure 1. Layer 4 consisted of reddish brown, relatively compact, silty sand deposits *ca*. 40-50cm thick. A total of four semi-subterranean structures were originally cut into the upper surface of this layer. Layer 5 was a laminated chalky limestone layer *ca*. 40cm thick, the lower part of which served as a natural floor of the structures. Layer 6 was a cortical flint layer *ca*. 5-10cm thick, being exposed throughout the floors. Layer 7 was a limestone bedrock layer at least 30cm thick. The illicit excavation dug through these layers, leaving big holes throughout the settlement, especially in the center of Structure 1.

Structural Remains

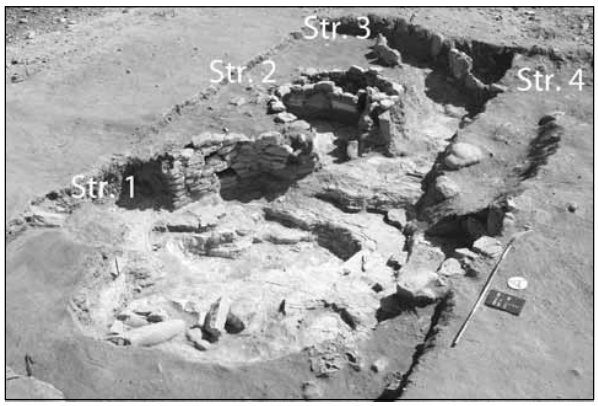
The excavation area contained a total of four



7. Wādī Ghuwayr 17: site plan (above) and excavation area (below).



8. Wādī Ghuwayr 17: general view of Structures 1 - 4 (facing north).



9. Wādī Ghuwayr 17: general view of Structures 1 - 4 (facing north-east).

semi-subterranean structures (**Figs. 8 and 9**). They were oval in general plan and three types could be distinguished: a large masonry structure with a deep floor (Structure 1), a small masonry structure with a relatively deep floor (Structure 2) and two small, shallow features characterized by upright slab walls (Structures 3 - 4). The smaller structures focused on the space in front of the large key structure, forming (probably in combination with other small features still hidden under the disturbed deposits) a small structural complex extending in an east - west direction.

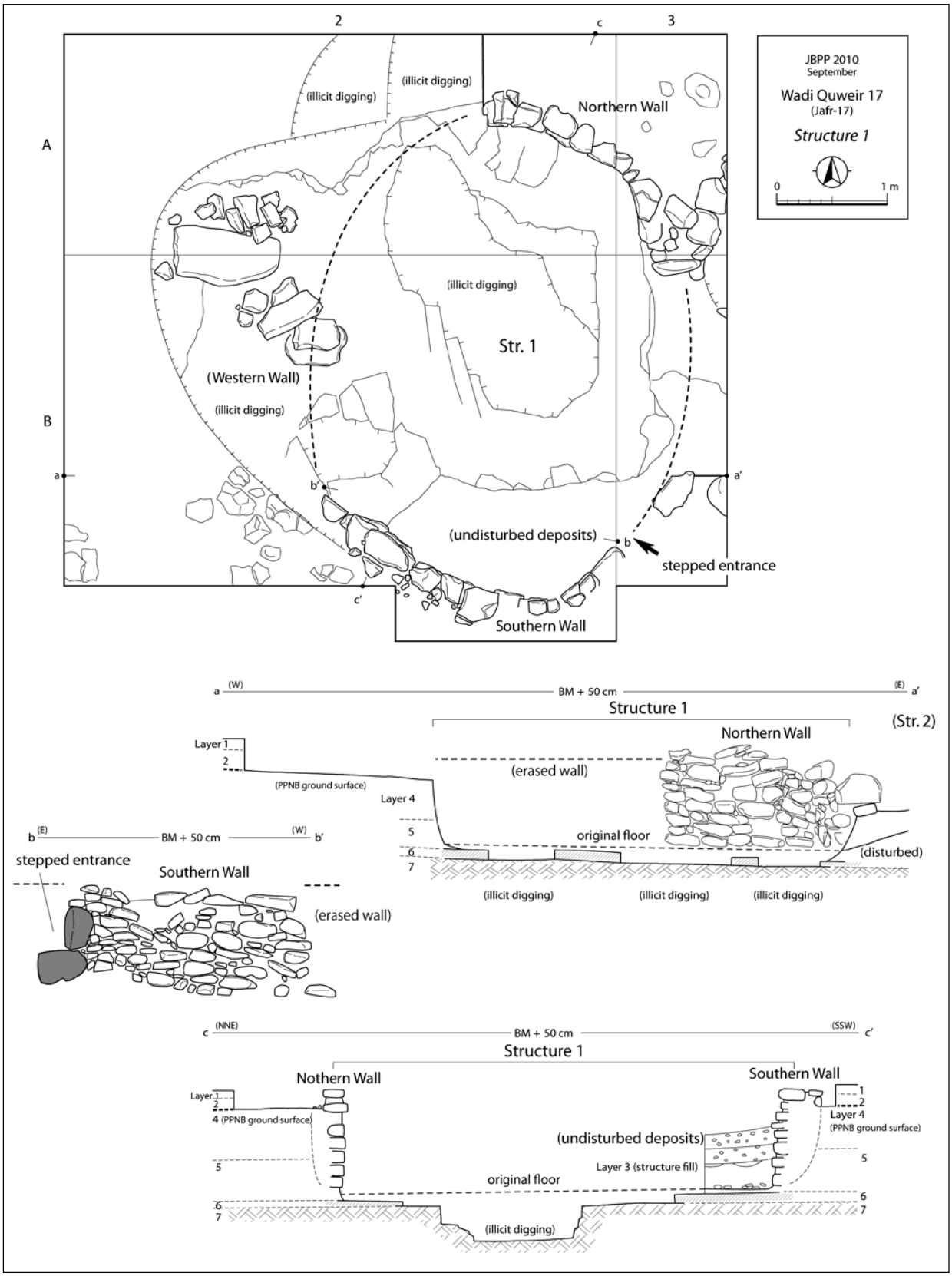
Structure 1

Structure 1, the main component of the complex, occupied the western half of the excavation area, measuring *ca*. 4.5m in the north - south major axis and *ca*. 3.5 m in the east - west minor axis, with an original floor depth of *ca*. 0.8m (**Figs. 10, 11 and 12**). The illicit digging was concentrated on this key structure; only a part of the northern, southern and western walls escaped destruction. The floor was also extensively damaged by robber pits, and no small features such as hearths were preserved.

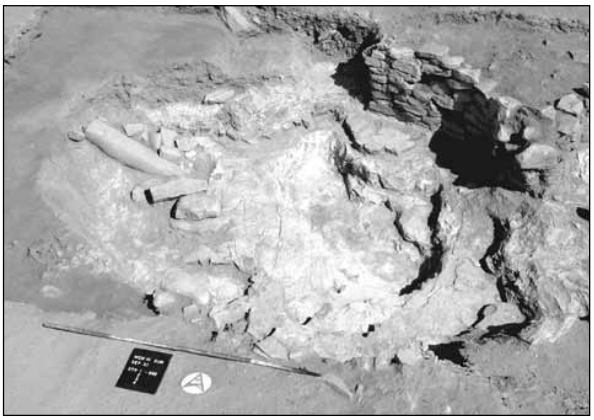
The northern wall was preserved to a height of *ca*. 0.9 m and a length of *ca*. 2m (**Fig. 13**). It was constructed of up to ten courses of undressed or partly dressed limestone cobbles set in stretcher bond. The uppermost courses protruded above the contemporary ground surface, suggesting the existence of an upper structural component. However, the scarcity of fallen stones around the wall implied that the upper structure, if any, was not more than several courses - inclusive of the preserved part - or *ca*. 0.5m high. Overall, the construction was of relatively high quality; every course was laid nearly horizontally using clay mortar with small stones to stabilize. However, the eastern half of the wall leant inwards to a considerable extent, indicating that it was subjected to strong sideways pressure from the surrounding soil for a considerable period of time. A few holes were found in the top of the wall, but these probably represent shallow probing activity by the looters. In addition, a large stone weight, a key to dating the Jafr PPNB barrage system, was found more or less *in situ* beside the wall (**Figs. 14, 28: 1**).

The southern wall, on the other hand, was preserved to a height of *ca*. 0.9m and a length of *ca*. 3m (**Fig. 15**). In contrast to the northern wall, it was poorly constructed, and construction materials were less standardized and often piled up irregularly with a large mortared gap between any two adjacent stones. There is a strong possibility that the original wall collapsed at some point, owing to soil pressure, and was then reconstructed in a hurry. It is probably for this reason that the structure was slightly skewed in general plan at the south-eastern corner. A narrow, *ca*. 30cm wide, stepped entrance originally flanked by a pair of upright boulders was identified at the eastern edge of the preserved wall.

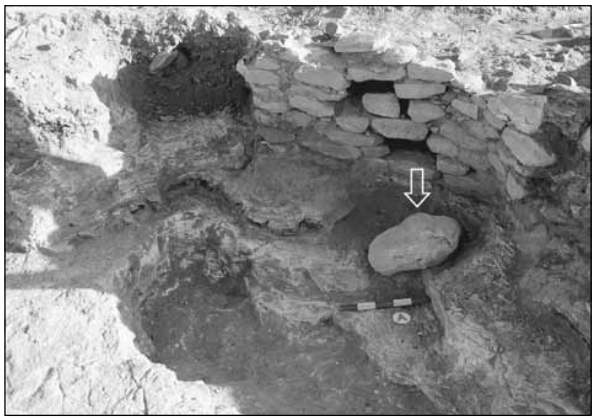
The western wall was almost destroyed, but a few foundation stones still remained roughly *in situ* (**Fig. 16**). In addition, a dozen construction stones were found dislodged from their original positions. They included a limestone boulder *ca*. 1.1m high, which reminded us of the *massebot* found at Structure 03 of Wādī Abū Ṭulayḥa (Fujii 2007a: Fig. 7). It is interesting to note that both examples occupied the same recess of the



10. Wādī Ghuwayr 17: plan and sections / elevations of Structure 1.



11. Wādī Ghuwayr 17: close-up of Structure 1 (facing north-north-west).

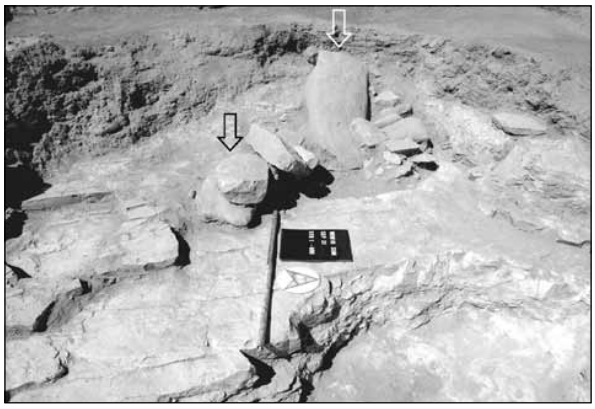


14. Wādī Ghuwayr 17: grooved stone weight found in situ beside the northern wall (facing north).

12. Wādī Ghuwayr 17: close-up of Structure 1 (facing south-east).

15. Wādī Ghuwayr 17: close-up of southern wall of Structure 1 (facing south).

13. Wādī Ghuwayr 17: close-up of northern wall of Structure 1 (facing north).

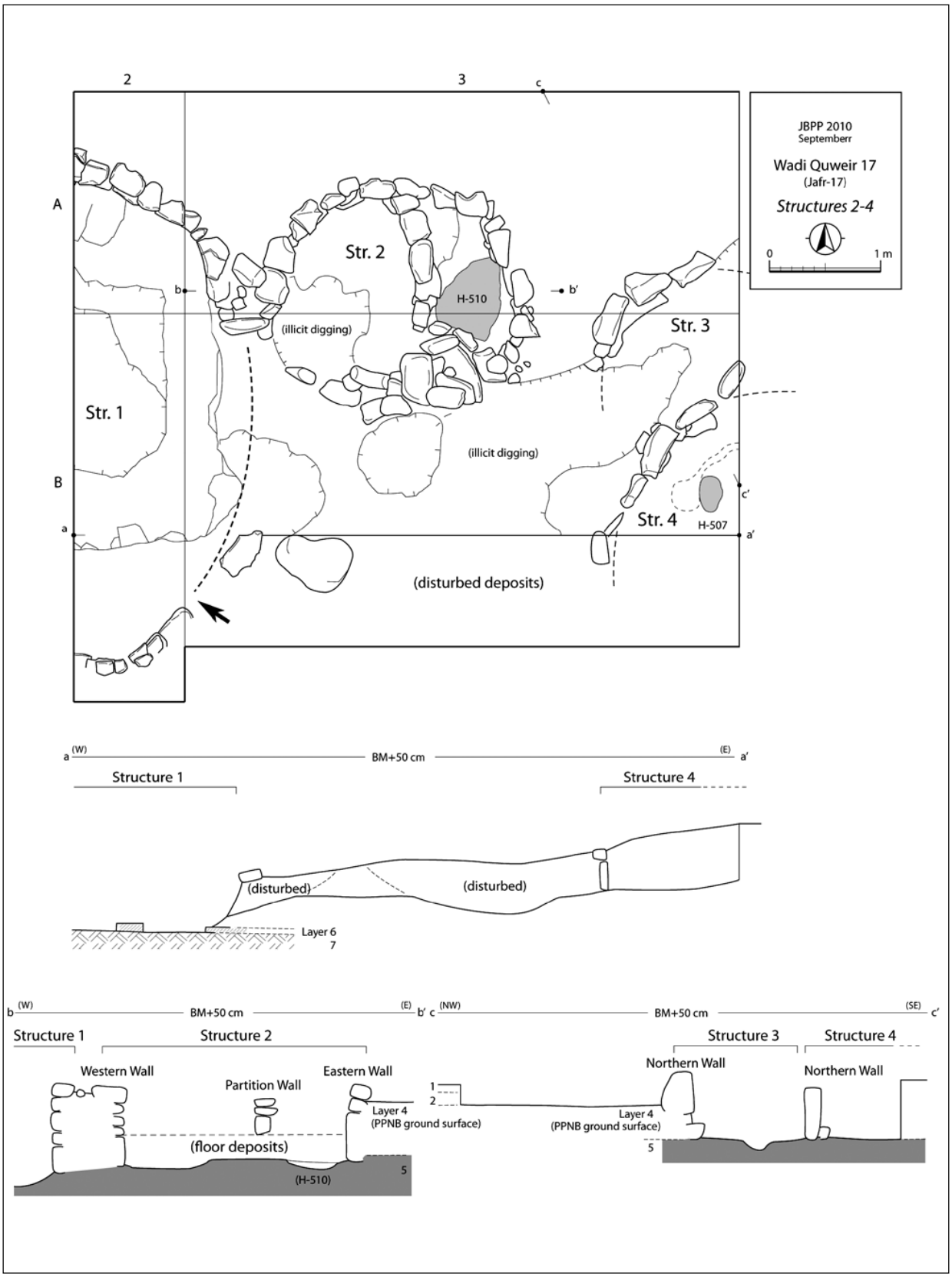


16. Wādī Ghuwayr 17: close-up of western wall remnant of Structure 1 (facing west).

key structure, namely, its north-western corner.

Structure 2

Structure 2 was one of three small features attached to the key structure; it measured *ca*. 2.3m in the east - west major axis and *ca*. 2m in the north - south minor axis, with a floor depth of *ca*. 0.6m (**Fig. 17**). This small structure escaped damage by looters and was relatively well-preserved. The only exception to this was the south-western corner, which was entirely absent, leaving a small gap along the wall alignment. It appears that a stepped entrance existed



17. Wādī Ghuwayr 17: plan and sections / elevations of Structures 2 - 4.

here; the existence of a large slab at the western corner also hints that the structure was directly connected with the neighboring key structure by means of a narrow path (**Fig. 13**).

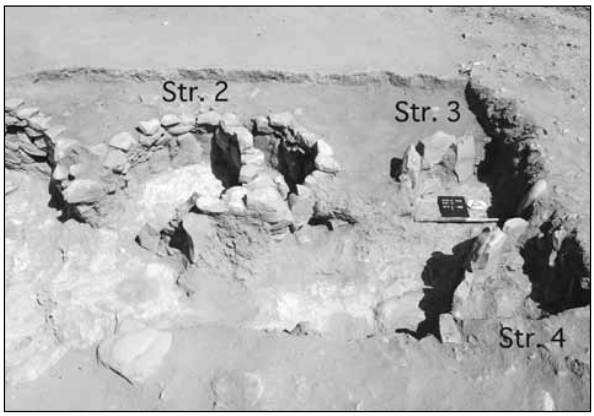
This structure was eclectic in its construction; while the foundation course utilized large upright stones, upper courses used a stretcher-bond technique using smaller cobbles (**Fig. 18**). Again, the uppermost few courses protruded from the contemporary ground surface. An irregular hearth, *ca*. 60cm in diameter and *ca*. 8cm in depth, was found at the eastern corner of the floor. In addition, a partition-like wall was found at the easterly part of the room, but was interpreted as a later addition in view of the stratigraphic gap between it and the original floor (**Fig. 19**). It appears that this additional wall functioned as a support for the inclining retaining walls. The deposits on the secondary floor included a number of naviform core and blade elements, indicating that this reinforcement work was undertaken in the PPNB period.

Structure 3

This small feature, *ca*. 1.5m by *ca*. 1m in floor area with a floor depth of *ca*. 0.3m, was partly exposed at the eastern edge of the excavation area (**Figs. 17 and 20**). Unlike the two adjacent structures described above, it was constructed with a single row and course of upright limestone slabs. Their basal level varied considerably suggesting that, as with the other structures, this small feature also suffered partial collapse and reconstruction over the course of its history. Neither entrance nor hearth was identified, but a cache of seven grinding stones were found on the south-western corner of the preserved floor (**Fig. 26: 5-8**).

Structure 4

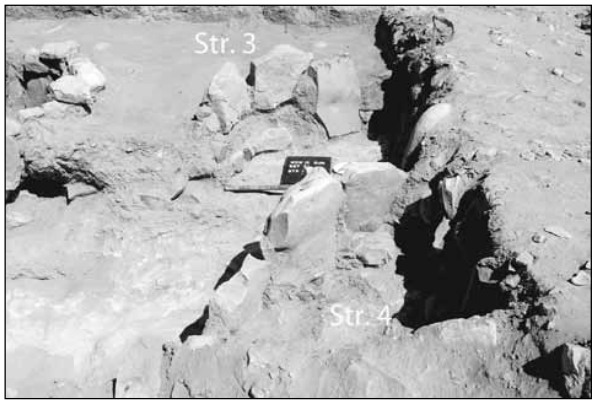
Structure 4 was uncovered at the south-eastern corner of the excavation area (**Figs. 17 and 21**). It had much in common with neighboring Structure 3, being characterized by an upright slab wall technique as well as smaller



18. Wādī Ghuwayr 17: general view of Structures 2 - 4 (facing north).

19. Wādī Ghuwayr 17: close-up of Structure 2 (facing north).

20. Wādī Ghuwayr 17: close-up of Structure 2 (facing south-east).



21. Wādī Ghuwayr 17: close-up of Structures 3 - 4 (facing north).

floor area (*ca*. 2m in major axis) and floor depth (*ca*. 0.3m). No clear evidence of an entrance was confirmed, but a small hearth, *ca*. 30cm in its longer axis and *ca*. 6cm in depth, was found roughly in the center of the preserved floor.

Artifacts

The excavation area yielded several hundred artifacts, most of which were chipped flint and ground stone implements. Other finds were scarce, being limited to two bone tools, several adornments, a dozen petroglyphs and a small quantity of faunal / botanical remains. Overall, the small finds from Wādī Ghuwayr 17 have much in common with those from Wādī Abū Ṭulayḥa, suggesting that the two sites are of roughly the same date.

Chipped Flint Tools

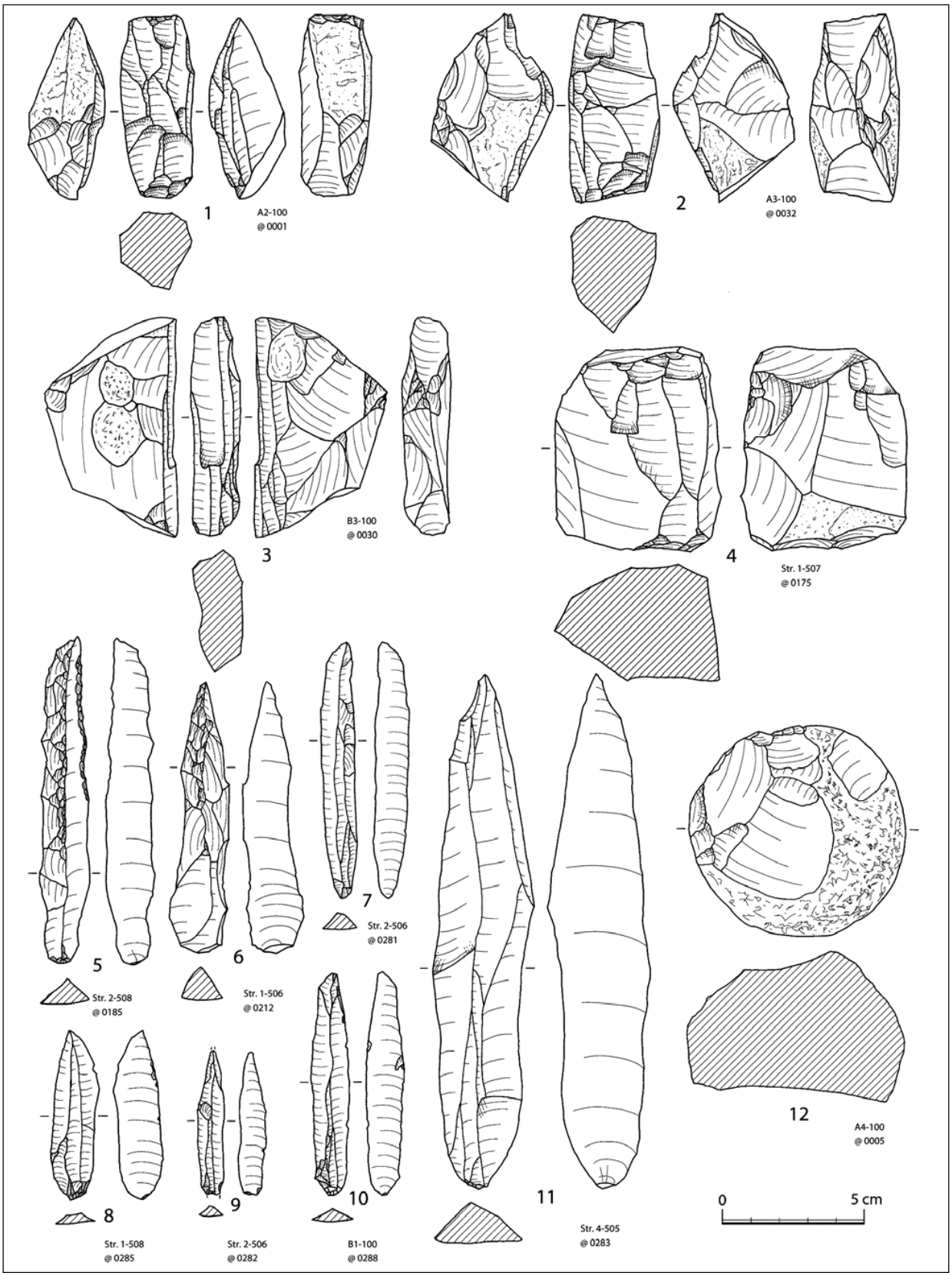
The flint assemblage was dominated by naviform core and blade elements (**Fig. 22**). Intrusive items included Levallois flakes, tabular scrapers, Jafr blades (Quintero *et al*. 2002) and nondescript abraded retouched blades and flakes, but they occurred largely as surface finds and only in limited numbers. The PPNB assemblage used light gray to dark brown, slightly matt, high-quality Eocene flint endemic in the Jafr basin as raw material. No obsidian artifacts were recovered. The existence of several hammer stones (**Fig. 22: 12**) as well as cores (**Fig. 22: 1-4**) and debitage (**Fig. 22: 5-11**) attests to on-site production of the artifacts, although the scarcity of flint nodules and primary elements suggests that the initial core preparation took place elsewhere, probably at flint outcrops in nearby escarpments and drainages.

The tool kit included points / arrowheads (**Fig. 23: 1-18**), spearheads / knives on blades (**Fig. 23: 19-20**), bifacial knives (**Fig. 23: 21**), drills (**Fig. 24: 1-6**), notches / denticulates (**Fig. 24: 7-9**), burins (**Fig. 24: 10-12**), endscrapers, snapped / truncated blades (**Fig. 24: 13-14**) and retouched blades and flakes. In addition, bifacially retouched tools (**Fig. 25: 1-3**), chopping tools (**Fig. 25: 6**), and heavy-duty digging tools made on robust flakes or elongated nodules (**Fig. 25: 4-5, 7**) were also included. Since the illicit digging most likely affected the original character of the assemblage, little can be said about the relative frequency of artifact types. The following two observations should however be noted. First, points / arrowheads still account for 11.4 % of the retouched tools recovered, suggesting that hunting was an important subsistence activity. Second, the complete absence of sickle elements with silica sheen is not consistent with MPPNB assemblages reflecting intensive cereal cultivation, although such artifacts may have been looted from the deposit. Also, some of the unglossed retouched blades with finely serrated lateral edges may have been used as components of reaping tools, an assemblage pattern more consistent with short-term tool use, but also with LPPNB occupations in southern Jordan (Quintero *et al*. 1997).

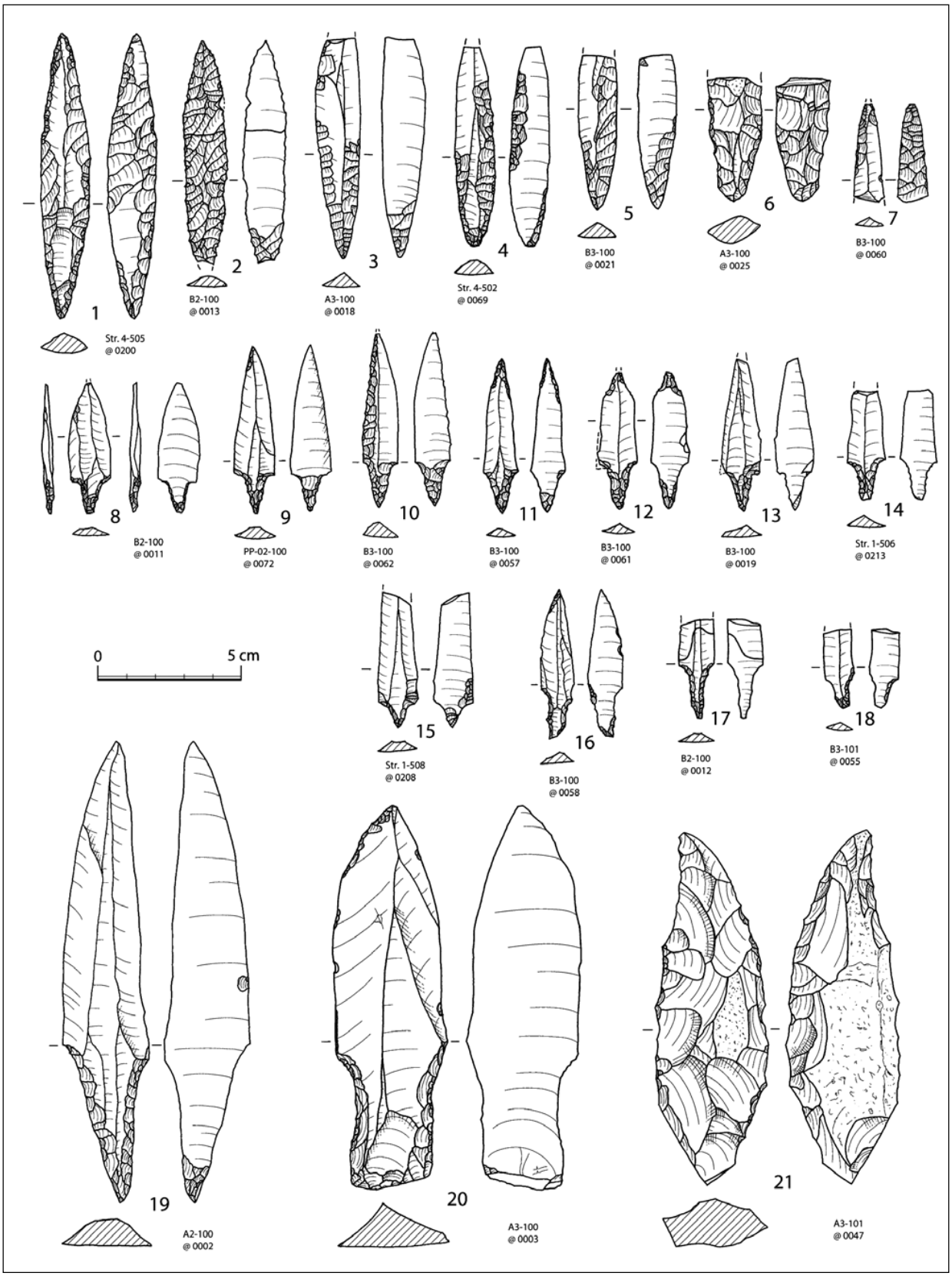
As for the point typology, it is noteworthy that Amuq (**Fig. 23: 1-7**) and Byblos types (**Fig. 23: 8-15**) are predominant. Miscellaneous types also occurred in small numbers (**Fig. 23: 16-18**), but no proper Jericho-type points with a pair of wide, well-developed barbs are included. The frequency of the Amuq type points is, in general, suggestive of a LPPNB date, although aspects of the assemblage seem to show an affinity with the flint assemblage of ʻAyn Abū Nukhayla, a small settlement in Wādī Ḥismā dating to *ca*. 8,500 b.p. (Henry *et al*. 2003), a date widely accepted as transitional from MPPNB to LPPNB (Rollefson 1998). The points from Wādī Ghuwayr 17, excluding Amuq examples, are characterized by their small dimensions and abrupt or semi-abrupt retouch focusing on the tip and the base. It could be argued that some examples are either shouldered (i.e. Byblos-type) or very weakly barbed (i.e. Jericho-type). Similar examples have been found at other desert sites including Wādī Abū Ṭulayḥa (e.g. Fujii 2007a: Fig. 27, no. 15-28, 2008a: Fig. 2-4; Nagaya 2009). Given these considerations, it seems apparent that the flint assemblage can be dated to the late MPPNB or the LPPNB.

Grinding Implements

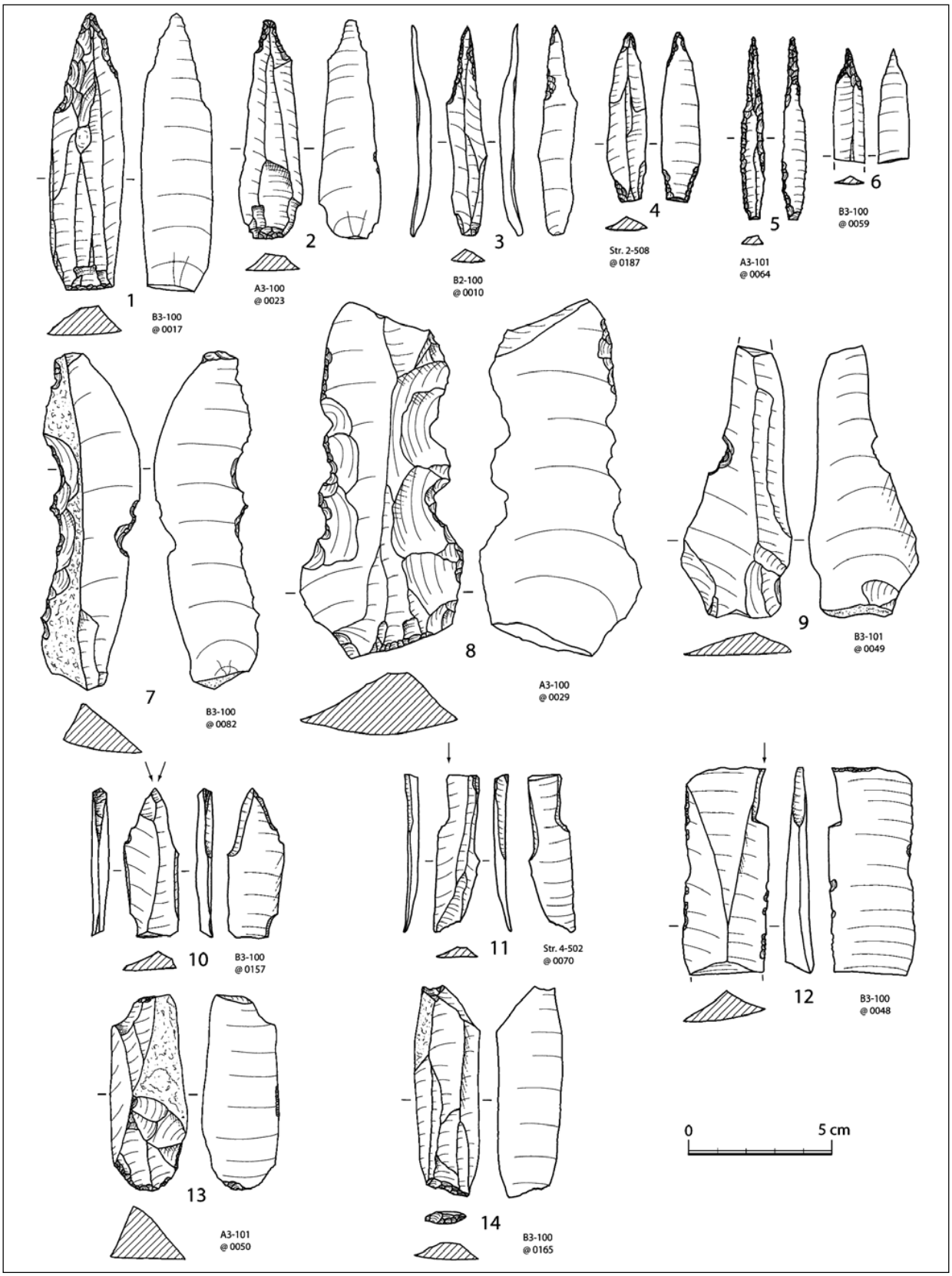
Grinding implements include a few elongated basin querns made of cortical flint, the basin of a large example having been created by flint-on-flint percussion (**Fig. 26: 1**), a few round to oval querns made of limestone (**Fig. 26: 2**), and a few dozen oval to semi-quadrangular handstones made of flint, limestone or basalt (**Fig. 26: 3-10**). Basin querns are standard equipment



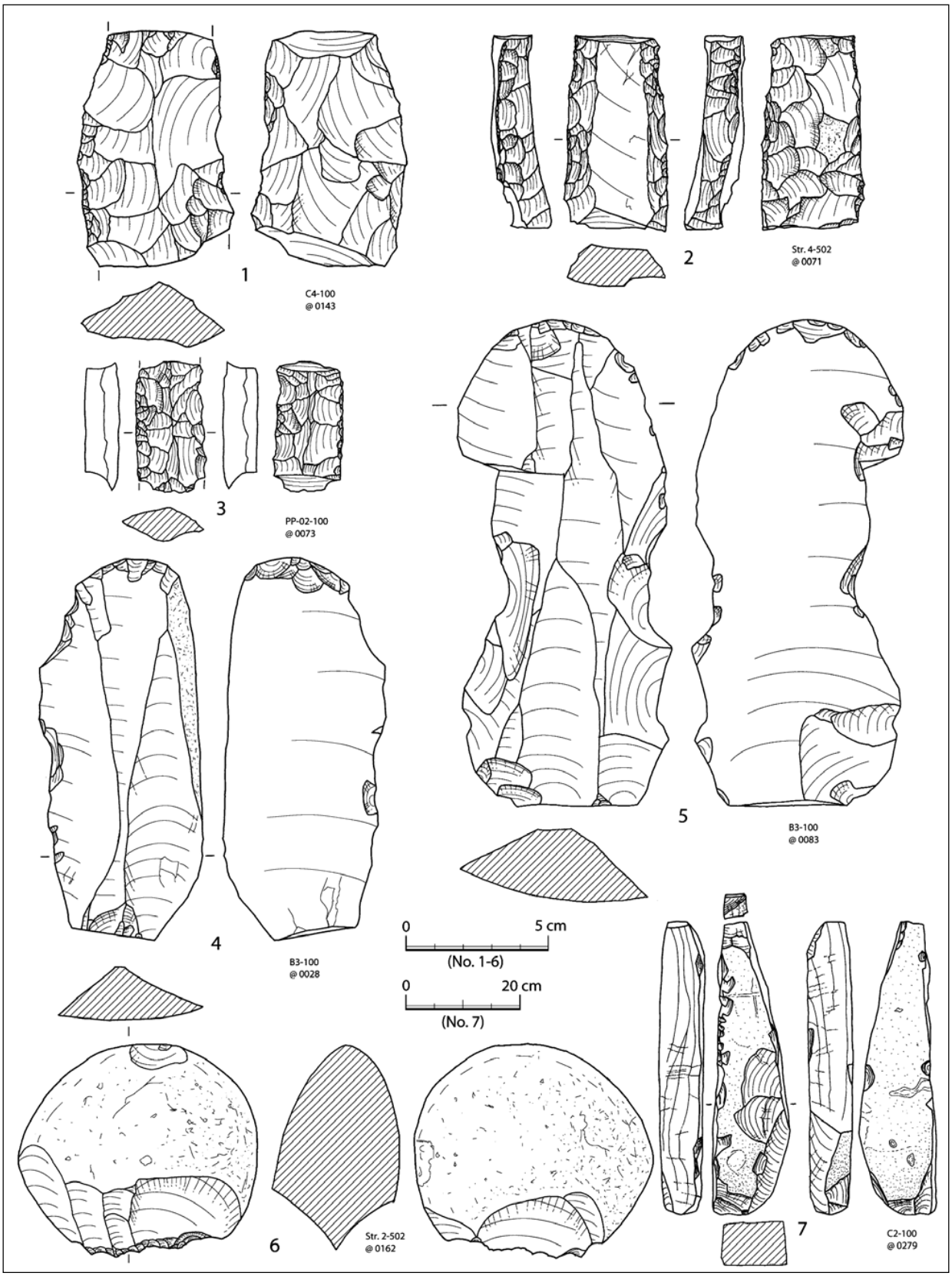
22. Wādī Ghuwayr 17: chipped flint artifacts (cores, debitage and a hammer stone).



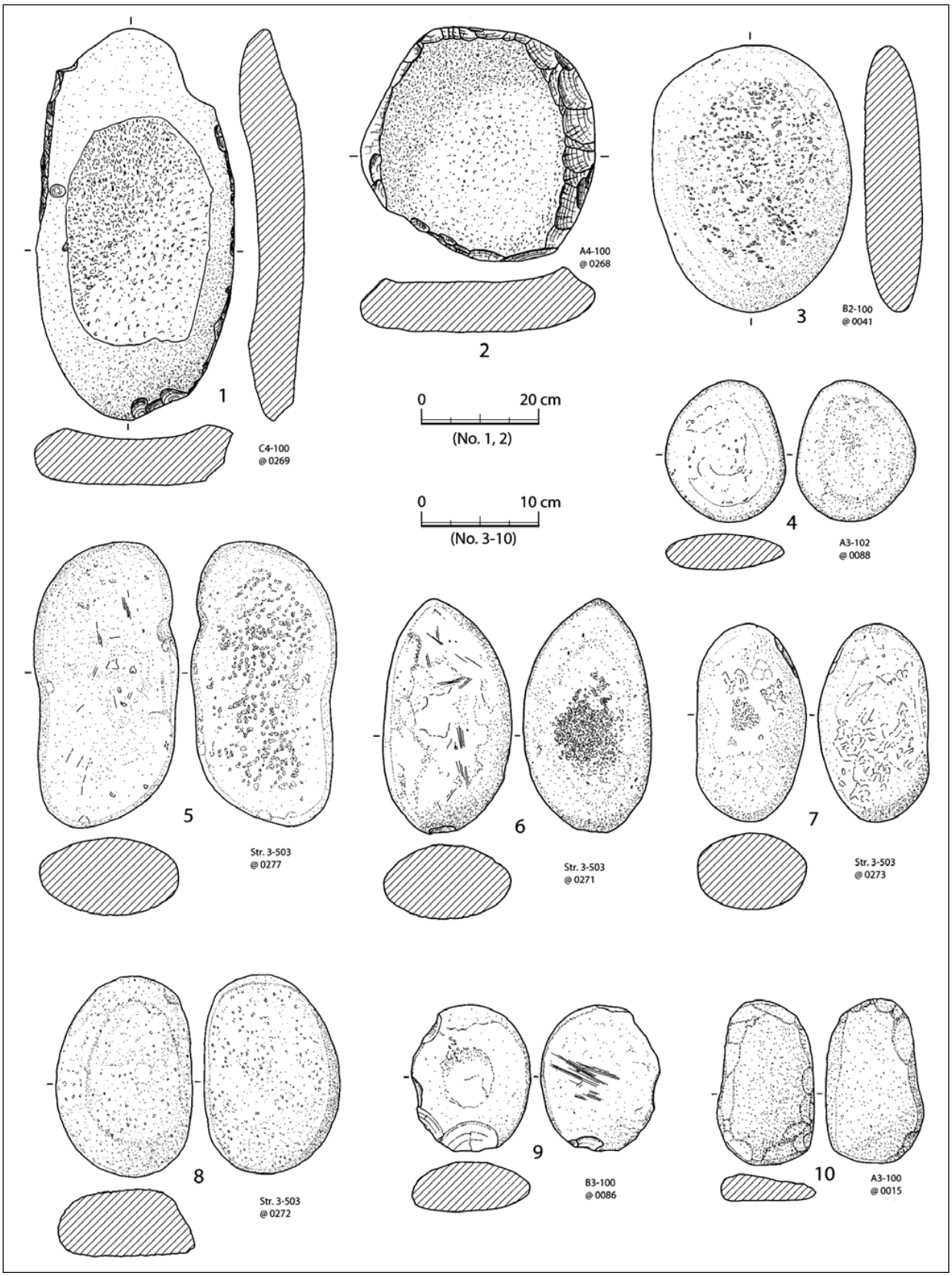
23. Wādī Ghuwayr 17: chipped flint artifacts (retouched tools).



24. Wādī Ghuwayr 17: chipped flint artifacts (retouched tools).



25. Wādī Ghuwayr 17: chipped flint artifacts (retouched tools).



26. Wādī Ghuwayr 17: querns (no. 1-2) and grinding slabs (nos. 3-10).

of PPNB desert sites in southern Jordan; parallel examples have for example been reported from Wādī Abū Ṭulayḥa (Fujii 2008a: Fig. 29, no. 1-2, 5-6) and ʻAyn Abū Nukhayla (Henry *et al*. 2003: Fig. 13, no. A-C). Handstones are also common in the Jafr PPNB, and similar examples occurred again at Wādī Abū Ṭulayḥa in large numbers (Fujii 2008a: Fig. 29, no. 7-18, 2009a; Fig. 17, no. 4-9). These heavy-duty tools often bear remarkable production and use wear traces. Most of them occurred in disturbed deposits but, as noted above, seven of the handstones were found together on the floor of Structure 3 (**Fig. 26: 5-8**). Their concentration in the minor structures suggests that domestic subsistence activities focused on those places rather than on the larger key structure.

Incidentally, the frequency of grinding implements is seemingly inconsistent with the harsh site setting and the scarcity of reaping tools, further supporting the likelihood that a more benevolent climate existed when the site was occupied. Noteworthy in this regard is the existence of a barrage system at Wādī Ghuwayr 106 several kilometers to the west (Fujii *et al*. this volume). Given that this system may represent an enclave agricultural field in use during the PPNB, it makes sense that Wādī Ghuwayr 17 produced a certain number of grinding tools. However, the functional association and contemporaneity of the two sites needs verification.

Stone Vessels

A total of seven limestone vessel fragments were recovered from fill layers of Structure 1 and disturbed deposits around it. Shallow bowls *ca*. 10 - 20cm in diameter and *ca*. 10cm in height accounted for the majority (**Fig. 27: 2**), but a large bowl with a diameter of *ca*. 50cm and a height of *ca*. 20cm is also included (**Fig. 27: 1**). Overall, the vessels were not elaborate in craftsmanship, being characterized by irregular profiles and thick walls. Their specific use is still unknown.

Flint and Limestone Bowlets

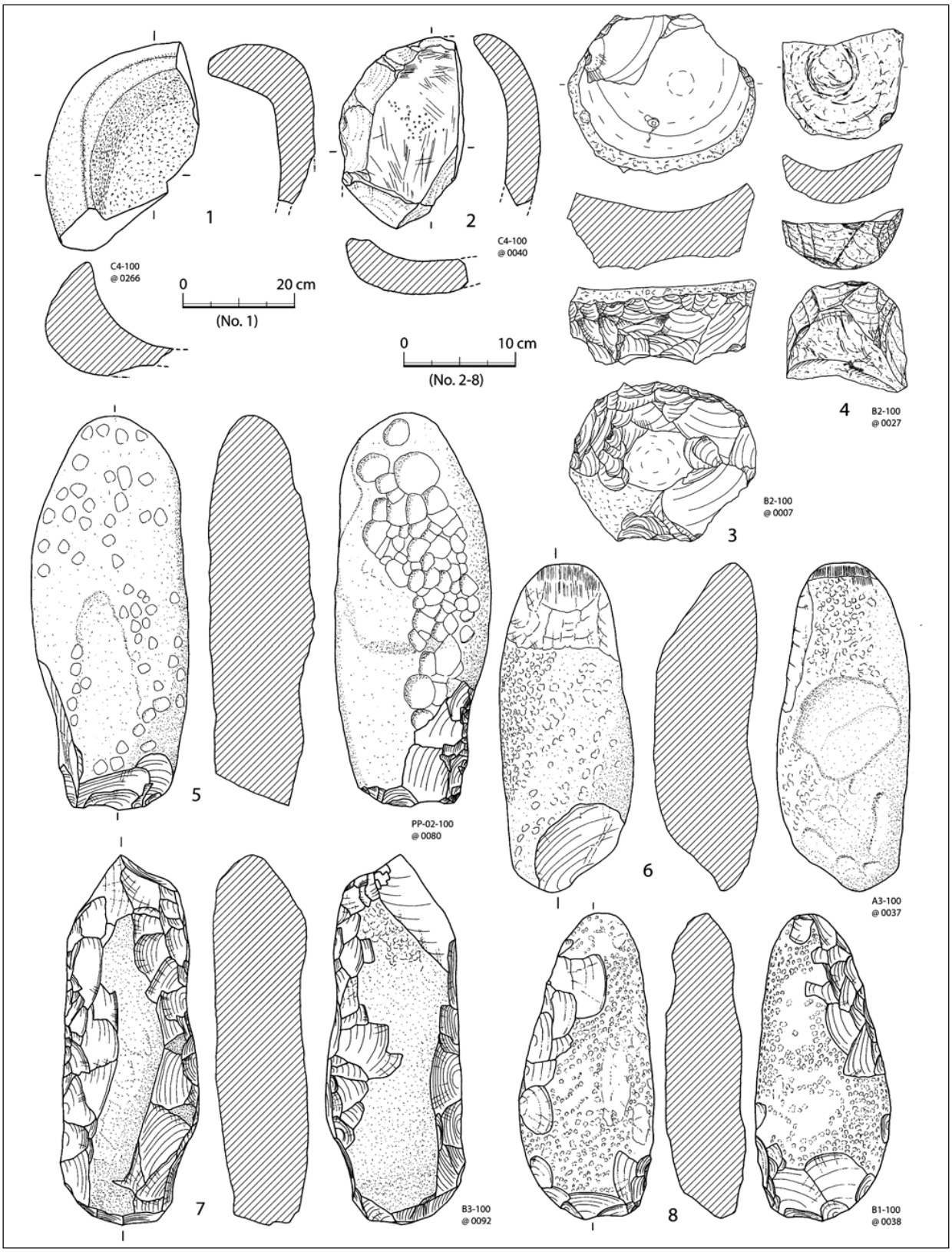
The flint bowlet, a stone vessel flaked from a cortical flint pebble around a shallow, thermal-flaked concavity, is characteristic of the M - LPPNB cultural entity in southern Jordan. A dozen examples have been reported from Baṣṭa, Baʻja, al-Ḥimmah, ʻAyn al-Jammām, and Wādī Abū Ṭulayḥa (Fujii 2009b). The survey and rescue excavation at Wādī Ghuwayr 17 added three examples, including a limestone example (**Fig. 27: 3**), to the collection. At least two of them were found among the disturbed deposits of Sq. B2, suggesting that they originated from the key structure. They were relatively large in dimensions (more than 10cm in diameter) and roughly trimmed around their periphery, being comparable to the MPPNB bowlets from Wādī Abū Ṭulayḥa (Fujii 2009b: 24-25). No remarkable macroscopic use wear was recognized.

Diagonally Truncated Stone Bars

The diagonally truncated stone bar made of limestone (or rarely flint) is another chronological marker of the western Jafr Pastoral PPNB, and parallel examples have been found at Wādī Abū Ṭulayḥa in large numbers (e.g. Fujii 2008a: Fig. 31, no. 1-2, 2009a: Fig. 19, no. 1-3). Despite the limited excavation, Wādī Ghuwayr 17 produced a total of thirteen examples (**Fig. 27: 5-8**). They were standardized in both dimensions (*ca*. 20 - 30cm long) and weight (*ca*. 3 - 5kg), bearing heavy damage at their truncated distal end. In view of their frequency and remarkable edge damage, they are thought to have been used for digging, possibly through the limestone layers underlying the silty sand deposits. It is probably for this reason that, unlike the flint and limestone bowlets, they occurred in various loci within the excavation area. The heavy-duty digging tools made of an elongated flint nodule described above were probably also used for the same purpose (**Fig. 25: 7**). Another possibility is that these tools were used as percussors to form or roughen the working surfaces of millstones.

Notched and Grooved Stone Weight

The large stone weight with a pair of notches and / or grooves in its central part is a type artifact of the Jafr PPNB barrage system. All of the three barrage systems known to date, including Wādī Ghuwayr 106, have yielded these diagnostic artifacts (Fujii 2007a, 2007b; Fujii *et al*. in this volume). It is possible that they served merely as construction material, but this is likely not their original use. In a barrage system they are usually incorporated into a reinforcement wall attached to the central part of the



27. Wādī Ghuwayr 17: stone vessels (nos. 1-2), flint / limestone bowlets (nos. 3-4) and diagonally truncated stone bars (nos. 5-8).

barrage, suggesting that they were a functional component. Nevertheless, that function remains a mystery. Taking this into consideration, one of us (SF) suggests that they were built into the key part of the barrage wall as ritual objects for praying for the safe-keeping and eternity of the barrage (Fujii 2010a).

Unexpectedly, Wādī Ghuwayr 17 also produced a similar example (**Figs. 14, 28: 1**). As with the other examples, it was very large in dimensions, measuring *ca*. 56cm long, 40cm wide, *ca*. 19cm thick and *ca*. 53kg in weight. While one lateral edge was roughly trimmed, the other edge was left unmodified due to the presence of a natural concavity. A shallow groove running horizontally across the upper surface is also of natural origin. The occurrence of the *in situ* find at the PPNB settlement enhanced the validity of the diagnostic stone weight as a chronological marker of the Jafr barrage system.

Pillar Base

The large limestone slab with a central conical depression is also characteristic of the western Jafr PPNB, and a large number of examples, interpreted as pillar bases, were recorded at Wādī Abū Ṭulayḥa (e.g. Fujii 2009a: 24-25). Wādī Ghuwayr 17 yielded a halved example *ca*. 60cm in diameter. It occurred in disturbed deposits in Sq. A2, suggesting its original association with Structure 1 (**Fig. 28: 2**). An anthropogenic, socket-like concavity *ca*. 12cm in diameter and *ca*. 5cm deep occupied its central position. No clear macroscopic use wear was recognized, but a petroglyph was added to the elongated fractured surface across the socket hole. In addition, there was a smaller, questionable example (**Fig. 28: 3**). It should be noted, incidentally, that a significant literature exists which classify similar artifacts as cuphole mortars or cup-shaped mortars, assigning them to milling assemblages (e.g. Shaffrey 2007: 350-353). We tentatively classified them as pillar bases on the basis of our excavated evidence from Wādī Abū Ṭulayḥa (Fujii 2006a: 16, 2007a: 379-380).

Game Board

The game board with two rows of small holes is common in the southern Levant, and a few dozen examples have been reported from PPNB sites including al-Bayḍā (Kirkbride 1966: Fig. 8), as-Sifiyya (Hamzeh Mahasneh pers. comm..), ‘Ayn Ghazāl (Rollefson 1992: Fig. 1; Rollefson and Kafafi 1997: Fig. 14), and Wādī Abū Ṭulayḥa (e.g. Fujii 2009a: Fig. 17). Cis-jordan sites including Jericho (Kenyon and Holland 1983: Fig. 229), Wadi Tbeik (Bar-Yosef 1982: 10) and Kfar HaHoresh (Nigel Goring-Morris pers. comm..) have also yielded similar artifacts. Wādī Ghuwayr 17 yielded a halved example (**Fig. 28: 4**). Its occurrence in the disturbed deposits of Sq. A4 suggested its association with minor structural components, a trend common to the early phase of Wādī Abū Ṭulayḥa.

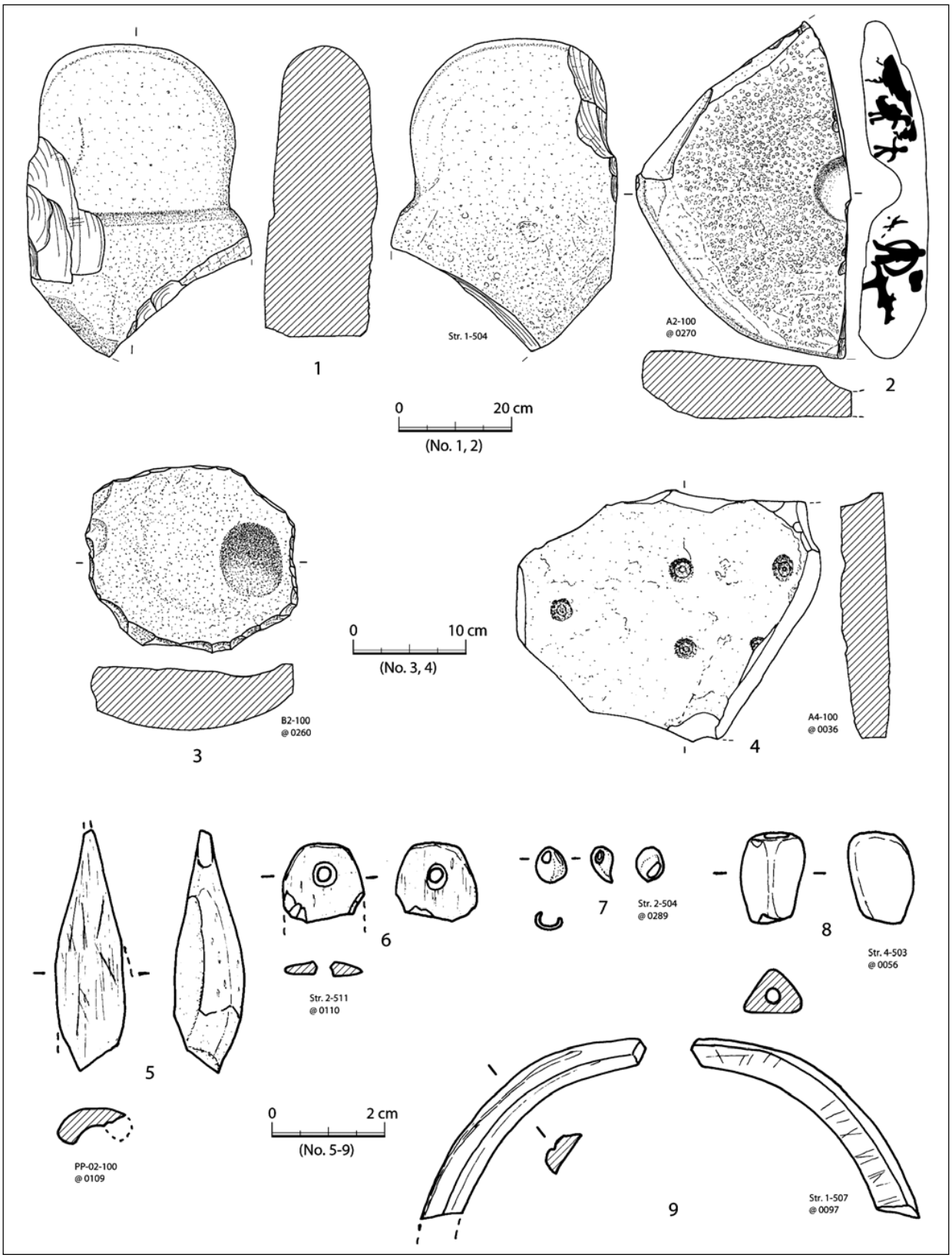
Unlike the other examples, this game board was exceptionally fashioned from a cortical flint slab. It was relatively large in size, measuring *ca*. 27cm in preserved length, *ca*. 22cm wide, *ca*. 3.7cm thick and *ca*. 3.6kg in weight. The cortical surface still retained a total of five small concavities, all of which were produced by a pecking technique. The isolated hole at the left edge was possibly used for a depot of game pieces. The other four holes were arranged regularly in two rows, but were not associated with a pair of horizontal grooves connecting any two adjacent holes. In view of the overall size and morphology, it seems likely that this game board had originally at least six holes and a pair of depots.

Whetstones

The excavation area yielded several whetstones made largely of sandstone. Most of them were found in fill layers of Structure 1 and disturbed deposits around it. They are palm-size in most cases, being oval to semi-quadrangular in general plan. Some striations were still observable on their flat working surface, suggesting that they were used for grinding or rubbing small hard objects such as bone tools and adornments.

Bone Tools

Scarcity of bone implements is a feature of the Jafr Pastoral PPNB. Wādī Ghuwayr 17 was no exception, and only two small examples were recovered from an upper fill layer of Structure 2 and disturbed deposits around it. One of them was a short drill (**Fig. 28: 5**) and the other was a head fragment of a pierced, spatula-like tool (**Fig. 28: 6**).



28. Wādī Ghuwayr 17: notched and grooved stone weight (no. 1), pillar bases (nos. 2-3), game board (no. 4), bone tools (nos. 5-6) and adornments (nos. 7-9).

Adornments

Scarcity of adornments is also characteristic of the Jafr Pastoral PPNB. The finds from Wādī Ghuwayr 17 were limited to a small bead, probably made from a land snail shell (**Fig. 28: 7**), a prismatic bead made of malachite (**Fig. 28: 8**) and a fragment of a stone bracelet (**Fig. 28: 9**). The stone bracelet is common on PPNB settlements in the southern Levant; its production process is elucidated at Ba'ja, for example (Gebel and Bienert 1997: Fig. 14). The occurrence of the malachite bead (and several fragments described below) is also suggestive of material flow from the contemporary west, probably the Faynān area.

Miscellaneous Finds

Several small fragments of malachite, quartz, marble and reddish sandstone were found, largely in fill layers of Structure 1. Since the Jafr basin is thought to be devoid of such material, these colorful exotic stone fragments probably were brought to the site as pigment or raw material for adornments from mountainous areas to the west. In addition, faunal and botanical remains were recovered in small quantities from undisturbed fill layers of Structure 2. A close examination of these materials is now in progress, but preliminary study suggests that nuts (*Pistacia* sp.) are common in the botanical samples (Hiroo Nasu pers. comm.).

Petroglyphs

An abundance of portable petroglyph slabs is a distinctive feature of the Jafr Pastoral PPNB (Fujii 2008b). Wādī Ghuwayr 17 was no exception, and no less than 11 examples were recovered despite the limited excavation area (**Figs. 29, 30 and 31**). The stones with petroglyphs occurred exclusively in disturbed deposits around Structure 1, suggesting they originated from the key structure. Most of the petroglyphs were on a weathered, somewhat darkened, flat surface of an undressed limestone slab or cobble, but one was on the fractured surface of the halved pillar base (**Figs. 28: 2, 31: 1**). In terms of technology, every petroglyph was produced by pecking; no line engraving technique was employed, with the exception of one scratched example (**Fig. 29: 1**).

As for iconography, the predominant motif was that of small to medium herbivores roaming alone (**Fig. 29: 3**) or in a small herd (**Fig. 30: 1, 3-4**). Other motifs include a carnivore-like creature with a long tail (**Fig. 31: 1**), a few bird-like designs with relatively long legs (**Figs. 30: 4, 31: 1**) and several anthropomorphic figures (**Figs. 29: 2, 5; 30: 2, 4, 31: 1-2**). The frequency of anthropomorphic figures is unique to Wādī Ghuwayr and merits special attention. Two petroglyphs depict a human-like figure tending a goat-like quadruped with a short tail and relatively stout trunk (**Fig. 30: 2, 4**). This might be a representation of pasturing around the site. Cross-referencing with faunal evidence is eagerly awaited.

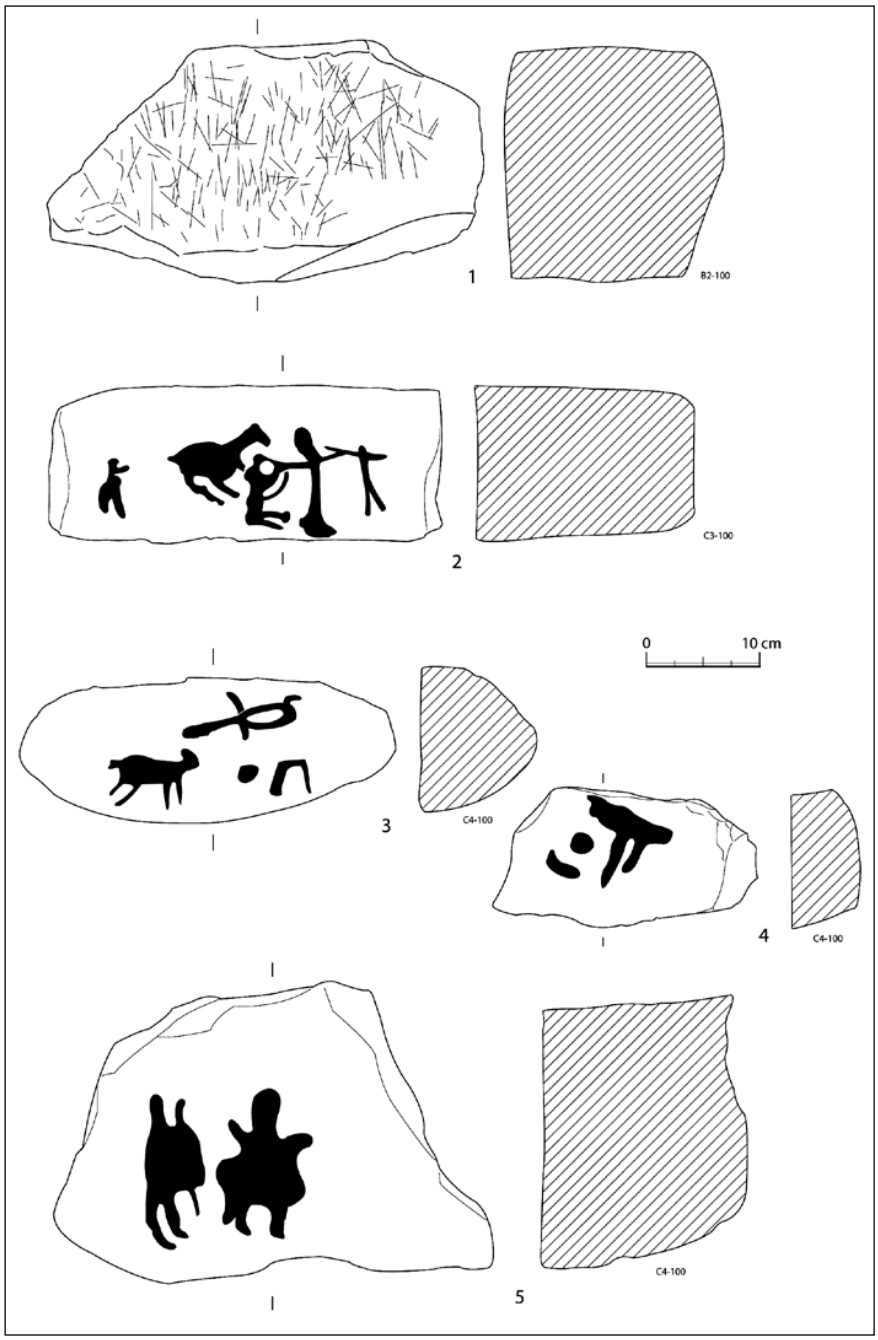
Summary and Discussion

The rescue excavation at Wādī Ghuwayr 17 has provided further insights into the Neolithic land use of the Jafr basin. To conclude, we will briefly review the results of the investigation, focusing on a few major issues.

Settlement Size

In view of the excavation results and distribution of surface finds, the size of the Wādī Ghuwayr 17 settlement is estimated at *ca*. 0.015 - 0.02ha (*ca*. 15 - 20m long by *ca*. 10m wide). This is approximately one-fifth to one-tenth of the norm for PPNB desert settlements, such as Wādī Abū Ṭulayḥa (*ca*. 0.1 - 0.15ha; Fujii 2009a: 204), Wādī Jīlāt 7 (0.07 - 0.2ha; Garrard *et al*. 1994: 75), Wādī Jīlāt 26 (0.8ha; Garrard *et al*. 1994: 77), and 'Ayn Abū Nukhayla (*ca*. 0.12ha; Henry *et al*. 2003: 2). This contrast highlights the ephemeral nature of Wādī Ghuwayr 17.

However, this does not necessarily mean that the settlement had a population of one-fifth to one-tenth of that of more typical desert settlements. It should be noted, for example, that the elongated settlement of Wādī Abū Ṭulayḥa is thought to have been formed through the repeated renewal - over approximately ten cycles - of a structural complex, each time extending into an adjacent 'plot' (Fujii 2009a: 206). Wādī Ghuwayr 17, on the other hand, consisted of a single complex with Structure 1 being the key feature. It is therefore unsurprising that this single-complex settlement should have a size around one-tenth that of a ten-complex settlement. Our tentative interpretation is that Wādī Ghuwayr 17

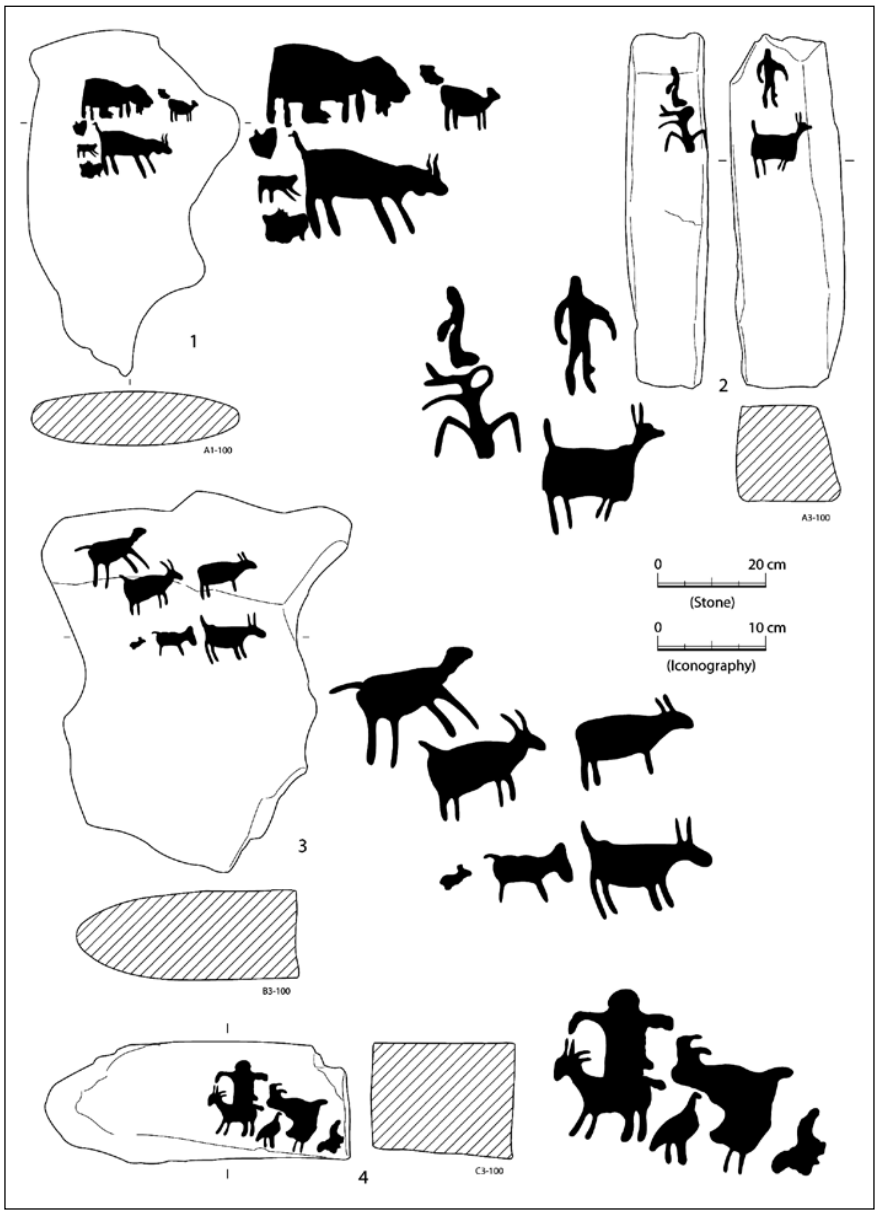


29. Wādī Ghuwayr 17: petroglyphs.

represents a single-phase settlement, possibly overlapping with some stage of the occupation of Wādī Abū Ṭulayḥa. This working hypothesis leads us to the conclusion that, regardless of its apparent size, every desert settlement had a small population, probably not more than a few dozen persons. Such a small settlement size and population may well have been the norm in the Jafr Pastoral PPNB, but further study is needed to validate this challenging perspective.

Dating

Although no C14 data are available at the time of writing, Wādī Ghuwayr 17 can be attributed to the PPNB on the basis of diagnostic finds such as naviform core and blade elements, Amuq- and Byblos-type points, large basin querns made of flint, flint and limestone bowlets, diagonally truncated stone bars and a game board. Overall affinities with the M - LPPNB agro-pastoral outpost of Wādī Abū

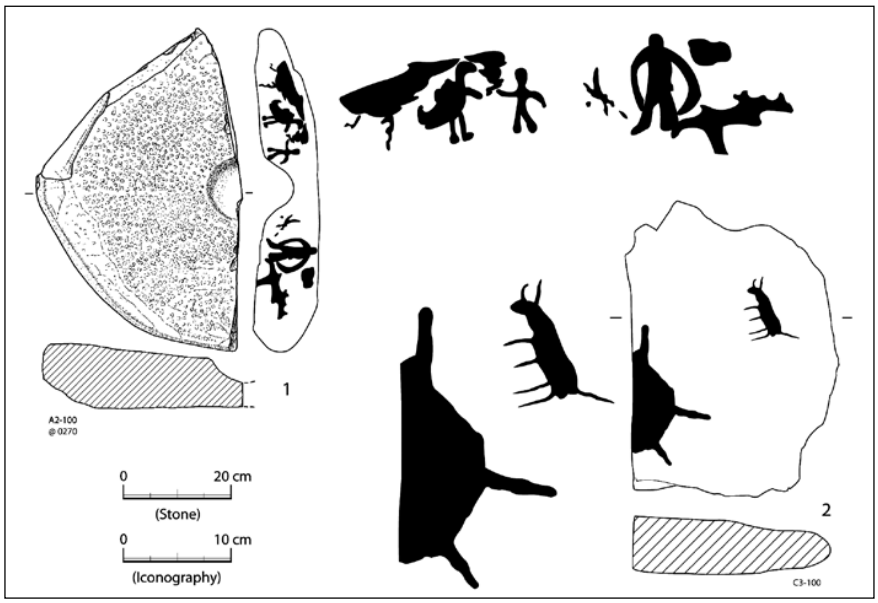


30. Wādī Ghuwayr 17: petroglyphs.

Ṭulayḥa are demonstrated by the techno-typology of structural remains, the general plan of the structural complex and the iconography of the petroglyphs. There is little doubt that both sites share a similar date.

The question of dating, therefore, focuses on what phase of the PPNB might the site represents. The nature of the structural complex sheds some light on the issue. The combination of an oval key structure and several minor components, including a deep floor-type feature, is comparable with Complex I at Wādī Abū Ṭulayḥa (**Fig. 32**). It is also interesting to note that structures at both complexes are equipped with a *massebot*-like upright boulder at their north-western corners (Fujii 2007a: Fig. 5). Also, as noted, the projectile point assemblage is best attributed to the late MPPNB / LPPNB. Given these affinities, the site of Wādī Ghuwayr 17 may be dated to the end of the MPPNB or the very beginning of the LPPNB. Further support for this tentative dating comes from the techno-typology of the bowlets. These are characterized by large dimensions and coarse shaping, and thus most likely fall into the MPPNB group from Wādī Abū Ṭulayḥa (Fujii 2009b: 24-25).

Previous work has suggested that Complex I at Wādī Abū Ṭulayḥa was constructed when



31. Wādī Ghuwayr 17: petroglyphs.

pastoral transhumance resumed in the area after a short interval in the latter stages of the MPPNB, and that the re-occupation involved the construction of a basin-irrigation barrage system (Fujii 2009a: 475-477). Given the supposed chronological affinity between the two sites, it would make sense if Wādī Ghuwayr 17 were associated with the two barrages at nearby Wādī Ghuwayr 106 (Fujii *et al*. this volume). It is interesting to speculate whether, as appears to have been the case at Wādī Abū Ṭulayḥa Complex I, the establishment of Wādī Ghuwayr 17 - sustained by the nearby barrage system - represents one episode in the full-fledged re-occupation of the arid margins at the end of the MPPNB or very beginning of the LPPNB.

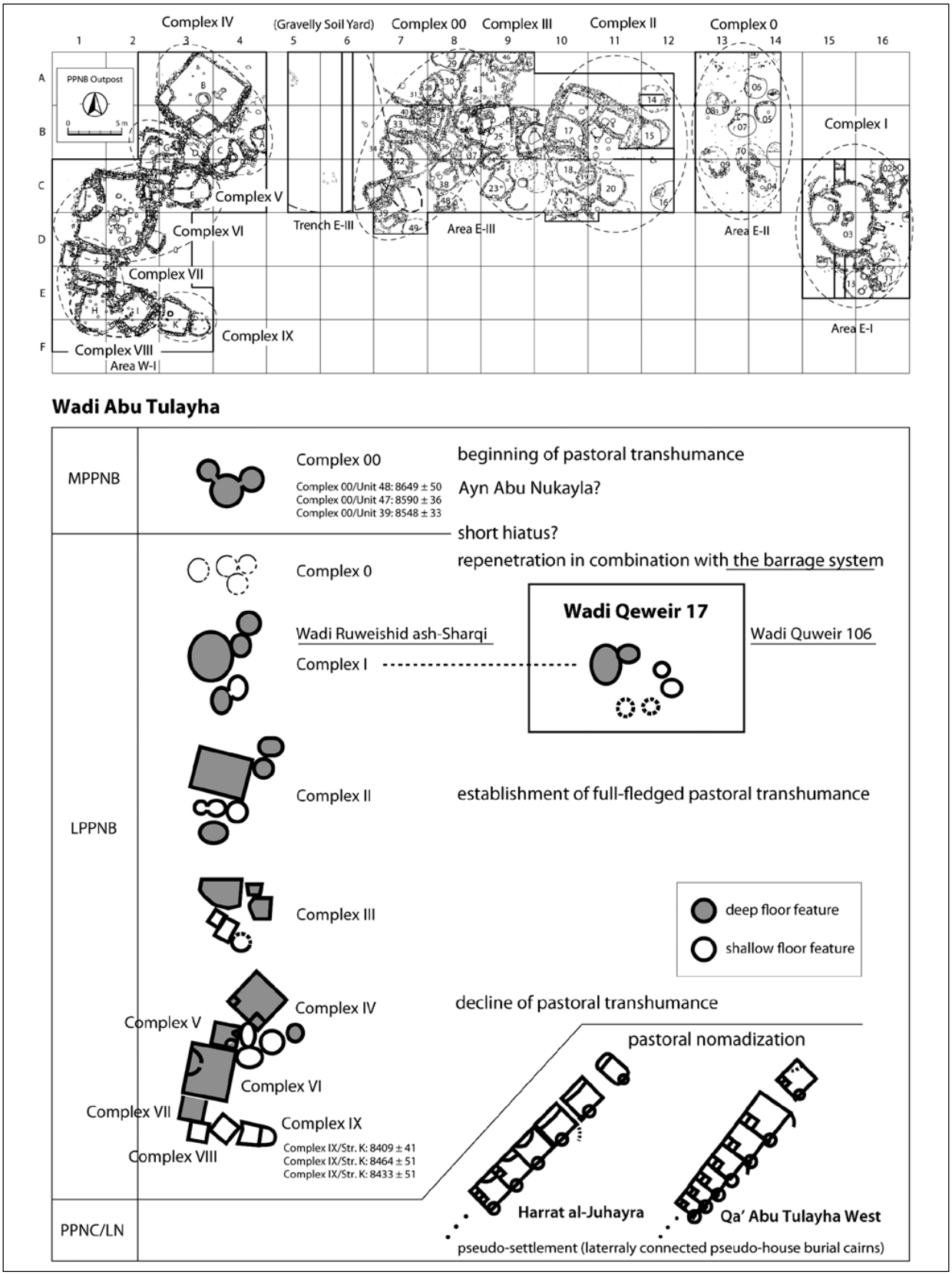
Site Function

In view of the harsh environmental conditions and small site size, there is little doubt that - as with other desert settlements – Wādī Ghuwayr 17 was used on a seasonal basis. No faunal or botanical evidence is available yet, but it would appear that the site was sustained by a mixed, risk-diversifying economy which included hunting (evidenced by the frequency of hunting weapons), pastoral transhumance (suggested by the occurrence of a petroglyph depicting pasturing) and basin-irrigated agriculture (implied by the occurrence of various grinding tools and the existence of the nearby barrage site of Wādī Ghuwayr 106). In addition, exploitation of Eocene flint, which occurs abundantly on the margins of the Jafr basin, may also have played an important role in the life of the site (Wilke *et al*. 2007).

As with Wādī Abū Ṭulayḥa, we can tentatively define the site as a seasonal, agro-pastoral outpost, most probably derived from farming communities to the west. It is most unlikely that the site represents a seasonal camp of early pastoral nomads who migrated within the basin, because the occurrence of malachite fragments, flint bowlets, a stone bracelet and a game board attests to a close relationship with the contemporary west. In view of surface water availability in the desert margins, there is a high probability that the outpost was used for short periods between winter and late spring, when a spring flowed near the site.

Concluding Remarks

Wādī Ghuwayr 17 has much in common with Wādī Abū Ṭulayḥa. The discovery of a second example of a PPNB agro-pastoral outpost has made it clearer that Jafr pastoral transhumance dates back to the end of the MPPNB or very beginning of the LPPNB. In this sense, we can argue that the establishment of full-fledged pastoral transhumance in the Jafr basin had its genesis in the well-known and widespread pastoral dispersal of this period (Quintero *et al*. 2004). We may also argue that the episode was related to the mega-site phenomenon in the southern



32. Comparative chronology of Wādī Abū Ṭulayḥa and Wādī Ghuwayr 17.

Jordan highlands (Gebel 2004, 2010) on the one hand, and the Neolithization of the Arabian peninsula (Zarins 1990; Drechsler 2009; Uerpmann *et al*. 2009) on the other. This expanded perspective might shed new light on the socio-cultural dynamics of the PPNB cultural entity in the southern Levant. We intend to continue our efforts towards a comprehensive understanding of the Jafr pastoral Neolithic.

Acknowledgements

Our research project is financially supported by the Japan Society for the Promotion of Science (Grant No. 17063004). We would like to express our sincerest gratitude to Prof. Dr Ziad al-Saad, Director General of the Department of Antiquities of Jordan, for his kind co-operation. We are also deeply indebted to Dr Mohammad Tarawneh, al-Hussein bin Talal University, and Mr Amer Bdour, Ma'an office of the Department, whose careful support enabled us to get through this difficult field season. Our thanks also go to Mr Mohammad Zahran, representative of the Department, and staff members Kazuyoshi Nagaya, Kae Suzuki and Hitomi Kimura. Their patience and efforts under harsh conditions were commendable.

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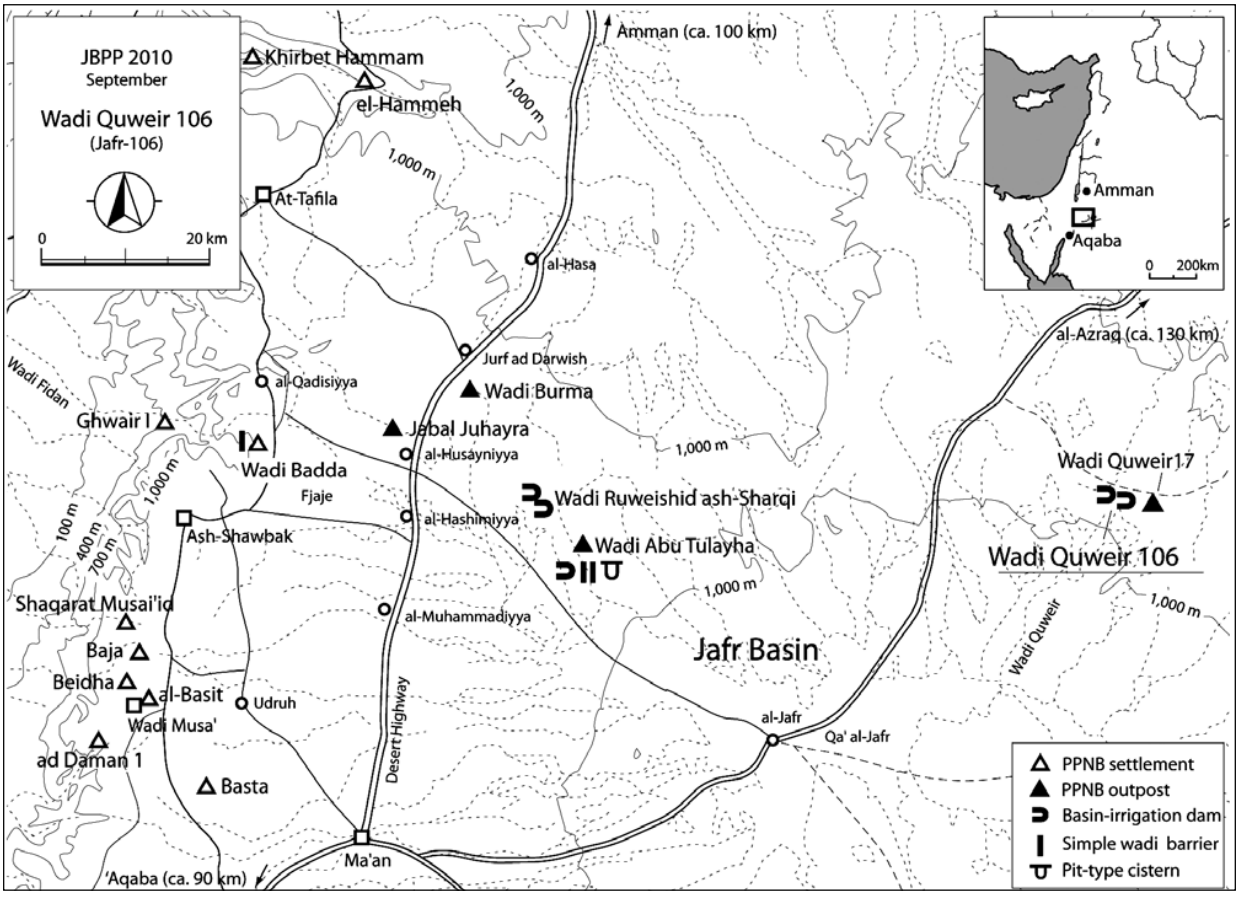
WĀDĪ GHUWAYR 106: A NEOLITHIC BARRAGE SYSTEM IN THE NORTH-EASTERN AL-JAFR BASIN

Sumio Fujii, Takuro Adachi, Leslie A. Quintero and Philip J. Wilke

Introduction

The 2010 summer field season of the Jafr Basin Prehistoric Project (JBPP) continued to address the correlation between pastoral nomadization and the Neolithic barrage system, a top priority issue for Phase 3 of the project (**Fig. 1**). The first two weeks were devoted to a rescue excavation at Wādī Ghuwayr 17, which proved to be a PPNB agro-pastoral outpost similar to Wādī Abū Ṭulayḥa (Wilke and Quintero 1998; Fujii *et al*. this volume). Work then focused on the nearby barrage site of Wādī Ghuwayr 106 and explored its possible association with the PPNB outpost. Limited excavation of the barrage system corroborated our belief that pastoral transhumance during the Jafr PPNB was facilitated by water-catchment systems. The following is a brief summary of the investigation re-



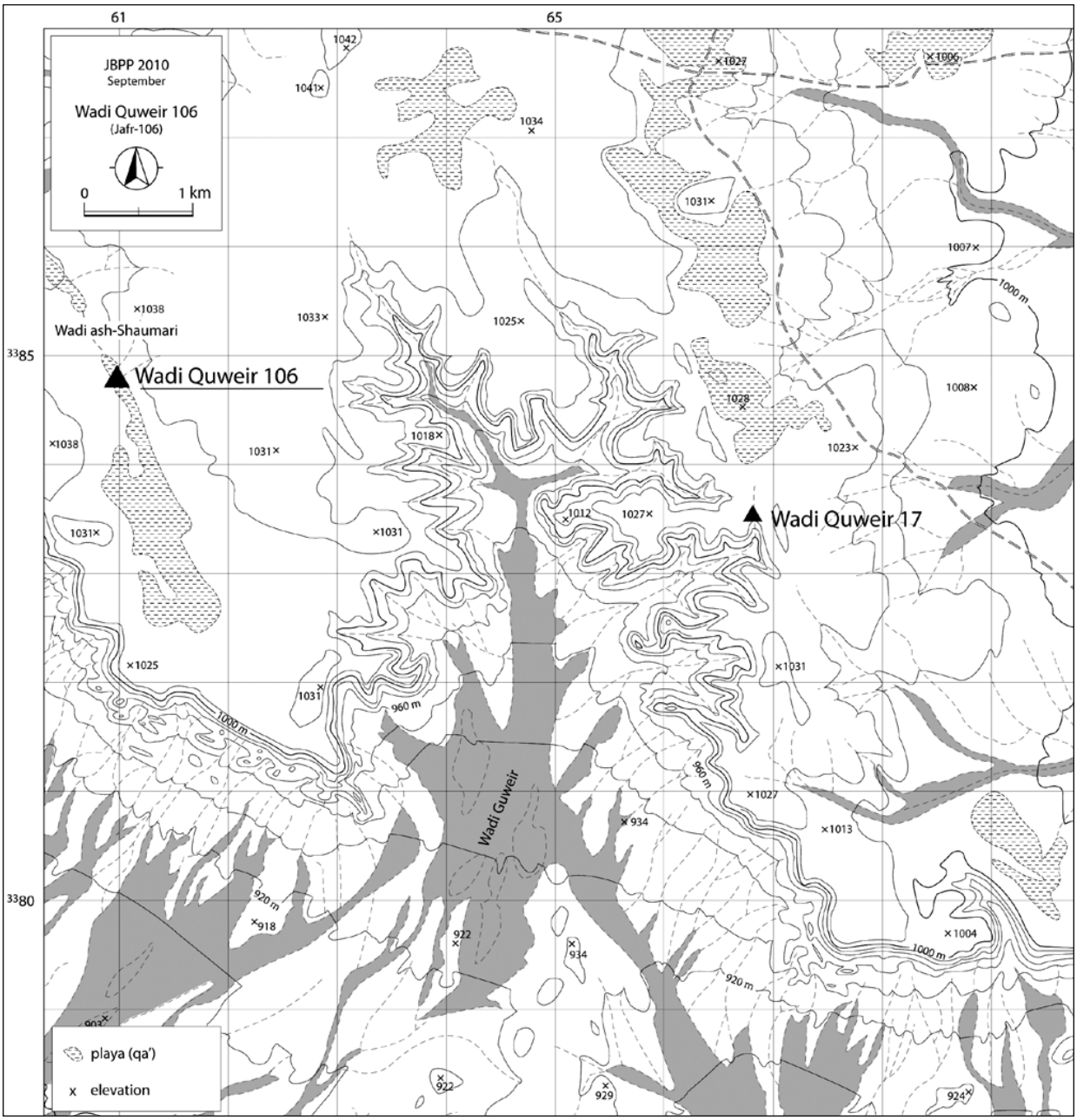
1. Wādī Ghuwayr 106 and Neolithic water catchment facilities in the Jafr basin.

sults from this unique site.

The Site and its Setting

The site was discovered by two of us (LAQ and PJW) in 1999 during reconnaissance survey of the north-eastern Jafr Basin, which commenced in 1997. The site was officially registered as Jafr-106 and interpreted as a water-catchment site of mixed affiliation based on the presence of Thamudic and Islamic inscriptions on structural stones and a mixed lithic assemblage. For the subsequent rescue excavation, Jafr-106 was re-designated Wādī Ghuwayr 106.

The site of Wādī Ghuwayr 106 is located on upland terrain *ca*. 6km west-north-west of Wādī Ghuwayr 17 (**Fig. 2**). In terms of hydrology, the site is located at the head of Wādī ash-Shawmarī, the adjacent major drainage system in the northern part of the Jafr Basin. Thus the site name of Wādī Ghuwayr 106 is not strictly appropriate, but we use it for descriptive purposes to indicate one of a number of archaeological sites around



2. Research area and location of Wādī Ghuwayr 106.

3. Wādī Ghuwayr 106: distant view of the site (looking north-west).

the head of Wādī Ghuwayr. The site is a simple, open-air site that consists only of two elongated freestanding stone-built walls. It is isolated in the middle of a flint pavement desert (Ar. *al-Ḥamād*) and appears not to have been associated with a settlement in terms of its operation (**Fig. 3**). The two wall alignments occupy flat terrain on the northern half of an elongated playa (Ar. *Qā'*) (**Fig. 4**). This playa, *ca*. 550m long and up to *ca*. 100m wide, is the lower component of a semi-open playa system that forms the upper reaches of one of the headwater forks of Wādī ash-Shawmarī . The two walls are located at the lowest part of the semi-open playa system, a key to understanding the location and function of the PPNB barrage system.

The Investigation

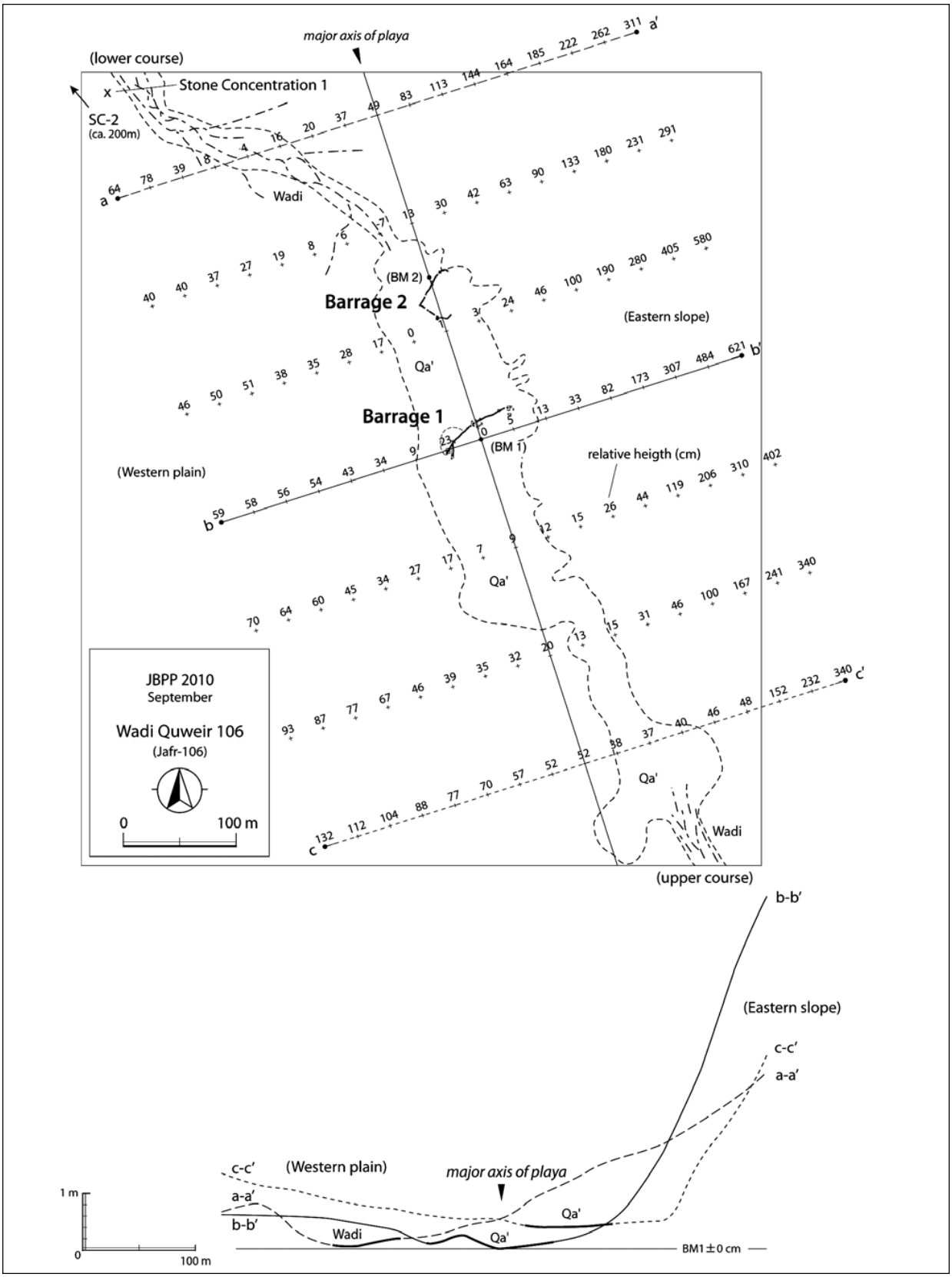
Investigation began with the setting up of two arbitrary leveling points (elevation *ca*. 1,020m) near the two wall alignments. Since the mapping area was both extensive and monotonous in topography, we abandoned production of a contour map and instead plotted the outline of the relevant natural features and measured relative elevations of the major axis and several perpendicular axes of the playa (**Fig. 4**). We then returned to the two stone walls and surveyed *in situ* wall materials at intervals of *ca*. 5-8m. The general plans of the two walls were produced by plotting out these marked points.

Since their role as water catchment facilities was obvious, we designated the two features Barrage 1 and Barrage 2, in descending order of elevation from south to north (**Figs. 5 and 6**). Barrage 1 was intensively examined by means of six small trenches. The exposed wall segments had a total length of *ca*. 18m, or approximately one-fifth of the total length of the barrage wall. Barrage 2, on the other hand, was quickly sounded by two small trenches. The two central trenches (i.e. Area 3 of Barrage 1 and Area 1 of Barrage 2) were set up along the major axe of the playa, but the other excavation areas were arranged along a magnetic north - south line. Excavated deposits were not sieved owing to the extreme scarcity of small finds, but a total of 20 liters of basal soil deposits were collected for flotation to retrieve any preserved organic remains. At time of writing this analysis has yet to be completed.

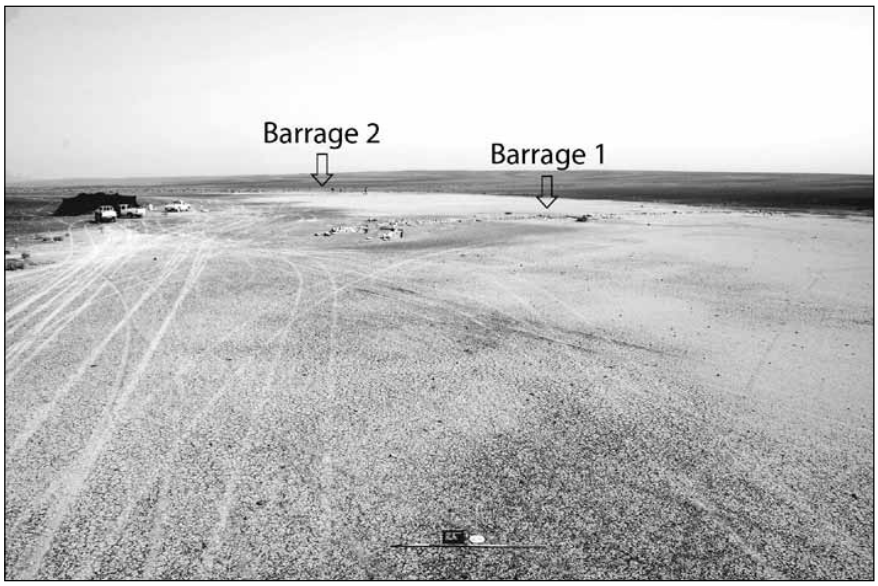
Unlike Wādī Ghuwayr 17, the site stratigraphy of Wādī Ghuwayr 106 was very simple and, apart from the retaining bank described below, every excavation area contained fluvial silty deposits only. Layer 1 or the surface layer was *ca*. 10-15cm thick and consisted of light buff, compact, silty sand deposits. Layer 2 was at least *ca*. 20cm thick, containing light brown, highly consolidated, silty sand deposits. The two barrages were constructed on the upper surface of Layer 2.

Excavation of Barrage 1

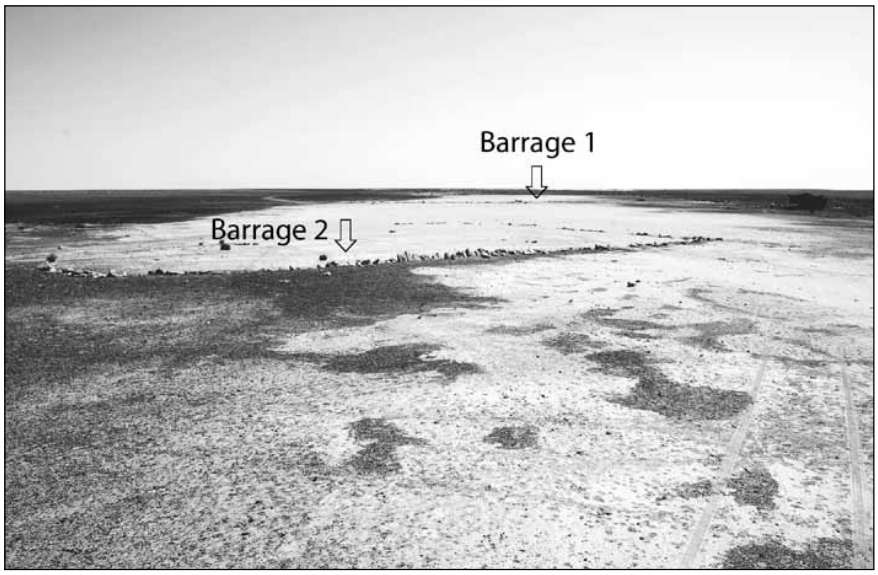
Barrage 1 is located at a point *ca*. 400m downstream of the inlet to the elongated playa, or *ca*. 150m upstream of its outlet; in other words,



4. Wādī Ghuwayr 106: site plan and elevations.



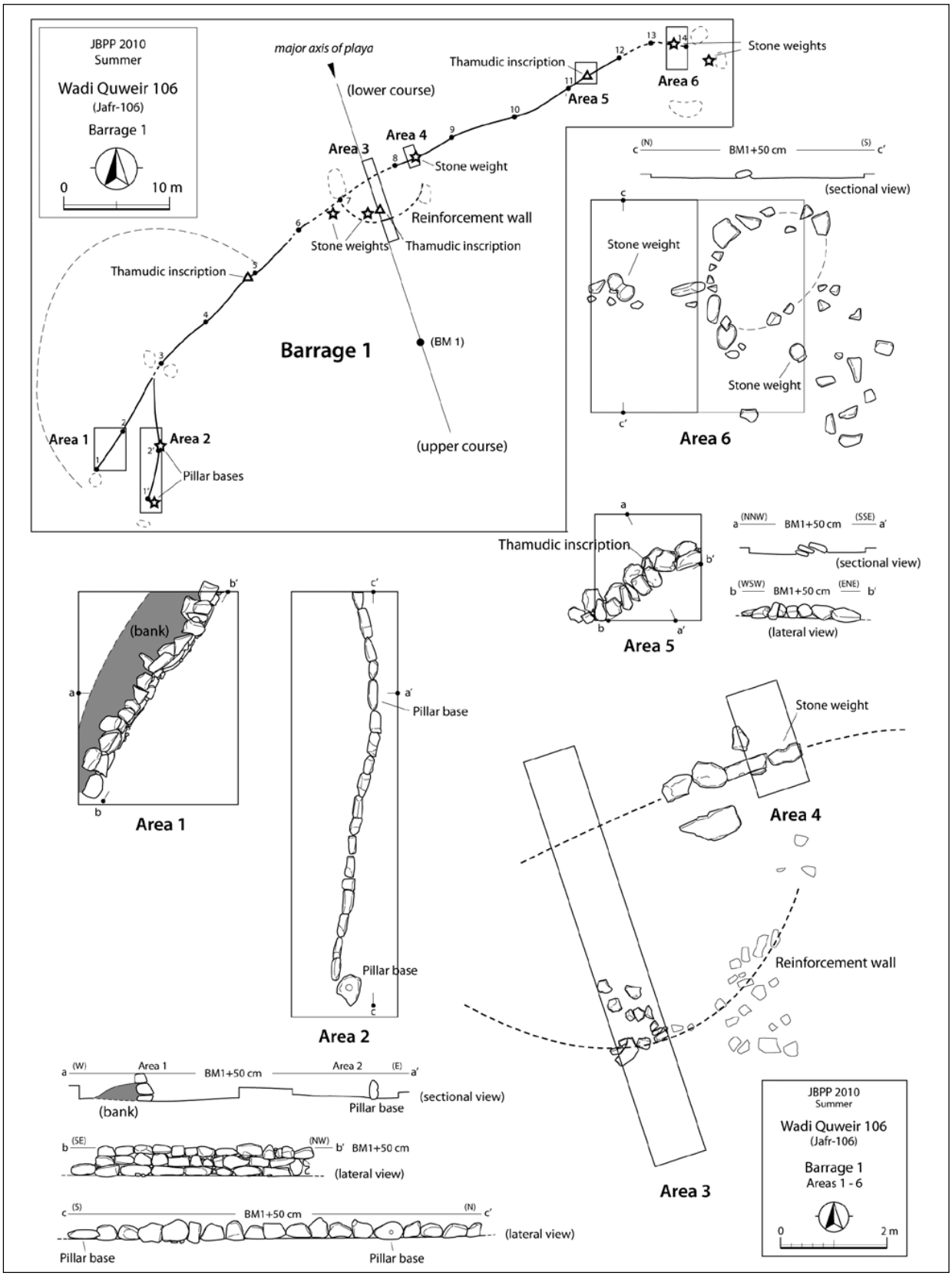
5. Wādī Ghuwayr 106: general view of the barrage system (looking north).



6. Wādī Ghuwayr 106: general view of the barrage system (looking south).

roughly in the middle of its northern half. It was constructed across the playa, being oriented to the south-south-east (**Fig. 4**). The barrage wall has a total length of *ca*. 72m and is preserved to a height of up to *ca*. 0.4-0.5m above the modern ground surface, being slightly incurved toward the upstream direction (**Figs. 7, 8 and 9**). As fallen stones around the wall are scarce, it is conceivable that there is little difference between its preserved and original heights. In fact, the preserved wall height is roughly equivalent to the elevation of the uppermost part of the playa and as such would have been able to submerge an area of *ca*. 2-3ha. This estimated flooding area of 2-3ha is similar to that of Barrage 1 at Wādī Abū Ṭulayḥa (Fujii 2007b), suggesting that this may have been a standard characteristic of such constructions in the Jafr PPNB.

The barrage wall was constructed of a single row and up to three to four courses of undressed or part-dressed limestone cobbles and boulders *ca*. 30-80cm long. Dry stone walling appears to have been the norm; no clear evidence for clay mortar was found with the sole exception of the retaining bank in Area 1. Construction material probably originated from the wadi bed *ca*. 200-300m downstream, where similar stones are exposed by erosion. Overall, the wall alignment was simple in structure; additional features were limited to a semi-circular reinforcement wall



7. Barrage 1: plans and sections / elevations.

8. Barrage 1: general view (looking north-east).

9. Barrage 1: general view (looking south-west).

in the centre and an extra wall segment at the south-west end.

Area 1

Area 1 was established to examine the structure of a well-preserved wall segment at the south-west end of the barrage. The excavation revealed a masonry wall *ca*. 4.5m long and up to *ca*. 0. 5m in preserved height, which was constructed of a single row and three courses of undressed or part-dressed limestone cobbles (**Figs. 7 and 10**). The masonry was of high quality and every course was laid horizontally, using small pieces of flint and limestone rubble as adjusters.

The foundation course utilised a stretcher bond, but the upper courses were eclectic in nature, being laid in both stretcher and header bond. This construction technique is reminiscent of Barrage 1 at Wādī Abū Ṭulayḥa (Fujii 2007b: Fig. 8, 2007c: Fig. 6). No clear evidence for clay mortar was confirmed, but a clay bank was found to the rear of the wall segment (**Fig. 11**). This retaining bank, *ca*. 0.3m high and *ca*. 1m wide, was probably added for both waterproofing and structural reinforcement of the barrage wall.

Area 2

The excavation at Area 2 explored the nature of a short wall segment attached to the south-west end of the barrage. This additional wall was *ca*. 7m long and up to *ca*. 0.3m in preserved height, being built of a single row of upright limestone slabs (**Figs. 7, 10 and 11**). Neither foundations

10. Barrage 1: Area 1 (above) and Area 2 (below) (looking north-west).

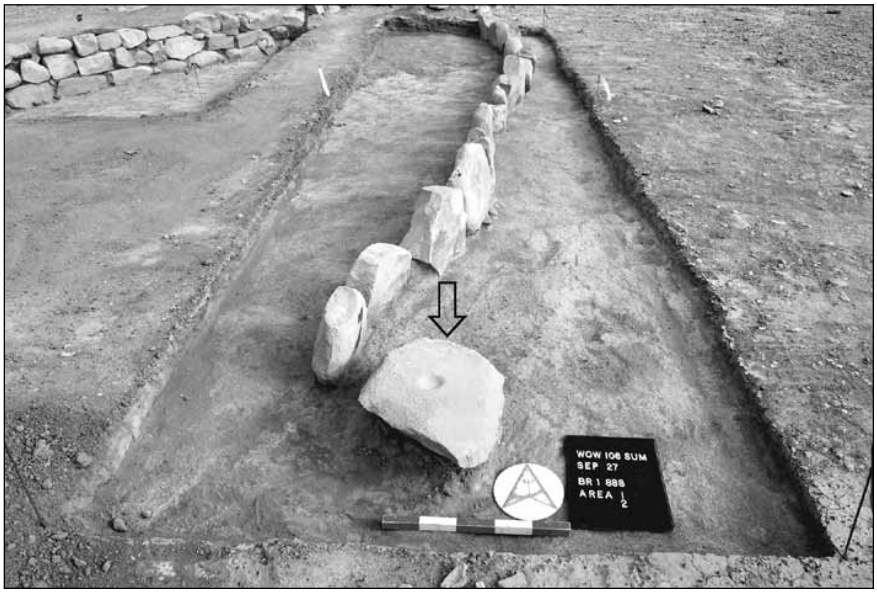
11. Barrage 1: Area 1 (below) and Area 2 (above) (looking south-east); white arrow shows bank to rear.

nor supporting elements to the rear were confirmed. It appears that the wall was added to reduce the strong sideways water pressure against the barrage wall. It is probably for this reason that it was much simpler in structure than the main wall. Interestingly, no similar device was confirmed at the opposite, north-eastern edge of the barrage. This is probably because this part is (and presumably was) *ca*. 20cm higher than the south-western part and therefore had less water pressure to contend with. It is an ironical outcome that although the south-west end of the barrage wall was well-preserved owing to the protection afforded by the additional wall, the north-eastern edge was washed out as a result of its absence.

The wall segment included two socketed limestone pillar bases (see below): one as a fallen stone at its southern end (**Figs. 12 and 33: 1**) and the other as an *in situ* item incorporated into its northern part (**Figs. 13 and 33: 2**). As discussed below, these diagnostic finds provide a key to exploring the date of the barrage.

Areas 3 and 4

These two excavation areas were opened to examine the central part of the barrage. Though heavily damaged by seasonal floods, the excava-



12. Barrage 1: pillar base found at the southern edge of Area 2 (looking north).

13. Barrage 1: pillar base incorporated into the barrage wall of Area 2 (looking south-west).

14. Barrage 1: Area 3 (center) and Area 4 (right) (looking north).

tion revealed traces of a semi-circular, protruding reinforcement wall, as well as the aligned foundation stones of the barrage wall (**Figs. 14 and 15**). The existence of the reinforcement wall at the crucial central part of the barrage, where it would have been subjected to the greatest water pressure, is a feature of all the PPNB barrages discovered to date in the Jafr Basin, suggesting that it may have been a standard element in their construction (Fujii n.d.a). It is probable that, as in the case of Barrage 1 at Wādī Abū Ṭulayḥa (Fujii 2007b: Fig. 9, 2007c: Fig. 5), the inner part of the reinforcement wall was originally packed with clay and rubble.

These two excavation areas yielded three large, bilaterally notched and / or bifacially grooved stone weights: two as stray finds around Area 3 (**Figs. 16, 17 and 32: 1-2**) and

15. Barrage 1: Area 3 (center) and Area 4 (left) (looking south-west).

16. Barrage 1: stone weight found beside Area 3 (looking north-east).

17. Barrage 1: stone weight found beside Area 3 (looking north).

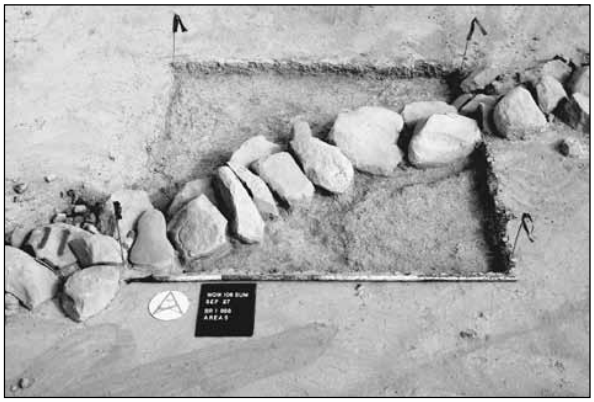
the other as a foundation stone in the wall segment of Area 4 (**Figs. 18 and 32: 3**). The occurrence of diagnostic stone weights – especially in the seemingly ubiquitous reinforcement wall

18. Barrage 1: stone weight incorporated into the barrage wall of Area 4 (looking south-east).

– is typical of dated PPNB barrages in the western Jafr Basin (Fujii 2010a, n.d.a), suggesting chronological synchronicity with them. In addition, a Thamudic or Hismaic IV inscription was recovered as a stray find in the southern part of Area 3, between the barrage and reinforcement walls (**Fig. 19**).

Area 5

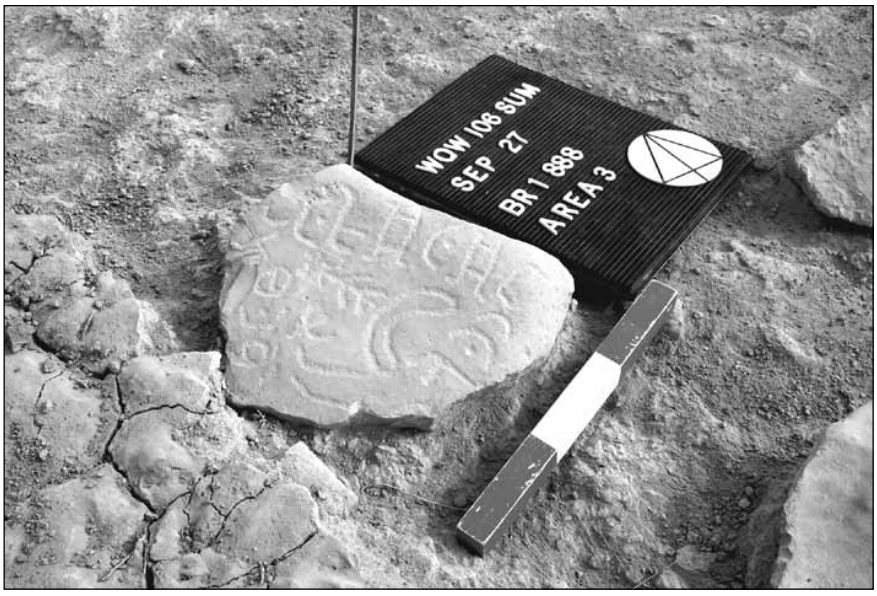
This small excavation area explored the chronological correlation between the barrage wall and a Thamudic inscription incorporated into it (**Fig. 20**). The inscribed slab was partly covered by other construction material and therefore appeared to be an original component of the barrage wall (**Fig. 21**). If this had been the case, the barrage would necessarily have post-dated the Thamudic inscription. However,



20. Barrage 1: Area 5 (looking north).

21. Barrage 1: Thamudic inscription incorporated into the barrage wall of Area 5 (looking west).

closer scrutiny revealed that – as was the case with similar stones nearby – the inscribed slab was leant up against foundation stones, with a minor stratigraphic gap between them. Thus, the uppermost stones, including the inscribed slab,



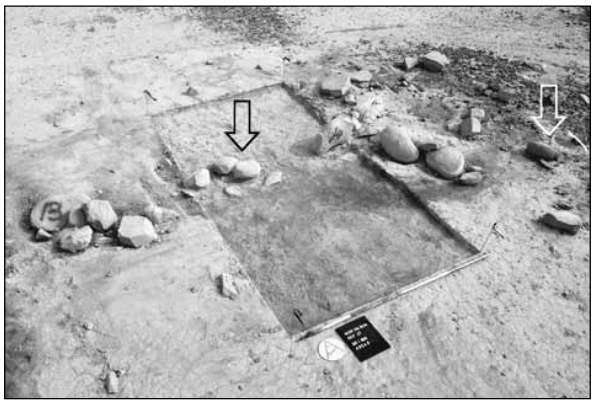
19. Barrage 1: Thamudic inscription found at the edge of Area 3 (looking north-east).

can be regarded as later additions or modifications. Supporting this interpretation is the structure of wall segment 4 / 5 where another *in situ* Thamudic inscription occurred. Here again, a two-phase structure similar to Area 5 was confirmed (**Fig. 22**). These observations suggest that the two inscribed slabs were incorporated into the wall during the course of *ad hoc* maintenance work during the first millennium AD. or later, indicating re-use of a much older water catchment system.

Area 6

The excavation in Area 6 examined the archaeological context of a notched and grooved stone weight that was exposed near the north-east end of the barrage. The excavation confirmed that it was among the remnants of the washed-out barrage wall (**Figs. 23 and 32: 4**). In addition, a halved stone weight was found outside the excavation area, at the very end of the barrage wall (**Figs. 24 and 33: 1**). There is little doubt that this artifact also derived from the washed-out wall.

22. Barrage 1: Thamudic inscription incorporated into wall segment 4 / 5 (looking north-east).



23. Barrage 1: Area 6 (looking north-east).

24. Barrage 1: halved stone weight found beside Area 6 (looking south-east).

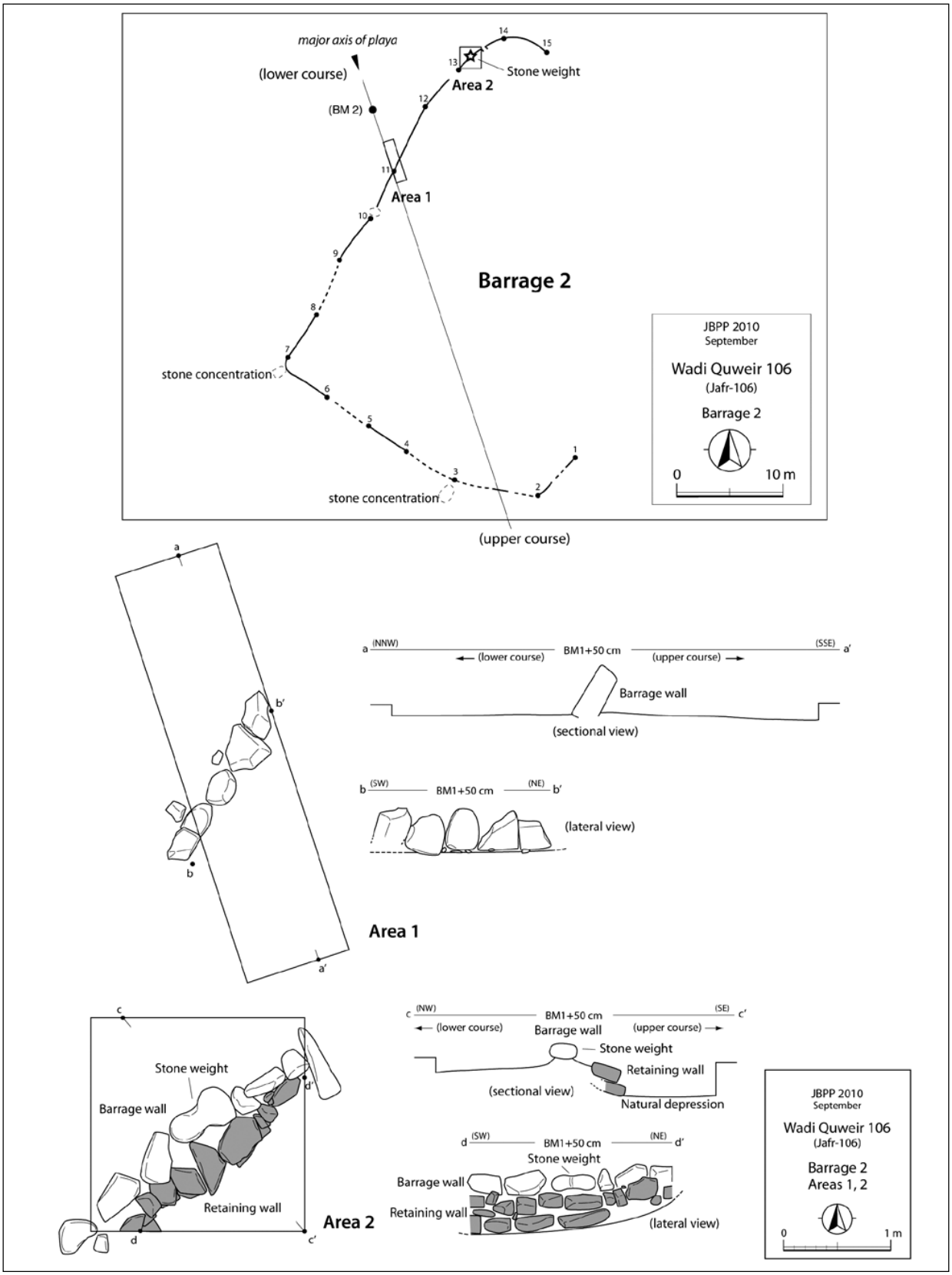
In contrast to the south-west end, the north-east end of the barrage was not equipped with a reinforcement wall to protect against the strong water pressure. As noted above, this is probably because it was higher in relative elevation and therefore subject to less pressure. Presumably, it is for the same reason that this part of the barrage wall was less substantially constructed. We can argue that such structural deficiencies were exposed by a wash-out.

Excavation of Barrage 2

Barrage 2 is situated *ca*. 130m north of Barrage 1, near the present outlet of the playa (**Fig. 4**). It deviates slightly from the shorter axis of the playa, being oriented to the south-east. The barrage wall was L-shaped in general plan, measuring *ca*. 74m in total length and *ca*. 0.4-0.5m in preserved height (**Figs. 25, 26 and 27**). Unlike Barrage 1, this barrage had neither a protruding reinforcement wall nor any other additional wall.

Area 1

The excavation at Area 1 was intended to clarify the structure of an upright slab wall that characterizes the central part of the barrage. The excavation showed that all construction material was placed directly on the playa surface without any foundations or support to the rear (**Figs. 25, 26, 27 and 28**). The wall itself was carefully constructed so as not to leave a significant gap between any two adjacent stones, but no clear evidence for clay mortar was found. This was also the case with Barrage 1 and the other parts



25. Barrage 2: plan and sections / elevations.

26. Barrage 2: general view (looking west).

27. Barrage 2: general view (looking south-west).

28. Barrage 2: Area 1 (looking north).

of Barrage 2, suggesting that it was not always essential for these barrages to be perfectly waterproof. However, most of the construction materials were placed at a slight angle, suggesting that the wall was constructed to withstand a degree of water pressure against it.

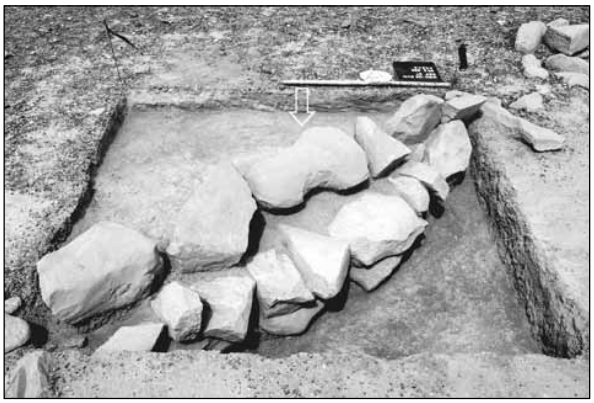
Area 2

This excavation area examined the archaeological context of a bilaterally notched stone weight that was partly exposed near the north-eastern end of the barrage (**Figs. 25 and 29**). Excavation confirmed that this diagnostic artifact was incorporated into the wall segment 13 / 14 at the time of its initial construction and can therefore be regarded as a chronological indicator for the barrage.

Another notable discovery was a small masonry wall constructed in a shallow depression *ca*. 0.7m deep. Interestingly, it was not located immediately under the barrage wall but was slightly offset. This suggests that it was probably added as a retaining wall to protect against erosion than as a foundation for the barrage wall itself. This feature was found only in the vicinity of the braided channel of the wadi; no parallel examples were identified elsewhere at Barrage 2 or at Barrage 1. It is therefore possible that the small depression represents the remnants of an earlier braided channel that pre-dates the construction of Barrage 2. If this is the case, the retaining wall may also have functioned as a reinforcing wall to help bridge the natural depression. Either way, this possible trace of an earlier braided channel is highly significant in the sense that it provides valuable insights into the formation process of the Wādī Ghuwayr barrage system.

Surrounding Small Features

In addition to the two barrages described above, we located two small stone concentrations on the west bank of the little wadi that drains out of the playa (**Fig. 4**). Both features included a pillar base analogous to the finds from Barrage 1.



29. Barrage 2: stone weight incorporated into the barrage wall of Area 2 (looking north).

Stone Concentration 1

This small feature, *ca*. 1m by *ca*. 1.5m in area, was located *ca*. 350m north-west of Barrage 2 (**Fig. 4**). It contained a few dozen small limestone cobbles, most of which lay on the present ground surface (**Fig. 30**). The date and function of this nondescript feature is unknown, but a relatively later date seems likely in view of its stratigraphic position. The stone concentration included a large pillar base comparable to that from Area 2 of Barrage 1 (**Fig. 34: 3**). The contextual correlation between the feature and the pillar base remains obscure, but there is little doubt that the artifact itself belongs to the same chronological horizon as the parallel example from Barrage 1. The occurrence of this diagnostic artifact near the material source is suggestive of on-site production.

Stone Concentration 2

This stone concentration was located *ca*. 200m north-west of stone concentration 1 (**Fig. 4**). A few dozen limestone cobbles *ca*. 20-40cm long were scattered across an ill-defined area measuring *ca*. 5m by *ca*. 3m (**Fig. 31**). Again, no reliable chronological indicator was obtained. A halved pillar base was found on the modern ground surface *ca*. 10m north of the main stone concentration (**Fig. 34: 4**). Although a contextual association between the artifact and stone concentration cannot be demonstrated, the fact it was found in close proximity to this possible source material hints at on-site production, as suggested above.

Small Finds

Small finds from the open-air barrage site were understandably very scarce, being limited to ten limestone artifacts, four Thamudic inscriptions (including the two seemingly *in situ* finds described above), a small number of undiagnostic flint flakes and nodules, and several Arabic graffiti. Since the latter three groups can be regarded as later additions or stray finds, the following description focuses on the limestone artifacts only.

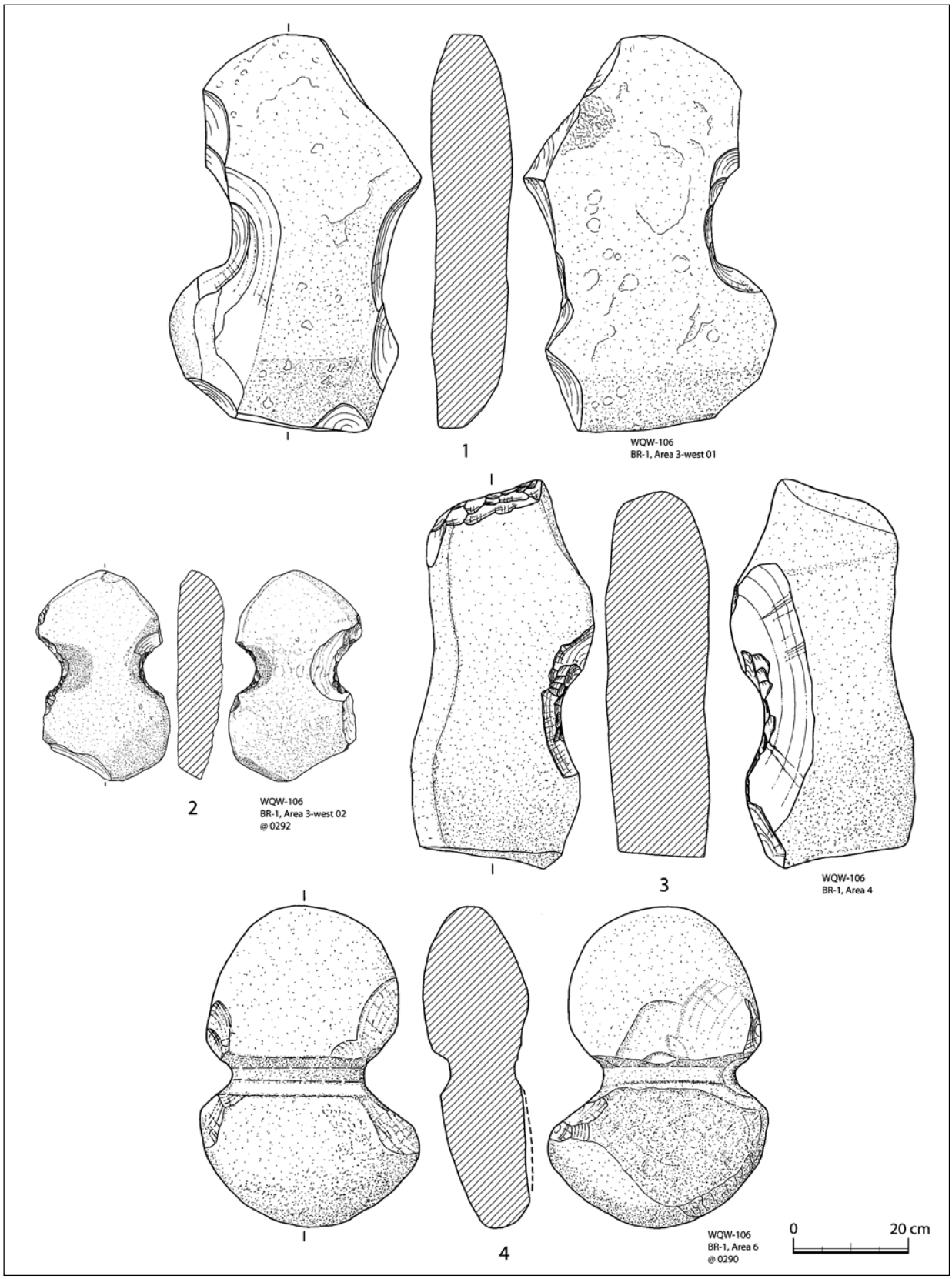
30. Surrounding small features: stone concentration 1 (looking north-west).

31. Surrounding small features: stone concentration 2 (looking south-east).

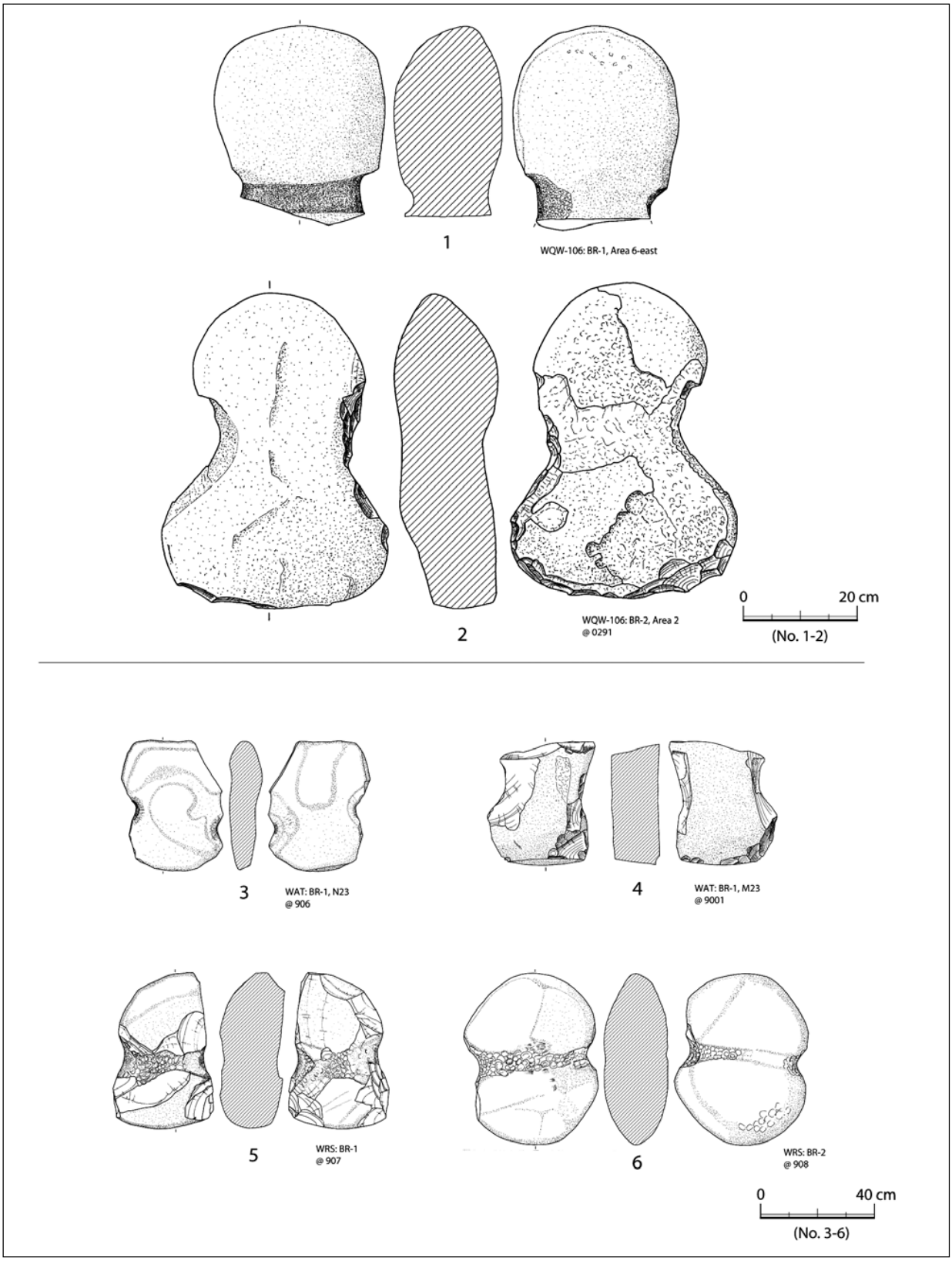
Stone Weights

The two barrages yielded a total of six bilaterally notched and / or bifacially grooved stone weights (**Figs. 32 and 33**). Five occurred at Barrage 1 (**Figs. 32: 1-4, 33: 1**) and the remaining example at Barrage 2 (**Fig. 33: 2**). In terms of context, three were found incorporated into the wall itself and can therefore be regarded as roughly contemporary with the barrages (**Figs. 32: 3-4, 33: 2**). The other three were recovered as stray finds, but there is little doubt that they originally were components of a nearby wall segment (**Figs. 32: 1-2, 33: 1**).

All six of the stone weights were made of relatively flat limestone cobbles or boulders. As already noted, suitable raw material can be still be found in the wadi bed a few hundred meters downstream of the playa. There is a strong possibility that the stone weights were produced at the material source and brought to the barrages. Large examples more than 50cm long (*ca*. 50-60kg in weight) were predominant, but a smaller example *ca*. 35cm long (*ca*. 10kg in weight) was also recovered. In general, they were violin-shaped, being characterized by a pair of lateral notches. A few examples had a pair of grooves connecting the two notches.



32. Stone weights: Wādī Ghuwayr 106.



33. Stone weights: Wādī Ghuwayr 106 (nos 1-2), Wādī Abū Ṭulayḥa (nos 3-4) and Wādī ar-Ruwayshid ash-Sharqī (nos 5-6).

Similar artifacts have been found at PPNB barrages and outposts in the western Jafr basin (**Fig. 33: 3-6**). It appears that the finds from Wādī Ghuwayr 106 are of a similar nature and age. Three of the six stone weights from Wādī Ghuwayr 106 occurred in and around the reinforcement wall of Barrage 1. It is possible that they were produced as good luck talismans, being incorporated into the key wall as ritual objects intended to secure the safety and longevity of the barrage. An alternative interpretation is that they were in some way associated with construction of the barrage and then subsequently re-used as construction material. The former interpretation seems more likely in view of their limited distribution, but further investigation is needed to confirm how these unique artifacts were used. Either way, the incorporation of a large stone weight into the key wall is a common feature of Jafr PPNB barrages (Fujii 2007b: Fig. 16, 2007c: Fig. 9, n.d.a) and may well have been the norm. In this sense, we can argue that the Wādī Ghuwayr barrage system belongs to the same cultural horizon.

Pillar Bases

A total of four pillar bases were recovered, two as more or less *in situ* finds in Area 2 of Barrage 1 (**Fig. 34: 1-2**) and the other two in association with the stone concentrations (**Fig. 34: 3-4**). All were made of an undressed or part-dressed limestone slab, *ca*. 40-50cm long and *ca*. 30-50kg in weight, and each had a small concavity, *ca*. 2-3cm deep and *ca*. 7-8cm in diameter, roughly in the centre. Other modifications are rare, being limited to rough trimming around the edges.

It is most unlikely that these pillar bases were used for their original purpose in the context of the barrages, because the *in situ* find from Area 2 of Barrage 1 was placed on edge (**Fig. 13**). It is also unlikely that they were carried in from a nearby settlement and incorporated into the barrage walls as re-used construction materials, primarily because no settlements are known in the immediate vicinity. The PPNB outpost of Wādī Ghuwayr 17 (Fujii *et al*. this volume) is one possible exception, but it seems improbable that the builders of the barrage would have taken the trouble to carry such heavy objects over *ca*. 6km. In view of the proximity to suitable source material and the absence of a neighboring settlement, it is more likely that – as with the stone weights – the four pillar bases were produced near the wadi, with only two of them being brought up the barrage. Our tentative interpretation is that they were produced as ritual objects from the beginning, but further investigation is needed to validate this assumption.

Similar objects have been found at the PPNB outposts of Wādī Ghuwayr 17 (Fujii *et al*. this volume) and Wādī Abū Ṭulayḥa (e.g. Fujii 2007a: Fig. 30). Our recent re-examination of Barrage 1 of Wādī Abū Ṭulayḥa also recovered two comparable examples (**Fig. 34: 5-6**). There is little doubt that the finds from the Wādī Ghuwayr barrage system are of similar date.

Summary and Discussion

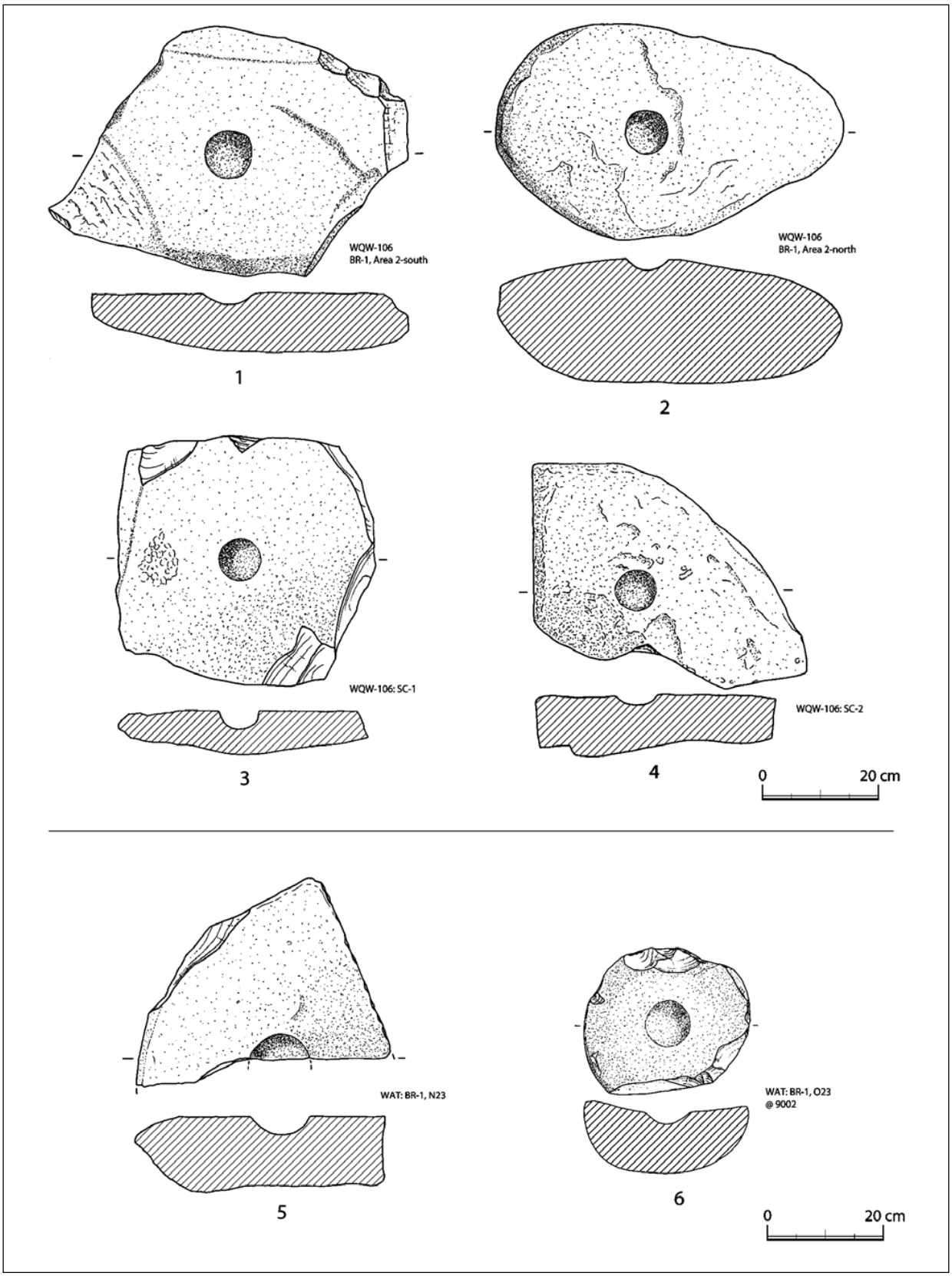
The excavation demonstrated that the unique, open-air site of Wādī Ghuwayr 106 represents a third example of a Jafr PPNB barrage system, after Wādī Abū Ṭulayḥa and Wādī ar-Ruwayshid ash-Sharqī (Fujii 2007b, 2007c, 2010a). The following discussion briefly considers the results of the investigation.

Date

Ample evidence supports the attribution of the two barrages to the PPNB period, including the *in situ* occurrence of several diagnostic finds. We should note that similar objects were found at the nearby PPNB outpost of Wādī Ghuwayr 17 as well as at Wādī Abū Ṭulayḥa (Fujii *et al*. this volume). The occurrence of analogous limestone products at a well-dated settlement in the same area deserves special emphasis. Another line of evidence is the existence of the semi-circular, protruding reinforcement wall attached to the central part of Barrage 1. Similar features have been identified at Barrages 1 and 2 of Wādī Abū Ṭulayḥa (Fujii 2007b: Figs. 9, 22, 2007c: Figs. 7, 9) and Barrage 2 of Wādī ar-Ruwayshid ash-Sharqī (Fujii 2007b: Fig. 30, 2007c: Fig. 9, 12). Although no C14 data are available from the open-air barrage sites, there is little doubt that the Wādī Ghuwayr barrage system dates back to the PPNB.

Function

That the two elongated, stone wall alignments at Wādī Ghuwayr 106 were used as water



34: Pillar bases: Wādī Ghuwayr 106 (nos 1-4) and Wādī Abū Ṭulayḥa (nos 5-6).

catchment facilities seems certain: (1) because both occupy the lower half of the elongated playa, (2) because they were constructed across the dry lake bed and (3) because they were slightly incurved in the direction of the upper course of the drainage. Only water catchment facilities could be expected to have such characteristics.

Regarding their function, we should note that not only were they constructed on permeable terrain - being designed to form an extensive, shallow flooded area - they were also low in height and far from watertight. It is therefore rather unlikely that they served as dams in the strict sense of the word. Instead, it seems more reasonable to assume that they were used to regulate seasonal runoff, thereby promoting the impregnation or saturation of the ground. In this sense, they can be defined as basin-irrigation barrages, as suggested for the similar examples known from the western Jafr basin. One should also consider the possibility that such a system could supply additional water and / or anthropogenic grazing for pastoral stock, thereby facilitating agro-pastoral adaptations on the desert landscape.

Conditions for the Location of Jafr PPNB Barrage Systems

The investigation at Wādī Ghuwayr 106 has shed new light on the locational requirements of Jafr PPNB barrage systems. First, any two adjacent features of the playa system are connected by a braided or flat channel, thus forming a semi-open drainage system. Second, only the lowest playa is associated with the barrage system; the upper playas are left untouched. Third, the two barrages are located at the bottom half of the lowest playa. It follows, therefore, that the Wādī Ghuwayr barrage system occupies the lower half of the lowest feature of the semi-open playa system.

The reason for this is easy to understand, given that such a location makes it possible to create an extensive flooded area. Otherwise, one couldn't take full advantage of the topographical potential of the playa. The reason for the first and second requirements (see above) is difficult to specify, but we can argue that in comparison with upper or closed features, the lowest feature of a semi-open playa system is easier to feed and drain. As a result, it would be less subject to salt damage, an unavoidable problem besetting dryland irrigated agriculture. The two other barrage systems known so far in the Jafr basin are likewise located on the lowest playa(s) of a semi-open drainage system; no barrages have been identified on the upper playas of the same system, nor on the numerous closed playas of the basin. This indicates that the Jafr PPNB barrage system gave as much priority to convenience of drainage as to inputs of surface run-off water.

When these new observations are combined with our previous knowledge, the conditions for location of the Jafr PPNB barrage systems can be summarized as follows. First, available surface run-off water had to be easy to control and, therefore, moderate in volume. It is precisely for this reason that a side stream incorporating a playa system was preferred over major tributaries or the main stream of a wadi. Second, a sufficient quantity of large and heavy building material capable of withstanding strong water pressure had to be close at hand. Numerous areas fulfilling the first condition fail to meet the second, although it should be added that Jafr barrage systems occasionally substituted an earth bank for a stone-built wall, as evidenced at Barrage 2 of Wādī ar-Ruwayshid ash-Sharqī (Fujii 2010a). Third, the side wadi needed to have cultivable soil in its bed; a gentle stream associated with a playa system would have been preferable in this sense. Fourth, the terrain to be flooded not only had to be flat and extensive, but also permeable as well as water-retentive. This is because basin-irrigation depends on infiltration of captured water into the subsoil and its subsequent retention. It is probably for this reason that a silty playa rather than a rocky or sandy depression was preferred for the Jafr barrage systems. The final requirement was that inflowing surface water should dampen the ground and, at the same time, wash through it to a certain extent to prevent salinization by capillary action. For this reason, semi-open playa systems were preferred over closed ones and, within them, the lowest features were preferable to upper ones.

It is unlikely that the barrage constructors struggled to reach this conclusion. This is because present vegetation is also concentrated on the lowest component(s) of semi-open playa systems, being scarce on upper or closed features even after heavy rain. The truth may be that they simply followed the distribution of

contemporary vegetation, and followed the example of existing vernal pools and their seasonal biotic systems. This behavior should be considered an excellent example of early sustainable agricultural practices based on a full understanding of environmental constraints. It is particularly noteworthy that the Jafr PPNB barrage systems, including that of Wādī Ghuwayr 106, were constructed to reconcile the two contradictory requirements of dryland agriculture, namely, irrigation and soil desalinization. This interpretation reasonably explains why there was no requirement for the Jafr PPNB barrages to be completely watertight.

Correlation Between the Two Barrages

Another point of interest concerns the functional correlation between the two adjacent barrages. A key aspect of this question is the structural difference between the two. As noted above, Barrage 1 was equipped with a protruding reinforcement wall and short additional wall, in addition to the slightly incurved main wall. In contrast, Barrage 2 was less strengthened in structural terms, being equipped with just the L-shaped main wall. This is probably because Barrage 2 was located downstream of Barrage 1 and was therefore subject to less water pressure. Viewed in this light, Barrage 2 might be a later addition to Barrage 1, although the occurrence of the diagnostic stone weight indicates that the episode still falls within the time range of the PPNB period.

However, the construction order suggested above seems counter-intuitive, because Barrage 2 has a considerable advantage over Barrage 1 in terms of the availability of building material as well as the scale of the supposed flooding area. A key to this enigma is the trace of a braided channel revealed at Area 2 of Barrage 2, which implies that the original playa was smaller in dimensions than the present one. It is therefore possible that Barrage 1 was constructed at the lower edge of the original playa. Following the same line of argument, Barrage 2 might then have been added at a later date, taking advantage of the downstream expansion of the playa resulting from the construction of Barrage 1.

Were the two barrages used in combination? This question is essential to understanding the functioning of the Jafr PPNB barrage system. We can only argue that they formed a barrage 'system' if they were used together to increase the productivity of basin-irrigated agriculture. It is however conceivable that upper barrage was affected by salinization, which in turn prompted the construction of a new barrage on less saline ground formed at the lower edge of the now expanded playa. If this were the case, it would follow that downstream renewal is the most important aspect of the Jafr PPNB barrage system. The latter interpretation seems more likely in view of the site formation history of the contemporary outpost of Wādī Abū Ṭulayḥa (Fujii 2009 : 206), which suggests cycles of repeated use and abandonment over a long period of time. This tentative interpretation cautions against overestimation of the intensity and long-term stability of the Jafr Pastoral Neolithic, and deserves further examination.

Correlation with Wādī Ghuwayr 17

The next question concerns the community who operated the barrage system; who exploited and managed this basin-irrigated agricultural field in the middle of a flint strewn desert? The PPNB agro-pastoral outpost of Wādī Ghuwayr 17 (Fujii *et al*. this volume) is the nearest known encampment, although it is *ca*. 6km from the barrage system. Its artifacts are however both chronologically and functionally consistent with the period and function of the barrage system. For example, it yielded a large number of grinding implements and serrated blades, probably sickle elements, which together reflect crop harvesting and processing. Since no suitable arable land was available close to the outpost, there is a good likelihood that the barrage system functioned to support its agro-pastoral activities.

A similar relationship has been proposed for the barrage system of Wādī ar-Ruwayshid ash-Sharqī and the contemporary outpost of Wādī Abū Ṭulayḥa (Fujii 2007b, 2007c, 2010b, n.d.a). Thus, the combination of an agro-pastoral outpost with an enclave agricultural field that incorporated water catchment and pasturage may have been a common feature of the Jafr Pastoral PPNB. Quite why these two essential site components appear to have been so widely separated is difficult to explain, but it is conceivable that this was the result of differences in their respective functional requirements. As noted above,

the Jafr PPNB barrage systems were based on quite tightly defined topographic and hydrological parameters. The location of a pastoral outpost would have been governed by subsistence considerations that emphasized other factors, such as proximity to hunting areas and flint sources, and the availability of drinking water, fuel and shelter. Considered in this light, it is unsurprising that the barrage system and its associated settlement were slightly displaced from each other. Needless to say, in both the western Jafr region of Wādī Abū Ṭulayḥa and the remote uplands of the eastern Wādī Ghuwayr people found a way to interweave both components into a viable system. We may argue that such flexibility was essential to survival in these arid peripheries.

Correlation with Wādī Abū Ṭulayḥa

To begin with, we should recall that the outpost of Wādī Ghuwayr 17 consisted only of a single structural complex, and that this had much in common with Complex I at Wādī Abū Ṭulayḥa (Fujii *et al*. this volume). It follows that Wādī Ghuwayr 17 is a single-phase outpost established at more or less the same time as Complex I of Wādī Abū Ṭulayḥa, that is, at the very end of the MPPNB or very beginning of the LPPNB (Fujii 2009: 203). This in turn means that the nearby barrage system would have been used for that limited time only. The reason why the two Wādī Ghuwayr sites were established at this time is of particular interest. Pertinent in this regard is the formation process noted at the outpost of Wādī Abū Ṭulayḥa. We have previously argued that the period represented by Complex I witnessed resettlement. This proposes reoccupation of the arid region after a short hiatus, an episode that was associated with the introduction of new technology in the form of the barrage system (Fujii 2008: 475-477). This interpretation – the barrage-supported pastoral reoccupation hypothesis – fits well with the brief appearance of the Wādī Ghuwayr site complex.

The Wādī Ghuwayr site complex sheds new light on the processes of pastoral nomadization suggested at Wādī Abū Ṭulayḥa (Fujii n.d.b). We have already argued that the Jafr PPNB barrage system may have been renewed downstream as a result of surface soil salinization. However, continual downstream renewal would eventually have become incompatible with the desired location at the lower edge of the lowest feature of a semi-open playa system, unless the playa itself continued to expand downstream as a result of barrage construction. This limitation may explain why the barrage-supported agro-pastoral outpost of Wādī Ghuwayr 17 was so short-lived, and why the occupational history of the other known barrage-supported outpost (i.e. Wādī Abū Ṭulayḥa) appears to have been occasionally interrupted and renewed (Fujii 2009: 206). Assuming that remote outposts must have been periodically abandoned, we may argue that Jafr PPNB barrage-backed transhumance had the potential for pastoral nomadization from its earliest stages, regardless of the climatic deterioration suggested at Wādī Abū Ṭulayḥa (Fujii 2009: 206-207, n.d.b).

Concluding Remarks

The investigation at Wādī Ghuwayr 106 has not only identified a third example of a PPNB barrage system, but has also shed new light on the unique locational requirements of such systems. We are now able to explain the reason why the Jafr PPNB basin-irrigation barrage focused on the lowest feature of a semi-open playa system, why it was renewed downstream to rejuvenate the barrage system, and why it was likely to be separated from its operating body or populace to maintain an agricultural field. There is no doubt that the barrage system was a key supporting component of the Jafr PPNB pastoral occupation. Personal communications from colleagues and local inhabitants alike suggest that similar systems occur up to and beyond the Saudi Arabian border. If this is the case, it follows that the Jafr PPNB barrage phenomenon will broaden our understanding of the process of Neolithization in the northern half of the Arabian Peninsula as well as that of pastoral nomadization in southern Jordan. This makes sense when one considers that exploitation of surface run-off water was an essential pre-requisite for full-fledged movement into the arid peripheries (Mithen 2010: 5256-5266). The next field season, scheduled for the summer of 2011, will continue efforts towards gaining a more comprehensive understanding of the Jafr Pastoral Neolithic.

Acknowledgements

Our research project is financially supported

by the Japan Society for the Promotion of Science (Grant no. 17063004). We would like to express our sincerest gratitude to Dr Ziad al-Saad, Director General of the Department of Antiquities of Jordan, for his kind co-operation. We are also deeply indebted to Dr Mohammad Tarawneh, al-Hussein bin Talal University, and Mr Amer Bdour, Ma'an office of the Department, whose careful support enabled us to get through this difficult field season. Our thanks also go to Mr Hani Falahat, representative of the Department, staff members Kazuyoshi Nagaya, Kae Suzuki, and Hitomi Kimura, and local workers. Their efforts in the remote wilderness were essential to the success of this field season.

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THE INTERNATIONAL AL-KHUBTHA TOMBS PROJECT (IKTP): PRELIMINARY REPORT ON THE 2010 SEASON

Lucy Wadeson

Acknowledgements

The first field season of the International al-Khubtha Tombs Project (IKTP) at Petra took place between September 5th and 23rd, 2010. The project was generously funded by the German-French research project "Early Petra", directed by Prof Michel Mouton (Paris) and Prof Stephan G. Schmid (Berlin) and sponsored by the German Research Association (DFG), the Excellence Cluster TOPOI at the Humboldt University, Berlin and the Association for the Understanding of Ancient Cultures (AUAC).

We would like to thank the Director General of the Department of Antiquities of the Hashemite Kingdom of Jordan, Dr Ziad al-Saad, for granting the permit to work in Petra (Permit No. 2010/64) and also the Commissioner of the Petra Archaeological Park, Dr Emad Hijazeen, for his support of the project. The Department of Antiquities representative was Mohammad Salameen, whose assistance was most appreciated. I would also like to express thanks to Tahani Salhi, Director of Cultural Resources, and Haroun Amarat for their help during the duration of the project. Dr Carol Palmer, Nadja Qaisi and Alison Damick (British Institute/CBRL, Amman) and Dr Christopher Tuttle (ACOR, Amman) were most supportive of the project and I am grateful for their advice and help concerning logistical matters. In addition, artefact cleaning was provided courtesy of the ACOR Conservation Cooperative.

IKTP 2010 was directed by Dr Lucy Wadeson while holding a CBRL Visiting Research Fellowship and the G.A. Wainwright Postdoctoral Fellowship at the University of Oxford. The project was kindly initiated and organised by Prof Stephan G. Schmid, to whom we owe special thanks for making this project possible. The team included Marco Dehner (Berlin) and Maxie Haufe (Berlin) and up to eight workmen from the Bdool tribe. During the team's stay at Nazzal's Camp in Petra, Suleiman Mohammad el-Bdool, his wife Aziza, and Ali Khalaf el-Bdool proved an excellent camp team.

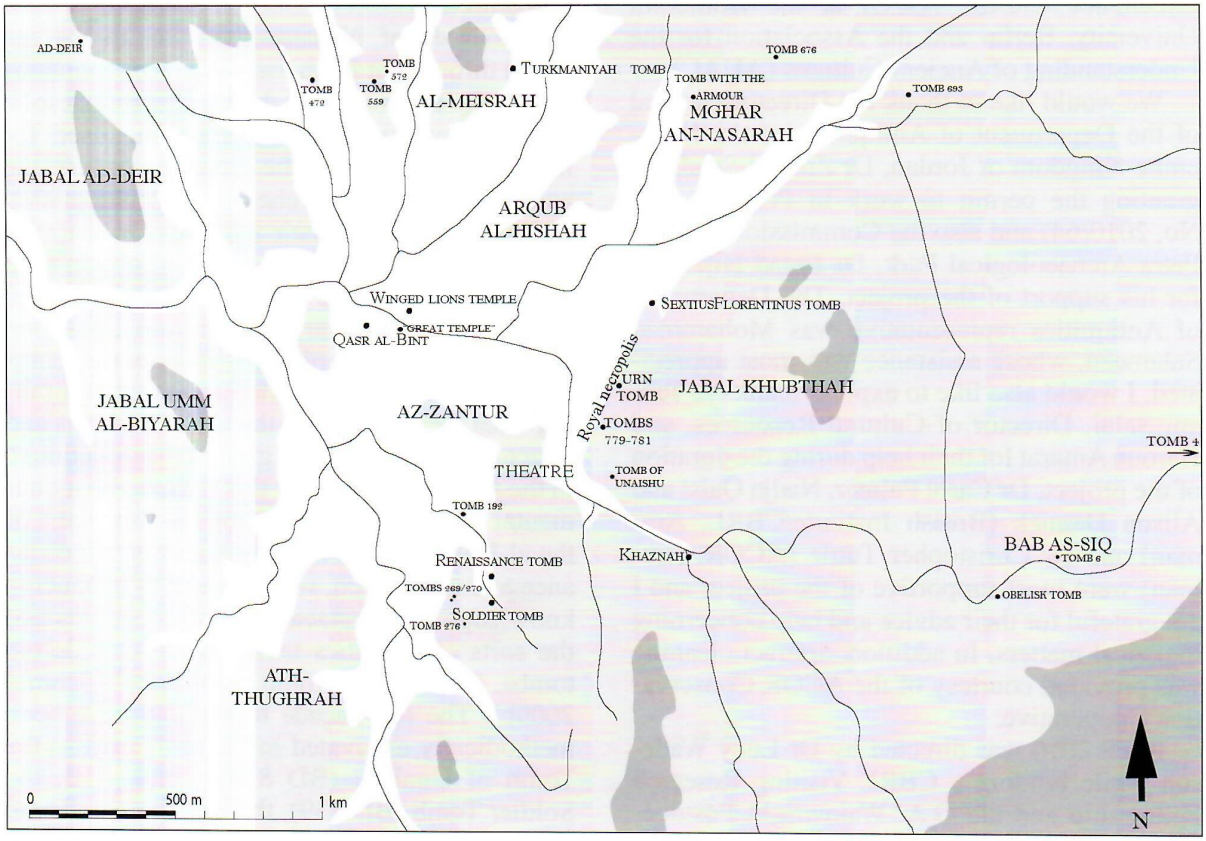
Introduction

Hundreds of Nabataean façade tombs are found throughout Petra, carved in the mountains and wadis that surround the city centre. Despite having been looted in the past and used for habitation purposes in the previous century, the author's recent comprehensive documentation and examination of their interior plans in relation to their façades has shed new light on their chronology, the little known Nabataean burial practices, and funerary architecture (Wadeson 2010a, 2010b). Nevertheless, many of the tombs have unclear floors and exterior platforms, limiting what we know about the form of burials and structures carved into the ground that functioned in the funerary ritual. For this reason, the monumental Tombs 779 and 781[1] on the west flank of the al-Khubtha mountain were chosen for clearance and excavation, with the aim of enhancing knowledge of Nabataean burial procedures and the sorts of activities taking place outside the tombs, in so-called 'tomb complexes' (Schmid 2009b). The few façade tombs that have been methodically excavated in the past, such as the Tomb of Unaishu (BD 813), Tomb 64B, the Soldier Tomb (BD 239), the Renaissance Tomb (BD 229) and the tombs beneath the al-Khasneh (62D-E), yielded important information for

1. The numbering system of Brünnow and von Domaszewski (1904) is retained in the author's study of the tombs.

our understanding of Nabataean funerary customs (Zayadine 1974: 142-50, Zayadine 1982: 365-93; Huguenot *et al.* 2004: 204-206; Farajat and Nawafleh 2005: 373-93; Schmid 2009a: 95-105). Thus, we were confident that the IKT project would produce significant results that would advance the field of Nabataean funerary archaeology.

The western flank of al-Khubtha is well-known for having some of the largest and most elaborate of the façade tombs (the so-called 'Royal Tombs'), including the Urn Tomb, the Corinthian Tomb, the Palace Tomb, the Tomb of Unaishu and a large number of Hegr and Double Pylon tombs, which are the most complex types among the non-classical façade tombs (Wadeson 2010a: 51-2).[2] This necropolis lines the Wādī Mūsā as one exits the Sīq and proceeds north, and has excellent visibility from the city centre and the Theatre area (**Figs. 1-2**). Most of the al-Khubtha tombs lie on an east-west alignment and their façades face west. Tombs 779 and 781 (Brünnow and von Domaszewski 1904: 398-99) are located on a terrace to the south of the Urn Tomb and almost opposite the Theatre (**Figs. 3-4**). They appear to form a complex with Tomb 780, which lies between them, yet this tomb is unfinished and therefore was not the focus of any detailed work in the first season of this project. Tombs 779 and 781 were chosen for clearance and excavation since they both have interior chambers notable for their size, arrangement, tooling, arcosolia burials and decorative elements, and large platforms in front of their façades with traces of accompanying structures forming 'tomb complexes'. Furthermore, Tomb 779 has a façade of the Double Pylon type, while Tomb 781 is a Hegr tomb, meaning that any datable material excavated from the tombs could throw interesting light on the relative chronology of the different façade types at Petra (Wadeson 2010a: 48-69, 2011a).



1. Map of Petra (after I. Sachet).

2. For example, among the 35 façade tombs recorded in this area in the 'Funerary Topography of Petra Project' (FTPP) directed by the author, 29 belong to the Complex Classical, Hegr and Double Pylon types.

2. Tombs at the base of al-Khubtha, Petra (L. Wadeson).

Fieldwork Strategy

In the 2010 season of excavation we divided the interior and exterior areas of Tombs 779 and 781 into sectors, according to the following criteria (**Fig. 5**):

Sector A – the area outside the façade of Tomb 779, delineated by the enclosing rock walls, and including the small chamber in the north wall and the recessed area to the west.

Sector B – the area outside the façade of Tomb 781, delineated by the enclosing rock walls on the southern, western and northern sides.

Sector C – the area behind the façade of Tomb 781, i.e. the interior of the tomb.

Sector D – the area behind the façade of Tomb 779, i.e. the interior of the tomb.

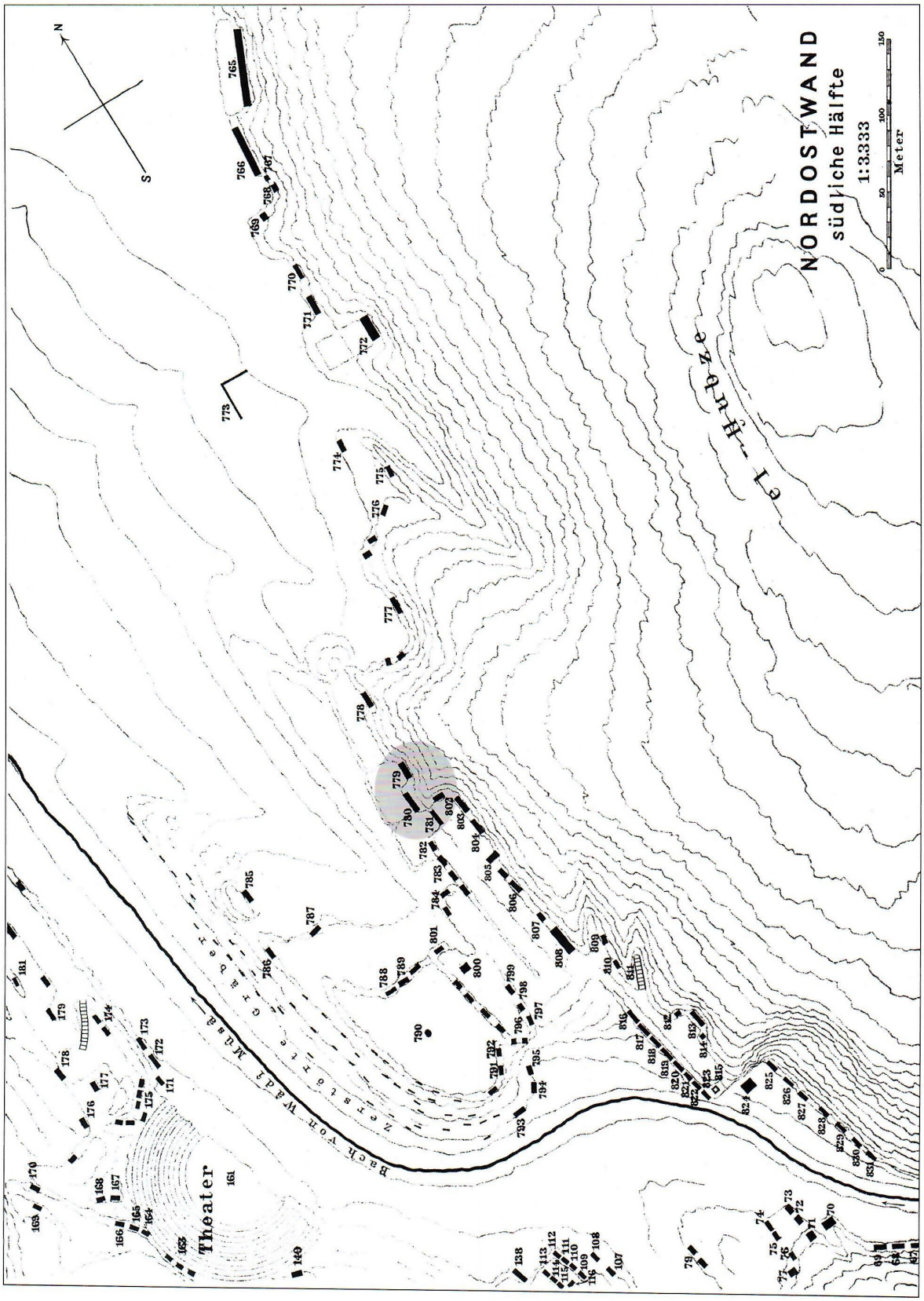
Within Sector A, five trenches were opened: Trenches 1, 7 and 10 covered the north-eastern, north-western and south-western parts of the exterior platform; Trench 8 was inside the small rock-cut chamber to the north-west of the platform; and Trench 2 lay in the recessed area to the west of the latter chamber. In Sector B, Trenches 3 and 5 were opened on the western edge of the platform. Trench 4 was opened in Sector C, comprising the grave cut inside the arcosolium in the back of the subsidiary chamber. Inside Sector D, Trench 6 corresponded to the arcosolium grave in the back wall of the chamber, Trench 9 was located across the threshold of the tomb, and Trench 11 comprised the niche cut in the south wall of the arcosolium. All trenches were completely excavated down to the surface of the rock originally worked by the Nabataeans.

Preliminary Results

Tomb 779: Exterior (Sector A)

Tomb 779 has a 7.57 m wide façade of the Double Pylon type, with two rows of crowsteps (**Fig. 4**). Above the doorway is a carved groove for an inset pediment and on either side is a window, which facilitated the carving of the interior chamber. Either side of the façade are high rock walls, enclosing a platform area in front (l. 11.30 m x w. 8.40 m). Part of the southern rock wall is in fact the northern side of Tomb 780. A small chamber is carved in the northern rock wall, and above its entrance is a carved betyl in a niche (**Fig. 6**). It is unclear whether this betyl relates to the chamber or the quarrying of the rock above, since such votives were commonly carved by stonemasons during the removal of the rock, supposedly as an act of contrition to the gods (Shaer and Aslan 2000: 105-106, Fig. 37; Shaer 2004: 403). To the west of the small chamber is a recessed area, enclosed on its west side by a high rock wall. Access to the tomb complex appears to have been from the southern side, leading from Tomb 780 (**Fig. 5**). The western edge is bound by a low rock wall and below is a sheer drop to the wadi below. Before excavation commenced, the only section of bedrock exposed was at the base of the southern wall, on the western edge (**Fig. 7**). In this area a rectangular shaped cutting was visible (Structure/ST 10), immediately at the base of the southern wall.

The clearance of the platform area was undertaken systematically with the opening of Trenches 1, 7 and 10, each of which roughly corresponded to a quarter of the platform (**Fig. 5**). Due to time constraints, the south-eastern corner was not excavated. The fill covering the bedrock was approximately 0.42 m thick in the eastern end of Trench 1 and 0.03 m thick in the western end of Trench 7, since the bedrock sloped down gradually from east to west. The material largely consisted of a reddish-brown sand with some ashy grey patches, indicating the remains of recent Bedouin fires, and inclusions of small to medium-sized stones. A large amount of pottery was recovered from these trenches, consisting of both Nabataean coarseware and fineware, with painted sherds predominantly dating to Phase 3B (AD 75 - 100) (Schmid 2000). However, modern material was found throughout, to

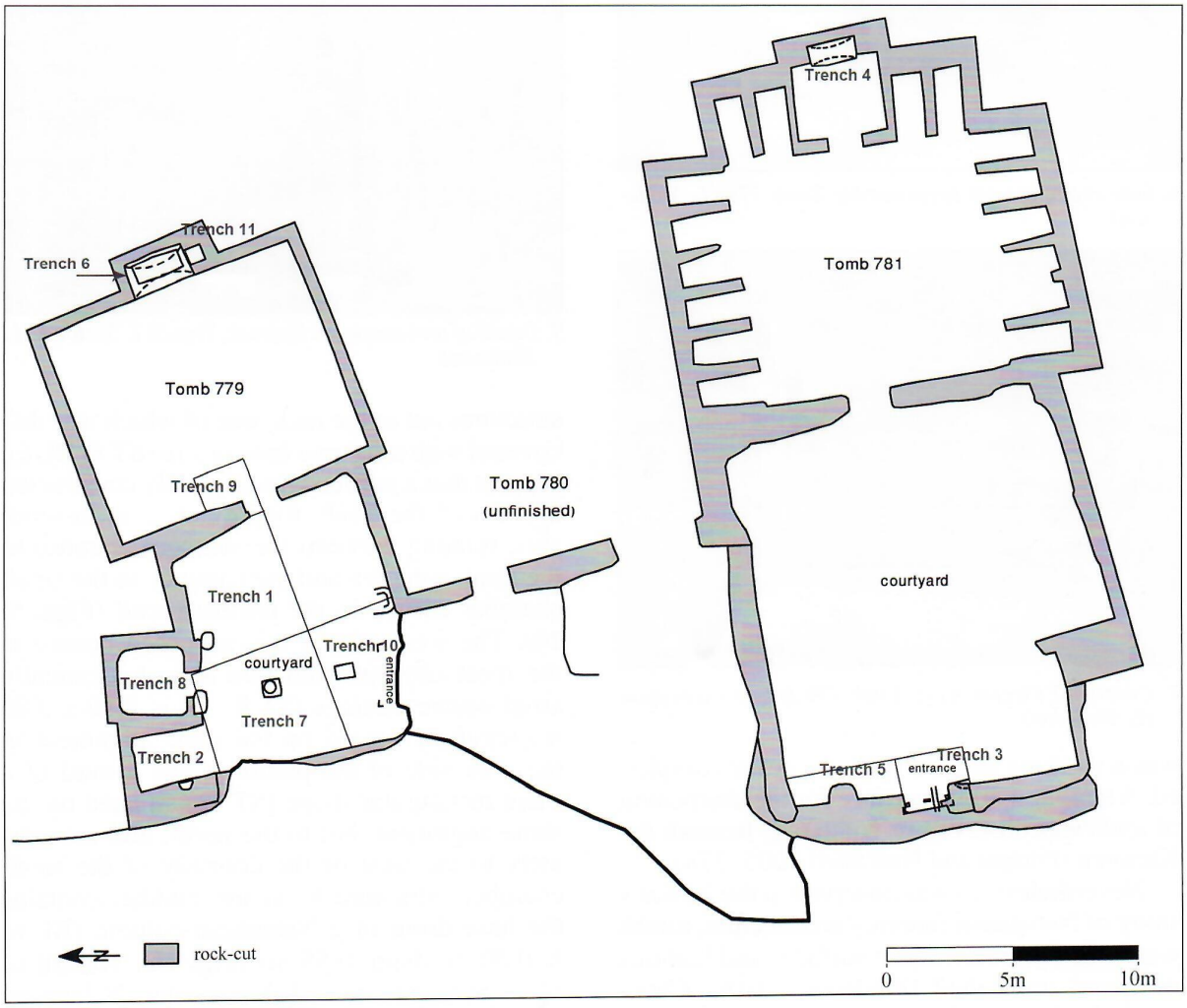


3. Tombs 779 and 781 (shaded) at the base of al-Khubtha (Brünnow and Domaszewski 1904: Pl. 19).

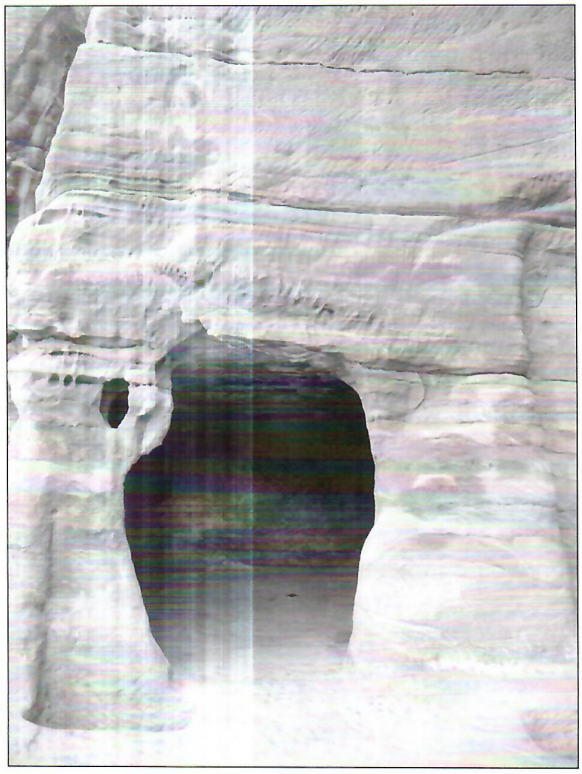
the level of the bedrock, indicating that it was a disturbed layer. Medieval material, such as pottery and ballista balls demonstrate that the area outside this tomb was re-used from antiquity to modern times. A recent *ṭābūn* (ST 1; diam.: 0.80 m; depth in centre: 0.25 m) was discovered in Trench 1, approximately 0.18 m beneath the surface.

4. Façade Tombs 779, 780 and 781 at the base of al-Khubtha, Petra (L. Wadeson).

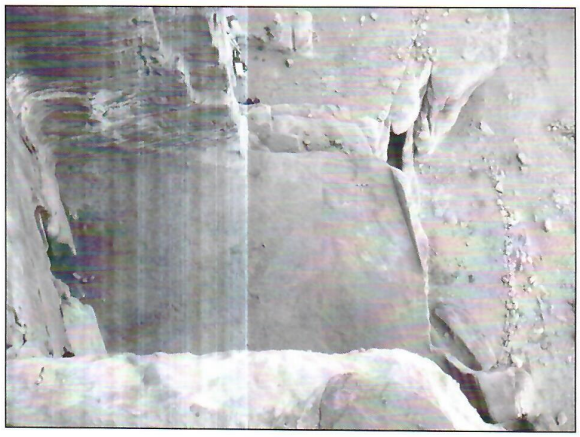
The bedrock exposed beneath Trenches 1, 7 and 10 revealed some interesting structures and features. Firstly, the entire surface is not level and has the appearance of being unfinished, with lumps and dips in the rock. In the north-eastern quarter numerous random scratching from tools are found, particularly concentrated around a small trapezoidal receptacle (0.20 x 0.40 m; c. 0.04 m deep) (**Figs. 8-9**). This may have once held water necessary for the sharpening of the tools used in the carving of the tomb, and would indicate that this part of the platform



5. Plan of Tombs 779 and 781, including trench numbers (M. Dehner and L. Wadeson).



6. Side chamber with betyl outside Tomb 779 (L. Wadeson).



7. Courtyard (Sector A) of Tomb 779 before excavation (L. Wadeson).

was a working surface that was never completed. A similar working surface for the sharpening of tools was observed in Tomb 62E beneath the Khasneh (Farajat and Nawafleh 2005: 378).

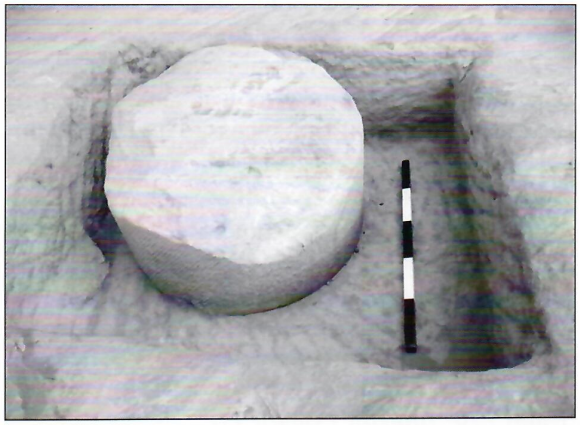
Nevertheless, as was observed in the author's study of Nabataean funerary architecture, tombs were still used even when surfaces and features remained unfinished (Wadeson 2010b: Chapter 4). In the case of Tomb 779, several regular

8. Trench 1 (Sector A) after excavation (L. Wadeson).

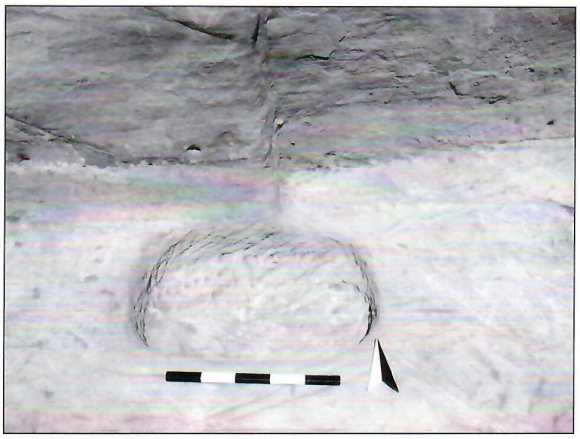
9. Detail of tool-marks on bedrock, Trench 1, Sector A (L. Wadeson).

structures cut in the rock, one of which was discovered with a column base *in situ* (ST 8; BL 8), suggest that a portico was originally constructed in front of the tomb, roughly on a north-south axis, running between the southern entrance to the tomb complex and the entrance to the small chamber carved in the northern wall (**Figs. 5, 10**). The west side of this supposed portico is the most obvious with two almost identically sized square cuttings (ST 8 – 9; c. 0.80 x 0.80 m) regularly placed on the same alignment in the west side of the platform, and a third of a more rectangular shape (ST 11) situated on the same alignment, but to the north, and immediately to the west of the doorway of the small chamber. Structure 8, in the middle, contains the base drum of a Nabataean column (BL 8; h. 0.30 m, diam. 0.55 m) (**Fig. 11**). The fill of this structure contained almost solely Nabataean fineware of Phases 3b and 3c (late first century

10. Trenches 1, 2, 7, 10 (Sector A) after excavation – courtyard of Tomb 779 (L. Wadeson).



11. Column drum in situ in Structure 8, Trench 7, Sector A (L. Wadeson).



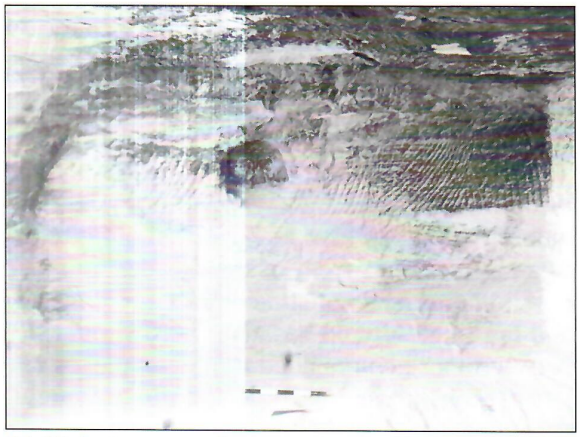
12. Structure 3, Trench 1, Sector A (L. Wadeson).

AD-early second century AD), but no modern material, suggesting it is an undisturbed part of the courtyard. Remarkably, although the depth of this cutting and that of those to the south (ST 9) and north (ST 11) are noticeably different due to the slope of the bedrock, their bases are in fact almost exactly the same height above sea level (906.62-906.67 m), which indicates they belong to the same phase and plan as foundations for the portico. The northern-most structure (ST 11) is half the length of the others and abutting the northern rock-wall, therefore it may reasonably have held a pilaster.

The east side of the portico is somewhat harder to reconstruct: the oval-shaped cutting in the north end (ST 3; 0.84 x 0.50 m), east of the entrance to the small chamber, is aligned with Structure 10 (0.58 x 0.45 m) on the southern side (see above) in the unexcavated quarter, but they present different shapes (**Figs. 5, 12**). Notably though, they are both situated beneath walls which could have supported inset structures. Porticoes seem to have been a common element of tomb complexes at Petra, and well-known examples are found accompanying the Soldier Tomb, the Urn Tomb, Tomb 4 (*al-Khān*) and the Tomb of Unaishu (Wadeson 2011b: 5-6). Not only did they give architectural order to the funerary space in front of the façades, but also possibly provided a sheltered place for gathering and feasting. Schmid has also noted similarities between these colonnaded tomb complexes and late Hellenistic and early Roman luxury architecture (Schmid 2009b: 160-61).

The small side chamber in the exterior northern wall of Tomb 779, to which the portico leads, did not take long to clean, since it was only covered by a 1.5 cm layer of sand and modern rubbish. The rock floor is uneven but contains five curious holes (c. 0.10 m diam.) carved in the southern half, the function of which remains undetermined (**Fig. 13**). The walls of this small chamber are not straight and roughly carved (w. 3.20 m, l. 3.70 m) presenting an unfinished appearance, although there is a small rounded niche in each of the lateral walls located c. 1.11-1.14 m above the rock floor (**Fig. 14**), suggesting that the chamber was in use. Small chambers lacking burial installations are common elements of tomb complexes at Petra, such as those accompanying Tomb 253 in Wādī Farasa West, Tomb 192 in Wādī Farasa and also the Turkmaniyah Tomb, according to its inscription (*CIS* II 350; McKenzie 1990: 58 n. 30, 167-68; Healey 1993: 238-42). Possible functions include a storage or food preparation area for the funerary activities

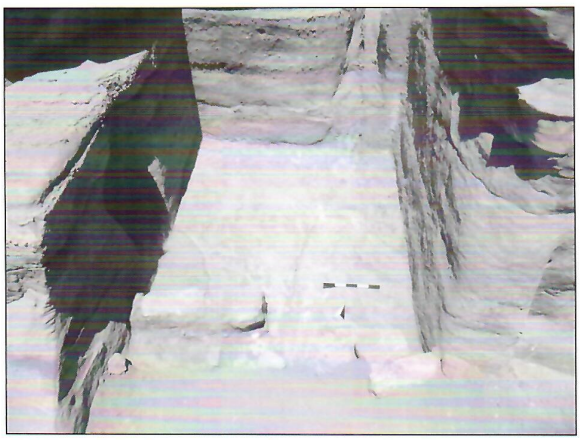
13. Floor of side chamber outside Tomb 779 (L. Wadeson).



14. Niche in west wall of side chamber outside Tomb 779 (L. Wadeson).

taking place at the tomb (Wadeson 2011b: 9).

Trench 2 in Sector A was opened in the northwest corner, in the recessed area to the west of the small chamber (**Fig. 5**). Measuring 3.50 m long by 2.40 m wide, it is bound by rock walls on the north, east and west sides and has an eroded/broken niche in the west wall. The area was filled with a thick layer (0.91 m at the north) of reddish sand that was higher in the northern end due to the debris that would have washed down from the water channel in the rock above. The water running down caused erosion in the northern rock wall and natural channels formed over time. After the removal of ca. 0.04 m of material from the southern end, the remains of a possible built wall emerged, consisting of two worked blocks lying on a thin layer of sand (**Fig. 15**). While the first 0.73 m of material in the northern end of this trench contained Nabataean, Medieval and modern findings, the last 0.20-



15. Trench 2, Sector A, with remains of wall (L. Wadeson).

0.30 m of the southern and northern ends contained exclusively Nabataean and late Roman pottery. It is therefore possible that this wall was constructed in antiquity as a means of closing the southern end of this recess. The idea of this space as a reservoir serving the tomb complex is an attractive one, given that sources of water are commonly found in funerary complexes to serve the ritual activities (Wadeson 2011b: 8). However, no remains of hydraulic mortar were noted on the walls of this recess and thus its function remains unknown.

Tomb 779: Interior (Sector D)

The burial chamber of Tomb 779 is approximately 12.2 m wide and 10.2 m long. Its walls are straight and neatly carved with fine line dressing tilted on a 45 degrees angle from the horizontal, and bands of horizontal lines below the ceiling and vertical lines down the corners. This tooling style is notably similar to that found in the Obelisk Tomb and Bāb as-Sīq Triclinium (McKenzie 1990: 44). Several 'loopholes' are carved both high and low in the walls of this chamber and the only visible burial place is the pit grave carved inside the arcosolium in the back wall (**Fig. 16**). The chamber floor is blocked with approximately 0.40 m of goat dung and sand, which became evident with the opening of Trench 9 in the threshold of the tomb. Thus, the full height of the chamber is 4.52 m. Trench 9 was connected to Trench 1 in Sector A and extended 0.70 m across the southern half of the threshold, 2.5 m inside the chamber to the north and 2.5 m to the east (**Fig. 5**). The pottery within this fill was mostly Medieval, indicating

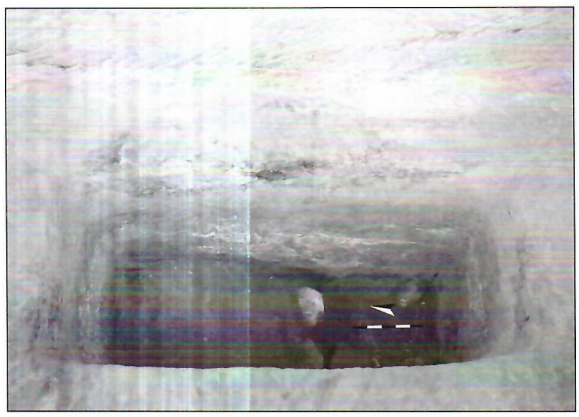
16. Chamber of Tomb 779 (Sector D), view towards south-eastern corner (L. Wadeson).

later reuse of the tomb. Approximately 0.10-0.13 m below the surface, large stone blocks appeared in the threshold area (LO 93), most likely placed there in the Medieval period to block the entrance to the tomb. One of these blocks (BL 7), now broken in two pieces, was decoratively carved with what appears to be a vine motif, typical of the first century AD (**Fig. 17**). It may have once formed part of the decoration of this tomb, before being reused at a later period. After removing the stones from the threshold area, the rock-cut holes for the frame and bolts of the tomb door became evident (**Fig. 18**). No rock-cut stairs were found leading to the tomb chamber, nor were there burials in the section of the chamber floor that was cleared.

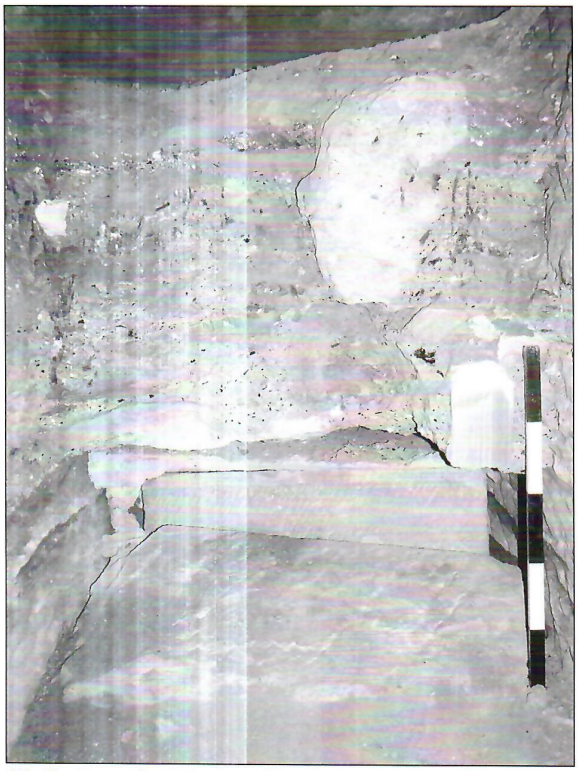
17. Carved block (BL 7) from threshold of Tomb 779 (Trench 9, Sector D) (L. Wadeson).

The other work inside the chamber involved clearing and excavating the pit grave (Trench 6) carved in the floor of the arcosolium in the back wall. The first 1.26 m of the fill of this grave was disturbed material, including Medieval pottery, animal bones and modern rubbish. It then became clear that the grave had been looted from the south end, which contained a number of disturbed stones, sand and more modern material. A common tactic of looters was to cut down into the supposed head area of the burial where the most valuable grave goods were usually located (Schmid and Barmasse 2006: 221). However, the north end of the grave was undisturbed and it was possible to observe the original sealing layers of the burial in section (**Figs. 19-20**). The top layer consisted of a hard and compact grey mortar (0.15 m thick) with inclusions of small stones, charcoal, bones and pottery. The painted sherds embedded in the mortar date to Schmid's Phases 3a and 3b (**Fig. 21**), giving the sealing of the burial a *terminus post quem* of AD 75-100. Below this was a 0.45 m thick layer of large stones embedded in the same mortar, with numerous potsherds of the same phase as those in the layer above. Underneath the layer of large stones and mortar was an empty space of ca. 0.43 m, and below this large covering slabs rest-

18. Exposed threshold (Trench 9) of Tomb 779 (L. Wadeson).



19. *Arcosolium grave (Trench 6) with original sealing layers in the north (looters' hole in the south), Tomb 779 (L. Wadeson).*



20. *Section of original sealing layers in arcosolium grave, Tomb 779 (L. Wadeson).*

21. *Painted pottery of Phase 3b embedded in mortar, from arcosolium grave, Tomb 779 (L. Wadeson).*

ing on the rock-cut shoulders of the grave. These were sealed with a chalky white mortar that was more brittle than the grey mortar and had inclusions of small pebbles and no pottery (**Fig. 22**). Unfortunately, this level had been disturbed by the looters, who presumably reached in and under the grey mortar layer (in the empty space) from the southern end.

Although disturbed, the final layer of the burial underneath the cover slabs revealed some interesting material: at the northern end of the grave was a gritty black material with inclusions of charcoal, small potsherds and bone fragments. Within this layer a circular lump of bronze was recovered. After cleaning, this turned out to be the foot of a camel (2.5 x 2.5 cm), most likely broken off a small bronze figurine originally placed with this prestigious burial (**Fig. 23**). Camel imagery is of course appropriate for Petra, considering the role that camels played in trade and the wealth this brought the Nabataeans. The Nabataean terra-

22. *Covering slabs embedded in white mortar in north end of arcosolium grave, Tomb 779 (L. Wadeson).*

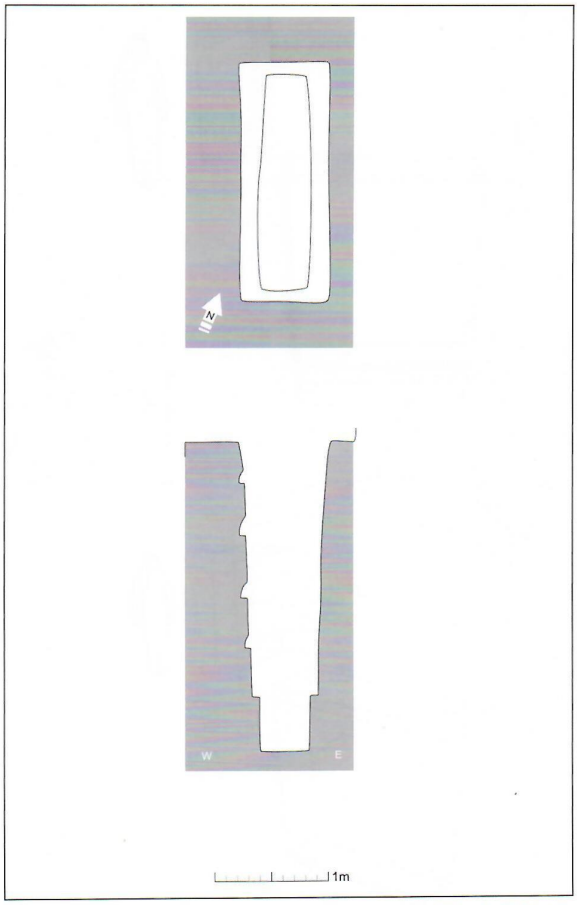
23. *Bronze camel foot from arcosolium grave, Tomb 779 (L. Wadeson).*

cotta camel figurines (el-Khouri 2002: 189-96) and the camel caravan carved in the Sīq (Ruben 2003: 40-43) provide further examples of this imagery. The ashy black material lay over a fine sand that contained disturbed and fragmentary human remains, and therefore may indicate the deposition of burnt material over the burial, a practice that has been noted in other Nabataean burial contexts (Perry 2002: 266). Small skull fragments were found in the north end of the grave, indicating the orientation of the burial. The grave robbers had mistakenly presumed the head was at the south end when they looted this grave. Among the disturbed bones at the bottom of the grave were large sherds of cooking pots, a base fragment of an inscribed Nabataean lamp, and painted fineware of Phases 3a-c (**Fig. 24**), indicating the variety of objects deposited with the burial. In addition, small pieces of charcoal and small chunks of the greyish mortar that was used to seal the burial were noted.

Despite its disturbed state, the excavation of this burial provides new information on Nabataean burial practices, such as the careful way the burials were sealed with various types of mortars used at different levels (of which samples were taken for analysis), and the possible deposition of burnt material at the bottom of the grave. In addition, the fragmentary human remains collected will be studied by an anthropologist, providing further insight into the Nabataeans' treatment of their dead. This data can then be compared with that from the few excavated pit grave burials from the Tomb of Unaishu, the Renaissance Tomb and the Soldier Tomb Complex in Wādī Farasa to enhance what we know of Nabataean funerary customs (Zayadine 1974: 144-45; Huguenot *et al.* 2004: 204-6; Schmid and Barmasse 2006: 220-27).

Although it shares similarities with other pit graves in Petra, the structure of the grave in Tomb 779 is noteworthy: the complete depth of the grave is 2.90 m and the rock-cut shoulders for supporting the covering slabs appear at a depth of 2.40 m (**Figs. 25-26**). To provide access to this deep grave, four toe-holes were carved in a vertical line in the western wall (**Fig. 27**), a feature which is usually only observed in shaft tombs at Petra. The dimensions of the top of the grave are 2.25 m long and 0.88 m wide, whereas at the bottom they are 2.03 m long and 0.52 m wide, indicating the significant narrowing of the walls. This deep grave was for a single burial, clearly of an important individual given its size, the complex sealing system, the accompanying grave goods, and the elaborate arcosolium carved above (**Fig. 28**), which is located in the

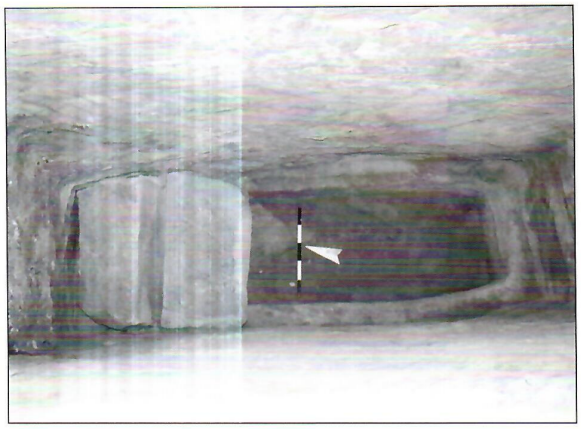
24. Painted fineware of Phases 3a-c from arcosolium grave, Tomb 779 (LO 59) (L. Wadeson).



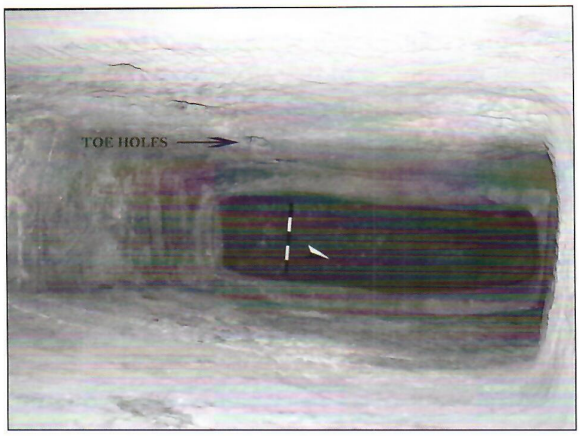
25. Plan and section of arcosolium grave in Tomb 779 (Q. Tweissi and L. Wadeson).

most prominent position of the chamber usually reserved for the tomb owner (Wadeson 2011a).

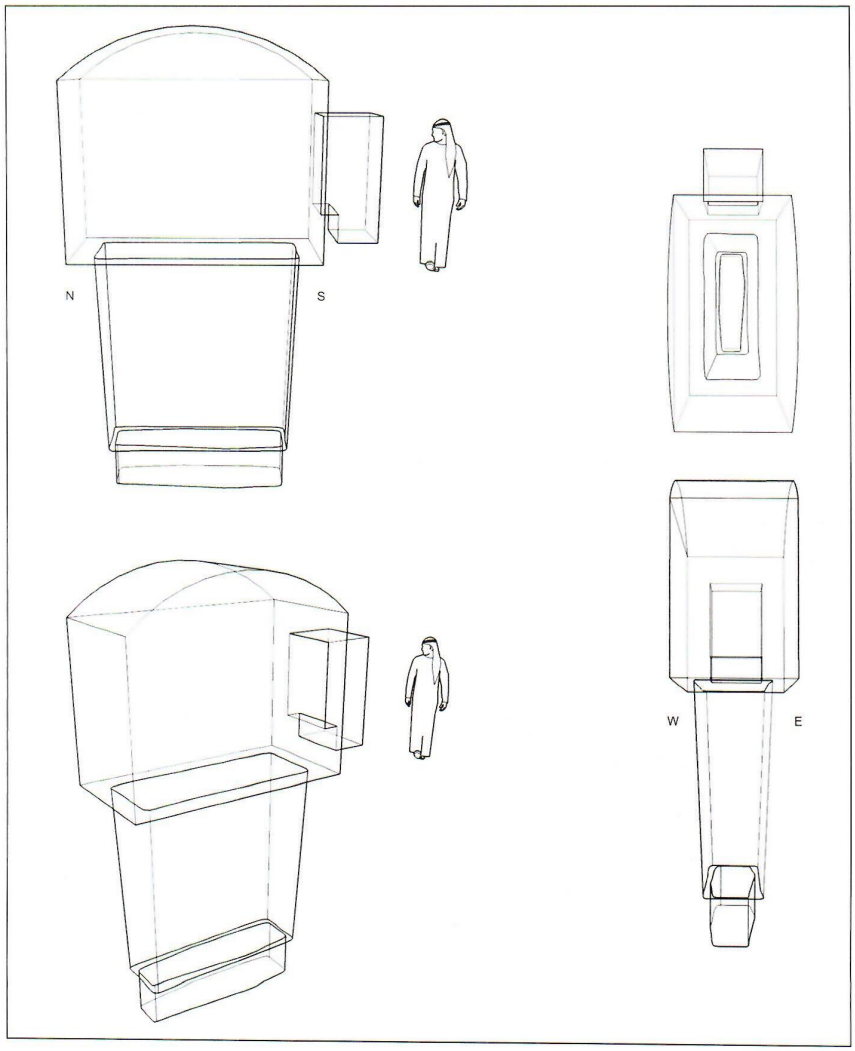
The arcosolium, which measures 2.96 m wide, 1.69 m long and 2.92 m high, has abundant traces of plaster, indicating that it was left open (**Fig. 29**). This type of burial structure is



26. Covering slabs on rock-cut shoulders in arcosolium grave, Tomb 779 (L. Wadeson).



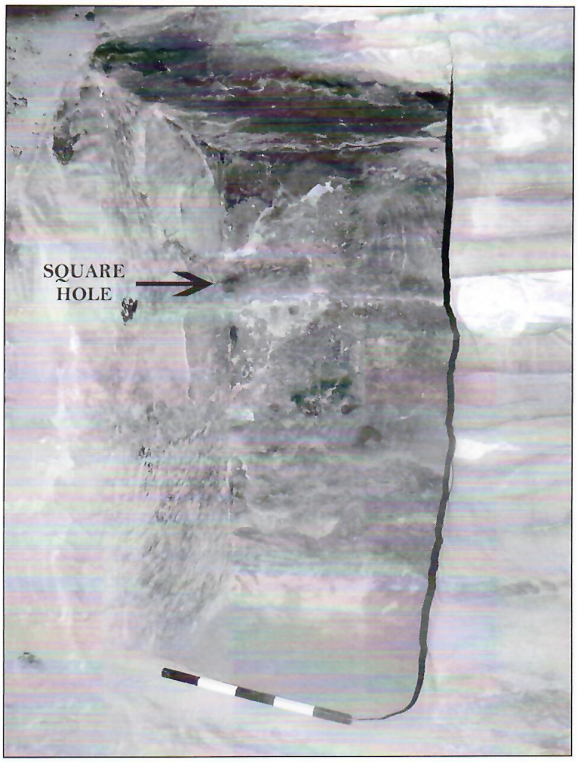
27. Bottom of arcosolium grave in Tomb 779, with toe-holes in west wall (L. Wadeson).



28. 3-D reconstruction drawing of arcosolium and grave in Tomb 779 (Q. Tweissi).

29. Arcosolium in Tomb 779 (L. Wadeson).

rare in Petra, being observed in only a handful of other tombs, such as Tomb 781, Tomb 825, the Obelisk Tomb and the Soldier Tomb. In further research a comparative study will be made of all the arcosolia in order to shed light on the chronological relationship between these tombs. Even more uncommon is the peculiar niche carved in the southern wall of the arcosolium in Tomb 779, measuring 1.57 m high, 0.86 m wide and 1.02 m deep (**Figs. 16, 30**). We cleared the bottom of this niche to discover that it extends 0.23 m below the rock edge. Traces of a greyish hydraulic mortar at the base indicate that it may have held water. However, the walls were once plastered, and two regular sets of two small square holes (0.05 m x 0.05 m) in the back wall may have been used to support wooden shelving. This would suggest that it was a storage area, perhaps for cult implements or offerings to the dead. The entire niche was decorated with architectural framing, as inset grooves at the top and bottom reveal.

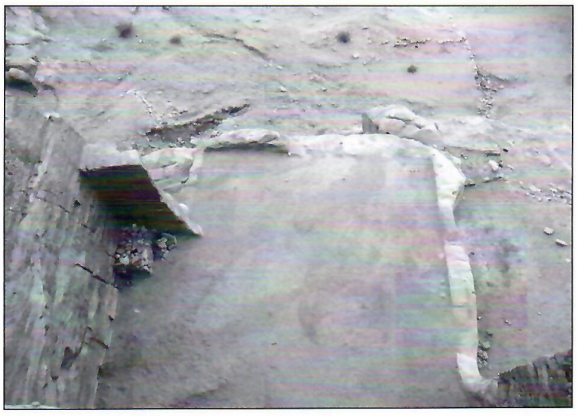


30. Niche in south wall of arcosolium, Tomb 779 (L. Wadeson).

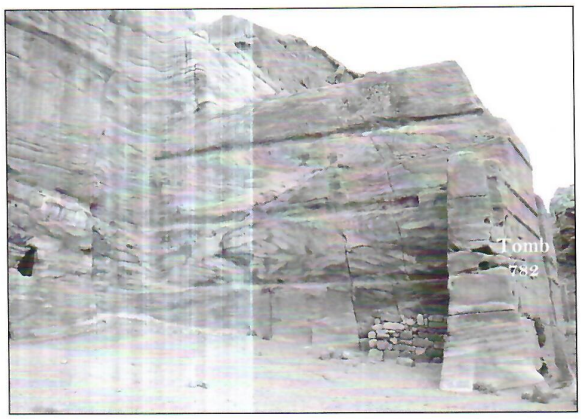
The interior of Tomb 779 appears to be finished, unlike parts of the exterior, and its size and original decoration would have been an impressive sight to visitors to the tomb. It remains to be seen if further burials are carved in the floor of this massive chamber, the clearance of which is planned for the second season of excavation.

Tomb 781: Exterior (Sector B)

Tomb 781, to the south of Tomb 779, has a façade of the Hegr type that measures 10.45 m in width (**Fig. 4**). The surface of the façade is heavily eroded, but one can make out a shallow niche high above the doorway. Either side of the doorway are windows, and above is a groove for an inset pediment. The platform in front of this tomb is much larger than that of Tomb 779, measuring c. 16.70 m long by 13.30 m wide (**Fig. 31**). On the northern and western sides, the platform is enclosed by a low rock wall. On the southern side is a high rock wall with a series of carved grooves, possibly to support a roofed structure in this area, to the side of the façade (**Fig. 32**). At the base of this wall, but blocked



31. Courtyard (Sector B) of Tomb 781 before excavation (L. Wadeson).



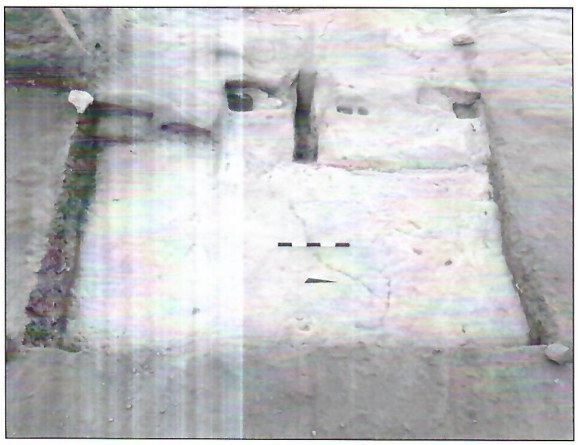
32. Southern exterior wall of Tomb 781 with rock-cut grooves (L. Wadeson).

by sand, the tops of two niches are visible, perhaps once used as a support for vaulting, as commonly observed in Nabataean cisterns. The southern wall cuts the façade of Tomb 782 to the south, and thus postdates this tomb.

A 3 x 3 m trench (Trench 3) was opened at the western limit of the platform, in alignment with the tomb entrance (**Fig. 5**). After the removal of a c. 0.26 m layer of sand and stones, the bedrock was reached. The pottery from this layer was mostly Nabataean, of Phases 2c and 3 (first century AD). The bedrock surface was smooth and well-worked, but the most notable features were the holes for a doorframe and locking system at the western edge (**Fig. 33**). This reveals that an exterior doorway provided access into the whole complex from the west (on the same axis as the tomb entrance). A comparable example in Petra is the monumental entrance-building providing access to the Soldier Tomb Complex in Wādī Farasa East, although this is perpendicular to the tomb (for the latest report on the IWFP, see Schmid 2009a: 95-105). Monumental gateways are also found leading into the complexes of Tombs 269/270 and Tomb 572. Control of access into the funerary area was clearly required, perhaps due to issues concerning the legal property of the tomb or its sanctity (Wadeson 2011b: 6).

In the case of Tomb 781, it is difficult to reconstruct how this external doorway was accessed from the west, since the rock edge has broken off into large boulders which now lie in the wadi below. Notably, a channel (1.10 m long, 0.20 m wide) is carved beneath the level of the threshold (and between the post-holes) perhaps to conduct water accumulated in the platform (which slopes down from east to west) over the edge of the rock. However, it is not connected to any drainage system and seems to be unfinished since it slopes down from the east end and rises up again on the west end. It is possible that this is a later structure, but the pottery inside the channel was exclusively Nabataean, of Phase 3a-b (AD 20-100), without any later material (**Fig. 34**). A channel is also carved into the threshold of the Painted Room (BD 849) in as-Sīq al-Bārid, but this is related to a complex hydraulic system (Twaissi *et al.* 2010: 36, Fig. 8).

Trench 3 was extended to the north by 5 metres with the addition of Trench 5, which reached the northern rock wall (**Fig. 5**). The pottery findings were similar to those of Trench 3, yet there were also some Medieval sherds at the northern



33. Threshold of external platform of Tomb 781 (Trench 3, Sector B) (L. Wadeson).

34. Painted pottery of Phases 3a-b from channel in Trench 3, Sector B (L. Wadeson).

end, where there were traces of later fires. Nothing of significance was noted in the bed-rock, apart from a carved protrusion on the western side that may have been the support for a wall separating this area into two rooms (**Fig. 35**).

The large platform of Tomb 781 may have further notable structures carved in the rock, given the discovery of the external gateway. In future seasons we aim to complete the clearance of this external area, starting with the south-eastern corner beneath the high rock wall. However, this will take some time due to the large amounts of sand that have accumulated over the eastern half of the courtyard.

Tomb 781: Interior (Sector C)

The main burial chamber of Tomb 781 measures 11.47 m in width and 11.14 m in length. There are 16 loculi carved in the back and side walls and a small subsidiary chamber (w. 4.11 m; l. 3.44 m) carved in the middle of the back wall, the entrance of which is elaborated with a carved entablature and pilasters (**Figs. 5, 36**). In the back wall of the subsidiary chamber is an arcosolium with a pit grave carved in its floor

35. Bedrock floor of Trenches 3 and 5, Sector B (L. Wadeson).

36. Chamber of Tomb 781 (Sector C), view towards north-eastern corner (L. Wadeson).

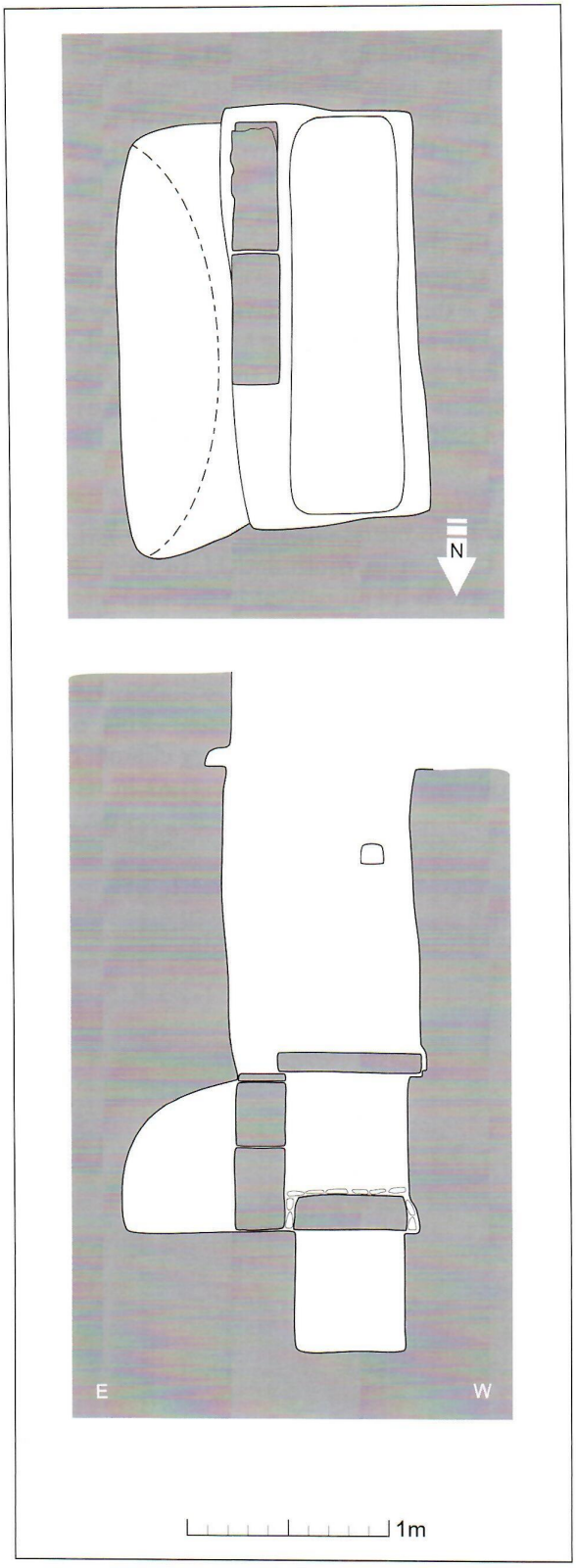
37. Arcosolium of Tomb 781 (L. Wadeson).

(**Fig. 37**). The floor of the main chamber is fully blocked with sand and animal dung, while the floor of the subsidiary chamber is only partially blocked and the outlines of two pit graves are evident. The height of the ceiling to the blocked floor is 4.12 m. The carving of the main chamber is neat with stippled tool-work. Overall, the burial structures in this tomb are neatly arranged and symmetrical, as is typical for Hegr tombs (Wadeson 2010a: 61-5).

It was decided to clear the grave (Trench 4) inside the arcosolium, seeing as this was obviously the most important burial of the tomb, being aligned with the tomb entrance and main entrance to the complex, and having the most elaborate burial structure. The first 0.70 – 1.00 m of the fill of this grave was an accumulation of animal dung, sand and rubbish, giving an indication that the burial was disturbed. In the northern end, a looters' hole became evident, filled with a large number of disturbed stones that were once used to seal the grave. However, the southern end of the grave retained the original undisturbed sealing layers, which could be studied in section.

The first original layer *in situ* comprised large sandstones embedded in a reddish sandy mortar of about 0.65 m in thickness (**Fig. 38**). Beneath this were two courses of covering slabs resting on a rock-cut shoulder on the west wall of the grave and a built wall on the east side, consisting of two courses of three carefully worked stone blocks (**Fig. 39**). The covering slabs turned out to be reused cornice blocks with very finely carved mouldings, though it is unclear

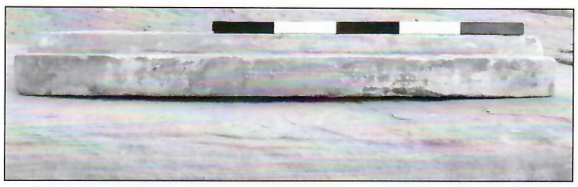
38. Section of original sealing layers in arcosolium grave of Tomb 781 – facing south (L. Wadeson).



39. Plan and section of arcosolium grave in Tomb 781 (Q. Tweissi and M. Haufe).

from where they originated (**Fig. 40**). They were sealed with a whitish, chalky mortar with inclusions of small pebbles (similar to that found in the arcosolium grave of Tomb 779). Beneath the slabs was an empty space of *ca.* 0.15 m, then a fine, silty sand with inclusions of small animal bones and potsherds (including two Nabataean painted sherds of Phase 3b – AD 75-100). Some human bones were recovered, but the burial was clearly disturbed by the looters from the northern end.

Beneath this burial, at a level of ca. 2.30 m down from the top of the grave, were two layers of mortar – the first being a yellowish mortar with small inclusions of pottery and pebbles, and the second being the white chalky mortar noted above. These mortars were sealing another layer of covering slabs that consisted of roughly worked stone blocks. The blocks were not quite wide enough to cover the space of the grave, therefore the gaps between them and the wall were filled with small pieces of cut sandstone (**Fig. 39**). This layer rested on a further set of rock-cut shoulders, 2.45 m down from the top of the grave. The shoulders on the western wall were cut back into the rock, as opposed to protruding out from it. The shoulders on the eastern wall supported the built wall, mentioned above. The space below was for another burial, of which considerably more bones were recovered. There was a high concentration of pottery with this burial, with painted sherds ranging from Phases 2b-c – Phase 3b (25 BC – AD 100), some of which were embedded in mortar (**Fig. 41**). There were also several small chunks of greyish mortar containing charcoal, however it is unclear whether these were placed there intentionally or fell from the sealing layers above when the grave was disturbed. On the bedrock, at the bottom of the grave, were the remains of a brown organic material that may indicate a wooden coffin. Samples of this substance were taken for analysis. Wooden coffins have been noted in other tombs at Petra (for e.g. see Bikai and Perry 2001: 60; Farajat and Nawafleh 2005: 375), therefore it would not be surprising to find them in use in Tomb 781.

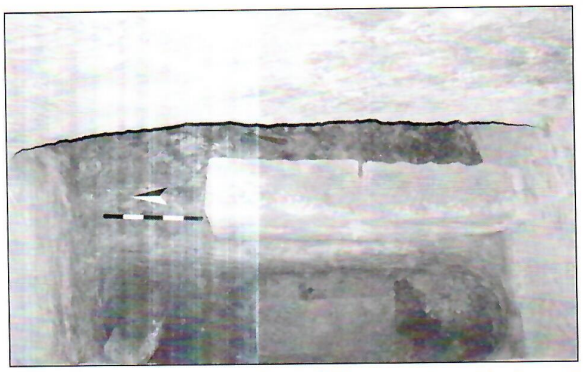


40. Reused cornice block (BL1) from sealing layer in arcosolium grave of Tomb 781 (L. Wadeson).

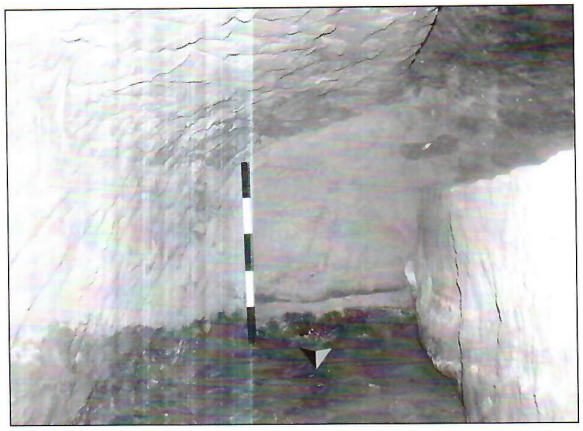
41. Painted pottery from arcosolium grave (LO 74) in Tomb 781 (L. Wadeson).

Besides the new information gained on the sealing system of Nabataean burials, and the bone and four different types of mortar taken for analysis (**Fig. 42**), this grave reveals an entirely new form not previously recorded in Petra: the built wall in fact originally sealed a vaulted niche, carved to the side of the grave shaft in the eastern wall (**Figs. 39, 43-44**). This side-niche contained a third burial, with part of the legs and feet intact in the northern end. The orientation of the head to the south was surprising as the looters had entered the grave from the north end. The looters had reached this burial by removing the northernmost blocks of the wall. It seemingly had been robbed twice – both in the Medieval period and in modern times according to the recovered material. The remains of this burial were consistent with those found in the main shaft of the grave, and again possible wooden

42. Four different types of mortar from sealing layers in arcosolium grave of Tomb 781 (L. Wadeson).



43. Arcosolium grave in Tomb 781 – remains of built wall blocking side niche (L. Wadeson).



44. Side niche for burial in arcosolium grave, Tomb 781 (NB: built wall on right) (L. Wadeson).

coffin traces were observed on the surface of the bedrock. The discovery of an iron nail in the southern end supports the hypothesis of a coffin burial (**Fig. 45**) (see Zayadine 1979: 185, 189 for the discovery of a nail in Shaft Tomb B1 at Petra). The pottery recovered from this burial ranges from Schmid's Phases 2a – 3c (mid first century BC – early second century AD), but the later material may have reached this lower level when the grave was looted.

The use of the hidden side-niche, sealed by the massive wall underground, suggests that an important individual was buried here, possibly the tomb owner or head of the family. Close family members were maybe buried in the other spaces of the grave shaft, but this can only be confirmed when the bones are analysed. Similar side-niche burials in pit graves are found in the Nabataean tombs at Mada'in Salih, such as in the Qasr as-Sane Tomb, a Hegr tomb dated to AD 8 (Jaussen and Savignac 1909: Fig. 178). The form is also reminiscent of the Nabataean

45. Nail from side niche burial in arcosolium grave of Tomb 781 (L. Wadeson).

burials at Khirbat Kazūn (Politis 1998: 612), however these are on a much smaller and simpler scale.

The arcosolium is smaller than that in Tomb 779, measuring 2.96 m wide, 1.69 m long and 2.92 m high (**Fig. 37**). The walls have neat toolmarks suggesting that the arcosolium space was left open, unlike the walls of the grave which are roughly worked. Both the southern and northern walls each have a small niche just below the arch, possibly to hold a lamp, while the eastern wall contains a row of three niches at the level of the opening of the grave. Their function is not clear, but they may have supported wooden beams which were used to close the top of the grave shaft. In future seasons, we plan to continue clearing the graves and loculi in the chamber of Tomb 781 and will hopefully be able to shed light on the chronology of the burials and the identity of the deceased individuals.

Concluding Remarks and Future Work

Tombs 779 and 781 on the west flank of al-Khubtha at Petra must have belonged to prominent members of Nabataean society in the first century AD given their elaborate façades and interiors, prominent positions, and the accompanying structures found outside the tombs. The two most important burial places in the back of both tomb chambers were likely those of the tomb owner(s) given their prominence and the evidence from the Mada'in Salih tomb inscriptions, which indicates that the tomb owners were usually buried at the back of the chamber (Wadeson 2011a). The burials inside these arcosolia graves are roughly contemporary, having taken place towards the end of the first century AD and the

beginning of the second century AD, according to the pottery. However, the tombs themselves could have been carved much earlier. This hopes to be verified by a second season of excavation, in which further burials inside these tombs will be cleared. Although the burials are likely to be disturbed, as was the case with the arcosolia burials, the material recovered is valuable for reconstructing the little known Nabataean funerary customs. For example, from the first season of excavation we can propose that the effort invested by the Nabataeans in sealing their burials so thoroughly speaks against the supposed custom of secondary burial, which has often been attributed to them in the past (Negev 1986: 74-75; Healey 1993: 8, 39; Wright 1998: 160-64; Nehmé 2000: 177; Perry 2002: 265). Analysis of the bones, mortar, burnt deposits and organic material will also shed light on burial practices and bring us closer to understanding how the Nabataeans treated their dead. Furthermore, in Tomb 781 we discovered an entirely new form of rock-cut burial structure consisting of a deep shaft and side niche for burial, sealed by an underground wall.

The excavated areas outside Tombs 779 and 781 revealed that they were both part of 'tomb complexes,' which included large enclosed platforms, porticoes, additional chambers, and possible sources of water. All these structures aided the funerary ritual that took place outside the tomb, including gathering, feasting and honouring the dead. The portico discovered in front of Tomb 779 would have ordered the space in front of the façade and added to the aesthetic effect, even though the platform surface appears to be unfinished. In addition, it would have directed the visitor towards the side chamber in the north wall, perhaps where the first funerary rites took place. The discovery of an external doorway leading into the complex of Tomb 781 suggests that access into the funerary area was controlled. The alignment of this external entrance with the tomb entrance, burial chambers and arcosolia burial is reminiscent of Alexandrian funerary architecture, particularly the Ptolemaic-period Mafrousa Tomb (McKenzie 1990: 65-66, Pl. 186), and highlights the possible use of the external platform for the focus of the funerary activities in honour of the deceased within the tomb. In the second season, we plan to continue excavating outside Tomb 781, particularly beneath the southern wall, in order to determine what structures were associated with it. The last quarter of the courtyard of Tomb 779 will also be cleared.

In terms of the chronology of the façades, by studying the architectural relationship between Tombs 779 and 781, and unfinished Tomb 780 it could be concluded that the massive Double Pylon Tomb 780 was the first to be carved. The rock removed for the carving of the latter tomb allowed access and visibility to Tomb 779, proof that the smaller Double Pylon tomb was carved later (**Fig. 4**). This accords with the patterns revealed in the author's study of the chronology of the façades, i.e. the largest façades were the earliest in Petra, and the smaller versions (even of the same type) were carved later (Wadeson 2010a). It is hoped that through further seasons of excavation, the IKT project will be able to elucidate the reason that Tomb 780 was left unfinished, and its relationship to the neighbouring Tombs 779 and 781.

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PRELIMINARY REPORT ON THE WĀDĪ ḤAFĪR PETROGLYPH SURVEY, 2005-2006, WITH SPECIAL COMMENT ON THE DISTRIBUTION OF SELECTED THAMUDIC E / ḤISMAIC INSCRIPTIONS AND ROCK DRAWINGS

Glenn J. Corbett

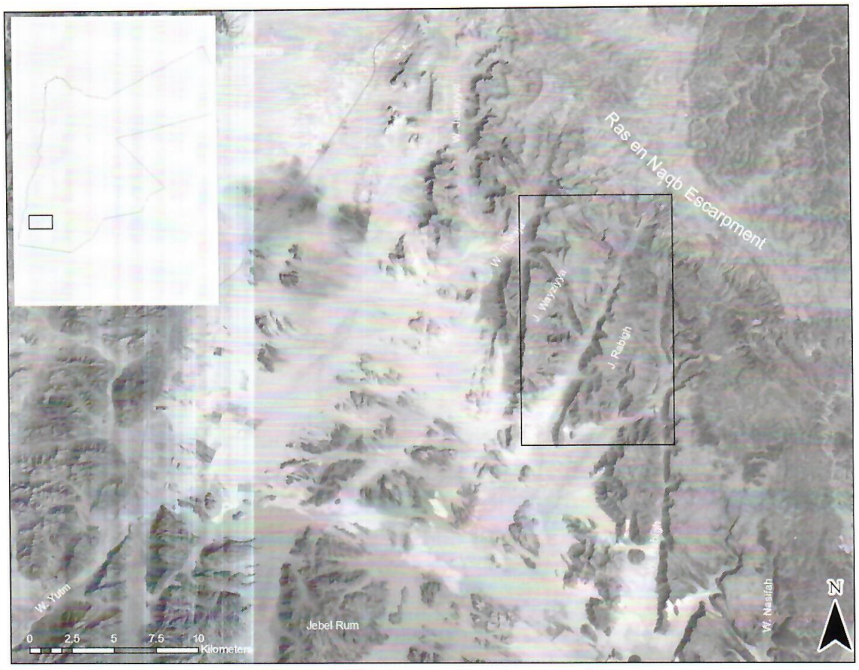
The Wādī Ḥafīr Petroglyph Survey (WHPS) was conducted over the course of three, two-week sessions from October 2005 to April 2006. Field work was funded by research grants from the American Center of Oriental Research and the Council of American Overseas Research Centers, with the formal approval and recognition of the Department of Antiquities and its then Director General, Dr. Fawwaz al-Khraysheh, to whom I am most grateful. The project was ably assisted in the field by departmental representatives Ahmad al-Shami, Manal Basiouni, and Suleiman al-Shuqairat, as well as by the author's wife, Elena D. Corbett, Ph.D. During field work, the project was based in the Zawaydeh Tourist Camp located near the village of ad-Dīsī.

The WHPS had two primary aims: first, to revisit and re-record petroglyph and ancient rock carving sites in the Wādī Ḥafīr recorded by the late William Jobling of the University of Sydney during the 'Aqaba-Ma'an Archaeological and Epigraphy Survey (AMAES), 1979-1990; and second, to determine if these Jobling sites, as well as newly-recorded petroglyph sites, show any meaningful patterns of spatial distribution, both in terms of their locations and their epigraphic and artistic content. The latter goal was accomplished and facilitated through the development of a Geographic Information Systems (GIS) database of site locations, which ultimately formed the basis of the author's dissertation on the distribution of Thamudic E/Ḥismaic inscriptions and rock drawings in the Wādī Ḥafīr (Corbett 2010).

Overview of Topography, Climate, and Hydrology

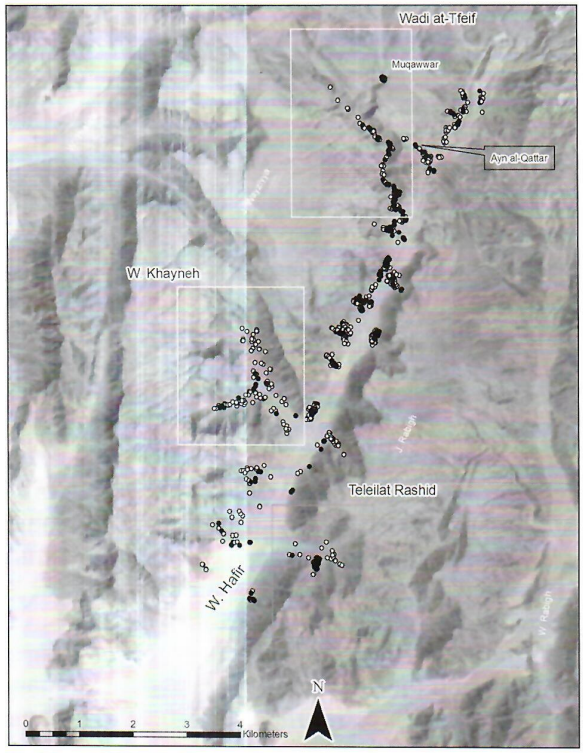
The steep-sided Wādī Ḥafīr gorge is a long and narrow canyon which stretches approximately 18 km from the Rās an-Naqab Escarpment towards the Qā' ad-Dīsī mudflat in the center of the Ḥismā Basin in southern Jordan (**Fig. 1**). The Ḥafīr is flanked on the west by Jabal Wayziyya and on the east by Jabal Rābigh, two rather broad and flat sandstone mesas, or inselbergs, which form part of the distinctive and erosion-resistance geological shelf between the Rās an-Naqab escarpment and the desert floor of the Ḥismā. Between these two gently-eastward-sloping tabletop mesas, the deeply-incised Ḥafīr cuts into the escarpment like a dagger, beginning in the south as a 2 km wide sandy plain at 860 masl but then narrowing dramatically to the north as it gradually rises in elevation and relief towards the escarpment and its head at Rās Khawr al-Jam (elev. 1400 masl). A number of tributary wadis of varying size enter the main wadi from the adjacent inselbergs, the largest being Wādī aṭ-Ṭufayf and Wādī Khāynah from Jabal Wayziyya, and Tulaylāt Rāshid from Jabal Rābigh (**Fig. 2**).

While the floor of the Ḥafīr alternates between patches of sand and undulating, rocky terrain, the canyon's slopes, along with its tributaries, are littered with hundreds of thousands of blackened sandstone boulders that have broken off or eroded down from the walls of the canyon and flanking mesas over the millennia (**Fig. 3**). Along much of the wadi, these boulders occur in fairly regular bands of talus that have accumulated at the base of the adjacent jabals. Erosion and drainage along the wadi's tributaries, however, have resulted in extensive though heavily-dissected alluvial fans that litter their drainage areas with irregularly-shaped "boulder fields." These sandstone boulders, which range



1. The Northern Ḥismā of southern Jordan (with Wādī Ḥafīr highlighted).

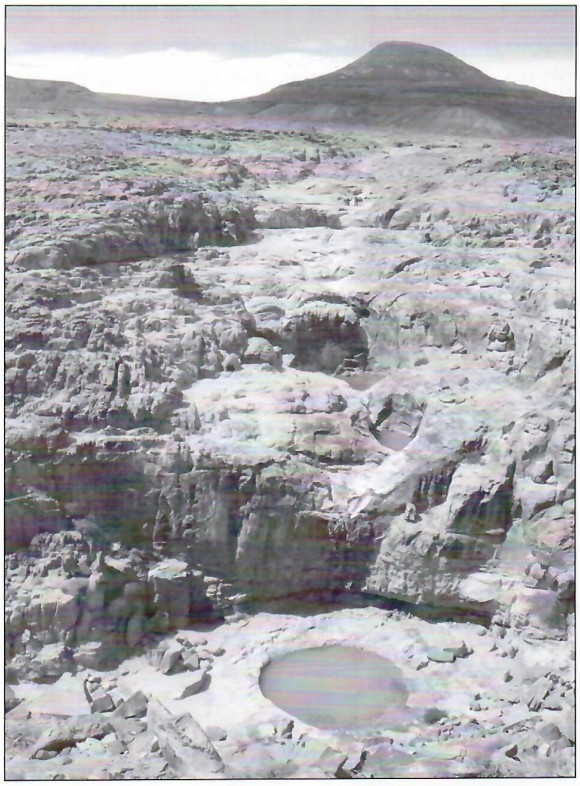
in size from less than a meter to as much as 5-10 m long, are often covered with a heavy coat of shiny black desert varnish or patina, thereby transforming the rocks into ideal canvases for would-be artists and authors. Likewise, the more gradual relief of the tributaries' alluvial fans made these areas fairly accessible to past human populations, as evidenced not only by the amount of rock art and inscriptions found in these areas, but also by the regular occurrence of built features, including stone circles, clearings, and low walls.



2. The Wādī Ḥafīr and its main tributaries with WHPS marked in white (located Jobling/AMAES sites appear in black).

The Ḥismā region is subject to a hot, dry climate throughout most of the year, with a much shorter but colder and wetter climate from December to March. On average, the Ḥismā receives less than 50-80 mm of rain per year and nearly all of that rain falls during a handful of torrential winter downpours that produce powerful flash floods. Locally, the topography of the Ḥafīr and its adjacent flat-topped mesas allows for the potential capture and exploitation of these winter flood waters. A prime example is the Muqawwar cascades located at the head of the Wādī aṭ-Ṭufayf (**Fig. 4**). Here, an extensive network of seasonal drainages flowing both from the escarpment and atop Jabal Wayziyya converge at a single point before making their final descent into Wādī aṭ-Ṭufayf. The cascades are marked by a series of natural collection pools formed in the bedrock, the last and largest of which was intentionally widened and deep-

3. The boulder-strewn slopes of the Ḥafīr.



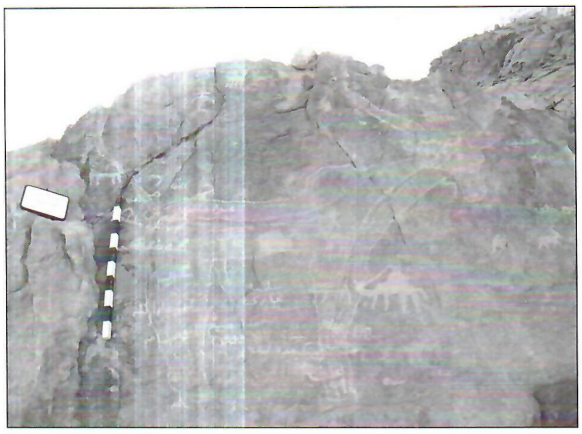
4. The cascades of Muqawwar.

ened in antiquity. Elsewhere in the Ḥafīr, rain waters collect in small, ephemeral pools along the natural drainage of the wadi, especially in areas of more gradual relief. The Ḥafīr has only one perennial water source, a drip-spring located at the northern end of the wadi variously known as Qaṭṭār Ḥafīr or ʿAyn al-Qaṭṭār.[1]

Survey Methodology

Initially, the WHPS focused on surveying areas of the Ḥafīr that the author suspected would have had some social, cultural, or economic "significance" to the Ḥafīr's ancient populations—those areas or features of the landscape that *may* have attracted particular attention from ancient carvers. Examples of such places included prominent hills, springs and water sources, monumental stones, unusual rock formations, and manmade features like cairns or stone circles. While this "purposive" survey methodology did reveal several unique and notable natural and manmade features within the Ḥafīr, including the prominent "bull stone" near the entrance to Wādī Khāynah (**Fig. 5**)[2] and the small but fascinating al-Batuh rock arch (**Fig. 6**), it was soon

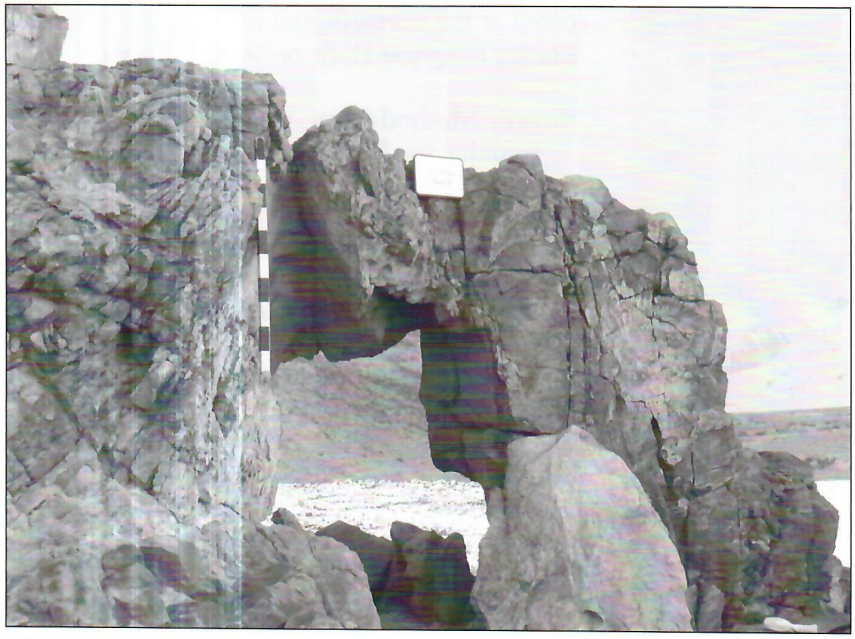
1. This spring was first recorded by Jobling (1985: 219–220) and has since been revisited by Saba Farès-Drappeau and Fawzi Zayadine (2004: 359–362), as well as the author's survey. The spring was outfitted in antiquity (perhaps during the Nabataean period) with an 8 m x 3 m x 1 m cistern that is still utilized today.
2. This stone was previously visited and photographed by both Jobling (1987a: pl. 55) and Farès-Drappeau and Zayadine (1997: 42, Arabic section).



5. The "bull stone" (06-0001) near the entrance to Wādī Khāynah.

realized that these locations, in most cases, were neither unique nor exceptional in their rock art or epigraphic remains. In fact, as the project ventured into the Ḥafīr's many tributaries searching for sites that had been photographed by Jobling, it became clear that most petroglyph sites—particularly those inscribed with Thamudic E/Ḥismaic inscriptions and drawings—were found deep in the wadi interiors in areas that generally lacked obvious topographic prominence or cultural/economic significance. As such, most of the survey's second session and all of the third session were devoted to a general "reconnaissance" survey of the Ḥafīr's primary and secondary tributaries, especially Tulaylāt Rāshid, Wādī Khāynah, and Wādī aṭ-Ṭufayf.

For both the purposive and reconnaissance survey methodologies, team members (usually numbering two to three) walked broadly across an area looking for inscriptions and rock carvings from all periods. Each survey was conducted in an orderly and planned fashion with an emphasis on covering as many different parts of the study area as thoroughly as possible. Where feasible, team members separated by about 75-100 m would walk a series of cardinally-oriented transects back and forth across an area until all significant topographic features had been surveyed. Once a site ("site" being defined here as an individual stone/boulder or rock face) had been identified, it was assigned a number[3] and photographed with a digital camera. For each photo, a whiteboard was used to record the site number and, in most cases, the direction of the



6. The al-Batuh rock arch (05-0026).

3. As part of the initial "purposive" survey strategy, the Ḥafīr was divided up into various zones (numbered 1–10), and each stone or rock face recorded within a particular zone was given a unique site number. So, for example, the first site recorded within the area of the Muqawwar cascades (designated Zone 7) was numbered 07-0001. By contrast, sites recorded as part of the broader "reconnaissance" survey strategy were simply given the prefix "R" followed by a unique site number (for example, R001), with no specific reference to the area of the Ḥafīr in which they were found.

photograph. The location of the stone or rock face was then recorded with a handheld Global Positioning System (GPS),[4] while any relevant observations about the site and its situation were noted on recording forms.

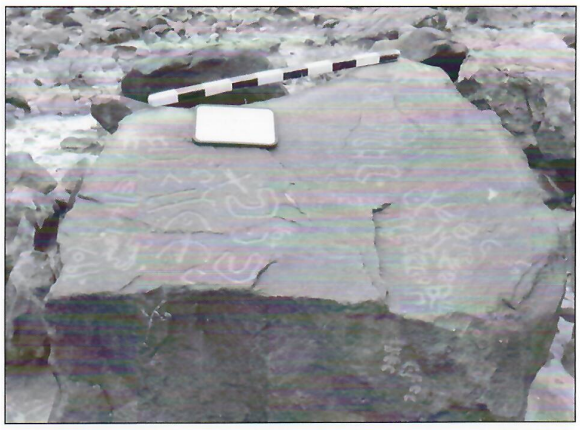
Locating Sites Photographed by Jobling's Survey

Jobling's AMAES spent the better part of four field seasons working in the Ḥafīr, where he photographed and recorded nearly a thousand petroglyph sites of all types and periods (Jobling 1983, 1985, 1987a, 1987b, 1988a, 1988b, see also Jobling 1986, 1989, 1990). Although Jobling was unable to map the location of his discoveries with exact precision, the project's notes, photographs, photographic log, and field maps allow one to determine the relative location and/or topographic position of many sites.[5] This is particularly true for sites that were recorded within specific tributaries, around the Ḥafīr's major natural and manmade features, and in the vicinity of its principal water sources (namely Muqawwar and 'Ayn al-Qaṭṭār). In exceptional cases, the project's field maps and notes even allow one to determine the specific area of the Ḥafīr where a site was located, sometimes within less than 100 m.

With this information in hand, the WHPS set out to relocate as many of Jobling's sites as possible and pinpoint their location with handheld GPS units, for subsequent inclusion in a GIS database of site locations. As the WHPS progressed through the Ḥafīr and its various tributaries and located more and more Jobling sites, it became increasingly easier to determine where exactly Jobling's team had worked and, more important, where we could expect to find sites from the Jobling photographic record that lacked a clear locational context. Ultimately, the WHPS was able to locate 268 of the petroglyph sites photographed by Jobling (**Fig. 2**), this representing between a quarter and a third of the estimated number of sites Jobling recorded in the Ḥafīr.[6] These data have given us a much better understanding of where precisely Jobling did (and did not) survey within the Ḥafīr, as well as important insight into the possible locations of sites from Jobling's photographic record that were either missed or not located by the WHPS.

Preliminary Findings

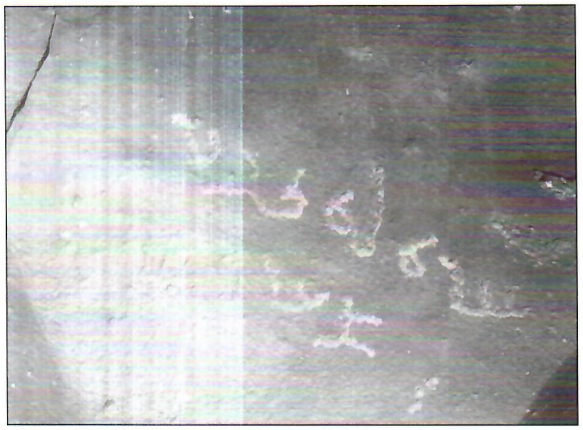
During the course of the WHPS, it became very clear that the Ḥafīr contained many more sites than just those that had been photographed by Jobling. During the six-week survey season, a total of 1,200 carving sites were photographed, recorded, and mapped (**Fig. 2**), and it is estimated that several times that number still await discovery. Just under half of the recorded sites (547) include one or more Thamudic E/Ḥismaic inscriptions (**Fig. 7**). While a precise count of recorded Thamudic inscriptions will only come with detailed analysis of the survey's photographic record, a preliminary examination identified more than 1,800 inscriptions on the



7. Boulder covered in Thamudic E/Ḥismaic inscriptions (R445).

4. Three handheld GPS receivers were used by the WHPS: a Garmin GPS 12, a Garmin E-Trex Legend Cx, and a Magellan eXplorist 200. Although these handheld receivers generally guarantee an accuracy of at least +/- 15 m, the WHPS regularly received better results of +/- 7 m accuracy.
5. I would like to thank Prof. Jobling's widow, the late Lee Jobling, as well as his long-time field assistant and photographer Richard Morgan, for permission to use the archived records and notes of the AMAES.
6. A review of the Jobling photographic record shows that the AMAES likely photographed between 750 and 1,000 individual petroglyph sites within the Ḥafīr. The ambiguity arises from the fact that the AMAES did not assign unique site numbers to the stones it recorded, preferring instead to document the progress of the survey (and the sites it recorded) with a photographic log, noting only the general location where a particular roll of film had been shot. Because the photographs often focus on individual carvings/inscriptions and not entire stones, it can sometimes be difficult to determine how many shots from a roll were taken of a single site (as opposed to multiple sites), unless the stone happened to be re-recorded during the WHPS.

stones and rock faces recorded by the survey. By contrast, only seven inscriptions in Nabataean script and/or with Nabataean lexical features were recorded (**Fig. 8**),[7] while a slightly larger number (27) of unpointed Kufic and/or early Arabic inscriptions were found (**Fig. 9**).



8. Nabataean inscription from Muqawwar cascades (07-0001).

9. Kufic inscription (05-0004).

It is far more difficult to meaningfully categorize or describe the numerous and varied rock drawings that are found on the Ḥafīr's stones. While it is clear that many of the drawings are contemporary with the Thamudic E/Ḥismaic inscriptions (many of which often sign drawings of camels and hunt scenes—**Figs. 10 and 11**), there are countless others that—lacking inscribed signatures or identification—defy any straightforward dating, categorization, or explanation. Among the Ḥafīr's drawings are numerous examples of darkly-patinated, unsigned drawings of ibex, bulls, hunters, and hand and footprints (**Fig. 12**) that certainly date anywhere between several hundred and several thousand years before the Thamudic inscriptions. Perhaps equally numerous are more lightly-patinated de-

10. Thamudic camel drawing signed by zdmnt son of rm²l (R222).

11. Thamudic hunt scene signed by bglt son of zdlh (R348).

7. Several of the survey's Nabataean inscriptions (including three Thamudic E/Nabataean bilinguals), most of which are found in the vicinity of the Muqawwar cascades, have already been studied and published by Hani Hayajneh (2009). Additional Nabataean inscriptions from the Ḥafir were also published by Jobling (1990).

12. Footprint carvings (01-0003).

pictions of horse- or camel-mounted warriors or hunters armed with long lances and spears (**Fig. 13**) that, not being accompanied by any texts, would seem to post-date the Thamudic inscriptions. Then there are the drawings of hunters or camel-mounted Bedouin armed with rifles or muskets (**Fig. 14**) which certainly date to the mid- to late-Ottoman period. Unfortunately, while these broad temporal categorizations of the drawings can easily be discerned when looking at the collection as a whole, it can be very difficult in any particular case to decide how a drawing should be categorized and/or what criteria should be used to give a relative "date" to a drawing. As such, further categorization and description of this large corpus of drawings awaits more detailed analysis and study.

13. Riders on horseback armed with lances/spears (R090).

14. Hunter armed with rifle aiming at pair of ostriches (R130).

A Case Study: Using GIS and Landscape Data to Analyze the Distribution of Thamudic E/Ḥismaic Inscriptions and Rock Drawings

Using the spatial data recorded from the WHPS, the author's dissertation sought to better understand the distribution of one of the most common types of ancient petroglyphs found in the Wādī Ḥafīr: Thamudic E/Ḥismaic inscriptions and the signed rock drawings which often accompany them (see **Figs. 7, 10, and 11**).[8] These distinct carvings, which potentially number in the tens of thousands, are found across the deserts of southern Jordan and northwestern Saudi Arabia and can be imprecisely dated to the last few centuries B.C. and the first few centuries A.D., a period when the Nabataeans of Petra held economic and political sway over much of Transjordan and northern Arabia (Bowersock 1983; Taylor 2001). The study focused on identifying distribution patterns among these carvings within the Ḥafīr's three main tributaries: Wādī Khāynah, Tulaylāt Rāshid, and Wādī aṭ-Ṭufayf, as well as the cascade pools of Muqawwar located at the head of aṭ-Ṭufayf (see **Fig. 2**). In all, the locations of 740 inscriptions and 95 signed rock drawings (recorded from 200 individual stones and rock faces) were mapped and analyzed.

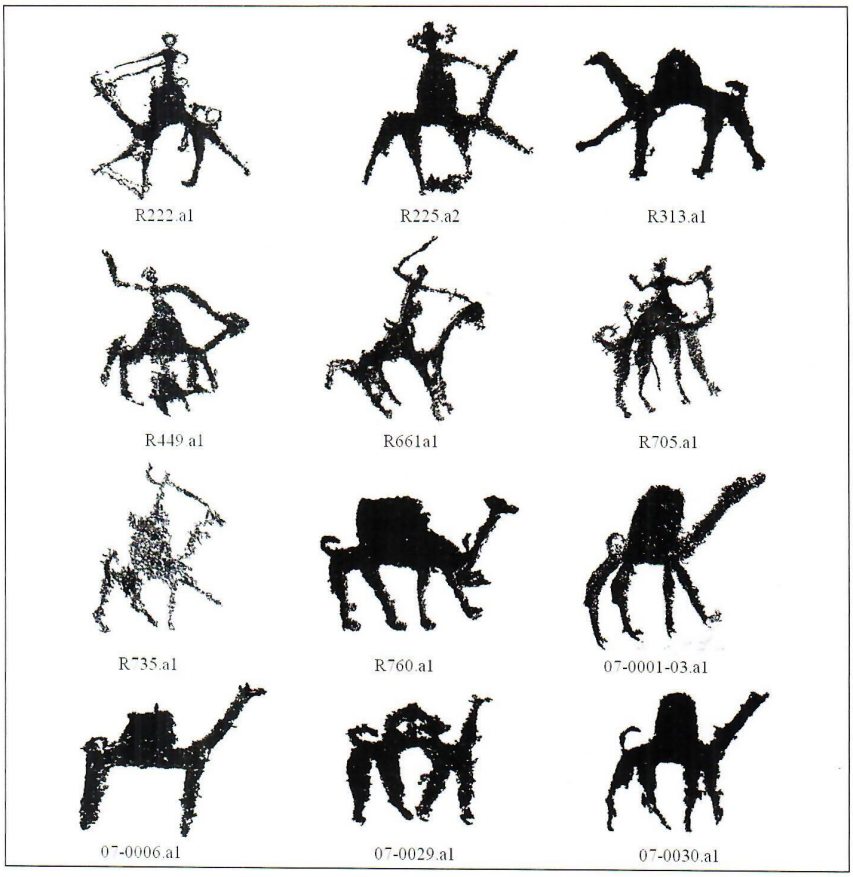
Describing the Inscriptions and Drawings

Almost all of the inscriptions included in the

8. A preliminary locational analysis, which provided an overview of the strengths and potentials of using GIS to query and analyze inscriptional data, can be found in *Studies in the History and Archaeology of Jordan* 10 (Corbett 2009).

study (707, or 96%) were carved in the Thamudic E/Ḥismaic script.[9] Also included in the analysis, however, were five Nabataean inscriptions, as well as three Thamudic C texts and one written in Thamudic D. The vast majority (68%) of the 740 recorded texts can be categorized as simple authorship expressions, where the author typically gives only his name (introduced by the particle *lam*) and, less frequently, the names of his forbearers. In only 11 examples does the author explicitly give the name of his tribe. About 13% of the texts can be described as drawing signatures, where the author takes credit for an accompanying drawing, often employing the verb *ḫṭṭ* ("he carved"), and less often, the name of the depicted animal, to describe his creation. An even smaller number of texts can be characterized as short prayers/curses to Arabian deities, including *ḏs²ry*, *lt*, and *mnwt* (6%), or as emotives (4%), where the author writes short, enigmatic expressions of love, longing, and grief. The attested personal names reveal that the inscriptions were carved by at least 420 different individuals, although nearly a quarter of the texts could have been carved by just a few dozen authors. Among the latter, individual members from several different families can be identified, which allows for the reconstruction of four distinct lineages: the families of *s²hr*, *rm ʿl*, *ʿn²l*, and *nht*.

Among the 95 drawings that were clearly signed by inscriptions, there are 39 camel drawings, 50 drawings of the hunt or hunted animals, three drawings that focus on the horse, and three that could not be categorized. An analysis of the signed camel drawings indicates that nearly all of the artists chose to depict young she-camels (*bkrt*) rather than male camels (*bkr*, *gml*). Generally, both sexes were depicted realistically and proportionally, with particular emphasis on the animal's slender build, long legs, and prominent hump (**Fig. 15**). In many cases, a rider was



15. Selection of Thamudic she-camel drawings.

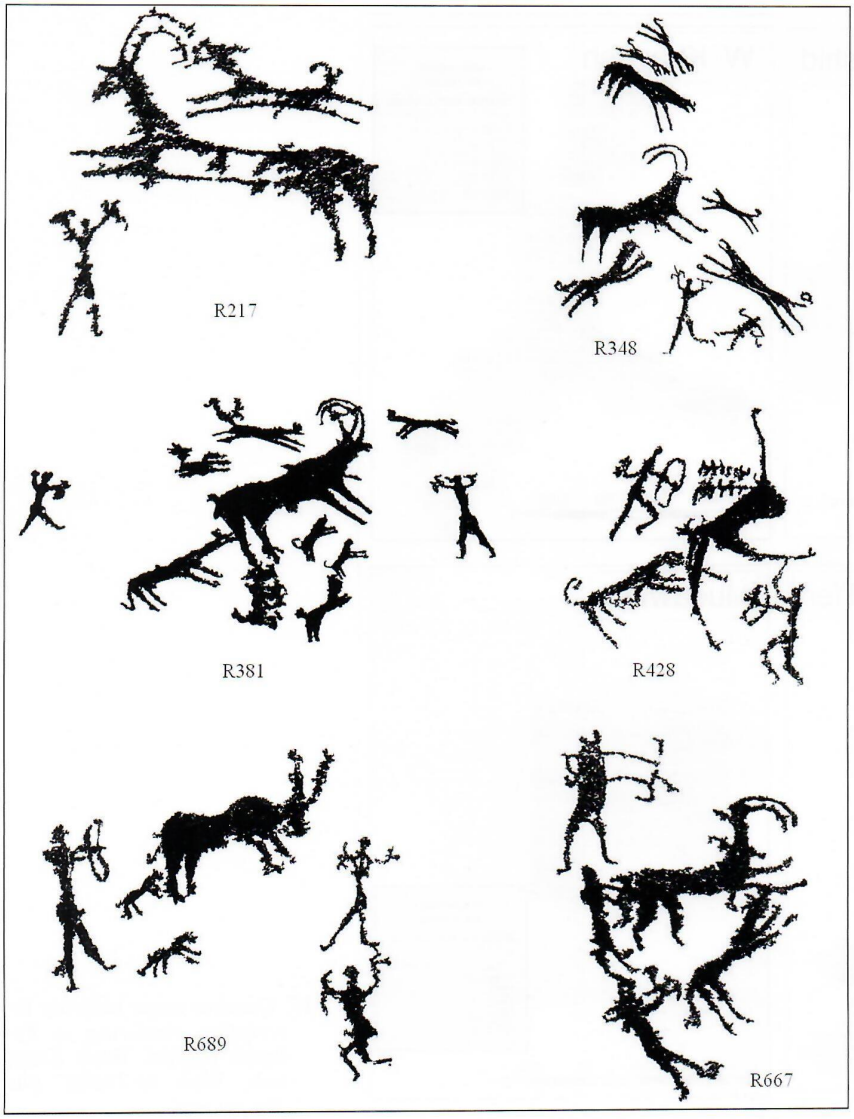
9. The best and most thorough review and analysis of Thamudic E/Ḥismaic inscriptions remains Geraldine King's unpublished dissertation of texts and drawings recorded from the nearby Wādī Judayyid (King 1990).

drawn atop the camel's hump, usually shown holding the reigns and a riding stick. More rarely, camels were drawn outfitted with saddles or swords. Almost always, the camel (or camel and rider) was drawn alone, without accompanying visual elements. This stands in marked contrast to the hunt drawings, the majority of which depict hunted animals like the ibex (*wʿl*), the oryx (*ṯr*), and the ostrich being attacked by hunters armed with bows and trained dogs (**Fig. 16**). Although there is great variety in the style and complexity of hunt drawings, most narrative scenes tend to show the animal at the center of the scene (often at a considerably larger scale), with the other actors and elements of the hunt drawn around the margins.

Analyzing the Distribution and Location of the Inscriptions and Drawings

Using various GIS tools and spatial analyses, the author's study aimed to: 1) detect and measure areas of inscription and drawing clustering within each tributary, 2) map the location of these clusters relative to each tributary's drainage network, and 3) discern meaningful distribution patterns in the content of the inscriptions and drawings. For the latter, particular attention was given to analyzing the distribution of script types, inscription types, drawing types, tribal names, as well as specific members of identified lineages.

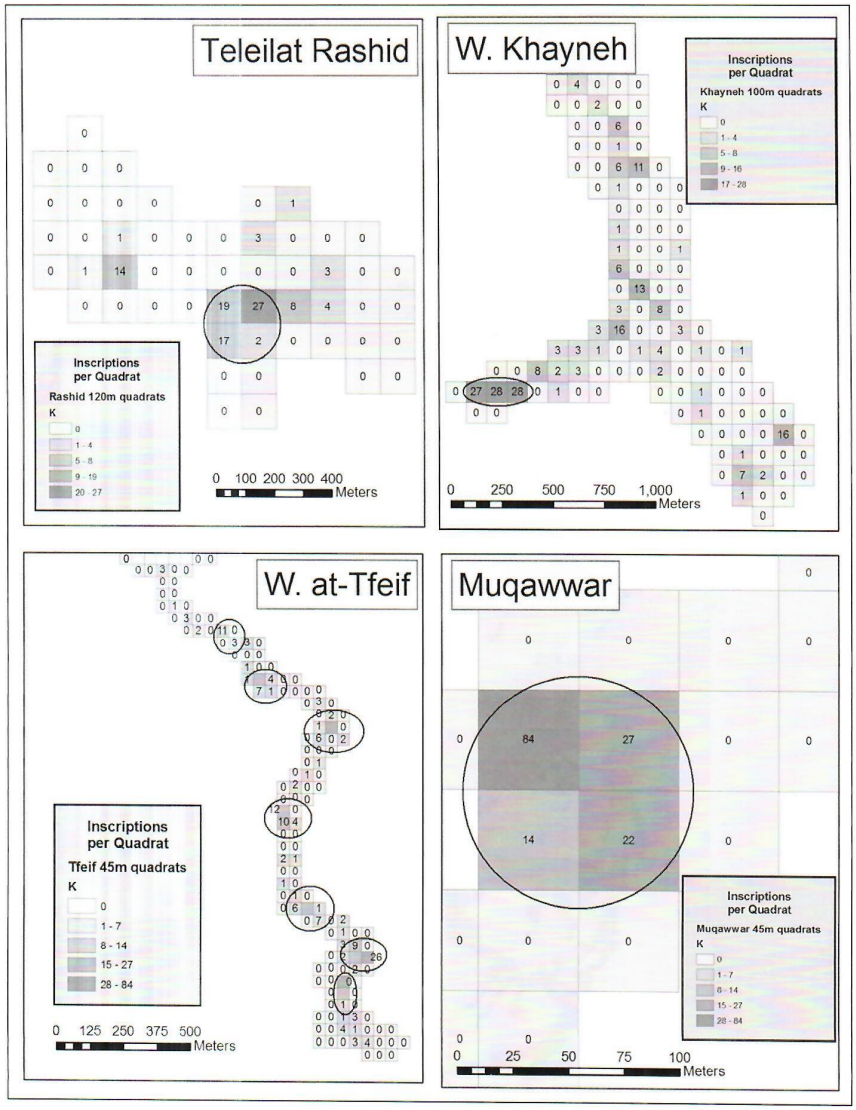
In analyzing the spatial and landscape context of the inscriptions and drawings from each



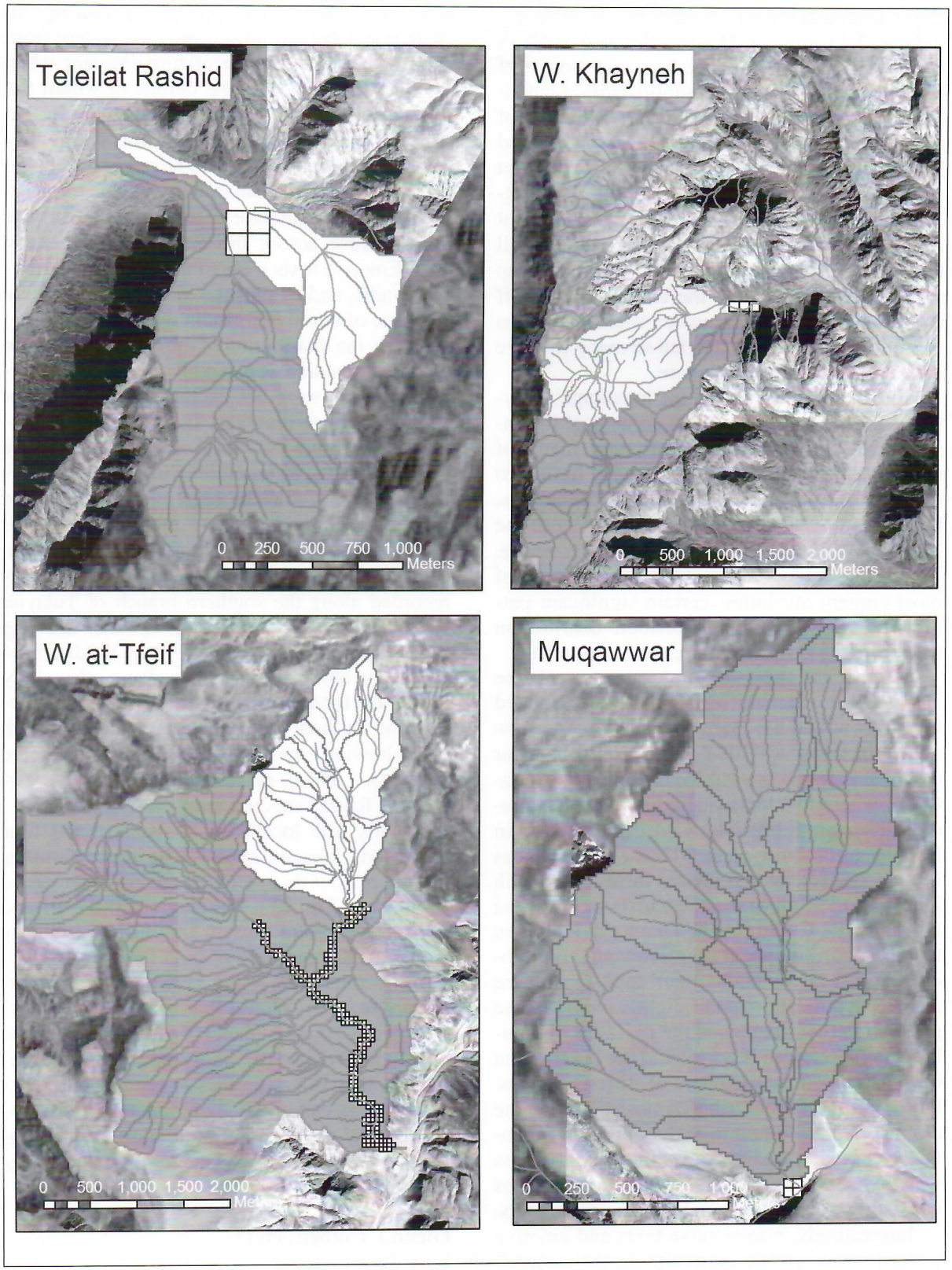
16. Selection of Thamudic hunting scenes.

tributary, it is clear that certain distribution patterns prevail across all three study areas. First, the cluster analysis revealed that there are specific locations within the tributaries that show far more inscription and drawing activity per unit of area (**Fig. 17**). In Tulaylāt Rāshid, for example, 65 of the 100 recorded inscriptions were found near the confluence of the wadi's south and southeast branches. Likewise, in Wādī Khāynah, more than a third of the 228 recorded inscriptions (83, or 36%) were found along a narrow stretch located at the far end of the wadi's southern branch. In Wādī aṭ-Ṭufayf, just less than half of the wadi's 412 recorded inscriptions (199, or 48%) were found among seven identified clusters of various sizes, nearly all occurring at bends along the wadi's sinuous path. And perhaps most telling, more than a third of the inscriptions recorded in aṭ-Ṭufayf (147, or 36%), and nearly a fifth of all inscriptions in the study, were found in and around the cascade pools of Muqawwar. These distributions make it clear that authors and artists were actively seeking out certain locations within these tributaries. But why?

Through the hydrological analysis, it was found that almost every major inscriptional cluster within each wadi is situated at or in close proximity to the drainage point of a significant watershed (**Fig. 18**). In Tulaylāt Rāshid, over half (1.74 km^2, or 56%) of the wadi's 3.08 km^2 total drainage flows through the area of highest inscription density. Likewise, the far end of



17. Quadrat maps showing inscription clustering in Tulaylāt Rāshid, Wādī Khāynah, Wādī aṭ-Ṭufayf, and Muqawwar.



18. Watershed maps for Tulaylāt Rāshid, Wādī Khāynah, Wādī aṭ-Ṭufayf, and Muqawwar.

Wādī Khāynah's south branch receives nearly a third (3.23 km^2, or 31%) of the wadi's 10.38 km^2 total catchment. The cascade pools of Muqawwar receive direct runoff from a catchment area of more than 3.0 km^2, with much of that drainage originating from the well-watered Rās an-Naqab escarpment. Finally, the outlet of the extremely narrow and sinuous Wādī aṭ-Ṭufayf receives runoff from a total catchment area of 12.70 km^2, the largest catchment of all the Ḥafīr's tributaries. Given the wadi's steep slopes and narrow bed, the cumulative runoff that drained through the valley must have been one of the main factors that led so many to carve their names and drawings here.

Somewhat surprisingly, the locational analysis of the textual and artistic content of the inscriptions and drawings shows that many of their key attributes are not localized or limited to identified clusters or specific landscape features, but rather are widely dispersed across both the individual tributaries and the Ḥafīr as a whole. Yet despite the overall scattered distribution of most content attributes, certain significant patterns do emerge when the attribute distribution data from the three tributaries are compared.

Despite the near total dominance of the Thamudic E/Ḥismaic script, there are isolated locations within the Ḥafīr that show some variability in the scripts that authors used. A clear example is found around the cascades of Muqawwar, where five texts (including three Thamudic E/Ḥismaic bilinguals) were either carved in Nabataean or show clear Nabataean influences in their syntactical and lexical forms (Hayajneh 2009). In addition, at least two texts were carved in Thamudic C and one in Thamudic D. Given that these scripts appear so infrequently throughout the rest of the Ḥafīr, their appearance here may be an indication of the slightly more diverse population that frequented the cascades. A similar pattern emerges if we look at the distribution of texts carved by members of different tribes. Of the eight different tribal names attested in the corpus, five are found in and around the Muqawwar cascades, again suggesting that this area was frequented by a diverse population, perhaps consisting of both local and non-local elements.

Interestingly, prayer/curse texts and emotive texts show very little patterning in their overall spatial distribution. Not only are prayers/curses found in almost every wadi and inscription cluster, but the formulas used vary widely from stone to stone. A similar picture emerges when we map the names of the deities to whom the prayers and curses were offered (**Fig. 19**). No tributary (nor any specific location within any of the tributaries) appears to have been reserved for prayers to a particular deity. The distribution of the various emotive expressions is likewise quite diffuse across the entirety of the study area. Emotive texts were found in all three tributary wadis, and in all three locations, more than one type of emotive formula was used.

When the distribution of the different drawing types is compared, it is readily apparent that particular wadis were not exclusively reserved for certain types of drawings (i.e. only hunt drawings, only camel drawings). In fact, in all three tributary wadis, different drawing types were often recorded within the same cluster. But when we take a closer look, two interesting—if still inexplicable—patterns emerge (**Fig. 20**). First, camels were depicted in all nine of the drawings recorded along the southern branch of Tulaylāt Rāshid, to the total exclusion of other drawing types. Second, the drawings from Wādī Khāynah, when compared with those from other study areas, are focused disproportionately on depictions of the hunt and hunted animals. Although other drawing types are present (four camel, three horse, two other), no fewer than 21 hunt drawings are found scattered throughout the wadi.

Finally, the locational analysis of the four identified lineages shows that these families did not restrict their activities to certain areas or tributaries (**Fig. 21**). Members of the *rmʿl* and *nht* lineages were present in all three tributary wadis, while members of both the *s²hr* and *ʿnʾl* families were each found in two of the three areas under study. Within Wādī Khāynah, however, there is some evidence that members of the *s²hr* family visited the wadi somewhat more frequently than other families or groups. Of the 13 inscriptions carved by members of known lineages, nine were carved by five different members (representing three generations) of the *s²hr* family.

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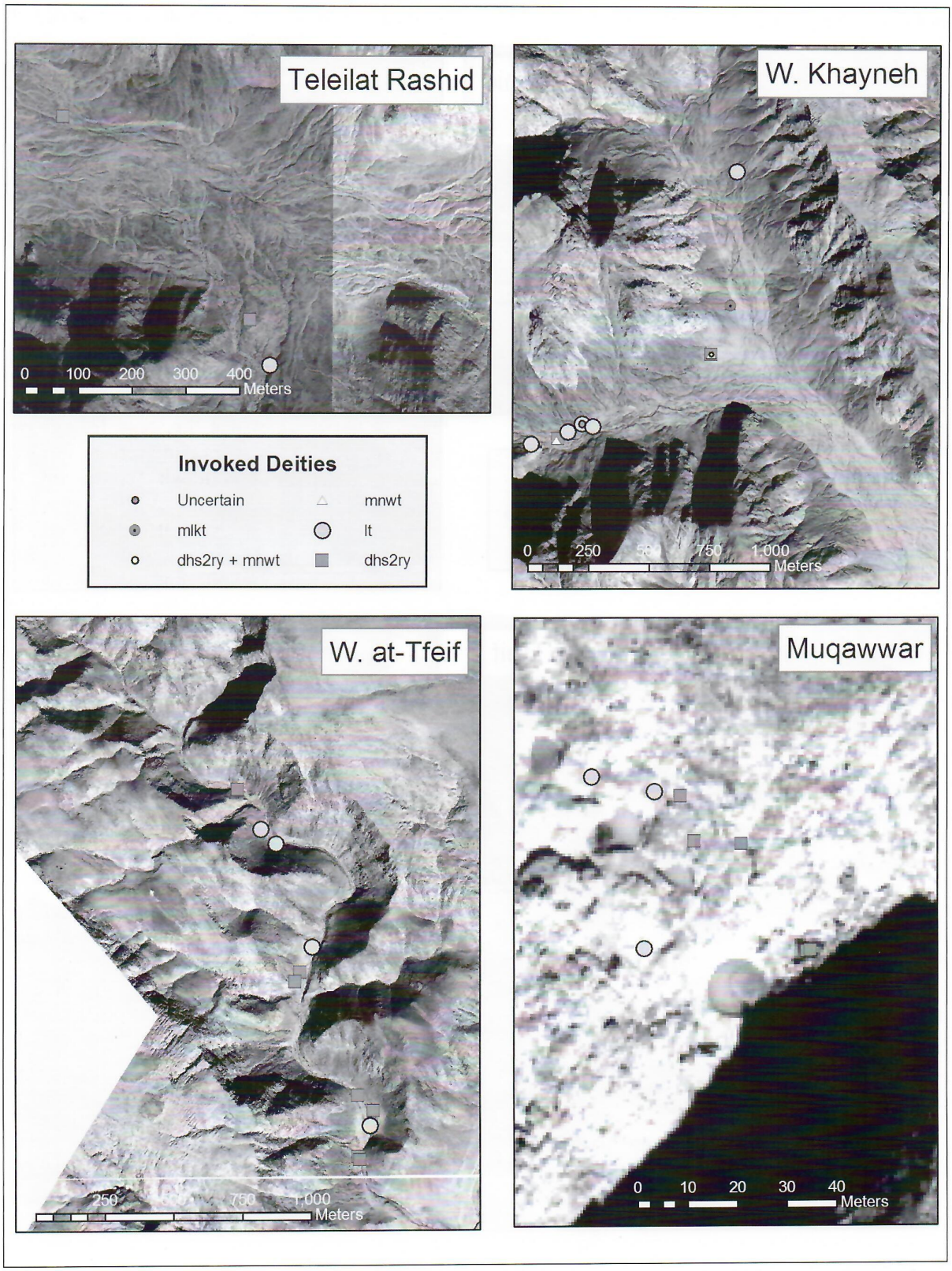
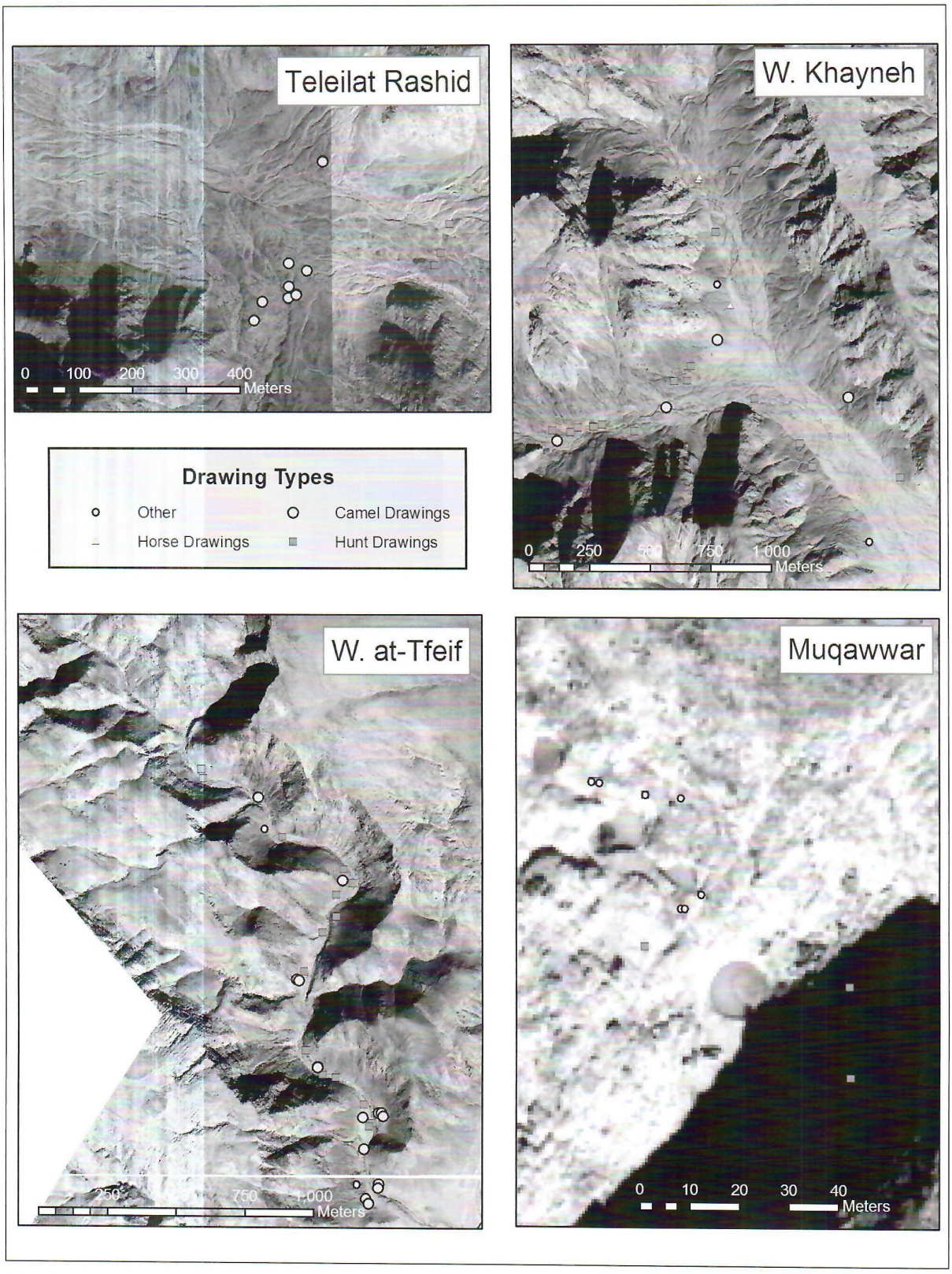
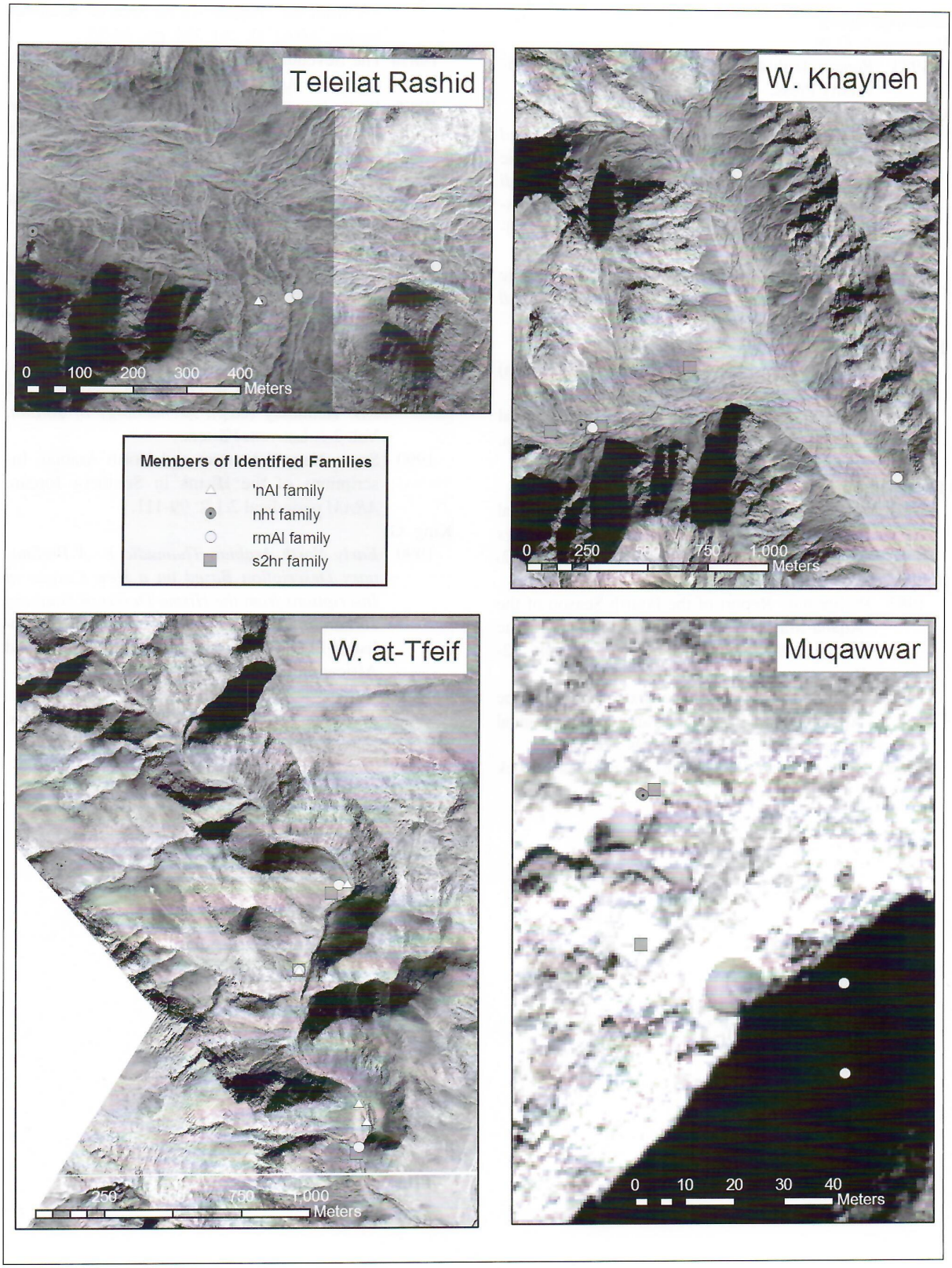


19. Distribution of prayer/curse texts and invoked deities by wadi.



20. Distribution of camel drawings vs. hunt drawings by wadi.



21. Distribution of identified families by wadi.

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DIGGING DEEPER: TECHNICAL REPORTS FROM THE DHĪBĀN EXCAVATION AND DEVELOPMENT PROJECT (2004-2009) [1]

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Introduction

The Dhiban Excavation and Development Project (hereafter DEDP) integrates archaeological practice with sustainable site development. The project's focus is the site of Tall Dhībān (**Fig. 1**) where the DEDP has excavated for four seasons (2004, 2005, 2009 and 2010). Overall, the project has focused on recovering data that assists in the reconstruction of local societies from the site's earliest habitation (Early Bronze 1b, *circa* 3100 BCE) to the modern day. To further this understanding, research objectives during these seasons have included:

1. Creating a digital topographic site map for use in Geographic Information Systems (GIS) software.
2. Re-excavating and improving excavation areas from former projects (especially "Area L" on the uppermost part of the site).
3. Linking human activities to local environmental data at various periods of occupation.
4. Co-ordinating excavation with the Department of Antiquities' conservation and preservation efforts, and preparing the site for public presentation.

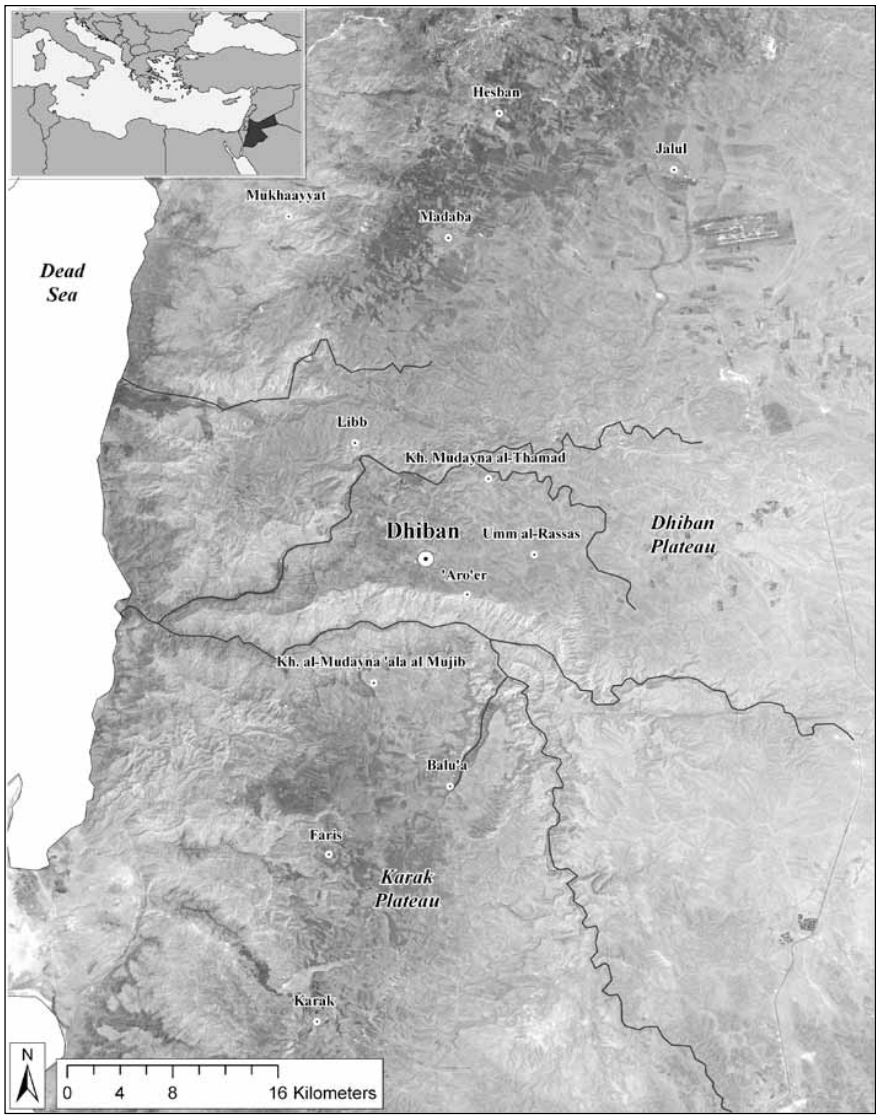
The following reports represent a significant step forward in our understanding of human activities at Dhībān, particularly regarding the nature of the Middle Islamic settlement and human activities during the site's recent history (Byzantine to present day). This article presents information about Dhībān's local environment, then discusses the creation of the digital site map that has aided researchers' understanding of the size and occupational history of the site. The article also includes preliminary information on the glass, faunal and palaeoethnobotanical remains at the site. The article concludes with a discussion of how the DEDP envisions integrating archaeological excavation with the community and twenty-first century digital media. Information in this article complements and expands upon the information available in earlier *ADAJ* articles about the DEDP's research (Porter *et al.* 2005; Porter *et al.* in press).

Palaeolandscape Assessment: Landscape and Hydrology

Dhībān is located on the Dhībān Plateau, which forms the southern edge of the Wadi al-Wālā watershed (**Fig. 1**). The site is flanked by the Wādī Sakrān to the west and Wādī Dhībān to the north. These local incised valleys effectively isolate the *tall* as a topographic feature distinct from the adjacent town and agricultural land. On a regional scale, the Dhībān Plateau is formed by the deeper wadi systems of the Wādī al-Wālā to the north and the Wādī al-Mūjib to the south. While both of these larger systems contain water year-round, the pluvial inputs of these systems are not identical. Local topography indicates that the Wādī al-Mūjib would not receive hydrologic inputs from rainfall in the Dhībān region, which would instead flow into the Wādī al-Wālā system and west to the Dead Sea.

Incision within these wadi systems was a function of hydrologic inputs and regional tec-

1. This article is the first of two bringing *ADAJ* readers up to date on the DEDP's research at Dhībān. It contains reports on mapping, the environment, numismatic data, glass finds, plant and animal remains, and digital documentation. The second article, which will appear in the next issue of *ADAJ*, contains specific information regarding on-site survey, excavation, architectural phasing and preliminary ceramic vessel reports from the 2009 and 2010 seasons.



1. Map showing the location of Dhībān in west-central Jordan and related topographic features. Note Dhībān's central location between Wādī al-Wālā to the north and Wādī al-Mūjib to the south.

tonics. More localized wadi systems are relatively shallow, whereas larger systems downstream from local drainages form significantly deeper valleys. The geomorphic expression of these wadi systems reflects stream order as well as headward adjustments to base level changes during the Quaternary (e.g., de Jaeger and de Dapper 2002). However, the fact that archaeological construction at Dhībān occurs at the base of the site, almost within the local wadi systems, also indicates that minimal downcutting has occurred during historic periods. Wadi incision in these upstream areas was likely more frequent during periods of higher rainfall and wetter climatic conditions, which occurred during the Pleistocene (Cordova 2007). The last several thousand years seem to have resulted in minimal downcutting and nominal sediment accumulation in the wadi channels immediately adjacent to Dhībān.

Despite the presence of several large regional faults and folds (al-Hunjul 1993a, 1993b), the limestone bedrock in the immediate area of Tall Dhībān exhibits minimal localized folding. Bedrock instead maintains a flat to slightly dipping (primarily to the south-east, though significant local variation exists) orientation. Local topography has been defined by the erosional action of the wadi networks examined above, creating isolated high points despite a lack of evident localized uplift. Wadi formation and morphology has been determined in part by bedrock (de Jaeger and de Dapper 2002), particularly in regions north of Tall Dhībān where wadi systems are

significantly incised. Despite their depth, these wadis remain passable on foot.

The expression of the landscape around Dhībān has likely been maintained without significant changes since at least Roman times, and potentially throughout the period of habitation of the site. The lack of recent incision within wadi drainages, paired with limited soil development and minimal sedimentary inputs, leaves a landscape affected primarily by degradational processes. The Dhībān Plateau as a whole has been exposed to significant fluvial and aeolian activity during the Quaternary, and erosion has been the dominant geologic process in this area during the Holocene. While this means that wadi systems in this region are more likely to have had sedimentary deposits removed than to have preserved depositional records, it also indicates a level of exposure for historical periods that may be a benefit to archaeological investigations.

Quaternary deposits, including those associated with the archaeological sediments of the site, occur directly on the Cretaceous limestone bedrock. In the immediate area of Dhībān, Quaternary deposits consist of minimal soil thicknesses, designated as Red Mediterranean soils (Cordova *et al*. 2005). Soil formation has occurred largely within colluvial deposits, which vary from large slides and rock falls to finer-scale deposition resulting from sheetwash events. Slopes within the wadis are steep and subject to continual degradation owing to the grazing of local sheep and goats as well as both animal and human foot traffic. Soil preservation on the site proper is also minimal due to the extensive anthropogenic alteration of the site itself.

Due to the limited sedimentary archive present in the Dhībān region, colluvial deposits may reveal more about local landscape changes, including human activities and climatic events, than other sedimentary sources. Limited excavations into the colluvial deposits preserved behind wall construction within the nearby Wādī Sakrān reveal surface soils poor in organic material on top of alternating beds of coarse gravels and fine-grained peds. These beds are inclined toward the wadi, supporting the hypothesis of colluvial deposition alternating with periods of stability.

Gravels found behind the base of constructed walls contain rounded clasts, which indicate fluvial deposition and transport as opposed to a colluvial origin. Walls were therefore constructed in trenches dug into extant wadi deposits. The presence of architectural features within local wadi bottoms may indicate a need to stabilize local hillsides against further degradation. Repeated episodes of colluvial deposition, followed by landscape stability, may indicate that colluvial action has responded to environmental triggers, possibly in the form of human activities further upslope or changes in local climatic conditions. Hypotheses developed by Cordova (1999) and others suggest that regional sedimentary accumulation within wadi systems may correlate with agriculturally induced soil degradation on local hillsides. Although a limited amount of pottery found within trenches indicates that these colluvial deposits correspond with periods of occupation at the site, further chronological control as well as sampling for agricultural indicators will be necessary to make any claims of causation for hillslope sediments at the site. Beyond the immediate site of Dhībān, the Dhībān Plateau has many similarly steep slopes into local wadi systems. Agricultural terraces are commonly found on these slopes, both as actively farmed fields and as abandoned architectural features. Some remnant wall construction can also be identified within wadi bottoms, suggesting that hillslope stabilization was necessary throughout the region, or that a single cultural group made use of wadi hillsides across the Plateau.

Investigations into palaeohydrology and palaeolandscape stability at Dhībān have only recently become a focus for the DEDP, and the latest observations represent the results of initial investigations into the nature of the historic landscape of the Plateau beyond the site proper. As work progresses on these wider-scale investigations, new insights will be forthcoming on the relationship between Dhībān's inhabitants and the Plateau's environment.

Topography and GIS

The purpose of the 2009-10 topographic survey was to consolidate and refine all previously collected survey data within a GIS. The project adopted ArchGIS for this purpose. To gain meaningful results from the GIS, a total cover-

age resolution of less than one meter for the site was required. In addition, selected areas were mapped at a higher resolution (<0.5m) to enable further analysis by the geoarchaeological team. The work was undertaken by Andrew T. Wilson with the help of undergraduate students from Knox College, the University of Liverpool and the University of California, Berkeley.

Several gaps existed in the earlier survey data. To identify areas which required refinement, a Triangular Irregular Network (TIN) was calculated using the 2004 - 05 survey point data. A TIN is the process by which all points within the survey area are connected using a series of triangles. Each triangle indicates the distance to the next point, the longer the triangles, the larger the distance between each control points. Areas with longer distances between control points indicate areas of the survey lacking in control points. Areas were re-surveyed if there was more than one meter between control points. The survey area was expanded in the 2009 - 10 seasons into the local wadi systems, requiring the addition of many survey points.

The new survey data proved vital in the creation of the digital site map and elevation model. Wilson processed the raw survey data in ArchGIS to produce a digital elevation model (DEM) and one meter contour map for the site and its immediate environs (**Fig. 2**). The creation of the DEM has enabled further excavation and analysis (**Figs. 3 and 4**). Chief was the re-calculation of site size, now estimated at 12 hectares rather than the 2.5 to 7.5 hectares identified in earlier ASOR excavation reports (Winnett and Reed 1964: 5, 39, n2). The DEM also aided in the identification of terraces, several of which had received no archaeological attention up to this point and may prove important in understanding long-term settlement history.

Glass Objects from Dhībān 2004-2009: Preliminary Report

Between 2004 and 2009, 903 glass fragments dating from the Late Hellenistic to modern periods were excavated at Dhībān. Though glass from archaeological sites is most often used to investigate trade and issues of dating, this corpus yields information about household activities as well as a more specific glimpse into the lives of women and children at the site.

Glass Vessels / Housewares

To date, most of the glass from Dhībān has been excavated from mixed contexts. Much of it is found within the fill of a Middle Islamic building and courtyard complex situated on the acropolis (**Fig. 4**; Porter *et al*. 2005; Porter *et al*. in press; Porter 2010; Routledge *et al*. in press), though it dates from a variety of periods.

Hellenistic-Early Roman Period

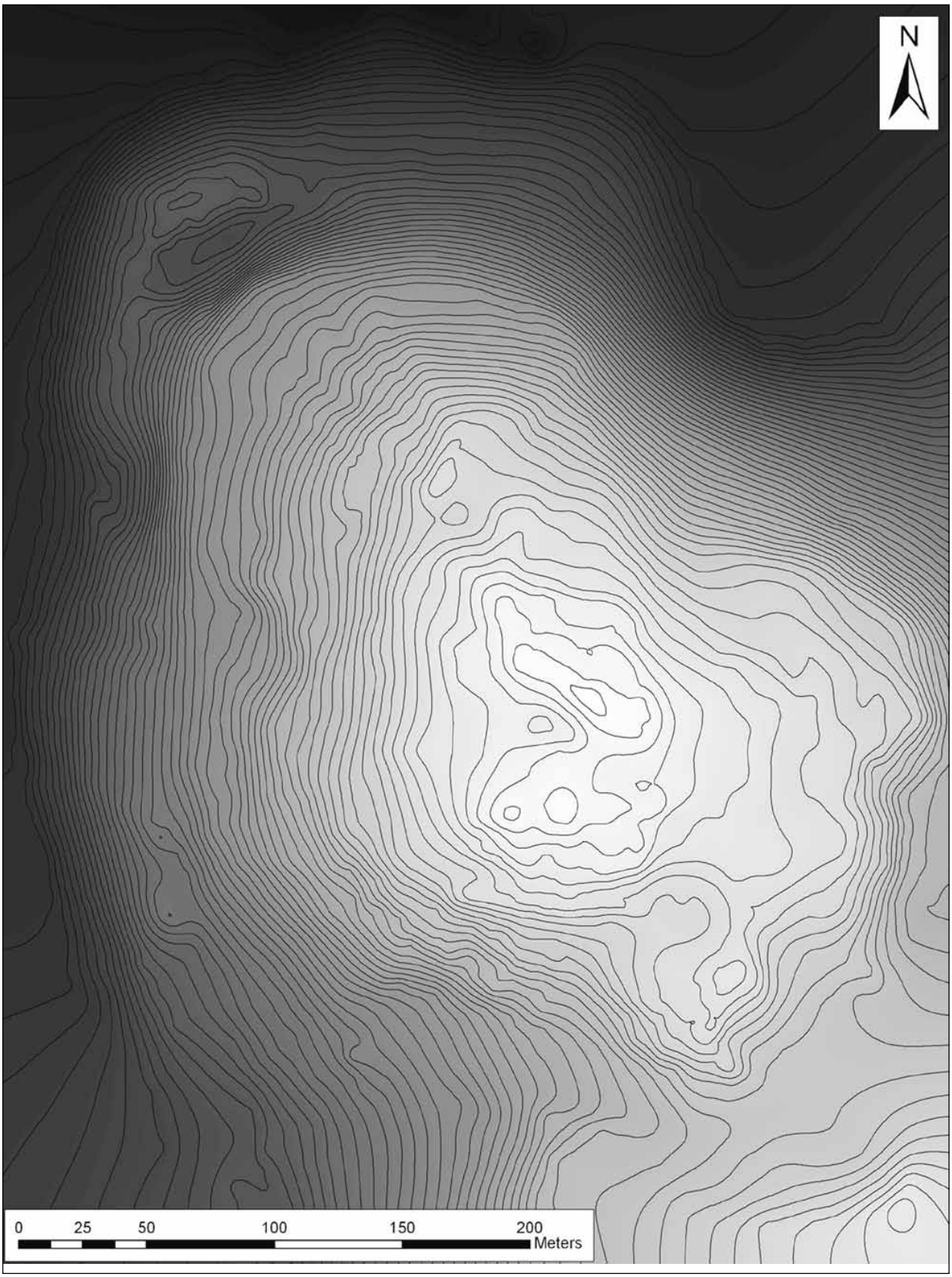
Within this period at Dhībān, we find a glass corpus consisting primarily of tablewares, mostly cups and bowls. There are two fragments of bowls with internal lathe cuts that appear to be Early Roman blown renditions of the Late Hellenistic pillar-molded bowl type. Prior to the invention of glass-blowing, glass vessels were very precious objects. After that technological shift, glass became more readily available but also easier to break. This was a simple function of the thickness of the glass. The cast vessels were thicker and thus harder to break, while the blown vessels had thinner walls which were much more fragile (Fischer 2000: 115). The thicker glass could be transported great distances without fear of breakage; the same was not true for the blown vessels. This suggests the blown glass objects were produced regionally.

Late Roman - Byzantine Period

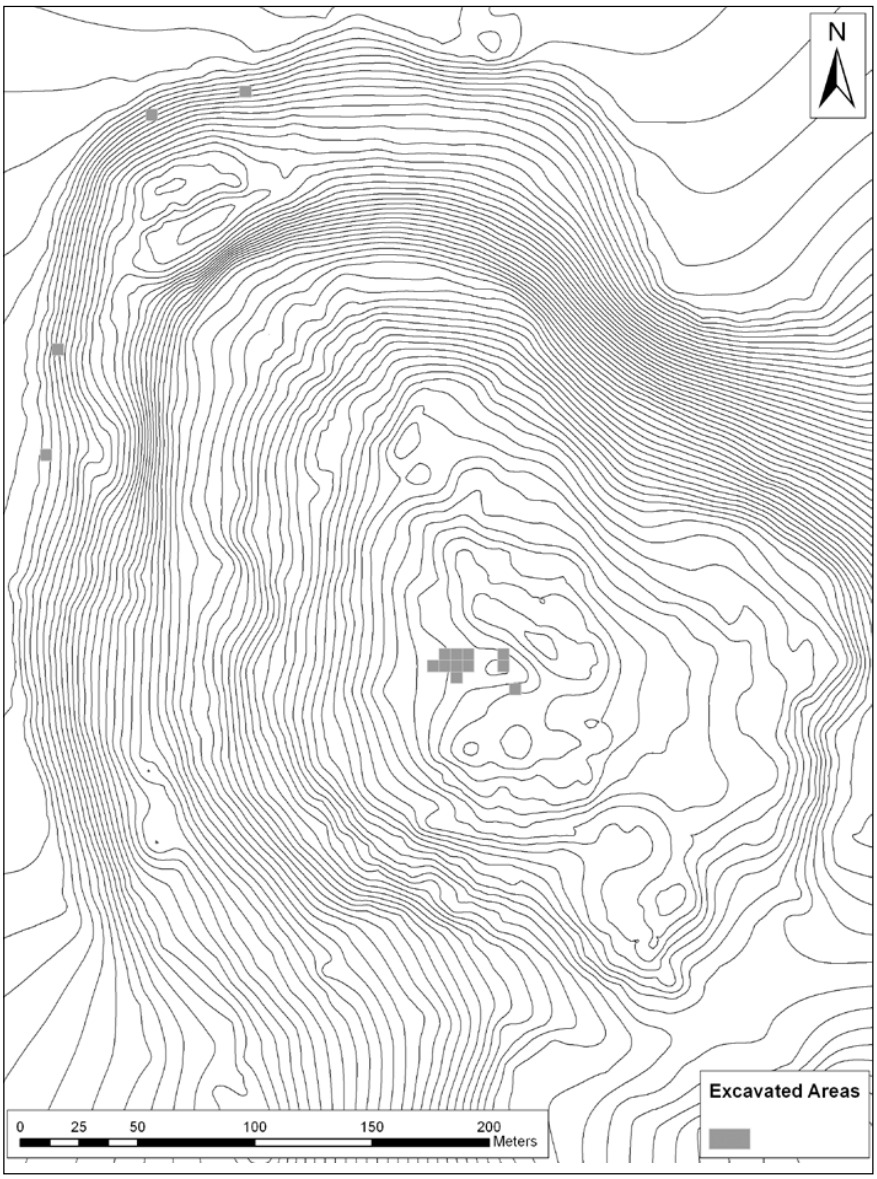
The Dhībān glass from these periods is again blown tablewares: cups, goblets, plates and bowls, with a few glass lamp fragments as well. There is one example of a 3rd-5th century blown lamp with blue dot decoration (parallel at Jalame (Weinberg 1988: 332)), as well as a 6th / 7th century lamp with ball stem (parallels at Sardis (Von Saldern 1980, pl. 23) and Nabretain (Fischer 2009: 343)). Here we begin to get a fuller picture of how glass was utilized within the household on a daily basis at the site.

Islamic Periods

The identifiable objects in the 2004-2009 corpus of Islamic glass consist almost exclusively of bracelets, which will be discussed further in a separate section of this report. There are also many glass vessel fragments at the site and, though it is not possible to determine, some may be from Islamic period wares. A very preliminary look at the 2010 materials suggests a



2. Shaded Digital Elevation Model (DEM) created from survey data collected in 2004, 2005 and 2009.



3. Excavation areas (grey squares) overlaying Dhībān's topographic features.

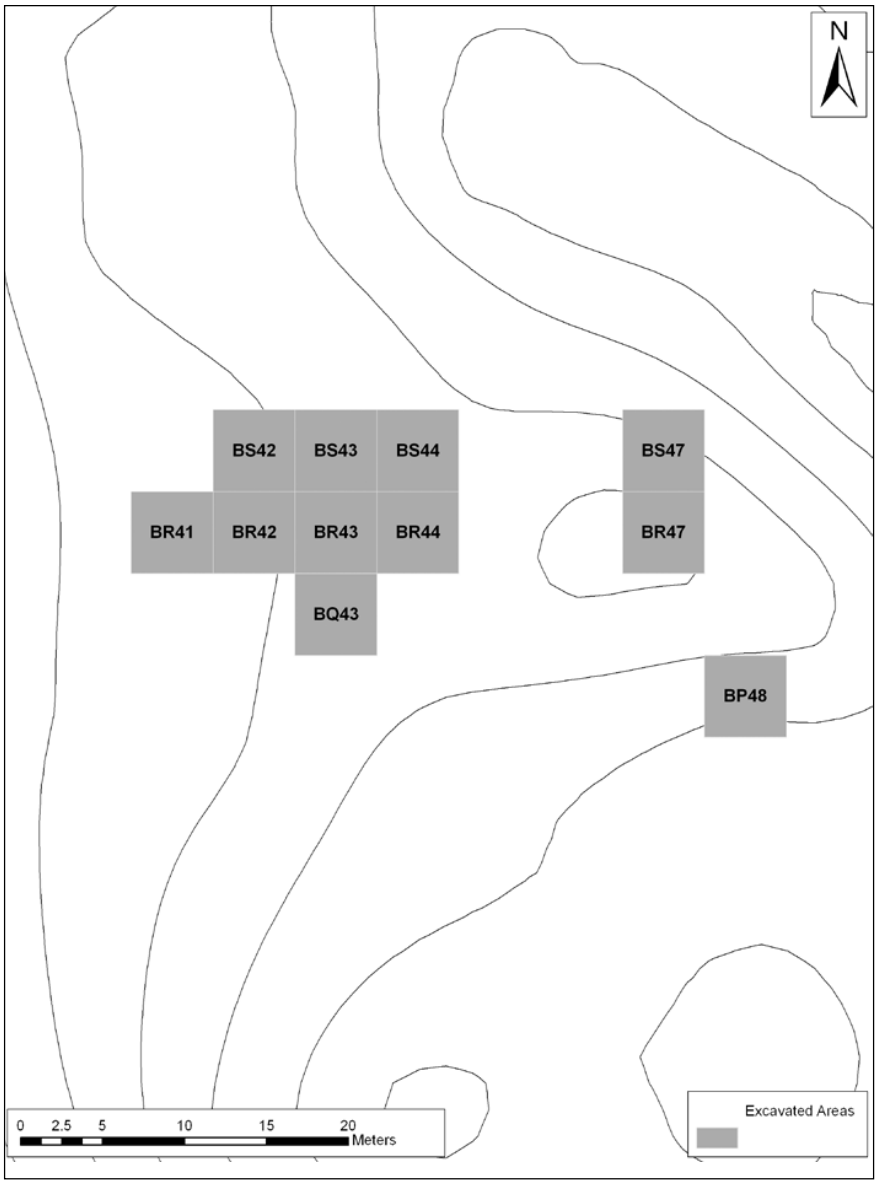
wider variety of glass objects from this period can be discussed in the future.

Modern Period

In the modern period, Pepsi and Coca-Cola bottles predominate. There are some alcohol bottle fragments as well as glass cups for tea. This shift away from tablewares to objects that can be used out-of-doors is indicative of the site's most recent use as a recreational get-away from the modern city of Dhībān. As in earlier periods, the glass can give us a vivid picture of the kinds of activities people have engaged in at the site.

Glass-Working

Thus far there has been only one potential indication that glass may have been worked at the site of Dhībān. Within the Middle Islamic courtyard area excavated in 2005 (BR41, 28, 122, 7; see Porter *et al*. in press) was a small piece of glass adhered to ceramic. This may be evidence that glass was being melted in ceramic installations at the site, but may also be a poorly fired glazed pot or the result of a fire at the site. At this time we have no conclusive evidence of glass-working. Due to the size of Dhībān, particularly in the Byzantine and Islamic periods, it is possible — but not necessarily the case —



4. Map of Dhībān's acropolis ("Area L") with DEDP excavation units labeled.

that glass was being formed into objects on-site. Alternatively, local consumers could have taken advantage of the thriving regional trade in glass objects, particularly from Hebron or Damascus.

Bracelets

The glass corpus from Dhībān contains 101 bracelet fragments, which represents 11.9 % of the glass fragments as a whole (total = 903). Once unreadable body fragments are removed from the corpus (527 of the total of 903), glass bracelets make up 28.7 % of the readable corpus. This figure is quite high compared to other sites in the region and indicates the bracelets should receive special attention when interpreting the site.

The proliferation of bracelets was clear during the 2004 and 2005 seasons. Previous chemical analysis has suggested the bracelets may be understood as having three separate periods and places of origin (Salvant 2007). Two of the compositions are considered Levantine, with a change in flux between the Byzantine and Islamic periods (Salvant 2007; but see Fischer and McCray 1999). The third composition is identified as an import from South Asia. The black bracelets which predominate at the site (75 % of the fragments) appear to be made from this third compositional type. Salvant has proposed that "these bracelets were imported from India"

(2007: 61). Salvant is relating them to bangles analyzed by Brill (1987), none of which have a date later than 1250 AD (Salvant 2007: 62). Brill's dating does not suggest this composition was only used until the 13th century, but merely indicates the dates of the glass he was analyzing.

Turning to the morphology of the bracelets yields a range of possible dates. Many of the bracelet types are very simple; Spaer (1988; 1992) has dated these types to "Pre-Islamic onwards". Sixty-five of the 101 bracelet fragments fall into Spaer's types A2a, A2b, C1a, C1b and D1a. A further 24 of the bracelets are of types found primarily in the Middle Islamic period and later (Spaer's A4a, A4b and A5b). Given the locations of excavation and soil deposition at Dhībān, it is likely the majority of bracelets excavated in the Middle Islamic building complex on the acropolis — though in mixed fill — are from the Middle or Late Islamic periods. Three bracelets from the area seem to be of an Ottoman type with added decorations, but they differ from Spaer's typology enough that they may instead be Middle Islamic. It is also possible some of the bracelets date from the Bani Hamida occupation of the site. This group is known to have made pilgrimages to Hebron, where glass bracelets have been sold in large quantities for centuries.

The prevalence of glass bracelets at sites in the region begs the question of their use and importance in daily life. To date, most studies of glass bracelet assemblages have focused on their chemical compositions as a way to look at ancient trade and technology. Less attention has been paid to their function. This seems to be a modern bias, with researchers assuming bracelets functioned as simple adornment and status markers as they do today. Given ethnographic parallels as well as historical records, this may be an overly simplistic interpretation.

Bracelets were produced for both adults and children. We do not have data to suggest that glass bracelets were worn by adult males, but it appears they may have been worn by male children. That they were worn by both adults and children is shown by the various circumferences produced, as well as their appearance in grave goods. Also, what may seem to be a bracelet when in fragmentary condition can be identified as a ring, anklet or hair ornament when circumference is considered. The purpose of the bracelets is unclear, though ethnographic parallels suggest they may have had apotropaic and / or healing functions in addition to being status markers. Future investigations of the Dhībān glass will consider these issues while continuing to look at the roles all types of glass objects played in the history of the site.

Faunal Evidence from Middle Islamic Dhībān: Interim Report on the 2005 Season

This report is a preliminary analysis of faunal specimens recovered from the 2005 excavation season at Tall Dhībān. The vast majority of the specimens came from Middle Islamic period levels, that is to say the post-construction phase of a building complex. A small portion of the assemblage came from the narrow L - SECT trench dating from the Iron Age to Byzantine periods, as described by Porter *et al*. (in press).

Methods

The analysts developed a methodological framework prior to analysis. Reference manuals were used in lieu of a modern reference collection, including those by Schmid (1972), Boessneck *et al*. (1964), Boessneck (1969) and Prummel and Frisch (1986). Questionable identifications were checked against modern specimens where available. Measurements are those described by von den Driesch (1976). We followed Payne (1973) and Zeder (1991: 93) in determining mortality patterns among sheep / goats through tooth eruption and wear analysis. Bone fusion stages are based on Silver (1969).

This report is based on the 2,542 specimens analyzed to date. 17 % of this assemblage (n = 447) was identified to skeletal element. Gnawing and breakage are based on these 447 specimens. Of these, 353 fragments could also be attributed to a specific taxonomic category (**Table 1**). The remaining specimens were counted (n = 2,095) and broadly classified by size (e.g., "large mammal").

Damage to the Assemblage

Many of the bones in the Dhībān assemblage show signs of wear and tear indicative of post-depositional surface exposure, such as weathering. The majority of specimens show at least light root etching, suggesting they spent some

Table 1: Taxa represented in the Tall Dhībān faunal assemblage.

Taxon	Common Name	Middle Islamic		Iron through Byzantine	
		NISP	Percent	NISP	Percent
Bos taurus	Cattle	45	14.1	1	3.0
Ovis aries / Capra hircus	Sheep or Goat	151	47.2	21	63.6
Ovis aries	Sheep	14	4.4	0	0.0
Capra hircus	Goat	29	9.1	1	3.0
Equus asinus	Donkey	9	2.8	1	3.0
Eauus caballus	Horse	1	0.3	0	0.0
Equus sp.	Other equid	3	0.9	0	0.0
Canis familiaris	Dog	2	0.6	0	0.0
Camelus sp.	Camel	1	0.3	0	0.0
Gallus gallus	Chicken	4	1.3	0	0.0
Aves	Other bird	18	5.6	4	12.1
Dama dama / Cervus elaphus	Fallow deer or Red deer	1	0.3	0	0.0
Gazella sp.	Gazelle	4	1.3	0	0.0
Capra aegagrus	Wild goat	1	0.3	0	0.0
Lepus spp.	Rabbit	1	0.3	0	0.0
Vulpes vulpes	Fox	4	1.3	0	0.0
Sus scrofa (wild)	Wild pig	9	2.8	0	0.0
Sus scrofa	Other pig (domestic)	6	1.9	1	3.0
Fish	Fish	14	4.4	1	3.0
Rana sp.	Frog	1	0.3%	0	0.0%
Microfauna	Rodents and other small animals	2	0.6%	3	9.1%
Total		**320**		**33**	

time near or on the surface. The weathering displays no patterns by taxon or body part, suggesting that butchery waste and meal refuse were discarded similarly.

Dog and rodent activity also impacted the Tall Dhībān assemblage. 5% of the assemblage displays evidence for gnawing or digestion (17 specimens with dog gnawing; 6 specimens with rodent gnawing). Dog gnawing appears mainly on the elements' ends, while small bones of the foot frequently have a 'digested' appearance. Oddly, only two dog elements have so far been identified. Possibly, dogs were disposed of elsewhere. Rodent gnawing occurs mainly on the sharp edges of elements. Their presence is supported by a handful of rodent bones in the assemblage.

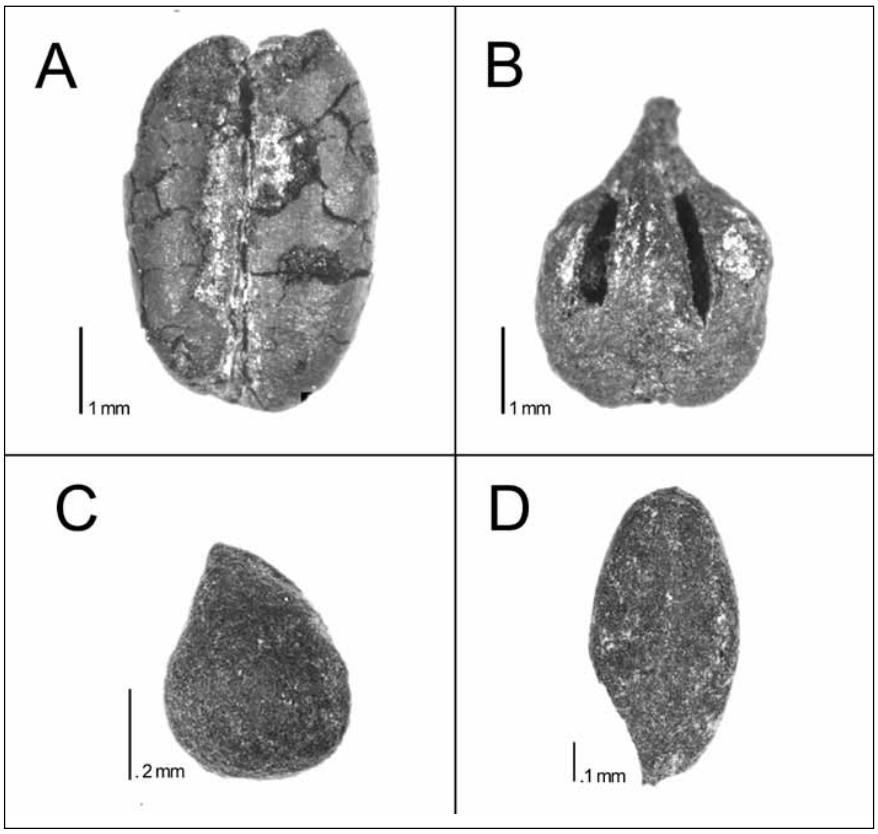
In spite of the evidence for potentially destructive weathering and gnawing, both a number of fish bones and small, friable specimens from very young individuals were recovered, attesting to careful recovery practices as well as favorable soil conditions.

8 % (n = 35) of the identified assemblage has butchery evidence, mostly in the form of slicing. The marks include ones from skinning, disarticulation, meat removal and marrow extraction; however, most relate to dismemberment. This is not surprising as dismemberment requires less skill than other processes and was likely to have been done quickly.

The Tall Dhībān Animals

The following results draw upon the specimens from the Middle Islamic period (**Table 1**). Details of the 33 identified specimens from the Byzantine – Iron Age trench are presented in **Fig. 5**, but are not discussed further.

Sheep and goats dominate the Middle Islamic assemblage, at 61 % overall. Goats are nearly



5. Four archaeological seeds from Middle Islamic contexts at Dhībān: (A) Wheat (Triticum sp.), (B) Grape (Vitis vinifera), (C) Fig (Ficus carica), (D) Canarygrass (Phalaris sp.).

twice as frequent as sheep (1.7 : 1). Sheep and goats were killed at young ages: mandibular tooth eruption and wear data on ten specimens indicates that over 50 % of ovicaprids were killed by the age of 12 months and 70 % were killed before reaching 24 months. Only two individuals reached maturity, one killed between 4 and 6 years and one reaching old age (>8 years). The latter were likely females maintained for breeding, whereas the majority of young animals were likely killed for meat.

These preliminary results are suggestive of a focus on young animals for meat production during the Middle Islamic period. Indeed, 8 of 9 sexed pelves came from females, suggesting that milk production was not a focus. Dominance of young animals and females further suggests that Dhībān was a producing site, sending surplus young males for consumption elsewhere. The preference for goats reflects the arid environment of the site and that wool production was not important.

The next most common taxon in the assemblage is cattle, at 14 %. Bone fusion data indicate that cattle were killed at around 2.5 years, before maturity. From tooth data, however, we know that some mature cattle were present. Pathologies observed on 20 % of toe bones suggest the use of older individuals for labor. The assemblage produced only two pelvis fragments, both from females. Despite evidence that cattle were slaughtered young, the inhabitants may not have consumed much beef: more than 80 % of the cattle elements are from non-meat-bearing parts of the carcass.

The third most common mammalian taxon in the Tall Dhībān assemblage is pig. These 15 fragments make up 4.7 % of the assemblage. The majority of specimens come from wild boar. Boar may have arrived at the site in portions; this is suggested by some articulating bones (a distal tibia with an attached astragalus and calcaneus). However, a high occurrence of foot bones (80 % of the pig sample) suggests that, like cattle, pigs may have been butchered at the site but consumed elsewhere.

13 horses and donkey specimens constitute 4 % of the assemblage. One large specimen comes from a horse (*Equus caballus*), but most of the others are from domestic donkeys (*Equus*

asinus).

Chickens and as yet unidentified birds make up 7 % of the assemblage. The majority of bird bones are upper limb elements. Fish species, likewise unidentified, constitute 4.4 % of the assemblage and consist mainly of vertebrae and cranial bones.

Conclusions

Preliminary analysis of this faunal assemblage has already provided economic insights. Dhībān probably raised animals to supply meat to urban markets, thereby indicating regional interconnectivity. The cattle and pig evidence suggests that crops were also grown and animals hunted. Thus, the economic strategy was partly exchange-based and partly localized, with hunting and farming in the vicinity of the settlement providing food sources over and above the flocks of sheep and goat.

Palaeoethnobotanical Research

In accordance with the research strategy of investigating multiple issues of archaeological importance at Dhībān, including palaeoenvironments, agricultural economies and modes of site occupation, the investigation of palaeoethnobotanical remains was one of the objectives of the 2009 season. Data derived from palaeoethnobotanical analyses often shed light on communities' subsistence strategies, economic intensification and other cultural phenomena (Dennell 1976; Hastorf 1988; Morrison 1994; Pearsall 1983). The research design of the 2009 season was aimed at addressing cultural and social questions rather than morphological or biological studies of plant remains *stricto sensu*.

There have been a number of archaeobotanical studies of assemblages from Jordan and surrounding areas that are contemporary with cultural occupations at Dhībān and mainly Iron Age in date (Crawford and LaBianca 1986; Kislev 1993; Liphschitz 1993; Liphschitz and Waisel 1987, 1989; Weiss and Kislev 2004; Willcox 1992). Other projects in Jordan which inform this study involve tests of both microbotanical and macrobotanical assumptions and methodologies (Charles *et al*. 2003; Mithen *et al*. 2008). The ability to track shifting agricultural strategies and site-use through time contributes to regional knowledge of the impact of shifting political and / or imperial interventions, especially during time periods - such as the Roman and Byzantine eras — from which there is comparatively little data available from Jordan.

2009 Sampling and Laboratory Strategy

During the 2009 season, sediment was extracted from every locus on the site as a bulk sample regardless of context, generating 158 flotation samples. Identifiable features (e.g. *†åbøn*, floor) were sampled in full. The volume of the sample selected for each locus was informed by prior laboratory work on material from the 2004 and 2005 seasons at Dhībān. From these analyses it was possible to ascertain the amount needed to acquire a representative sample of remains from the field for viable intra-site comparison (Pearsall 1999; van der Veen 1985; van der Veen and Fieller 1982). The mean volume of sample collected was 17 litres, with a standard deviation of 9 litres.

These samples were then immersed in a flotation machine that separated botanical remains from the surrounding sediment matrix (Wright 2005). When immersed in water, artifacts and ecofacts whose density is less than water float to the top. These include ancient carbonized botanical remains. The investigation of these carbonized remains is essential, as a widely held and empirically demonstrated assumption is that carbonized botanical remains are present on archaeological sites due to human agency (van der Veen 2007). After processing the samples, the light fraction was bagged and shipped to the University of California, Berkeley for laboratory analysis, whereas the heavy fraction was processed on-site.

In addition to macrobotanical samples, approximately 50 gm of sediment were collected from the same area in each locus for microbotanical analysis. These samples were also shipped to the University of California, Berkeley. As the preservation of botanical remains is dependent on a variety of factors (Miksicek 1987), other techniques that help to locate botanical remains were also exploited. The identification of microscopic starches and phytoliths are instrumental in identifying plant taxa that may have disappeared from the archaeological record as a result of adverse preservation conditions (Piperno 2006). Phytoliths are microscopic

silicate bodies that form in and around the cell walls of plants. As the shapes of these bodies are often diagnostic, they also have the potential to reveal traces of ancient irrigation regimes and agricultural systems (Mithen *et al*. 2008; Rosen and Weiner 1994). Laboratory work on macrobotanical remains has followed standard procedures of analysis, with personal modification (Pearsall 1999).

Preliminary Results

Preliminary analyses of the samples recovered from Dhībān have yielded insights into the lives of its ancient inhabitants. Research on the macrobotanical remains continues, especially on the Iron Age and Middle Islamic cultural occupations. Identified remains common to both the Iron Age and Middle Islamic periods include domesticated grape (*Vitis* sp.), probably the common grape (*Vitis vinifera*; **Fig. 5B**), as well as fig (*Ficus carica*, **Fig. 5C**), which echoes the results of nearby excavations such as Óisbån (Crawford and LaBianca 1986). Barley (*Hordeum* sp.) and wheat (*Triticum* sp.) are also found in contexts dating to both periods. Especially interesting is the presence of free-threshing wheat (*Triticum aestivum* / *durum*, **Fig. 5A**), which has a high water requirement. Agricultural weeds such as *Silene* sp. and *Phalaris* sp. (**Fig. 5D**) indicate agricultural regimes that would have required irrigation and co-ordinated labor to maintain.

In Middle Islamic contexts an abundance of weeds are present, such as *Phalaris* sp., *Galium* sp., *Malva* sp., numerous Poaceae (grasses) as well as potentially economic / subsistence crops such as *Vicia ervilia*. There are also a large number of leguminous taxa (*Astragalus* sp., *Trifolium* sp. and *Coronilla* sp.), which may be indicative of seeds being introduced in dung that was burned as fuel, as they are commonly consumed by grazing animals such as sheep and goat. Also present in Middle Islamic contexts are the remains of rachis and culms of wheat and barley; there is a notable contrast with the density of economic crops (here wheat, barley, fig, grape, lentil, pea and chickpea) in the same floor contexts, which is less than one seed per liter (n=27). This may indicate on-site processing of agricultural materials, though owing to competing crop processing models (Stevens 2003; van der Veen 2007), further research is necessary to disentangle such hypotheses.

Directions for Future Research

The results of this preliminary analysis have raised several questions about the ways in which the inhabitants of Dhībān interacted with their agricultural and environmental landscape. A pressing issue at a semi-arid site like Dhībān is the extent to which economic crops such as barley or fig entered the archaeological record as burned dung fuel, or as accidental spillage during cooking or crop processing. Continuing research will concentrate on the identification and analysis of wood charcoal to address this question, in addition to evaluating proxies for dung fuel burning such as the ratio of seeds to wood charcoal (Miller 1988). The identification of wood charcoal will also indicate the intensity of wood collection by communities at Dhībān through time, both in diversity and quantity.

The presence of agricultural weeds and wheat / barley rachis in the Middle Islamic period are tantalizing indicators of crop processing and agricultural activity. A key objective will be to assess the intensity and scale of this production in comparison to other forms of economic intensification. To that end, analysis of heavy fraction residues and the integration of the results of both microscopic and macroscopic palaeoethnobotanical analyses with faunal remains (e.g. van der Warker and Peres 2011) should shed light on the relationships between animal husbandry and plant production. The scale of irrigation in all periods will be assessed through isotopic analyses of select cereals (Ferrio *et al*. 2005). In combination, these methods should generate a more holistic view of the social and economic conditions of these communities, as reflected in their interaction with the biological world around them.

Digital Documentation and Dissemination

Archaeologists have increasingly embraced the use of digital documentation during fieldwork and post-excavation. Persuasive arguments for digitally recording archaeological sites have been made in terms of cost, portability, organization, ease of use, data standardization and creative re-use. Although there are problematic issues concerning format longevity, archival methods and durability, the technol-

ogy of digital recording is rapidly adapting to meet the demands of archaeological research and becoming progressively cheaper and easier to use. The move toward digital recording has also been viewed as part of a more inclusive and reflexive methodology, though the implementation of training in digital methods for archaeologists remains for the most part unrealized.

Bearing the complications and benefits of digital documentation in mind, a relatively modest methodology was devised for field recording at Tall Dhībān. Digital photography and videography was first handled by a graduate student trench supervisor, who was subsequently assisted by an undergraduate whom she trained on-site. Photographs were taken with a DSLR in RAW format, and were stored as both RAW files and converted JPG files. These photographs were then downloaded to a pair of parallel hard drives that were kept in separate locations for better data security. Site tours were both photographed and video recorded in high definition, with an auxiliary pocket-sized video recorder to supplement the footage. Several undergraduates used the video camera for a separate video project, being an introduction to the site for students in 2010. Much of this footage remains unedited but is stored securely on the project hard drives.

The strategy for the 2009 field season at Tall Dhībān included both digital documentation and public outreach components, efforts that will be expanded in subsequent years. The strategy for digital documentation and dissemination at Dhībān was one of immediacy: although standard archive-quality photography was taken and catalogued on-site for use in later reports and presentations, we also wanted to make information about the site available as it was being revealed throughout the season. This was challenging for both logistical and social reasons, but was rewarding in terms of increased connectivity with local and global audiences. Although internet access in and around Dhībān was limited, residents took an avid interest in our photos and site blog (http://Dhiban.wordpress.com). One resident was reported as "downloading every single photo" and another as "reading every blog entry," commenting on the contents of the entries after inviting several students over for dinner. Contributions to the blog were made by undergraduate and graduate students, as well as two of the site directors. The families and friends of the students involved in the project also commented on the blog. We received a total of 2,500 hits (and an additional 4,000 collective hits on individual photographs) for the six-week season, a moderate success for a site-specific archaeological research blog.

Excavation blogs and online photographic archives are becoming standard practice in archaeology, and at Dhībān they promoted greater communication between the excavation team and local community. Although the blog was in English, many residents of Dhībān were able to read it despite not being conversationally proficient in that language. Digital photography beyond the technological capability of mobile telephones was also rare in the community, with the result that local participants in the excavation actively sought documentation of their work and would often pose for photographs, sometimes demanding that they be taken over and over again. This was not a universal characteristic; some of the men participating in the excavation were uncomfortable with photography and we respected their wish to stay out of the site documentation strategy. Negotiating the complexities of representation in the photo archive and online was an unexpected, yet productive, aspect of community outreach during the season, and one that will be expanded upon in future fieldwork.

The requirements for hosting our collection of field photography and on-site student experiences also called for a non-traditional approach to the archive. Rather than setting up independent hosting of our blog and site photos, we chose to use pre-existing online resources, namely wordpress.com, for our blog, and flickr.com for our photography. While we have less control of the potential longevity and accessibility of our data, using these sites immediately allowed us to connect with a larger online audience, as these sites have pre-existing online communities and higher 'discoverability' than individually hosted websites. These sites are also relatively easy to use, allowing us to update at a rapid pace, even from the non-optimal internet connections that were locally available. We are still working on long-term hosting for our full archive, but these selections are still available for public use and licensed for not-for-profit re-use by educators

and other interested parties.

In an effort to further strengthen links with the community of Dhībān, the project sponsored an installation of photographs in Dhībān's town hall in 2010. As a result, local residents are now able to see more of what occurs during the excavations. The installation included photographs of the town as well as work on-site, thereby bringing work on the *tall* into the wider community in physical as well as digital forms .

Future work at Dhībān will bring more resources to elaboration of the 'immediate' archive, with even greater participation of students in on-site documentation. Integrating more student photography into the archive in the form of standard, official depictions of archaeology, as well as more informal photography documenting more experiential aspects of the site, will be a priority for future seasons. Digital documentation and dissemination at Dhībān is still at its formative stage, but will serve as a valuable resource giving greater, immediate visibility to the excavations and inviting stakeholders into the conversation about work performed at the site.

Concluding Remarks

During four seasons of excavation at Dhībān, the DEDP has focused on creating a new site map, collecting new data and finding innovative ways to share these discoveries in Jordan and beyond. The project completed its initial objectives in 2004 and 2005, namely to recover information from the old ASOR excavation areas to allow their publication. The reports in this article suggest many new avenues of research yet to be undertaken and form the heart of the project's research program for the coming years. Site mapping has led project members, first, to acknowledge the greater size of the site compared to previous estimates and, second, to prompt interest in the relationship of the designated ancient monument with the surrounding landscape. Analysis of recovered materials has revealed important information about past economic activities, including Dhībān's role as a regional supplier of meat to urban markets and the possibility that earlier residents developed and maintained an irrigation system. Future research will focus on understanding the economic relationship between Dhībān and the wider world throughout its long history, seeking to resolve whether Dhībān's role as a regional supplier of food was limited to the Middle Islamic period, or whether it included earlier periods as well. Fragments of glass bracelets suggest complex economic and social relationships enjoyed by the residents of Middle and Late Islamic Dhībān. Future excavation will continue to illuminate these relationships for all periods of Dhībān's history. Finally, the project will also continue to present the results of our work to the contemporary community of Dhībān, seeking new and innovative ways to integrate what happens on the site with life in the town.

Acknowledgements

The DEDP wishes to thank the Director of the Department of Antiquities, Dr Ziad al-Saad, and his staff, particularly Ali al-Khayyat and Basem al-Mahameed, for their assistance in coordinating research activities. Thanks also to the American Center of Oriental Research and the Council for British Research in the Levant for research support. The research described above was supported by Knox College, the American Philosophical Society, the Fondation Max Van Berchem, the University of California, Berkeley's Hellman Family Faculty Fund and Archaeological Research Facility's Stahl Endowment Fund, the G.A. Wainwright Fund for Near Eastern Archaeology and the University of Liverpool. Faunal analysis was specifically supported by the Princeton University Council on Research in the Humanities and Social Sciences. Glass analysis was supported by a 2009 - 2010 ACOR / CAORC Post-Graduate Fellowship. Some data presented in this article will soon be available at Open Context (www.opencontext.org), a publicly accessible data archive for archaeological research.

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THE DEEP-TIME NECROPOLIS AT AL-WISĀD POOLS, EASTERN BĀDIYA, JORDAN

Gary Rollefson, Yorke Rowan and Alexander Wasse

Introduction

At the end of a survey of the greater Wādī as-Sarḥān area in 2002 (Wasse and Rollefson 2005, 2006), two of us (GR and AW) visited one final site on the basis of information from a colleague that we might find Neolithic material there. Al-Wisād Pools did indeed have exposures of both Pre-Pottery Neolithic B (PPNB) and Late Neolithic (LN) artifacts, but since we were at the end of the survey season with still many hours of travel before we would arrive back in ʻAmmān, we paid scant attention to other archaeological evidence at the time.

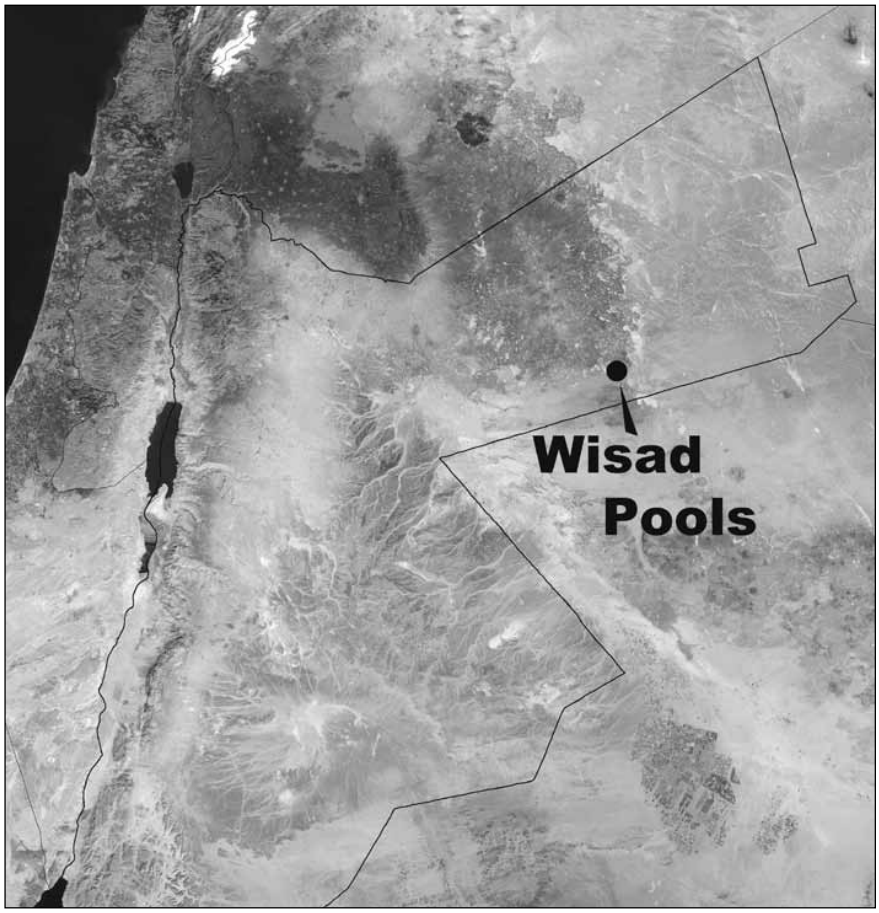
Five years later, on the way back to ʻAmmān from some other sites we had found during the 2002 survey at Jabal adh-Dharwa, we stopped again at al-Wisād Pools for a closer examination of the PPNB situation, and it was at this time that our eyes were lifted from the surface of the site and we saw the extent of the ancient structures that spread virtually from horizon to horizon. We were staggered: almost as far as the eye could see, concentrations of basalt blocks rose from the ground as broad mounds or low towers or large circles or chains of rectangular constructions. Clearly, none of this was Early Neolithic, but it was also almost certain that we were gazing across a vast prehistoric landscape that had been altered slowly over hundreds of generations, over thousands of years. How could we have missed this astonishing vista during our first visit?

On our return to ʻAmmān, with a pause at ʻMaitland's Hillfort', we resolved to develop a systematic investigation of the al-Wisād Pools necropolis as well as complementary Late Prehistoric occurrences among the numerous basalt-covered mesas east of Azraq. All three of us arranged for a project to map the Early and Late Prehistoric architecture in both areas, beginning with two four-week seasons at al-Wisād Pools in 2008 and 2009.

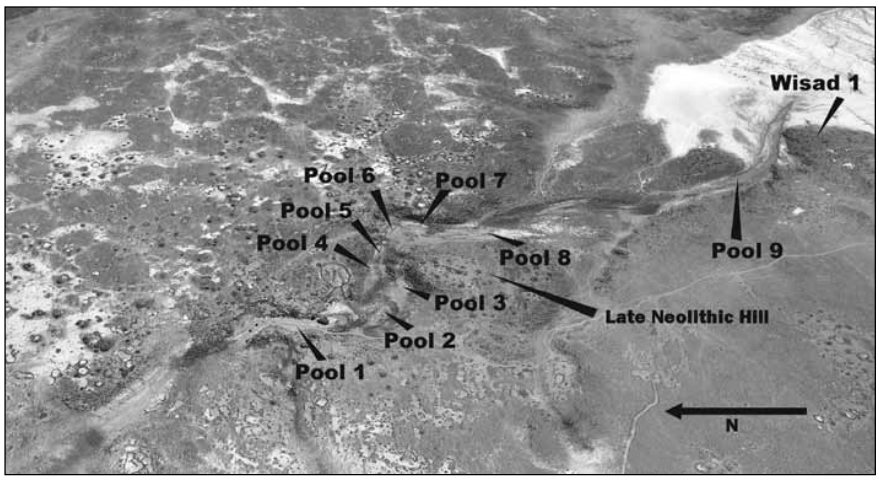
Al-Wisād Pools

Al-Wisād Pools consists of a series of natural depressions in the bedrock of a short wadi (*ca*. 1.2km long) that leads from one plateau to another approximately 8 - 9m lower in elevation near the eastern end of the Black Desert, just north of the border with Saudi Arabia at the al-Wisād Bādiya Police Post (**Fig. 1**). Access to the site is via a torturous, primitive track across the basalt countryside, requiring about four to four and a half hours to travel the *ca*. 120km ESE of North al-Azraq.

Al-Wisād is located in hyper-arid desert conditions (average precipitation less than 50mm / yr), and today winter rainfall is sporadic in the sense that there is no rainfall in any one spot for several years at a time. Nevertheless, when rain does fall, the upper plateau acts as a collection basin, and even a relatively small amount of precipitation can find its way into Wādī al-Wisād and fill the pools, some of which are deep enough (up to 1.5m) so that water can be retained for a considerable time. We have detected nine pools in the wadi (**Fig. 2**) that differ markedly in size. The depth of the pools can be seen by noting the height of the silt line above the wadi bed (note difference in color in (**Fig. 3**), where the lighter shade indicates the presence of silt deposited on the basalt blocks in the wadi). The capacity of Pool 1 was measured by taking 20 cross-section measurements along the 160m length of the depression, with an average cross section of 14.3m in width by 0.93m in depth. Pool 1, then, had a demonstrated capacity of more than 2,000m^3 (over a half-million US gal-



1. Location of al-Wisād Pools at the eastern edge of the basalt desert in Jordan's panhandle.



2. Distribution of the pools at al-Wisād and the location of the Late Neolithic village of Wisad 1 (Photo: D. Kennedy).

lons), which would have been an extraordinarily attractive location for herding groups. Simple visual inspection indicates that Pools 2-8 are much smaller in capacity. Pool 9 appears to have been more than 600m long, but at present it does not appear to have a depth appreciably greater than around 30-40cm. If the pool had an average width of *ca*. 30m, this would amount to around 6,500m^3 (more than 1.7 million US gallons), but its shallowness indicates it may have lost volume quickly under hot desert conditions. Even so, the situation of al-Wisād 1, a small semi-permanent LN (*ca*. 5,500 - 5,000 cal BC) village at the end of Pool 9, indicates that this resource was sufficient at times for a lengthy stay. The high density of pecked rock art representing an

3. View to north-east of al-Wisād Pool 1. The lighter color in the center of the photo is silt that has been deposited on the basalt blocks in Wādī al-Wisād during winter rains (Photo: G. Rollefson).

array of animals and 'desert kites' overlooking the pools suggest they held an attraction for millennia (Rollefson, Rowan and Wasse 2008).

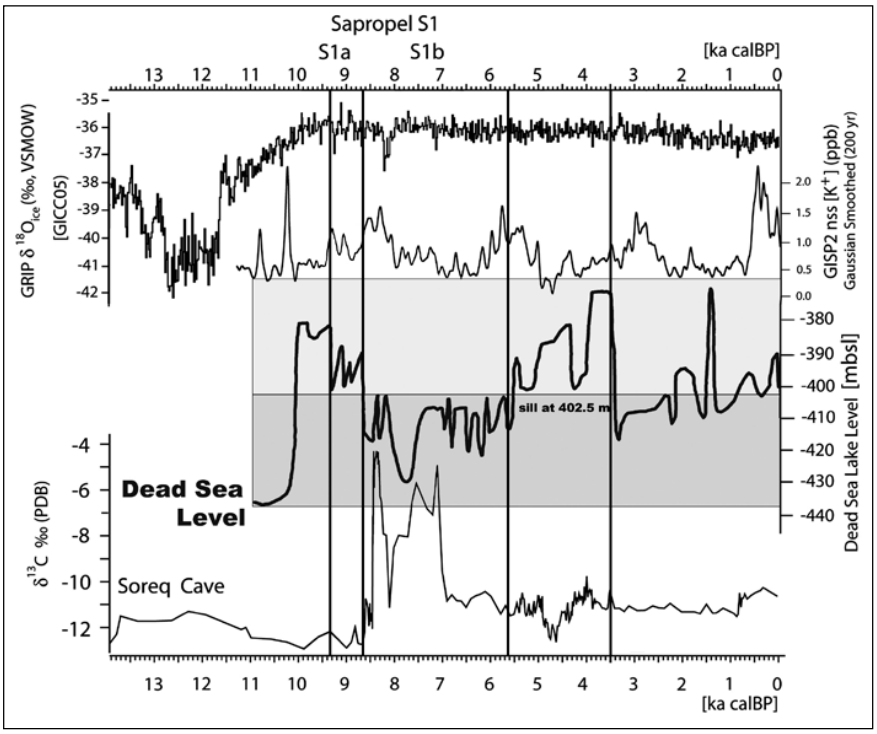
While we have counted nine pools, some of these are clearly artificially created by the placement of barrages constructed at various points along the length of the wadi. This is clearly the case between Pools 2 and 3,4 and 5,5 and 6, and 6 and 7. When these check dams were built is not known at the present time, but in part the barrages may have served to reduce the flow into Pool 9, where overflow on to the adjacent *qā'* (mudpan) would have essentially wasted the precious liquid.

The Bādiya and Water

The Jordanian Bādiya ('badlands') includes the uncultivable steppe and desert that extend northward out of the Arabian Peninsula. The eastern Bādiya, which includes the basalt plains and mesas of the 'Black Desert', was exploited by Paleolithic, Epipaleolithic and Neolithic hunter-gatherers who were dispersed across the territory (e.g. Betts 1998; Maher *et al*. n.d.; Richter *et al*. 2009; Rollefson *et al*. 1997). As populations of villagers grew during the Neolithic period in the western agricultural areas of the southern Levant, the Bādiya came under closer scrutiny by people whose herds of sheep and goats began to need pasture land that increasingly competed with farmland; the otherwise unproductive vegetation in the steppe and desert could be converted to meat, hair and wool, and dairy products. Herders therefore began to move from the arable countryside into the arid areas with their animals during the rainy months, not returning to the farming areas until after the harvests were in (Köhler-Rollefson 1992; Rollefson and Köhler-Rollefson 1993). As capital in the form of live animals grew with increasing intensification of the Bādiya, location of seasonal water sources became more and more important. Critically, this development was unfolding as precipitation was becoming more and more unpredictable.

The level of water in the Dead Sea basin has become an important yardstick for the reflection of changes in rainfall over time. One landmark that has emerged is the ridge - or 'sill' - that separates the northern and southern basins of the Dead Sea, the top of which is 405.2m below sea level (**Fig. 4**). When water level is above the sill, a single large body of water fills the basin, but when water level falls to more than 405.2m below sea level, two smaller bodies of water form or - as is the case today - the southern basin dries up completely. Since the Dead Sea is a closed drainage system, prior to the modern drain on water capacity due to large scale irrigation, it was precipitation that played the most important role in the level of the water.

Figure 4, then, is an indicator of changing rainfall patterns from 14,000 (calibrated) years ago at the left of the graph until modern times at the right. The lighter shading indicates when water levels were high (at least above the sill), while the darker shading indicates low wa-



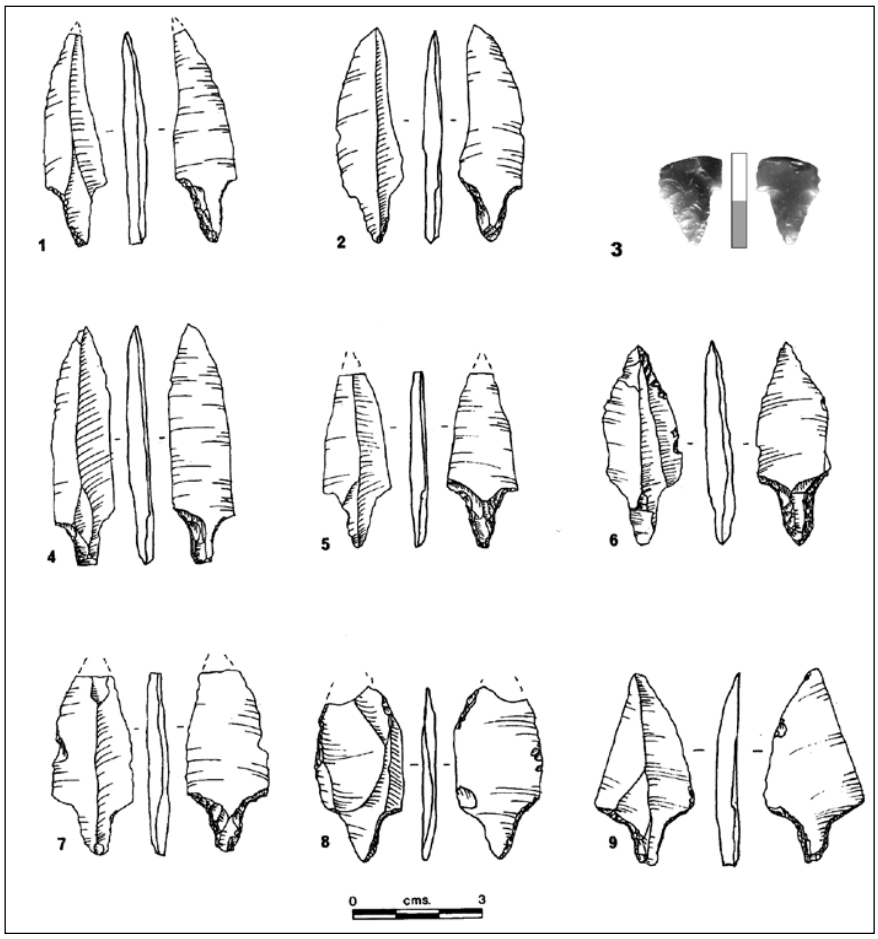
4. Graphs of changes in various climatic proxies for the southern Levant, with a focus on Dead Sea levels as representative of rainfall variation (the light and dark shaded areas). The first vertical line from left corresponds broadly with the shift from the MPPNB, the second line from left marks the end of the PPN and the beginning of the Pottery Neolithic / LN, the third line is the transition from the Middle to the Late Chalcolithic, and the vertical line to the right is perhaps generally coincident with the transition from the Middle to Late Bronze Age periods (modified from Weninger 2009: fig. 2).

ter levels / rainfall. The first vertical line from left corresponds broadly with the shift from the Middle Pre-Pottery Neolithic B (MPPNB), the second line from left marks the end of the Pre-Pottery Neolithic and the beginning of the Pottery Neolithic / LN, the third line is the transition from the Middle to the Late Chalcolithic, and the vertical line to the right is perhaps generally coincident with the transition from the Middle to Late Bronze Age periods. Although direct correlations between rainfall patterns and cultural changes have recently been strongly challenged (Maher *et al*. 2011), there are nevertheless strong relationships between Dead Sea levels and finely dated isotope variations in the Soreq Cave speleothems that suggest rainfall was significantly higher during the Late Chalcolithic and the EBII / EBIII transition (Matthews and Ayalon 2011: 168-169), reflecting increased rainfall much higher than today. Although there were significant drops in precipitation within the Chalcolithic itself and between the Late Chalcolithic and Early Bronze I, rainfall was still higher than at present and certainly greater than during the LN (Pottery Neolithic in the west and 'Desert Neolithic' in the east). The changes in Dead Sea levels during the LN indicate relatively rapid oscillations in runoff, from short periods of severe drought to times of rainfall almost as high as present conditions.

The fluctuations in precipitation would have had major impacts on farming in the west, but there would also have been significant simultaneous influences in terms of quantity and quality vegetation in the Bādiya that supported the herds of pastoral nomads. More seasonal water that was more evenly distributed across the landscape on a more reliable basis would have periodically sustained larger herds of sheep and goats as well as larger numbers of people who herded them. Wealth was relatively easy to accumulate during times of climatic amelioration in the Bādiya, and we can see the consequences of that wealth in terms of mortuary behavior at al-Wisād Pools.

Wisad 1: A Semi-Permanent LN Village

At the south-eastern end of Wādī al-Wisād and a meter or so above the southern end of Pool 9 is a small cluster of circular and sub-rectangular enclosures that likely represents a semi-permanent village of huts and animal pens spread across *ca*. 3 hectares (Wasse and Rollefson 2005: 17). The village can be dated by the presence across the site of small LN arrowheads (**Fig. 5**) that are variants of Betts' Bādiya points



5. 1 - 2, 4 - 9: LN Bādiya points from the basalt region of Jordan's eastern desert (Betts 1998: fig. 4.14); 3: Bādiya point from Wisad 1 (Photo: G. Rollefson).

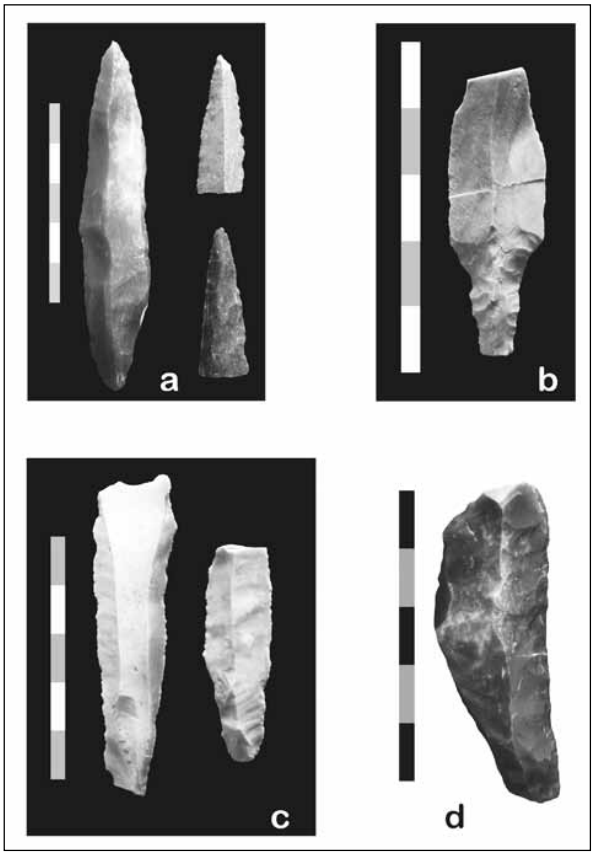
(Betts 1998: Fig. 4.14). The occupation would appear to coincide with the rapid increase of precipitation between 5,500 - 5,000 cal BC indicated in **Fig. 4**, when water in the pools at al-Wisād would have been more predictable. The degree of permanent settlement can not be determined on the basis of surface evidence, but the potential capacity of Pool 9 suggests that water was not necessarily the limiting factor for sustained residence at the site. The number of animal pens (5-6, with an estimated average diameter of 10-15m) suggests that a combined herd of *ca*. 70-100 animals may have depleted pasturage in the local vicinity relatively rapidly, forcing herdsmen to have taken the sheep and goats far enough away that they may not have returned to the village at night. But this scenario also might include the situation where small children and the elderly may have remained behind at Wisad 1 for a considerable period, moving only when distances between the herds / herdsmen and the resident families demanded relocation of the latter. It is possible that some degree of cereal cultivation along the edge of the *qā'* just to the south could have helped sustain a resident population (cf. Henry *et al*. 2003).

One of the imposing features of Wisad 1 is the presence of a prominent tower tomb (looted) with a preserved height of less than 2m but a diameter of *ca*. 5m at the base. The occurrence of this tomb on the village site raises the possibility that the use of tower tombs may have begun as early as the LN, and that some similar structures elsewhere at the al-Wisād Pools necropolis are also this early. Support for this relationship comes from site Jabal adh-Dharwa 2 (Wasse and Rollefson 2005: 16), approximately 50km to the south-west of Wisad 1, which is another semi-permanent village (*ca*. 0.5 hectares, not counting *ca*. 10 animal pens located on a lower terrace to the east and north-east) with LN artifacts and a looted tower tomb whose backdirt yielded human bone and ostrich eggshell. Jabal adh-Dharwa 2 is situated on a terrace of the

eponymous hill about a kilometer south-west of sizeable *q*ā‘ that would have provided water for a relatively long period of time. Projectile points here are heavier, almost bolt-like, than the thinner Bādiya points of Wisad 1.

Techno-typological Chronology of the al-Wisād Pools Necropolis

The pools at al-Wisād attracted human groups for millennia, stretching back as early as the Early Epipaleolithic (*ca*. 22-15,000 cal BC) based on dense accumulations of bladelets, bladelet cores, and tools, when water attracted animals that then attracted hunters. The bulk of Epipaleolithic artifacts came from the summit of 'Late Neolithic Hill'. MPPNB and Late PPNB (LPPNB) projectile points were mostly found just to the west and above Pool 1 and reveal that this geological oddity was also a popular location in the 8th millennium cal BC (**Fig. 6**). Late Neolithic Hill, as the name suggests, is an area of densely distributed cores, debitage, and tools of the LN period; it occupies the hollow of Wādī al-Wisād between Pools 4 and 8 (**Fig. 2**).



6. a-b: PPNB projectile points; c: PPNB knives; d: knife or scraper of uncertain age (Photo: G. Rollefson).

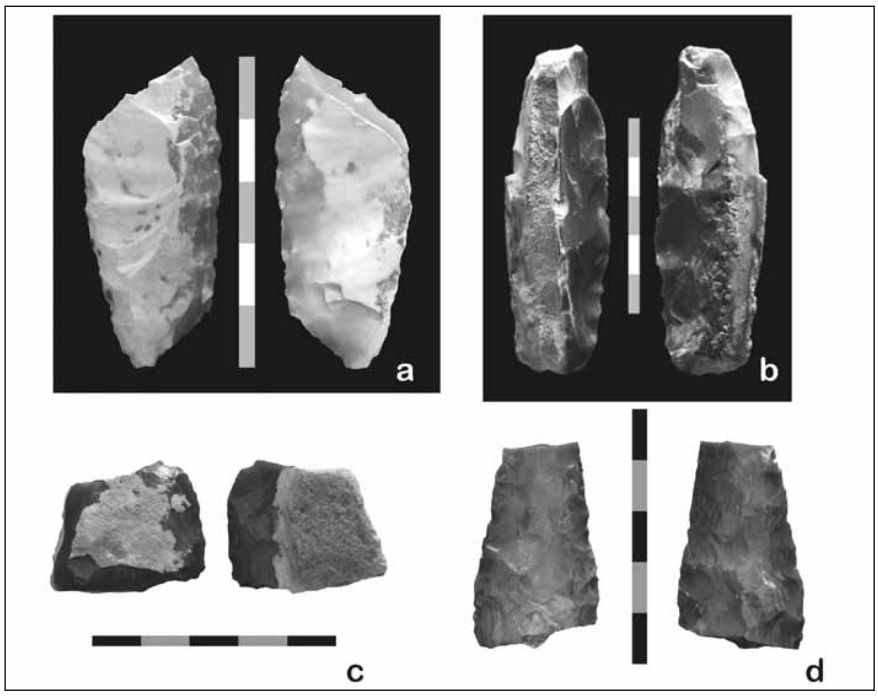
The concentration of LN artifacts on Late Neolithic Hill (and the Epipaleolithic density as well) suggests this was a favored locale for manufacturing tools; the top of the hill provides a good viewpoint of the entire wadi pool system as well as a commanding view of both the upper plateau and the large *qā‘* that begins at the edge of the village of Wisad 1. Although the LN visitors to the site were undoubtedly pastoralists, they would still undoubtedly have been heavily reliant on hunting game such as gazelle, onager, oryx, ostrich and other prey. But whereas the Epipaleolithic artifacts are essentially restricted to the summit of Late Neolithic Hill (and the MPPNB and LPPNB artifacts to a terrace above Pool 1), LN artifacts are found across the entire expanse of the necropolis as well as at the village of Wisad 1 (**Figs. 7-9**).

Other artifacts reflect later use of the site as well. Three transverse arrowheads (**Fig. 10**) probably date to the LN / Early Chalcolithic transitional period (e.g., *ca*. 5,200-4,700 cal BC), as Betts' work in the area between Jabal Qurma to Qaṣr Burqu‘ has shown (Betts n.d.). Although no complete specimens have been recovered so far, pieces of cortical scrapers (or 'tabular scrapers') are scattered sparsely across the site. These could be as early as the LN, but are more likely to be from the Chalcolithic or earlier Early Bronze Age periods (**Fig. 11**). Spread across the necropolis there are also small concentrations of debitage and diffuse scatters of non-diagnostic stone tools that are probably mostly attributable to the Chalcolithic or earlier Early Bronze Ages.[1]

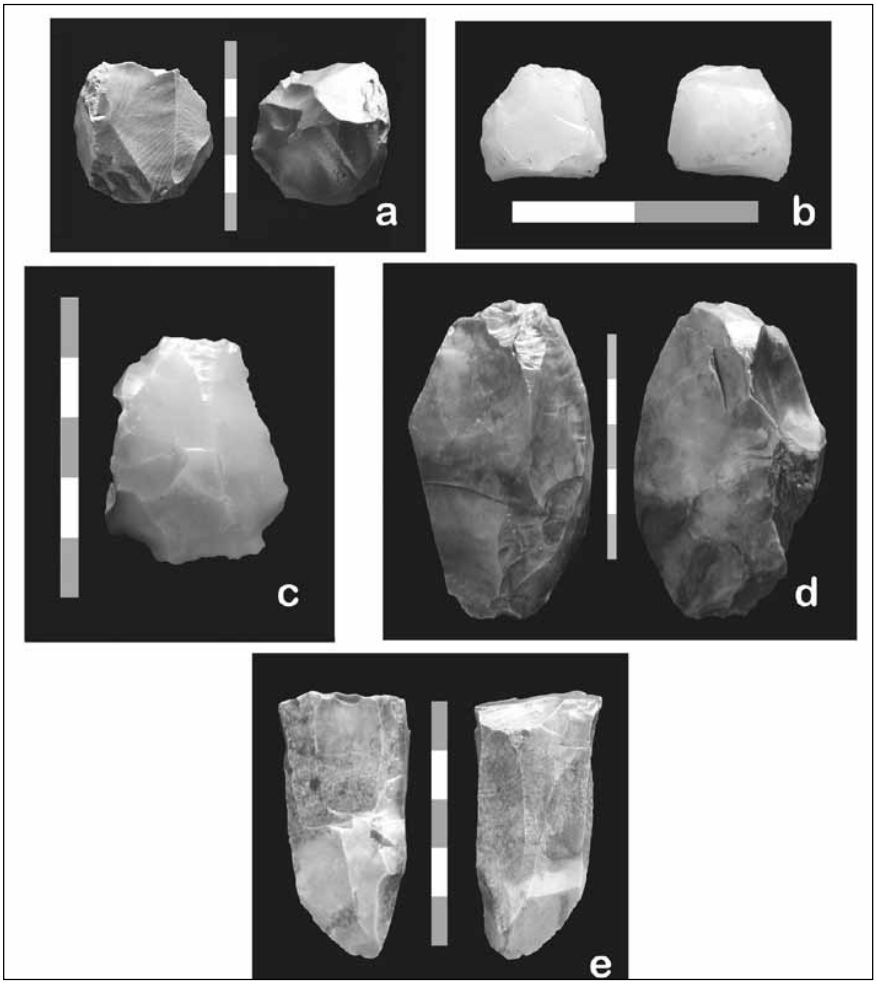
Architectural Variability at the al-Wisād Pools Necropolis

The 2008 season provided us the opportunity to experience the variety of different structures at al-Wisād. While one of us (AW) concentrated in the central part of the necropolis immediately around the pools (where most of the more imposing mortuary architecture was located), the

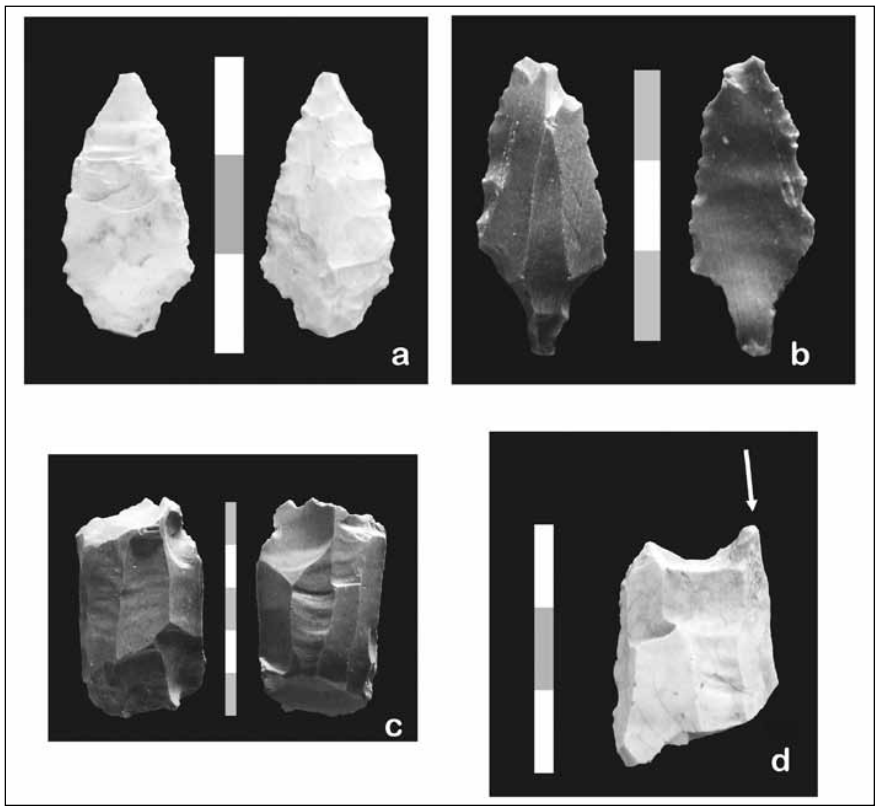
1. Rees dated the tower tombs to the Safaitic period based on the presence of inscriptions on many of them. He also suggested that they were constructed by the Roman army for use as guard houses (1929: 391-392). This is a classic example of not acknowledging the terminus ante quem concept.



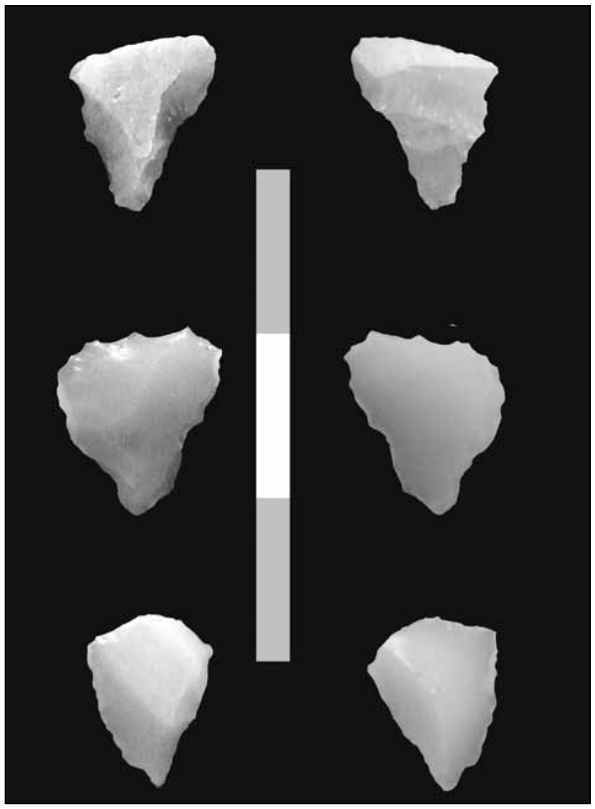
7. Bifacial knives from the core area of al-Wisād; a: LN chalcedony knife; b: unfinished knife; c - d: bifacial knife fragments (Photo: G. Rollefson).



8. Cores from the core area of al-Wisād; a, c, e: LN; b: tiny core (1cm maximum dimension) of unknown age; d: Epipaleolithic blade core (Photo: G. Rollefson).



9. a-b: LN arrowheads; c: LN blade core; d: probable LN truncation burin (Photo: G. Rollefson).

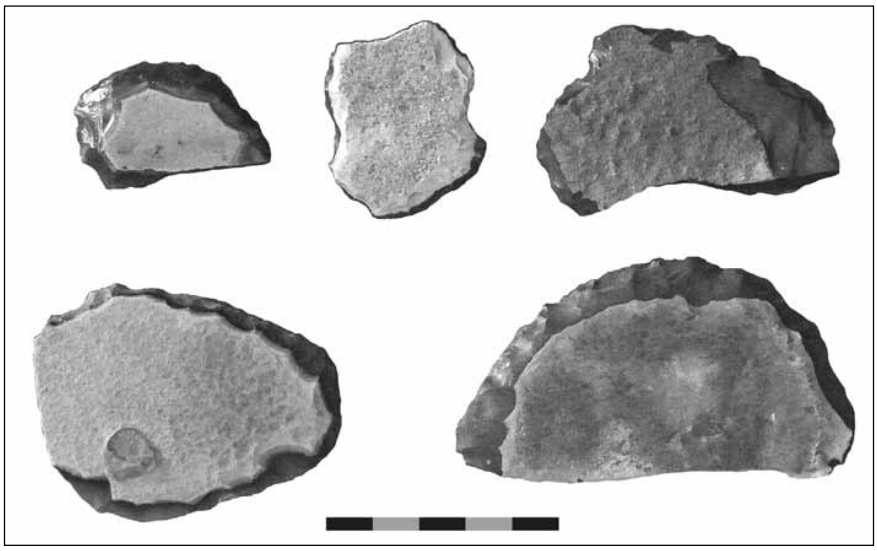


10. LN - Early Chalcolithic transverse arrowheads from al-Wisād Pools (Photo: G. Rollefson).

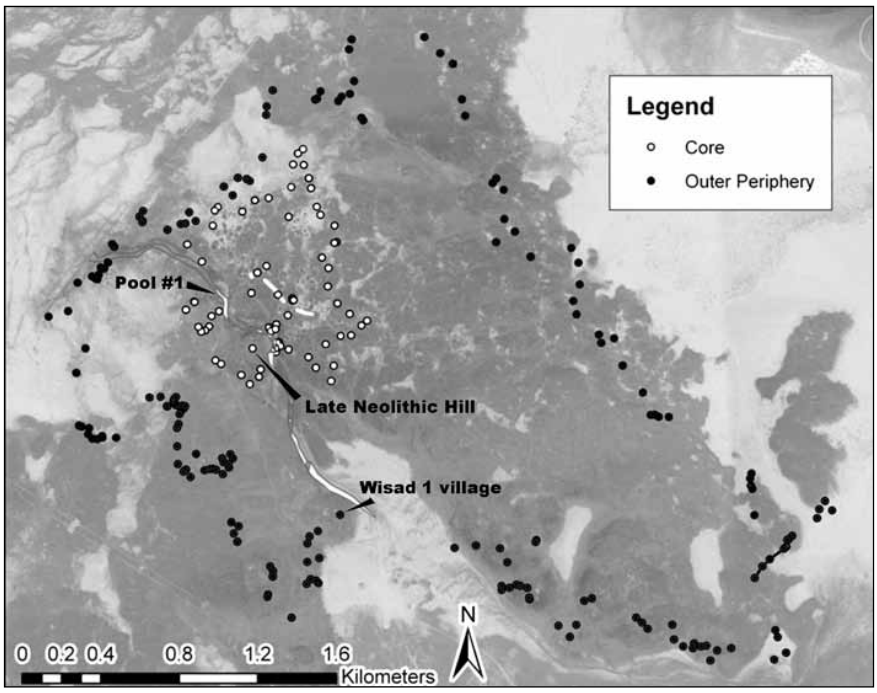
other two of us (YM and GR) explored the fringes of the site. All three of us located the centers of structures (mortuary, residential, pastoral and ritual) using hand-held GPS devices (**Fig. 12**). In 2009, 119 of the structures were mapped using a total station, but hundreds more remain to be sited (**Fig. 13**). In addition to small cemeteries of individual Islamic burial cairns (especially in the peripheral area alongside small mudpans), a very preliminary assessment suggests that there are at least ten major structural types, some with sub-types.

Type 1a

The most noticeable buildings are the tower tombs (**Fig. 14**). Tower tombs are known throughout most of the desert areas of the Arabian Peninsula, as far south as Yemen (e.g., Braemer *et al*. 2001). Tower tombs at al-Wisād have been preserved to just under 2m in height, with basal diameters of 5-7m; others from the basalt-covered mesas at Wādī al-Qaṭṭāfī are preserved to nearly 3m height, with basal diameters around 8m (cf. Rowan *et al*. 2011). Rosen's research in the Negev Desert has demonstrated that some tower tombs are probably Late Neolithic in age,



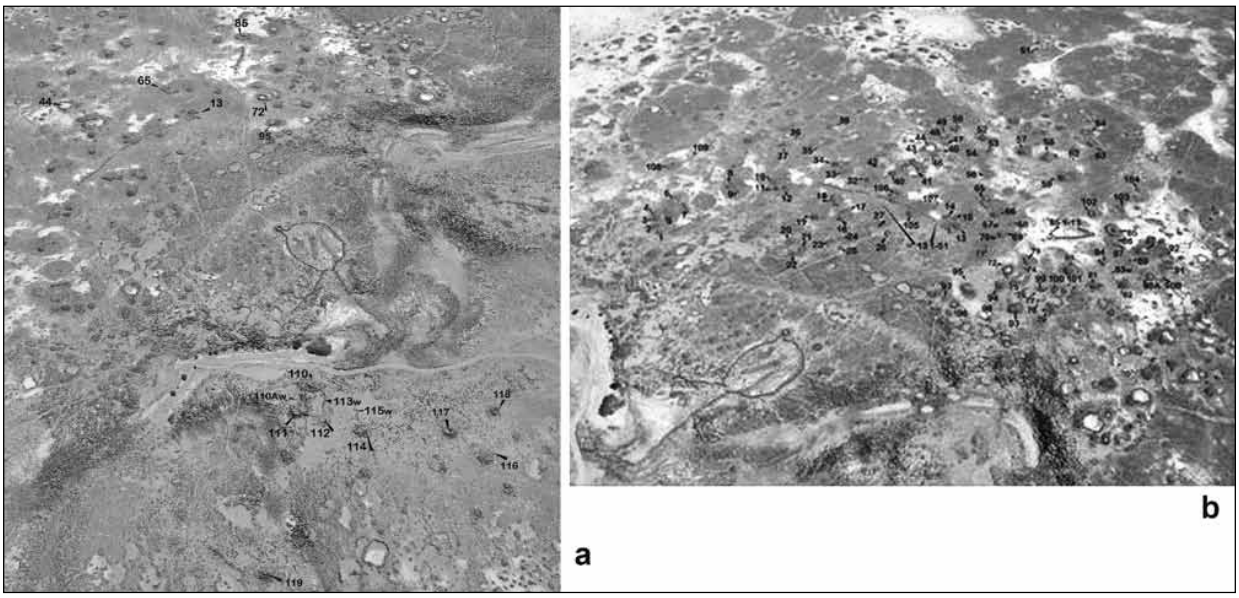
11. Cortical scraper fragments from al-Wisād Pools (Photo: G. Rollefson).



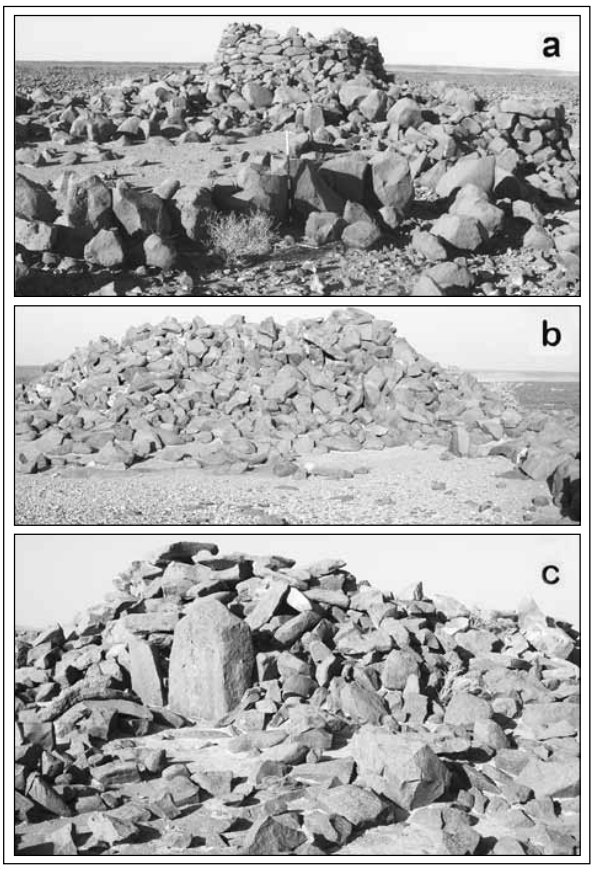
12. Map of architecture located by GPS devices in the core and periphery areas of al-Wisād Pools (after K. Harrington, n.d.).

dating to around 5,000 cal BC (Rosen *et al*. 2007: 19-22). At al-Wisād, scattered artifacts inside and immediately outside the tombs include beads and tool fragments that are consistent with a Late Neolithic date (**Fig. 15**). It should be noted that *nawāmīs* (*bedouin* term for tower tombs; sing. *nāmūs*) in the Sinai were dated to the Chalcolithic / Early Bronze Age (Bar Yosef *et al*. 1986: 163-185), and two large *nawāmīs* necropolises in Yemen have been dated to the Early Bronze Age (Braemer *et al*. 2001; McCorriston *et al*. 2011).

Within this type there is some degree of variability. Most tower tombs are set in isolation, but one tower tomb at al-Wisād ('Wisad Structure' 110, i.e. WS 110), for example, was surrounded by a 'courtyard' cleared in the basalt cover, using the boulders and smaller stones to create a massive wall (**Fig. 14a**). Others have small semi-circular paved areas separated from their surroundings by small basalt slabs set on edge to the west and east of the central structure (e.g., WS 80). Two tower tombs at al-Wisād have a large upright stone at the base on the eastern



13. Mapped structures at al-Wisād Pools as of the end of the 2009 season (Photos by D. Kennedy; images by G. Rollefson).

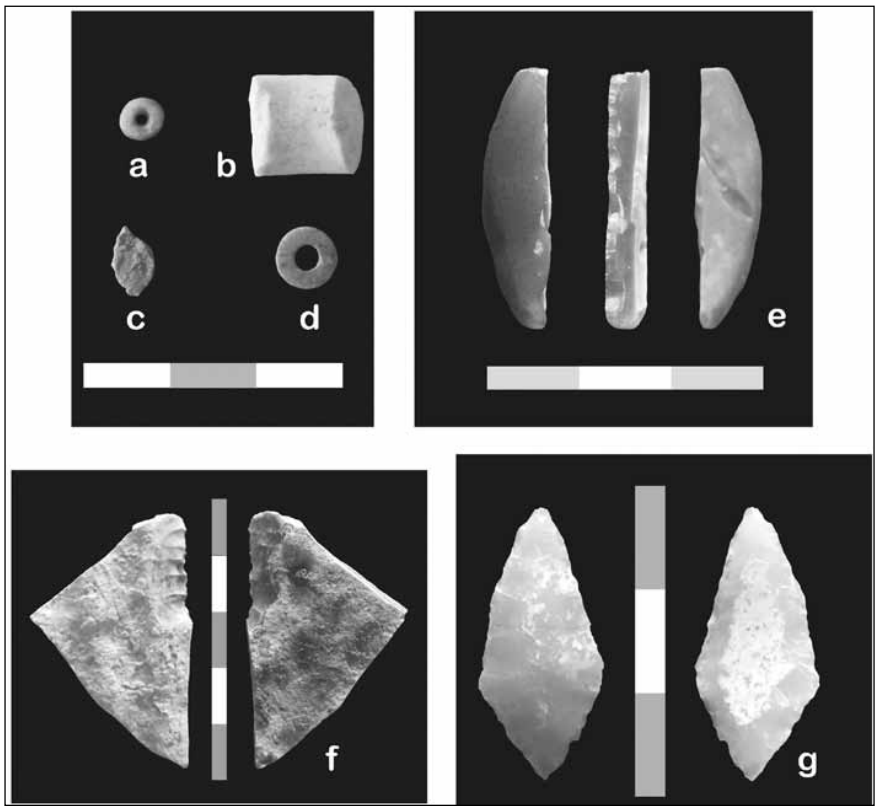


14. Some of the structural variability at al-Wisād Pools; a: WS 110 with a large western courtyard surrounded by a massive wall of basalt boulders; b: WS 72, a large circular 'namus-like' structure; c: WS 7, a long (10m) chain of rectangular chambers oriented north - south. (Photos: G. Rollefson).

edge of the structure (**Fig. 14c**); although it can not be demonstrated conclusively that this is associated with sunrises, it is a tempting interpretation. In terms of distribution, tower tombs are found all over the core area.

Type 1b

This sub-type is essentially a tower tomb but with added elements. The most striking feature is a 'tail' (a term coined by Rees in his description of structures in the eastern Bādiya, 1929: 391), or chain, of chambers measuring *ca*. 2 x 1.5m each. WS 13, for instance, has 44 chambers trailing towards the west in a long arc of *ca*. 120m (**Fig. 16**), although several others had shorter tails of from six to 14 chambers, with the tails oriented in several directions on the compass. Tailed tower tombs (called 'pendants' by Kennedy; cf. Kennedy and Bishop 2011) are common in the eastern Bādiya, especially on top of the basalt-capped mesas that are numerous in the south-western part of the basalt desert. The tower tomb on top of Maitland's Mesa has a tail of 55 chambers along the southern edge of the mesa (Rowan *et al*. 2011). The size of the towers is essentially the same as those without tails. To our knowledge, these have not been reported from the Negev or Sinai, but excellent examples are known from a site west of Riyadh, Saudi Arabia (Zarins *et al*. 1981: Plate 37c) and from central Yemen (Braemer *et al*. 2001).



15. Artifacts from inside tower tomb WS 118; a - e: ornaments; f: fragment of a tile knife; g: LN arrowhead (Photos: G. Rollefson).

There are several points of variability within this sub-type. First, the tower tomb could be isolated except for the attendant tail. Second, the tower tomb itself might be in the center of a circular platform walled all around (e.g. WS 85); another variation is a walled oval compound (e.g. WS 66). WS 13, on the other hand, added two more features: first, it was separated from its tail by a rectangular, low-walled, paved platform that included several small circular and sub-rectangular areas walled off from the rest of the platform by narrow standing stones about 60-75cm high; second, the tower was rectangular in plan, not circular (**Fig. 16**), and there might be more than one chamber inside the tower.

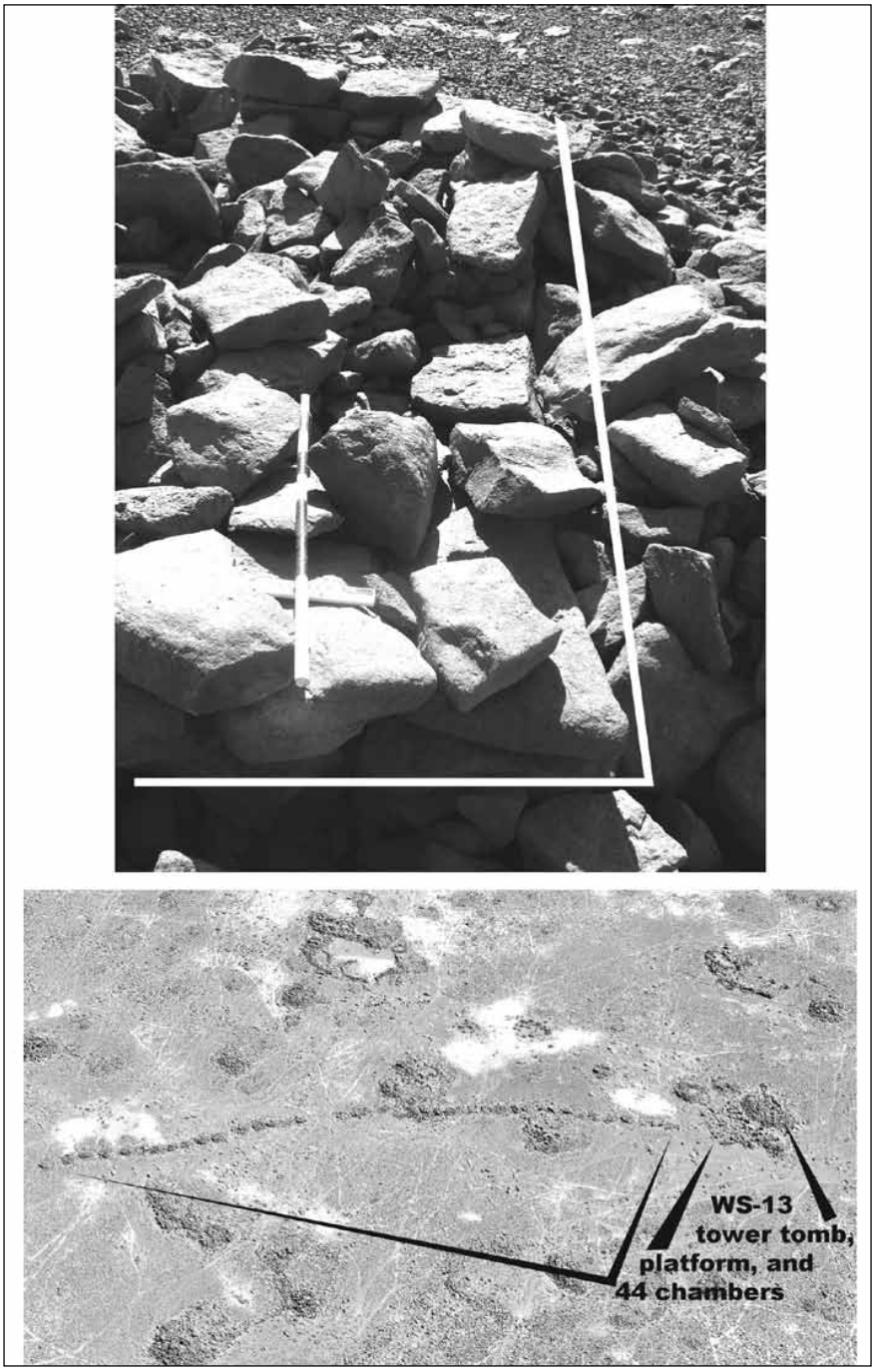
Dating this form of ritual monument is problematic at the moment, but the fundamental similarities of the tower tomb element with Type 1a suggest these might be somewhat later, perhaps Chalcolithic or Early Bronze Age.

Type 2

The second major structural form is the large circular or sub-rectangular mound of basalt blocks, with diameters often exceeding 10m and with preserved heights of up to a meter or more. While some appear to remain intact, many others have been severely damaged due to looting, but this action has also exposed interior features (**Fig. 20**). Type 2 cairns appear to be multi-chambered tumuli, ranging from two to as many as eight or more chambers. We estimate that these multi-chambered tumuli make up roughly a quarter of the major structures at al-Wisād. Regarding dating, at the moment we can only suggest that they probably are Late Neolithic, or perhaps slightly later. Abu Azizeh's research in the Thulaythuwāt area of southern Jordan has circular cairns that have been dated to 5,300-4,700 cal BC (Abu Azizeh 2010: 368).

Type 3

Rectangular linear structures unassociated with tower tombs or large circular tumuli occur less frequently at al-Wisād. WS 7, for example, is a 10m chain of four or five rectangular chambers approximately 1.5 x 1.0m and *ca*. 75cm high (**Fig. 17a**); one of the chambers has been thoroughly destroyed by looters, although the others appear to be intact. Were such chambers associated with burials? Or could they have been sturdy storage features to



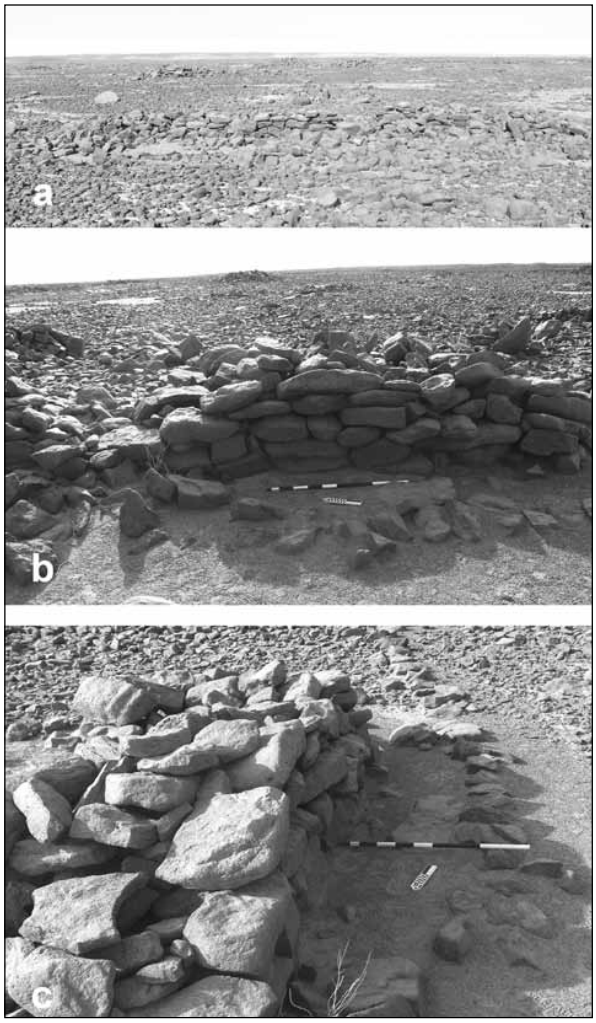
16. Type 1b tailed tower tomb WS 13; a: the white lines emphasize the rare rectilinear arrangement of the walls of this large tower tomb; b: the tower tomb at right is separated from a 'tail' of 44 chambers by a paved platform about 5 x 6m in extent (Aerial photo by D. Kennedy; other imaging by G. Rollefson).

hold equipment pending frequent returns to the same location?

Another example is WS 65, where a chain of five rectangular chambers constitutes the western 'wall' of a broader, almost square paved area that includes a slightly raised platform (**Fig. 17b-c**) and a lower paved courtyard with a pathway leading through it, set off by thin basalt slabs placed on edge.

Type 4

There are several examples of large circular enclosures (8-10m diameter) built of massive basalt slabs that have survived to a height of more than a meter. These we have termed '*nāmūs*-like', although they are evidently a third to two thirds larger than the Sinai originals (cf. Bar-Yosef *et al*. 1986: 125-126). Some of these structures (e.g. WS 72, **Fig. 18**) have a paved



17. Type 3 structures; a: WS 7, linear arrangement of enclosed chambers (north to left); b: WS 65, similar to WS 7, one of whose chambers is visibly empty; c: WS 65, view to south, with a curb of stones leading towards a ring-walled tower tomb (WS 66) (Photos: G. Rollefson).

courtyard as large as the building to the east, set off from the surrounding area by a wall of high, thin basalt slabs (*ca*. 60-75cm). The mass of the walls, their height and the paved courtyards argue against a simple residential construction (and are certainly unnecessarily complex for animal pens), so it appears these might have ritual associations. Type 4 structures constitute a small proportion of the al-Wisād structures, although they were prevalent at the southern foot of Maitland's Mesa (Rowan *et al*. 2011).

Type 5

Ritual 'complexes' add to the diversity of architecture at al-Wisād, and some of this com-

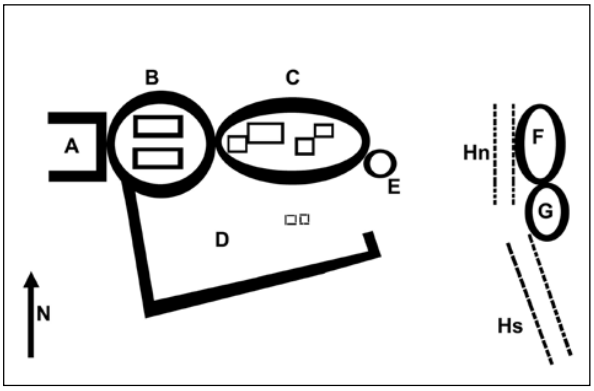
18. Type 4 structure WS 72, a 'nāmūs-like' structure; a: view of massive wall construction; b: view of interior of WS 72, showing abundant fallen wall stones, implying the walls were probably once more than a meter high; c: relationship of WS 72 to tailed tower tombs WS 13 and WS 85 (Aerial photo by D. Kennedy; other imaging by G. Rollefson).

plexity may reflect an evolutionary sequence of alterations to original, simpler ritual elements. While most of the buildings at al-Wisād might individually represent changes over time (including much of the variability in Types 1 - 4 described above), these accumulated develop-

ments appear to have been effected within only a few generations. But other examples might argue for extended alterations over longer periods of time. One of the most extreme examples of complexity is WS 58 (**Fig. 19**).

WS 58 (see **Fig. 19** for features A - H below) may have begun life as an isolated tower tomb, similar in all respects to Type 1a above (though there are clearly two interior chambers in WS 58). This would certainly be the case if tower tomb B existed in isolation. However, over time, additions were made to the basic tower tomb, although the sequence of changes has not yet been worked out. U-shaped element A abuts tower tomb B, as does an elliptical multi-chambered tomb C. When these appeared relative to walled courtyard D (which includes two tiny square cubicles) can not be determined, nor is it at all clear when circular feature E (which is only one slab high) was created in relation to features A - D. Smaller single-chamber tumuli F and G seem to be contemporary in a general sense, but this can not be correlated in any way with features A - E. Finally, there is 'curbed' pathway H (Hn and Hs in **Fig. 19**), outlined by small (25-40cm) slabs lying flat on the ground that separate tumuli F and G from the rest of the complex.

How WS 58 can be interpreted requires much more information than we have at the present time. There are several other large complexes with apparently multifaceted sequences, but they also defy definitive interpretation at this time. The complexity of all of them indicates something that is non-linear in development, but how that can be determined remains elusive.



19. Type 5 complex; sketch diagram of WS 58 in the central part of the core area. A is a u-shaped feature at the western edge, abutting tower tomb B, which has two internal chambers. Abutting this to the east is oval mound C that contains four interior chambers. D is a partially walled courtyard containing two small cubicles (interior dimension ca 30-40 cm maximum). E is a circle of stones. F and G are two oval mounds each with a single chamber. Between C / E and F / G are curbed 'paths' H, leading north (Hn) and south-east (Hs). Not to scale; orientation approximate. The diameter of B is approximately 3m (Sketch by G. Rollefson).

Type 6

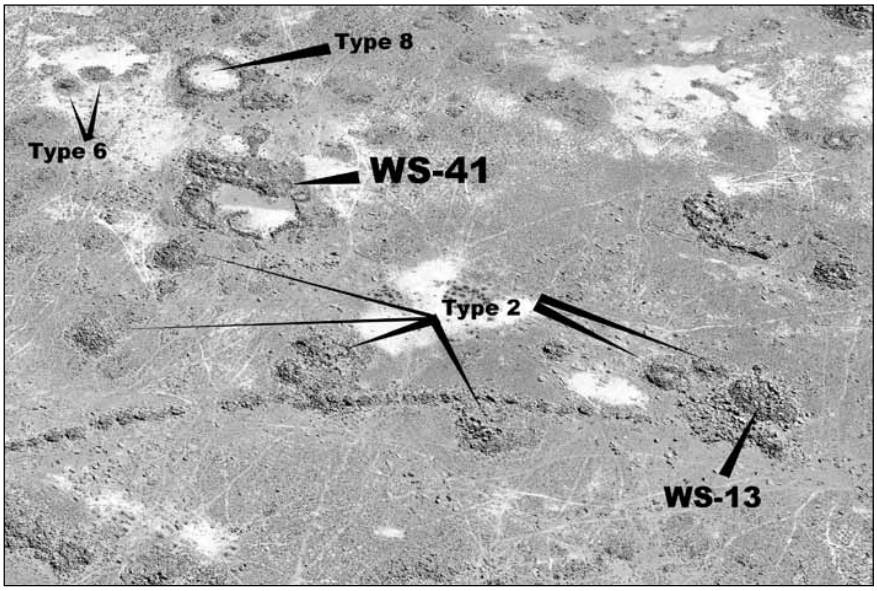
There are numerous low basalt cairns (*ca*. 2 x 1m, height 20cm) that are usually at odds with orientations that are normally indicative of Islamic burials. At the sites on the periphery of al-Wisād, south-east / north-west orientations, which allowed faces to be directed towards Makkah, were frequent. We have interpreted these as ritual, perhaps being late prehistoric burials of individuals of lower status than those buried in the larger tumuli. An appreciable number of them have standing stones in association, sometimes at both ends of the elliptical cairn. Dating – as ever – is a problem, but it is worth considering the possibility that these burial mounds might be associated with the largely invisible pastoral communities that are known to have inhabited the region during the later Bronze Age, Iron Age and Classical periods (**Fig. 20**).

Type 7

Some of the arrangements of stone walls and apparent clusters of alignments suggest that at times there were residential complexes atop the Wisad plateau. These are relatively scarce in comparison with other structure types, but stand out in terms of what might be arrangements of nuclear or even extended family walled compounds. WS 41, for example, was a walled compound of *ca*. 15 x 20m (**Fig. 20**). Inside the compound, with a spacious area for sheep or goats, were several smaller enclosures that might have been stone foundations for tents / huts and for storage features. The quantity of heavy basalt slabs necessary to construct this complex indicates that it was a compound that was repeatedly reoccupied.

Type 8

Walled clearings constitute the most numerous kind of construction at al-Wisād. Typically they are 10m or more in diameter and have low walls erected simply by clearing large spaces in which to camp and for animals to be protected.



20. Type 7, WS 41, a possible walled residential complex with animal pen, hut and storage rooms. This complex is close to tailed tower tomb WS 13; tumuli of types 2 and 6 are in the near vicinity, as is a type 8 animal pen (Aerial photo: D. Kennedy; other imaging by G. Rollefson).

In clearings where there were enormous, partially buried basalt boulders, we can assume these were animal pens (**Fig. 20**). Such clearings were probably repeatedly re-used. The variability in the color of the cleared surfaces likely reflects a seriation of clearance and use.

Type 9

There is a plethora of ephemeral but noticeable animal tracks across the necropolis that resulted from traffic as animals – herded and wild – passed to and from the pools at al-Wisād. But there are also some intentionally created paths of variable lengths that link up some of the Type 8 clearings. Usually the stones removed during the path creation were simply tossed aside, but there are also instances where the stones were kept beside the path, forming a curb (cf. **Fig. 19**: Hn and Hs).

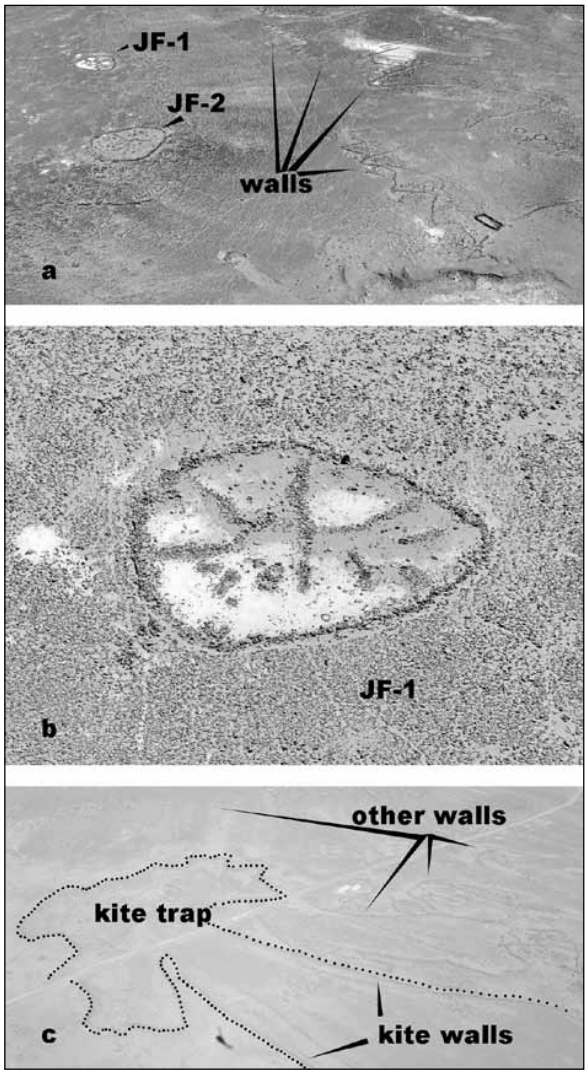
Type 10

Type 10 units are generally off-site constructions that may or may not be related to the visits to the al-Wisād necropolis. 'Kites' are hunting traps first identified by Rees (1929: 395), and there are several very large ones in the immediate vicinity of al-Wisād Pools. While some kites have walls kilometers in length at times, the quaint kite on the site itself, just east of Pool 1, is a miniature version (**Fig. 13**). The trap of the kite is slightly more than 60m in diameter and the length of the southern wall just over 100m. The circular part of the kite stands to a preserved height of more than a meter. The temporal relationship of this feature with any of the other structures at al-Wisād remains enigmatic, but it is possible that this was mostly used as a pen for sheep and goats that were taken to and from Pool 1 for watering.

There are 'real' kites of much larger dimensions in the vicinity of al-Wisād Pools, with traps of *ca*. 250m diameter and walls of undetermined length but reaching a kilometer or more; the diameter of the trap in **Fig. 21c** is more than 250m, taking the width of the truck track running through the kite as *ca*. 4m. There are also two 'jellyfish' (Kennedy refers to them as 'wheel houses') a couple of kilometers to the south of the site periphery (**Fig. 21a-b**). Along the eastern, southern, and south-western edges of the necropolis are enigmatic zigzag wall alignments (**Fig. 22**). The long walls may be analogous to the "*murets-barrières*" noted by Abu Azizeh in the Thulaythuwat region, interpreted as part of the pastoral system to control animal herds (Abu Azizeh 2010: 308-322).

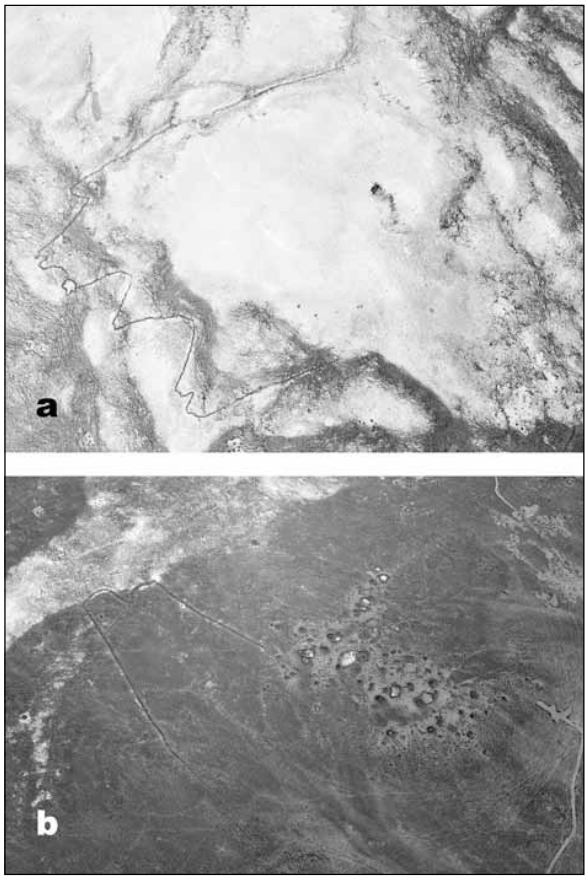
Discussion

Population pressure combined with climatic deterioration was a catastrophic combination for Neolithic residents of the mega-sites of Jordan at the turn of the seventh millennium BC. One response to the difficulties of staying alive under these circumstances would have been



21. Type 10 structures in the near vicinity of Wisad Pools; a: two small 'jellyfish' (JF) and some zigzag walls of unknown date and function approximately 4 km south of the pools in the necropolis; b: close-up of JF 1; c: a kite approximately 5 km south-east of al-Wisād, the walls and trap of which are enhanced by dotted lines. Diameter of the trap is over 250m (Aerial photos: D. Kennedy, additional imaging by G. Rollefson).

to look towards the arid lands of the eastern Bādiya, relying on the ability of sheep and goats to convert the otherwise unusable vegetation of the arid landscape into food and other goods to trade with people who remained behind to coax cereals and other crops from the hard-pressed soils of the agricultural areas. The foundations of today's *bedouin* societies were taking form, and by the Late Neolithic of the latter half of the seventh millennium full-scale herding societies had emerged.



22. Walls of unknown function and date; a: at the edge of the kite at the north-east edge of the necropolis; b: long walls that parallel a shallow wadi at the south-western edge of the necropolis periphery (Aerial photos: D. Kennedy; additional imaging by G. Rollefson).

But if life was taxing for farmers, it was not necessarily easy for the early herding families either. Rainfall necessary to provide seasonal vegetation in the badlands was also scarce in the sixth millennium, so the beginnings of the pastoral lifestyle were probably tenuous. But in the second half of the sixth millennium, when rainfall began to return to modern conditions, winter and spring pastures grew more and more lush, herds increased in size – as did the numbers of herding families – and wealth grew simultaneously. As tribal groups increased in size, social organization became more complex. Possibly through processes similar to those of 'big man' developments (Sahlins 1963; Hayden 2001), responsibilities for ensuring tribal welfare may have been accompanied by unequal access to wealth (especially animals); the emergence of the ancestors of today's sheikhs was well estab-

lished by the end of the fifth millennium. The death of these important tribal individuals was announced to the rest of the desert dwellers in the form of imposing mortuary architecture in places where visitors or passers-by could hardly ignore them.

Al-Wisād Pools would have quickly assumed a special place in the lives of herding societies in the late sixth and fifth millennia. Just as agricultural land and other assets had become increasingly commodified as 'restricted property' in the ninth and eight millennia BC among the farming societies in arable territories (Gebel 2010a), so did sources of predictably abundant water and pastureland become defended as tribal territories. Monumental mortuary structures would have demonstrated the depth of time of such restricted access. The pools at al-Wisād began as natural reservoirs, but over time additional barrage dams were constructed across the narrow Wādī al-Wisād to increase conservation of water by preventing its loss on to the broad plain at the mouth of the wadi. In a sense, then, we see at al-Wisād the development of a form of desert water management that would eventually culminate in what Gebel has called "Pastoral Well Cultures" leading to Arabia's "Oasis Economies" (Gebel 2010b; Gebel and Mahasneh n.d.) that would continue elaboration until modern times.

Despite earlier visits to the site by hunting groups, al-Wisād's primary occupational history was probably concentrated from the late sixth through the mid-third millennia, although the vagaries of rainfall - even during the mid-Holocene climatic optimum (cf. **Fig. 4**) - probably caused significant interruptions during that long span of time. As a consequence, at least some (if not most) of the variability that can be seen in the mortuary and ritual structures likely reflects an evolution of style over time. Furthermore, although the last groups who buried important personages there may have claimed some sort of ancestral link with the earlier inhabitants of the other tombs at the necropolis, they may actually have had little direct historic and genetic connection with the earlier groups.

For the moment, there are major problems concerning the use of al-Wisād Pools that require resolution before a minimal understanding of this remarkable place can be achieved. Everything we have at present comes from the surface, which is clearly unsatisfactory. From what we could tell in a brief assessment, almost all of the physically more impressive tombs have been looted, and this is another blow to a social and physical reclamation of the people who were buried there. At the moment, there are also no samples that can provide direct absolute dating for any of the structures and their contents. But this set of hurdles is about to be removed in future fieldwork at al-Wisād.

At least three more seasons will be devoted to mapping the structures, but in addition we will also have teams to recoup as much information as is possible from the tombs, looted or not. Commonly, looters both ancient and modern have shown an exclusive interest in artifacts from the graves, but they have left behind the mortal remains of their inhabitants. Although no longer in pristine location, the bone material (which is generally of good preservation) can be recovered so that we can obtain bone apatite radiocarbon dates, as well as provide at least minimal demographic information over the time span represented at the site. Furthermore, other teams will excavate samples of the non-mortuary architecture, including animal pens, residential buildings, and ritual structures, taking OSL samples for general dating when radiocarbon samples can not be recovered.

Research into the development of desert-dwelling peoples in Jordan and elsewhere in the Near East has been sporadic until the past few decades, but as new generations of archaeologists expand their research in the greater Arabian Peninsula, a more comprehensive picture of what seems to be an exotic, even romantic lifestyle will come into clearer focus.

Acknowledgments

Funding for this project has come from the authors, Whitman College Perry Summer Scholarships, Oriental Institute of the University of Chicago and Seven Pillars of Wisdom Trust. We could not have carried out the field work without the continuous support of Dr Barbara Porter, Director, and Dr Chris Tuttle, Associate Director, of ACOR, as well as students from Whitman College and friends in the 'Ammān community. We are indebted to the Department of Antiquities of Jordan for permission to under-

take the research. We also would like to express our gratitude to Dr Alison Betts, a pioneer in archaeological research in the Black Desert, for her invaluable insights and generous contribution to our work, and to Dr Morag Kersel for her patient help and dedication in the face of harsh field conditions.

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MACHAERUS PROJECT: PRELIMINARY REPORT ON THE 2011 HUNGARIAN - JORDANIAN EXCAVATIONS

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Introduction

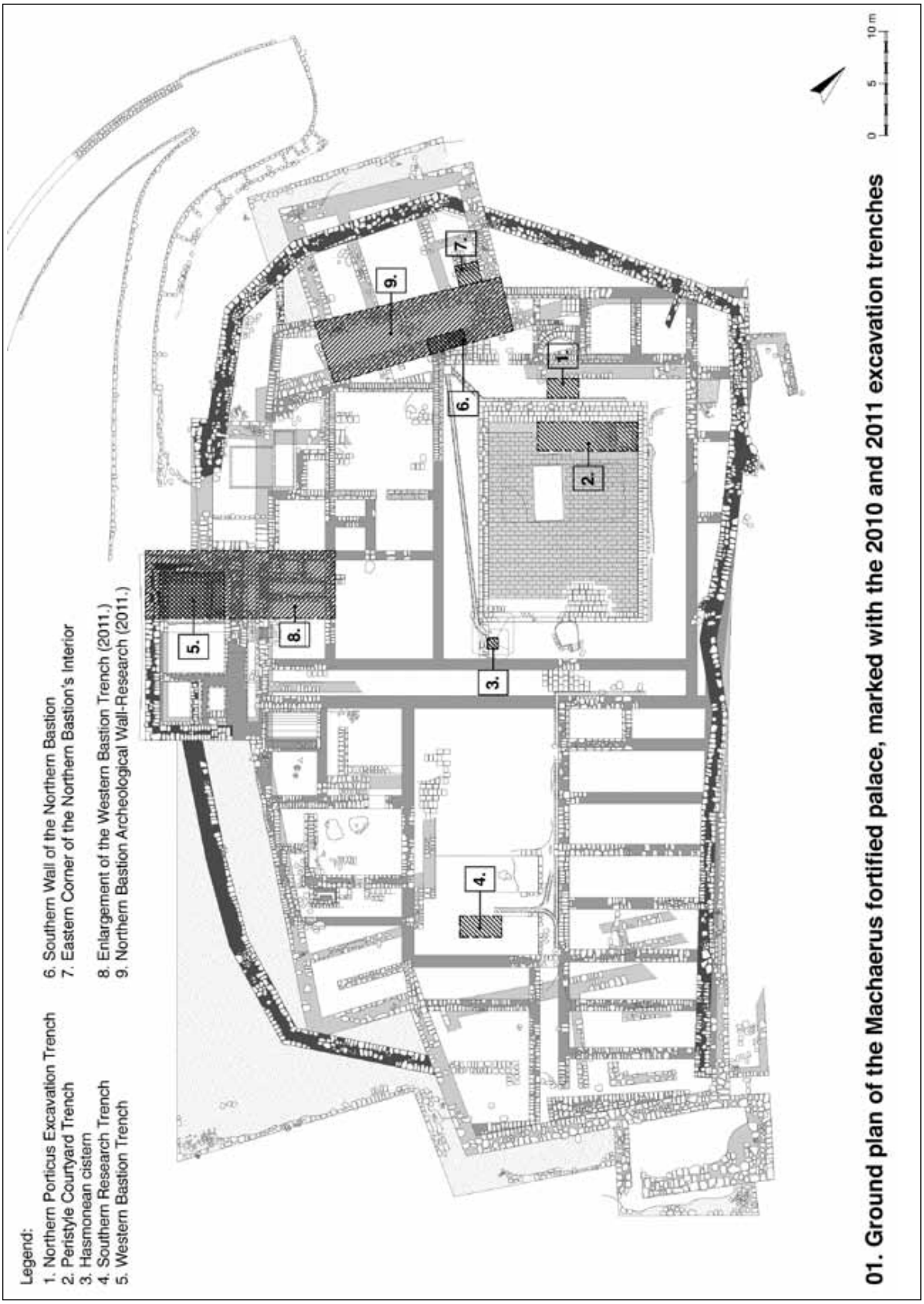
Following a three-month field survey in 2009 and two-month excavation season in 2010 at Qal'at al-Mishnaqa in Mukawir, known to ancient sources as Machaerus (Machairos), additional archaeological excavations and surveys were conducted at the fortified royal palace on the hilltop, overlooking the Dead Sea. The joint mission of the Hungarian Academy of Arts and Jordanian Department of Antiquities (excavation permit in the name of Dr Győző Vörös) carried out a one-month archaeological investigation at the site between 26 March and 21 April 2011. A general introduction to the site and preliminary scientific reports on the previous two seasons can be found in the 2010 *ADAJ*, *Liber Annuus* and *Munjazat* journals, and also in the forthcoming proceedings (*SHAJ* 11) of the 11th ICHAJ, held in Paris in June 2010.

The objectives of the 2011 season were the completion of the architectural and archaeological investigations and making preparations for the preservation, conservation, consolidation and *anastylosis*-restoration of the Machaerus palace-fortress, and its attractive future presentation to the public.

Archaeological Excavations

In 2010 we opened a 6 x 4 metre trench in the northern part of the western fortification tower (**Fig. 1**). The limits of the trench were the south-west, north-west and north-east walls of the bastion itself. To gain a better understanding of the archaeological stratigraphy inside the bastion, we positioned the south-east edge of the trench midway down the 6 x 8 metre hall. Rather unexpectedly, we did not expose any archaeological stratigraphy in this section, but instead uncovered the elevation of a previously unknown wall. In the six metre deep trench we discovered collapsed wall debris that had accumulated over the well-preserved bedrock and floor foundations, in between intact walls on either side. In addition to a large quantity of pottery, three *in situ* coins came to light during the clean-up: one depicted the Hasmonean anchor and another, the Hasmonean double cornucopia. Both these coins were minted by King Alexander Jannaeus of Jerusalem; the third was too corroded to yield any additional information. This trench gave an unexpected vertical dimension to the fortification that will become a key element in the monument's future presentation.

To gain a better understanding of the architectural structure of this trench, we enlarged it to 18 x 6 metres (see new plan with the 2010 trenches marked). We identified seven rooms within the trench, which we excavated to bedrock. These rooms are numbered from the south in the archaeological and architectural documentation. The south-east end of the section lies over the arched bath discovered by the Franciscan mission. The physical parameters, architectural structures and archaeological stratigraphy (including identified floor levels) can be studied on the drawn and photographic record. The bedrock in rooms 1, 2, 3, 6 and 7 was horizontal, with two rock-cut steps in the walls between rooms 1 and 2, and 2 and 3 respectively. Concerning the architectural character of the monumental walls, we can state that the Cyclopean masonry of the Hasmonean walls were used by the Herodian architects as foundations for their ashlars. The western bastion of Alexander Jannaeus' fortress was strengthened with a cross-wall and reduced in size by King Herod the Great's builders. From



1. Plan of the Machaerus palace-fortress, marked with the 2010 and 2011 excavation trenches.

the archaeological material recovered during our excavations, we can highlight fragments of five pottery lamps, three Aramaic *ostraca*, two extremely corroded bronze coins and one fossil ornamental bead (**Figs. 2, 3 and 4**).

Archaeological Walls

In the 2010 season we opened two trenches (Nos. 6 and 7) in the area of the northern fortification tower. They provided valuable information, as we discovered staircases in both of them. In trench 6, nine steps led up from the peristyle courtyard, and in trench 7 five steps descended from the same level.

2. The 2010 - 2011 western bastion trench (view from south).

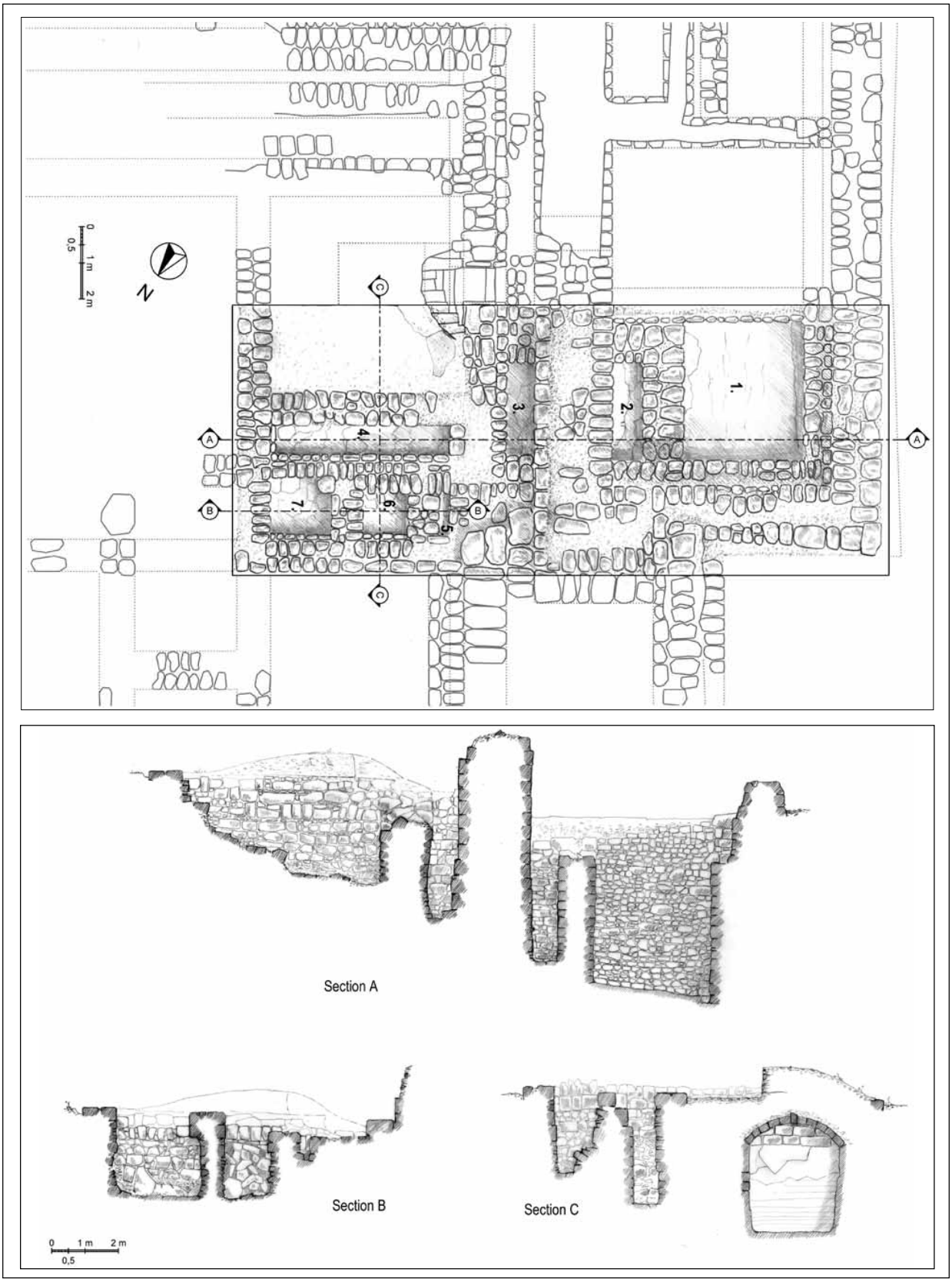
3. The 2010 - 2011 western bastion trench (view from north-east).

In these two trenches, we defined a large, 15 x 6 metre section for architectural research that proved to be the most problematic area of our 2009 and 2010 investigations (**Figs. 5 and 6**). Eventually our research was fruitful. We carried out detailed architectural analysis and excavated amidst the southern Herodian structures built adjacent to the northern Hasmonean bastion. As a result of our research we concluded that the south-west part of the outlined area consists of two blocked entrances of the Hasmonean fortress: the southern was one of the outer entrance gates of the fortification, whilst the northern represented one of the inner doors of the northern bastion (**Fig. 7**). The goal of the Herodian builders was to use the (probably) already ruined wall behind the northern Hasmonean bastion, which runs along our 2010 No. 6 section, as the foundation for an ascending staircase. Since the steps are in Greek feet, being 32cm deep and 20cm high, we calculate that 35 steps were would have been needed to ascend from the peristyle courtyard to the wall which turns directly towards that of the *triclinium*'s northern hall. The difference in height between the two levels has been estimated at *ca*. seven metres. It also gives the height of the three-hall *triclinium*'s arched roof (**Fig. 8**).

For the enclosed staircase, flanking walls were erected on both sides and the space between the bastion and the completed staircase filled in. The plan and two reconstructions show the two architectural periods, and well illustrate the development of architectural space in this part of the monument.

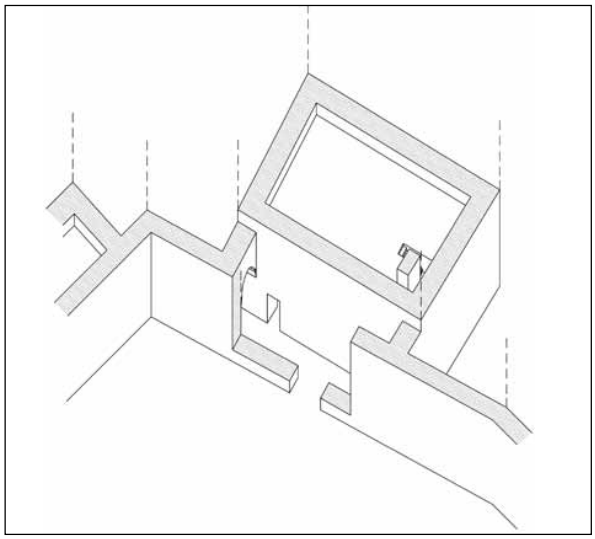
Architectural Survey and Geodesic Measurements

Following our architectural surveys of 2009 and 2010, this season's survey objectives were to check and collate the measurements from previous seasons, to undertake a comparative analysis of the different architectural periods and to finalise the details of the theoretical architectural reconstructions. As a result of our investigations, we were able to identify a previ-

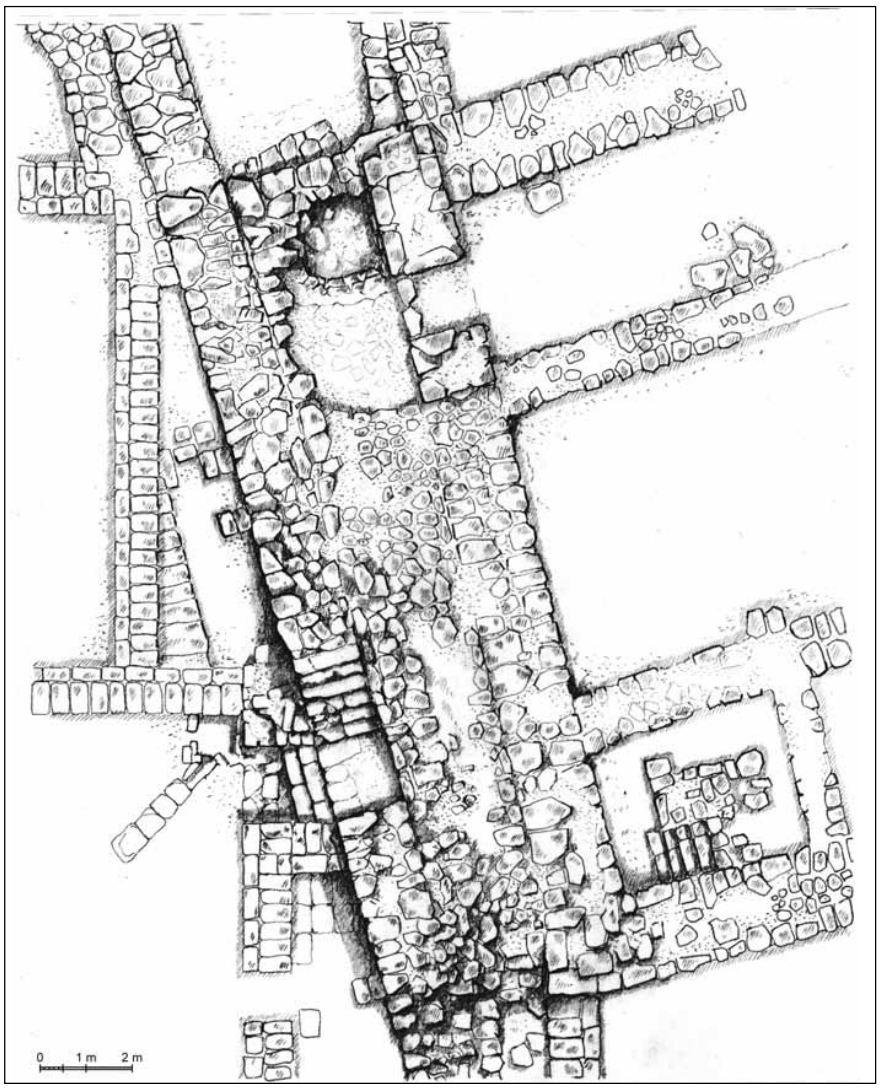


4. Architectural elevations and stratigraphic sections in the detailed drawing of the enlarged No. 8 trench.

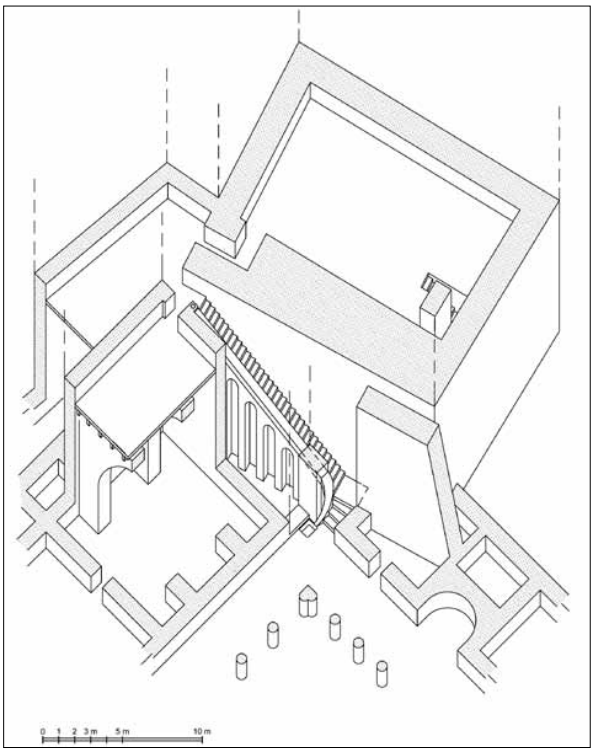
5. Location of the 2011 wall research (view from south-west).



7. Reconstruction drawing of the first architectural phase in Section No. 9.



6. The detailed layout of the wall research and excavations.



8. Reconstruction drawing of the second architectural phase in Section No. 9.

ously undocumented basin east of the peristyle courtyard (close to the staircase ascending from the northern watchtower up to the fortress). We also examined the relationship between the aqueduct, suburb and water catchment system on the one hand, and the cisterns and ancient main road leading up to the fortress on the other.

We paid special attention to making a detailed drawn and photographic record of the surviving architectural elements and also created an architectural catalogue / classification for their comparative examination. In light of these activities, we concluded that reconstruction of the Ionic and Doric columns would be possible: bases, capitals and a large number of drums from both have survived, as have their surmounting elements. We were aware of the *in situ* plaster decoration and carved details on the architectural elements, and made a very careful drawn and photographic record of all aspects.

The geodesic survey of the archaeological site was carried out with the support of the president of the Jabal Banī Hamida municipality, Mr Ibrahim al-Atrash, who personally visited the excavations. The peristyle courtyard of the Herodian royal palace is situated at an elevation of 698 metres above sea level, or approximately 1,100 metres above the Dead Sea. A digital total station was used to establish the geodesic fixed points, with optical projections to five points at Machaerus from the 'M 183 al-Dayr' survey point, located at a hilltop village to the south-east.

Mosaic Research

The most glorious part of the former Herodian royal palace was undoubtedly the 28.3 x 23.3 metre peristyle courtyard, with its apsidal throne niche on the axis and Doric columns on the four porticos, along with the connecting 25.6 x 9.6 metre *triclinium* with its three arched halls on the ground floor and upper floor with a stunning panoramic view of the Dead Sea and West Bank. Another gem of the Machaerus palace was the 20.1 x 12.9 metre royal bath, the third-largest surviving Herodian bath after those of Lower Herodion and Masada. Unfortunately, the halls of the bath were in very poor condition, but during the 1979 Franciscan excavations a splendid, decorated, black and white mosaic came to light (*tepidarium* mosaic: Corbo 1979: Pl. 44 B.). This is the oldest known mosaic in Jordan, which today has pride of place in the Madaba Archaeological Park, with an excellent parallel at Masada.

We started micro-archaeological investigations at the site of this mosaic's discovery and, in addition to a large number of *tesserae*, a 12 x 11cm *in situ* mosaic came to light (**Fig. 9**). After studying the floor level foundations of the mosaic in detail, we established that a similar floor structure was present in the neighbouring hall as well. As a result of our research, we discovered further 9 x 9mm black and white *tesserae*, plus three red examples, one of which was cut in trapezoid form; all had *in situ* cement on their sides. We therefore concluded that there was another bath hall with colourful mosaic decoration, most probably in its central so-called *emblemata* part.

Most of the floor level of the Herodian palace has been lost and, at the beginning of our archaeological work in 2009, we were only able to identify it in a few places (primarily where paving slabs survived *in situ*). However, we noticed that the surviving floor levels in the two bath halls with mosaics and in the northern hall of the *triclinium* were similar in structure. This

9. In situ mosaic remains in the royal bath.

suggested that the ground floor of the *triclinium* was originally also covered with mosaic. We discovered large numbers of 20 x 20mm *tesserae* in the debris accumulated against the wall foundations of the *triclinium* and on the hill side in the Franciscans' spoil heaps. Significantly, these were not found in the bath halls; all were carved on white limestone and on each piece we identified the same cement as on the bath *tesserae* (**Fig. 10**).

Preparation for Conservation and Anastylosis-Restoration

During the last three archaeological field seasons we have become well-acquainted with the archaeological and architectural heritage of the Machaerus palace-fortress. Detailed investigation of the monument has been carried out, as has comprehensive comparative research with analogous monuments on the West Bank. Our archaeological and architectural investigations were extended to all *in situ* archaeological remains and all displaced architectural elements found on the site. To gain a better understanding of the monument we opened nine archaeological trenches. This enabled us to identify three periods of architecture, *viz*. Hasmonean, Herodian and Zealot, and to make theoretical architectural reconstructions. Accordingly, we can work towards a preservation and presentation of this unique monument that will display its history and beauty from an architectural perspective. In the meantime, we aim to develop proposals for much-needed conservation and consolidation work. As a preliminary measure, we have covered the more fragile parts of the monument (e.g. *in situ* plaster, the water drainage system and edges of *in situ* paving slabs) with fine soil from the spoil heaps.

Summary

As a result of our three-month survey in 2009, two-month excavation season in 2010 and supplementary one-month excavation season in 2011, six months' fieldwork has now been carried out at Machaerus. Accordingly, we have come to a much better understanding of the history, architecture and the archaeology of the site. This research has provided an enormous body of data (e.g. complete architectural descriptions, geophysical survey data, results from nine excavation trenches, *ca*. 10,000 large-format, professionally-taken digital photographs, including detailed digital video footage), which will form the basis of scientific archaeo-architectural work that will preserve the heritage and legacy of Machaerus for future generations. On completion of our work, hopefully by the end of this year, we will be able to submit a proposal to the Government of Jordan for an architectural preservation programme that will present this important Biblical site in a creative and innovative light to visitors and pilgrims. The highlight of our recent archaeological season was the royal visit by HRH Queen Rania to Mukawir on 12 April 2011, where Her Majesty was briefed on the future tourist development plans for the Machaerus palace-fortress.

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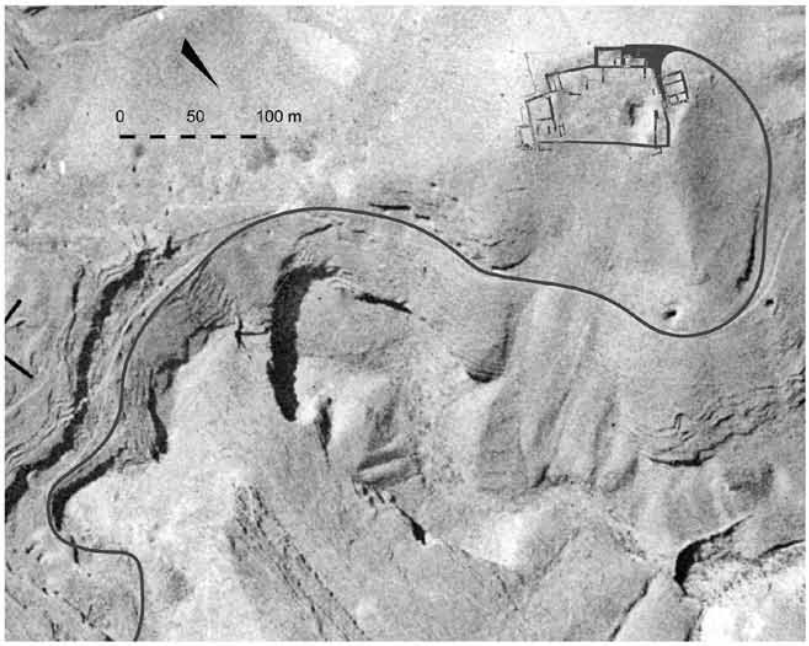
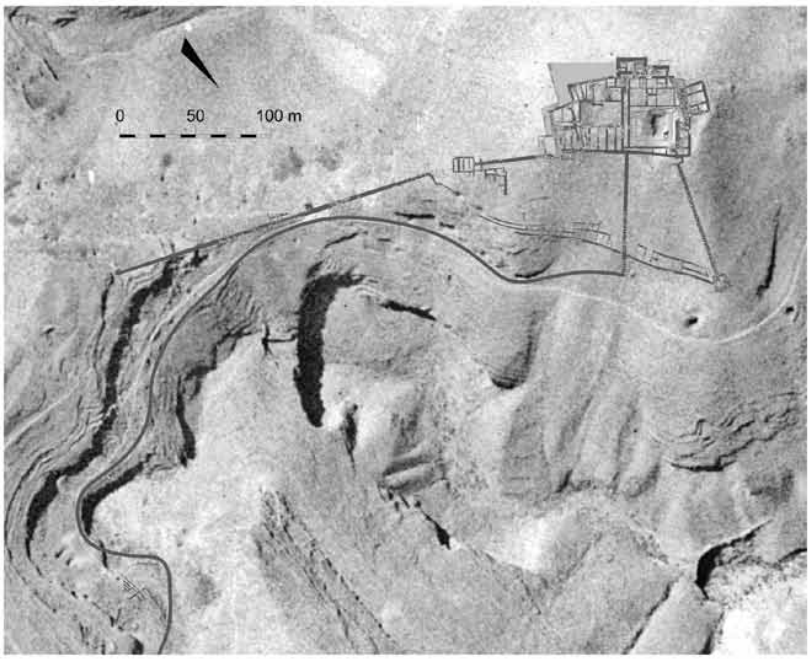
10.1. Ground plan of the fortress and the ascending road in the Hasmonean era



10.2. Ground plan of the palace-fortress, the lower city and the ascending road in the Herodian era



10. Architectural overview of the monument and its surroundings.

A MEDIEVAL ARCHAEOLOGY EXPERIENCE IN JORDAN THE *'MEDIEVAL' PETRA* MISSION OF UNIVERSITY OF FLORENCE

Guido Vannini

The Archaeological Mission of Florence University *'Medieval' Petra. Archaeology of settlements in the Crusader-Ayyubid age in Trans-Jordan* is part of the 'Strategic University Project' on *Mediterranean Feudal Society: Archaeological Profiles. Rise and fall, at the origins of modern Europe*, conducted by the Chair of Medieval Archaeology and dedicated to the archaeological study of feudal society – through the analysis of settlement forms in various territories within the Mediterranean area – at a time when the latter was the setting of a lengthy confrontation with the new political entities which were being established from Western Europe to the Islamic Mediterranean East in the late Middle Ages.

The research is aimed at documenting the material "*caracters originaux*" of the first Crusader settlement phase which are better preserved and stratigraphically readable, after the complete and final abandonment following the battle of Ḥiṭṭīn, 1187 (Kedar 1992; Ligato 2006), where the army of the Latin Kingdom of Jerusalem was defeated by Salah ad-Din. Within this framework, for about twenty years now, the mission has been engaged in a 'territorial archaeology' survey programme with a view to analysing the features and form of Latin '*incastellamento*' in the territories corresponding to the Lordship of Trans-Jordan in the XII century, both in its structural aspects and as an 'observatory' on the Crusader-Muslim frontier in the Holy Land, with respect to the Ayyubid settlement model (Vannini and Desideri 1995). The mission is divided into archaeology research (University of Florence), restoration (University of Pisa), archaeometry (University of Urbino), territorial topography (CNR – Istituto per le Tecnologie Applicate ai Beni Culturali of Rome), ICT development (CNRS – LSIS of Marseille – France) groups **(Fig. 1)**[1].

An element which, from the very outset, has characterised the mission's purposes is the introduction of recent methodological approaches and research procedures typical of some Italian and European medieval archaeology schools of thought in a region where traditional archaeology always owed its success (and still do)[2]. The

1. The institution supporting the project is the University of Florence (Medieval Archaeology Chair at the *Dipartimento di Studi Storici e Geografici*) in collaboration with the Department of Antiquities of Jordan; in 1999 it was a 'Pilot Project' of the MAE, also being financed several times by the MIUR as one of the 'Scientific research programmes of relevant national interest' (1989-2008), through the FIRB (2005-2008) and by the Italian-French bilateral scientific programme 'Galileo/Egide' (2005-2006); it has the continuing support of the MAE-'Cultural Relations' G.D. as Mission and pilot Project (1999) archaeological project (1987-2009) and since 1999 it has been a 'Strategic project' of Florence University. The mission is also part of the *Italian-Jordanian cooperation agreement* (since 1991), in 1994 it was acknowledged as one of UNESCO's goals and has been availing itself of a logistic base financed by the University (lodging, laboratory, computer workstation and an archive to file the findings) in Wādī Mūsā (Petra). Information about the mission can be found on the Internet in the website: www.shawbak.net.

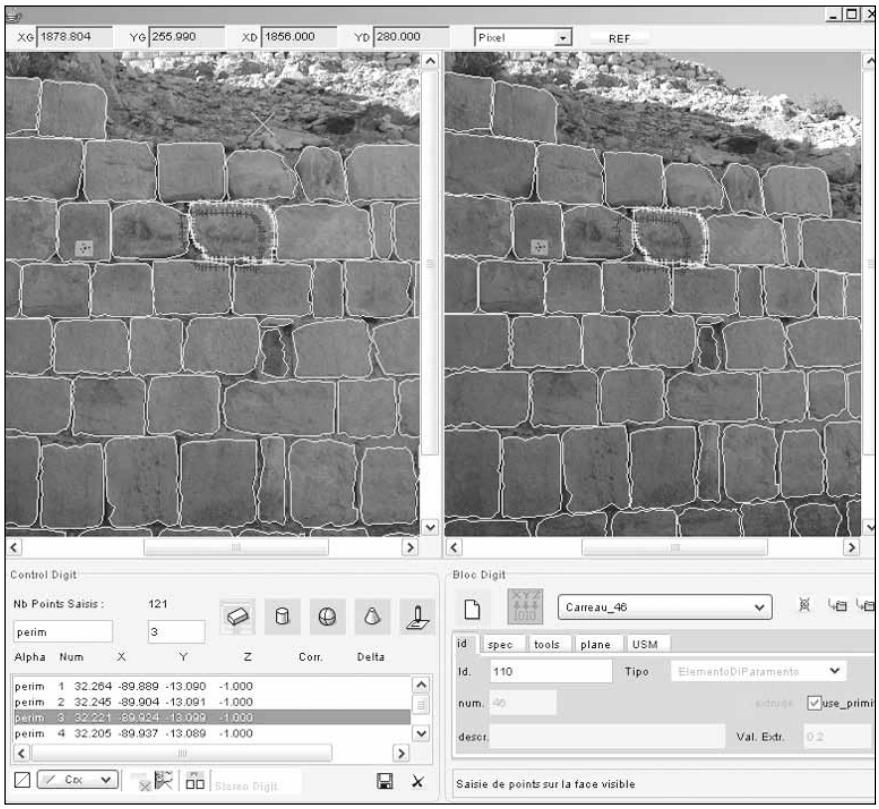
2. A role which was objectively carried out by the mission throughout its history and from which - I remember with pleasure new and independent research threads directly derived from it. It is the case of the work by the *Archaeological Restoration Research Group in Jordan*, directed by Luigi Marino (University of Florence) which since 1991 has been conducting intensive campaigns dedicated especially to survey and restoration issues in archaeological-monumental areas as part of the programme of the *Studium Biblicum Franciscanum* in Jerusalem (Marino 2003); or of the mission directed in 1993 by Roberto Franchi (University of Urbino) in the area of petrography applied to the preservation of archaeological sites in the Petra valley (Franchi 2003); or of the mission directed by Cristina Tonghini (University of Venice) which since 2002 has been at work on the Islamic fortified site of Shaizar, in Syria (Tonghini *et al*. 2003). Mention should also be made here of the programme on archaeological buildings on Umayyad sites conducted by Roberto Parenti (University of Siena).

1. University of Florence project base in Wādī Mūsā, with accomodation, laboratory and logistical facilities.

experiences in historical archaeology and territorial research, the necessary relationship with written sources – which characterise any research whose aim is to contribute to the designing of a historiographical interpretation model for a Mediterranean-based 'medieval' period (as in our case) – led to adopting an integral stratigraphy study approach not based mainly on excavation. The basic methodology option, indeed, consists in attributing a strategic role to 'light archaeology', a codified reading which, to sum up, integrates in a systematic way the various non-invasive archaeologies (landscape, environment, buildings, computer archaeology; targeted essays); all this allows for a use – and economically, in relation to the aims – which is directly historical of the documentation and of the archaeological analysis itself, as regards the cultural 'structures' of the past. It is indeed true that some of the solutions adopted are still experimental, but this is exactly in the line of whole sectors of recent archaeological research, especially regarding the Middle Ages **(Fig. 2)**. The central focus of the latter has been on fine-tuning and targeting their analysis tools of pre-industrial societies and their material 'structures' towards a reconstruction-interpretation of events and historic features based on the integrated use of various sources and in relation with other historiographical approaches[3].

Within this framework, the 'excavation' is used for well-defined targets emerging from research conducted on a territorial level and with variable intensity: from the large scale (the Crusader-Muslim frontier between Syria and Jordan), to the medium scale (the region included between the Dead Sea and the Red Sea), to the small scale (the Petra valley), down to the choice of 'stratigraphic observatories', identified on the basis of structured 'material-archives' in the area under consideration, which are able to provide reliable information not only about themselves, but also about the category (culture, chronology, typology) to which they belong and therefore about the 'environment' constituting their specific historic setting. This allowed for opti-

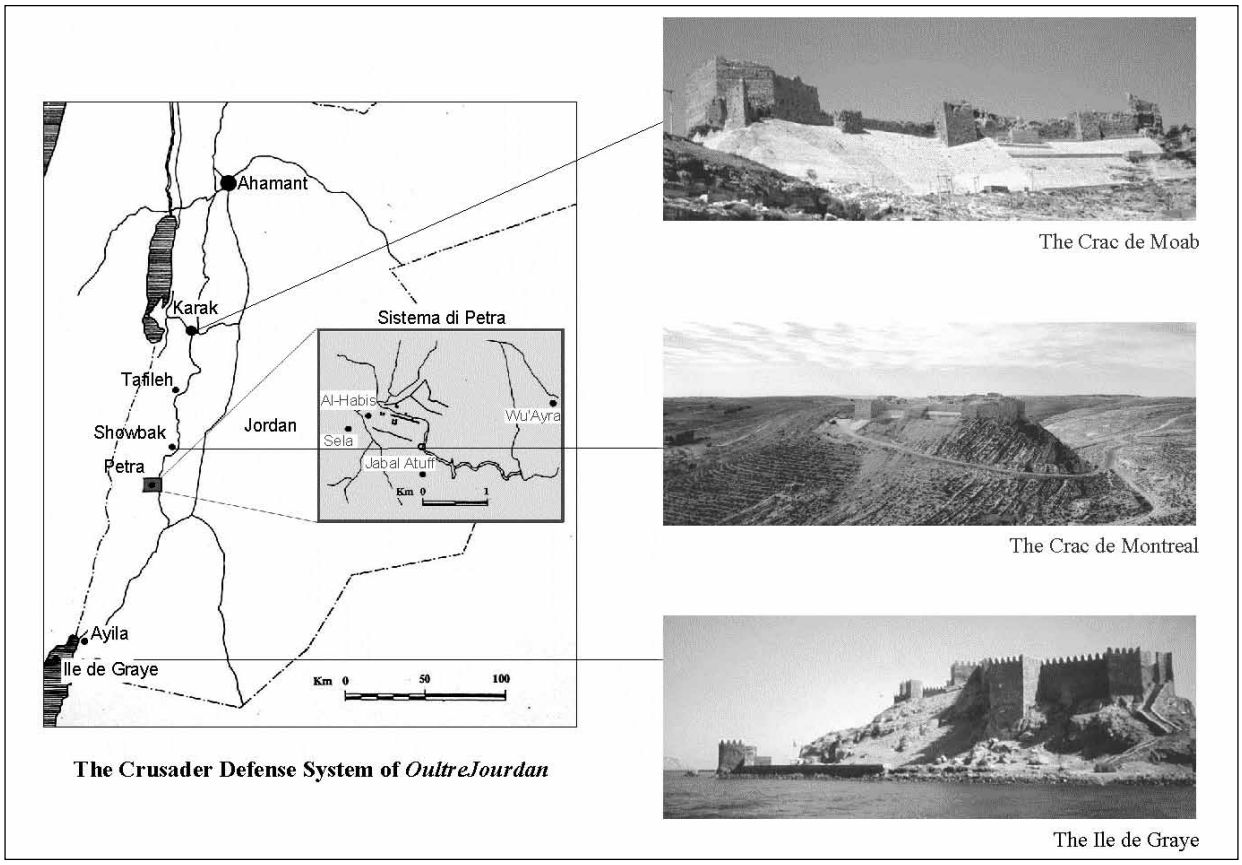
3. Hence the adoption of innovative methods whose aim is to overcome also the physical limitations of traditional excavation archaeology; this essentially means moving from the analysis of the episode (a site, an event) to that of the phenomenon (an environment, a topic): in other words, going from deductive analysis to inductive analysis. These were the assumptions chosen to design a territorial analysis system and an integrated technological measurement process: for this specific aspect the contribution by the Project was particularly relevant, especially as regards the merging and management of data which are heterogeneous also in terms of type, thus developing an effective representation and management model of the 'archaeological space-time' (e.g.: Drap *et al*. 2009; see Lucas 2005, 1999). This perspective, in a certain respect between method and merit, also serves the purpose of highlighting the character of a study area, archaeology, which may be able to contribute better than others to bringing closer the humanistic and scientific-technological side of culture; more in general, this issue appears to be increasingly crucial in contemporary society.



2. Ash-Shawbak: classification, interactive mapping, digitised catalogue of walls detected by photogrammetry.

mal use – and significant results which we think could be helpful as regards the quality of some historical interpretations suggested – of the investigations conducted (and now in progress) in two sites extensively excavated: the al-Wu'ayra Castle, suggesting an interpretation model for the Crusader settlement in the Petra valley, and the ash-Shawbak monumental fortified site, for the poleo-genetic function which the reactivation of the frontier in the region triggered on a site which proved to be an authentic archaeological archive for the history of the whole region over a long period of time.

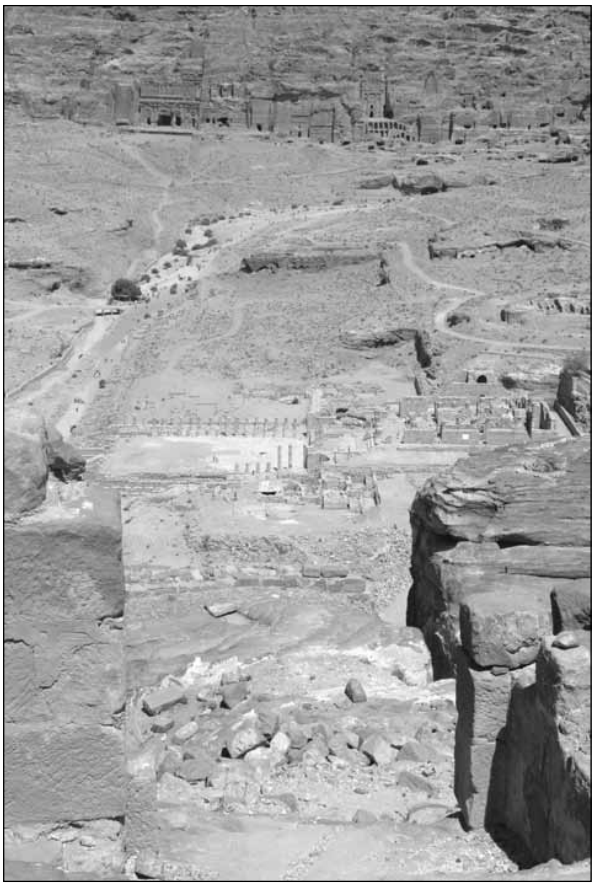
The first phase of the surveys (1986-1995) served the purpose of outlining the territorial framework of the first Crusader presence in the *Outrejordain* area, through 'varied-geometry' and variable intensity studies as well as, of course, on the basis of the interpretation models available at the time (in the mid-1980s), which had to rely on written sources as well as on the related long-standing tradition of studies in the sector, also regarding topography (Deschamps 1939: 40; Prawer 1982: 333-4; Pringle 1989: 171-202). Subsequently, on the basis of the results achieved during this work – systematic campaigns and 'light' readings carried out on the whole area represented by the sites which made up the settlement system of the Latin Lordship (al-Karak, aṭ-Ṭafīlah, Petra, ash-Shawbak, Ayla, Pharaoh's Island) – the research activity gradually focused more and more on southern Jordan, always with a view to assessing the methods, timing, operational choices and reasons underlying the Crusader settlement and to choosing one of the large fortified settlements present in the area – mainly ash-Shawbak and al-Karak according to the data found in literature – as a 'stratigraphic observatory' for the whole region **(Fig. 3)**. However, the evidence from territorial data literally led us, so to speak, to follow the very 'traces' of the Crusaders, to the surprising discovery of the new, though politically ephemeral, central role granted to the Petra valley by King Baldwin I himself (a few months after having conquered Jerusalem) as part of the Trans-Jordan territorial structure (Vannini and Nucciotti 2003). In other words, far from being a mere garrison, as it has always been considered (Musil 1907: 64 ff.; Brunnow and Domaszewski 1904-9; Deschamp 1934-39: 40-41; Kennedy 1994: 24-30; Pringle 1989),



3. Settlement in the Lordship of Transjordan and the Crusader fortification of Petra.

after nearly five hundred years of obscurity, in Petra there emerged an authentic, complex, mature traditional feudal fortification system of the whole valley, founded on the two large (as the subsequent 'light' surveys documented with precision) Castles of al-Ḥabīs and al-Wu'ayra, and other strongholds including among others (not all those mentioned in the chronicles have been identified), those located on Jabal 'Atūf or al-Khubtha **(Fig. 4)**. In this regard, a specific documentation significance was acquired by the stratigraphy reading programme, both horizontal (with diagnostic surveys and then extended sondages) and vertical (with targeted surface reconnaissance and wall stratigraphy analyses), conducted in the archaeological area of the imposing castle at al-Wu'ayra -*Li Vaux Moises* **(Fig. 5)**[4]. The site confirmed its role as strategic 'key' for Petra, not only during the Crusader period, and fully expressed the function as archaeological 'observatory' on the whole settlement in the valley during the XII century in many

4. The surveys made it possible to document a first structure which in all likelihood dated back at least to the Nabataean age (including also proto-historic evidence), obtained by blocking and filling the wadi north and south of the area, and especially the essential structures of the crusader settlements, for example the internal communication system (pathways, passages, patrol pathways, ramps, posterns, moving bridges); the water system for the collection, storage, distribution of rainwater; the urban plan of the keep; the stronghold and monumental area, with the various connection systems to the surrounding defended area. The fortified system consists of double line defended by as many as 14 quadrangular towers. Within this system, the formwork rises in an eccentric position along the external defence line and significantly at the level of the only access to the whole complex; the latter is protected on the outside by an imposing isolated foregate on the Wādī al-Wu'ayra, which makes use of a previous structure dating back at least to the Byzantine age, provided with moving bridges on both sides. The complex of the fortified church, which can be accessed though a ramp where the crusader graveyard was found protects the access to the main water tank of the whole settlement. Near the church two other accesses, to the north and west, establish a communication between the formwork and the more external fortification area. The site appears to have been abandoned after some of its parts had been reused briefly for production activities (Vannini and Vanni Desideri 1995; Vannini and Ton-

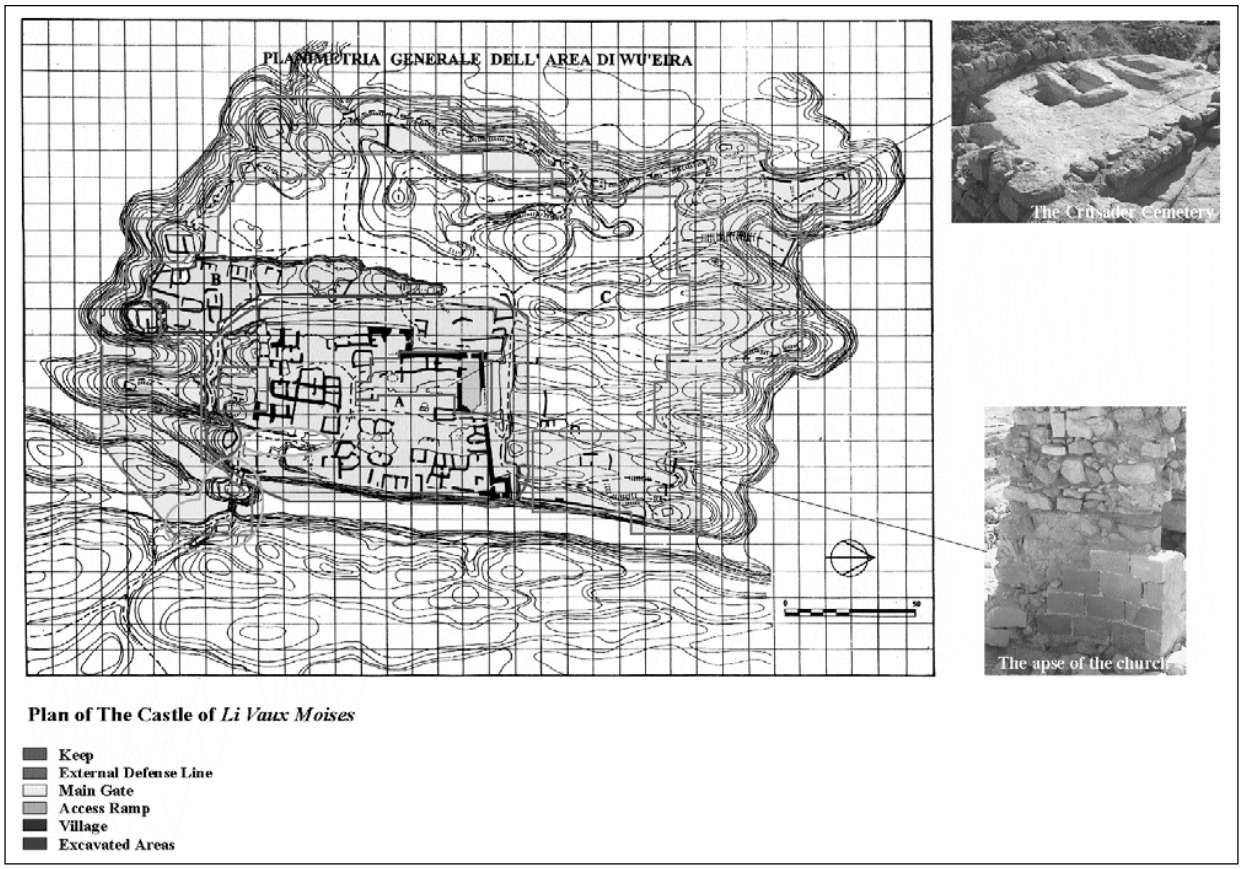


4. The valley of Petra in the XII century as seen from the Crusader castle of al-Ḥabīs; based the recent discovery of spectacular imperial re-urbanisation.

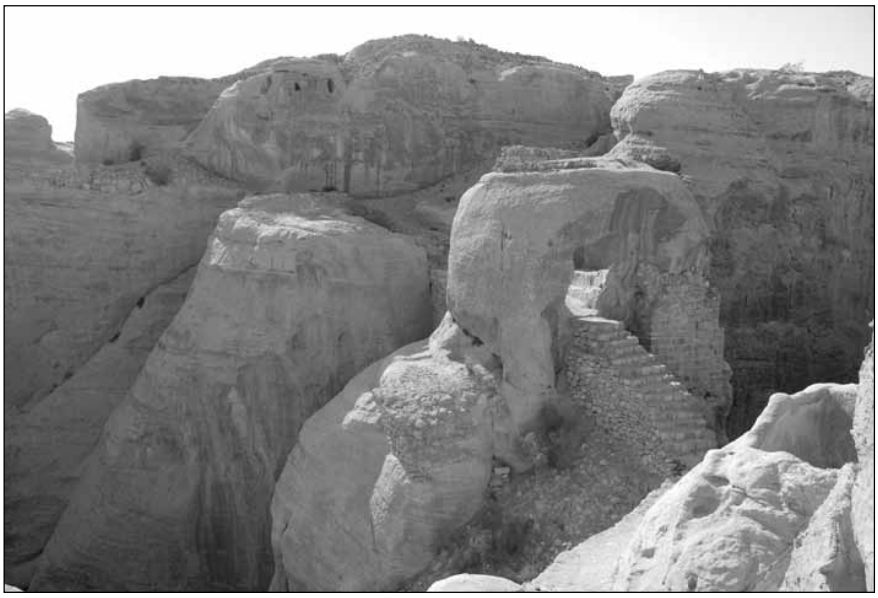
respects **(Fig. 6)**. This made it possible to put forward a historic-archaeological interpretation model which in later years was surprisingly confirmed also through research by other missions. For example, the pottery series documented with the outmost chronological precision (and for the very first time as regards similar productions from the XII century in the region: Neri 2006/7) allowed for the identification of a settlement at the bottom of the valley (Wādī Farasa, mission of the 'Humboldt' University of Berlin directed by S. Schmid: Schmid 2006, 2009: 106-107), of a second one just outside it (Bayḍa, ACOR mission directed by P. Bikai: Bikai *et al* 2009) and, most recently of ploughing traces in the abandonment levels of the 'Petra Pool Complex' (mission of University of Pennsylvania): this confirms the interpretation pattern which was suggested in those years attributing a settlement purpose and reason to the logistic control of the valley as a stronghold for the government of the whole region **(Fig. 7)**.

Indeed, the construction of this model and of its necessary material documentation basis with a critical review of written sources, has been the main objective of the following set of surveys (1996-2002), first of all by intensifying both the excavation campaigns in al-Wu'ayra, and starting on the second castle of the Petra system, al-Ḥabīs, an intensive programme of readings and surface measurements based on the strategic use of masonry archaeology on a 'topostratigraphic' basis (with experimental solutions which have proved particularly useful for the exploration conducted later in the demanding archaeological monumental area of ash-Shawbak)[5]. But most importantly the targeted 'landscape archaeology' campaigns were conducted to provide a first mapping of masonry types in the 'Crusader-Ayyubid' period which proved extremely interesting also in a specific respect: documenting the constant and planned reuse – both for strategic (the choice of sites) and tactical reasons (reuse, both *in situ* and of the materials) – by the Crusaders of abandoned site structures attributable to the ancient *limes arabicus*; this happened in al-Wu'ayra, al-Ḥabīs and ash-Shawbak **(Fig. 8)**[6]. In other words, the reactivation of an old function led to the re-

5. The rocky hill of al-Ḥabīs is the control point inside the Petra valley, part of the same system as al-Wu'ayra, which is its outside part. The surveys confirm that it has been used in antiquity at least since the Roman-Byzantine age. The fortified structure is divided into at least two separate phases. The stratigraphic analysis of the structures showed that the first phase of the building work was limited to the upper keep area, on the remains of an imposing Byzantine donjon; only later, with the construction of a large cistern resting on the second row of walls, was the settlement extended to the lowest terraces of the relief, to include as many as three rows of walls, as well as an imposing tower on top.
6. The drafting of chrono-typology atlases of stratigraphically attributed masonry work is one of the basic critical tools which has allowed to define, on a territorial scale, precise relationships also with the strategic choices and specific tactical solutions adopted centuries earlier, in the late-Roman and Byzantine age, for the defence of an area which, in this specific historic region, constituted a real long-term 'structure'. Therefore the comparative study of the structures preserved in the three sites studied with total stratigraphy (buildings, topography, underground structures) – al-Ḥabīs, al-Wu'ayra and ash-Shawbak – documenting Roman-Byzantine occupation phases, made it possible and will allow to shed new light on the interpretation of the whole structure of the same ancient *limes* of the region (see also Kennedy 2000: 175 and ss).



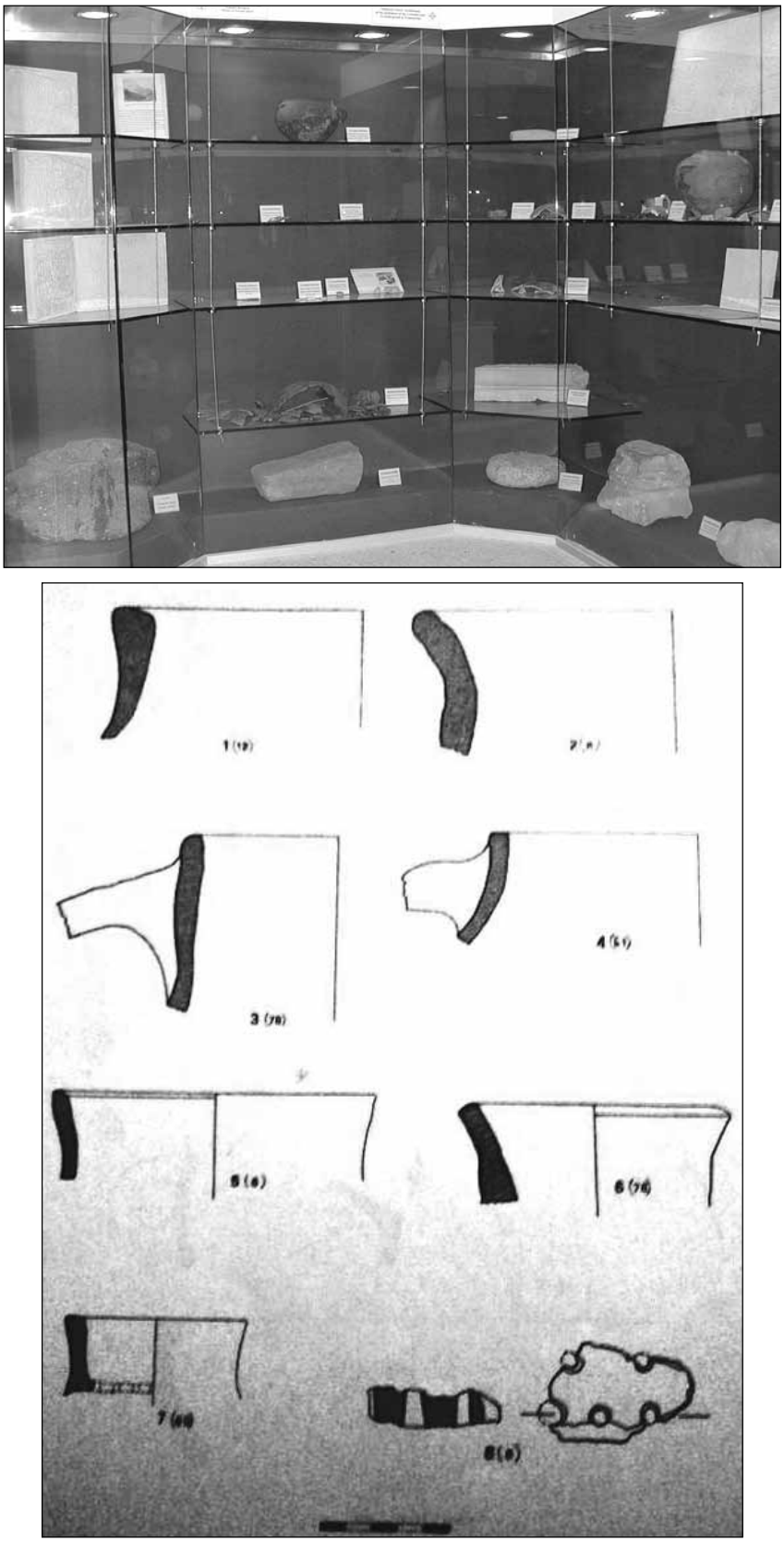
5. Wu'ayra castle, Petra: archaeological readings.



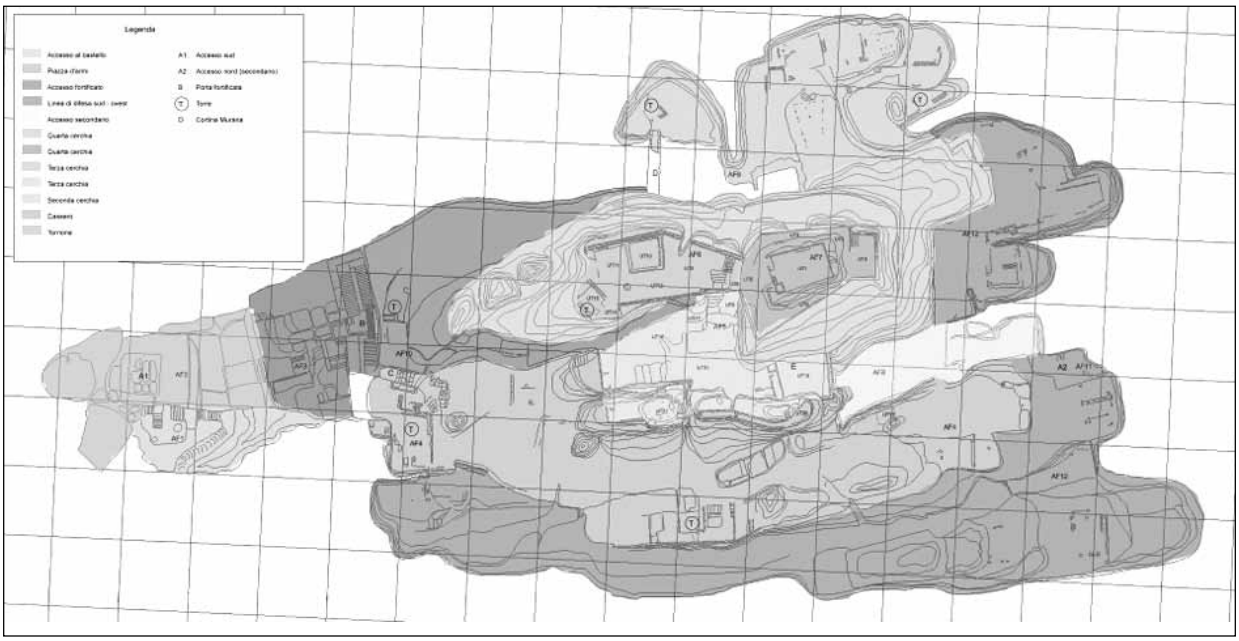
6. Wu'ayra, key of Petra: anti-porta and access system.

emerging and new interpretation from a 'medieval' perspective, with its own original features, of a whole region, between the Dead Sea and the Red Sea; a 'historic structure' which would no longer be abandoned but, once again, reinterpreted on different cultural basis by the Islamic rulers (Ayyubid and Mamluk) once they had resettled in the area, after the day of Ḥiṭṭīn.

Only at this point did the choice of ash-Shawbak as new 'stratigraphic observatory',



7. Wu'ayra: first ceramic types dated to the region of Petra in sec. XII (exhibition in Petra Forum hotel).



8. The castle of al-Ḥabis, key of the inner fortification system in the valley of Petra. The topography of the defense.

this time expected to shed light on the history of the whole region, seem to justify a new (2003-2008) research season (Vannini 2007). The *Crac de Montréal* mentioned in Frankish sources, as part of the strategic covering system for Petra and protection for the 'Kings' Highway' between Syria and Egypt and between the caravan routes along the Arabian desert and the Mediterranean, indeed, also constituted the first defence structure to the east of the Latin Kingdom of Jerusalem **(Fig. 9)**. The research on this site, with its unexpected and monumental roman origins (Nucciotti 2007: 36-37; Vannini and Nucciotti 2009: 62), restored the historic meaning of its extraordinary public buildings (the imposing cathedral of Saint Mary, the monumental Mamluk ramparts from the end of the thirteenth century) or of the new findings (some of them already starting with the research by R. Brown and the DoA in the 1980s: Brown 1988): among others, the majestic Ayyubid government palace, the largest surviving of that time in the whole Near East I **(Fig. 10)**, showing significant continuity also as regards stratigraphy with the monumental remains, recently discovered, of the earlier palace of king Baldwin I **(Fig. 11)**[7]; the large textile factory dyeing plant, the largest in the eastern Mediterranean found by the excavations, in activity at least from early Mamluk age (Vannini and Nucciotti 2009: 128-131; see Little

9. The 'Royal' castle at ash-Shawbak: an extraordinary strategic location and tactical choice, to control the fertile strip of the Arabian desert.

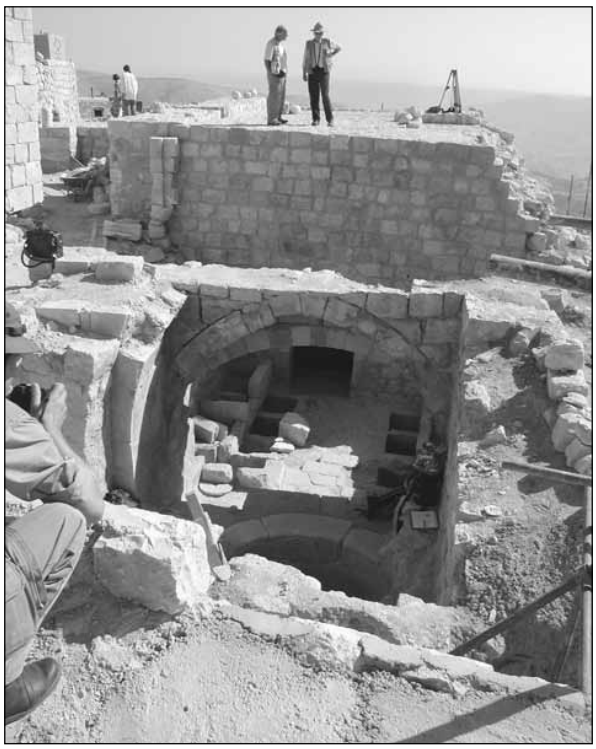
7. (See Nucciotti 2007: 41-45; the papers of G. Vannini, M. Nucciotti and M. Rugiadi in Vannini, Nucciotti 2009: 91-94, 111-114, 120-121). A place that represents a significant environmental continuity of function, even in relation with a territory administered in a substantially similar way to that of the previous crusader Lordship.

10. Ash-Shawbak. The 'audience hall' of the Ayyubid government palace: continuity and innovation of a territorial power (digital 3D photogrammetric model for the stratigraphic readings).

11. Ash-Shawbak. The monumental stairway, discovered in 2006, which connected the vaulted hall of the Crusader palace with the new Ayyubid government palace.

1984, 1986: 83-94) **(Fig. 12)**; they were all part of an extensive urban plan set up in the Ayyubid age at the beginning of the XIII century (no later than 1212, according to archaeosismic dating) and continuing for almost a century in the Mamluk age, transforming the old crusader castle into a real Islamic city, confirming at the highest level ash-Shawbak's new, original role as political, military, administrative and economic point of reference for the region **(Fig. 13)**[8]. Ash-Shaw-

8. A reading, on a strictly archaeological basis, aimed at reinterpreting also what we have discovered about ash-Shawbak from Arab written sources; the comparison with the Damascus gardens (Ibn Shaddad e Abu Il-Fida in Faucherre 2004: 45, 65), the astonishing figures of thousands of inhabitants between the end of the XIII and the beginning of the XIV century, now appear much less rhetorically hyperbolic(Ludolf di Sudheim in Dechamps 1939: 74): of course there is still a gap, but it is self-evident that the category to which they belong is the same: no longer a 'castle' (according to the continental European feudal culture) but rather a real 'city' (drawing on a culture which was local but, in the long run, Mediterranean). The same applies to European chroniclers, as in the case of the alleged exaggeration by Albert of Aix (RHC-Hocc III, 431): ash-Shawbak built in 18 days by king Baldwin I; this was not believable, at least until the discovery (2006) of the imposing abandoned ancient ruins, actually restored by the same king Baldwin. For an up dated discussion of archaeological data from Karak and 'Aqaba (see Milwright 2008; Withcomb 2006; Damgaard and Jennings 2010).



12. The Mamluk 'industrial' textile dyeing factory (end XIII-XIV century.)

bak, the *de facto* heir, after centuries and for a large section of the region included between 'Aqaba and Karak, of the late antiquity and Byzantine jurisdictions of Augustopolis/Udhruḥ and, especially, of Petra **(Fig. 14)**. This region, from another perspective, therefore proves to interpret its role as frontier – this time 'within' the Muslim world, between Cairo and Damascus – following models, also confirmed archeologically, which combine their role in the territory to which they belong with a broader Mediterranean outlook (Vannini 2011) **(Fig. 15)**.

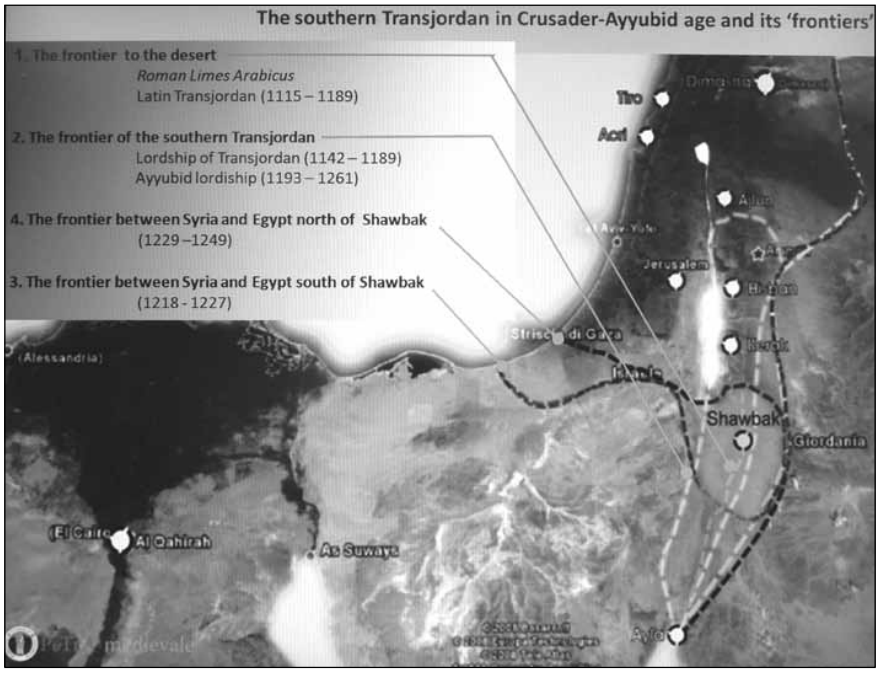
On the other hand, it is a known fact that archaeology has always been rooted in its time; the results of the research, also in this case, tend to merge, from a variety of perspectives with the various needs of local society. Therefore the castle of ash-Shawbak, now one of the most fascinating archaeological-monumental areas of the eastern Mediterranean has been the subject of an enhancement plan by the Department of Antiquities of the Hashemite Kingdom of Jordan, which was the topic of a very recent Italian-Jordanian international Agreement for scientific and cultural cooperation between the University of Florence and the DoA, integrating archaeological research, conservative restoration and enhancement[9].

This seems to be a promising prospect, also

13. The main road axis of the planned new town of early Ayyubid Shawbak (probably early XIII century).

9. Agreement is also in Vannini and Nucciotti 2008: 48-61.

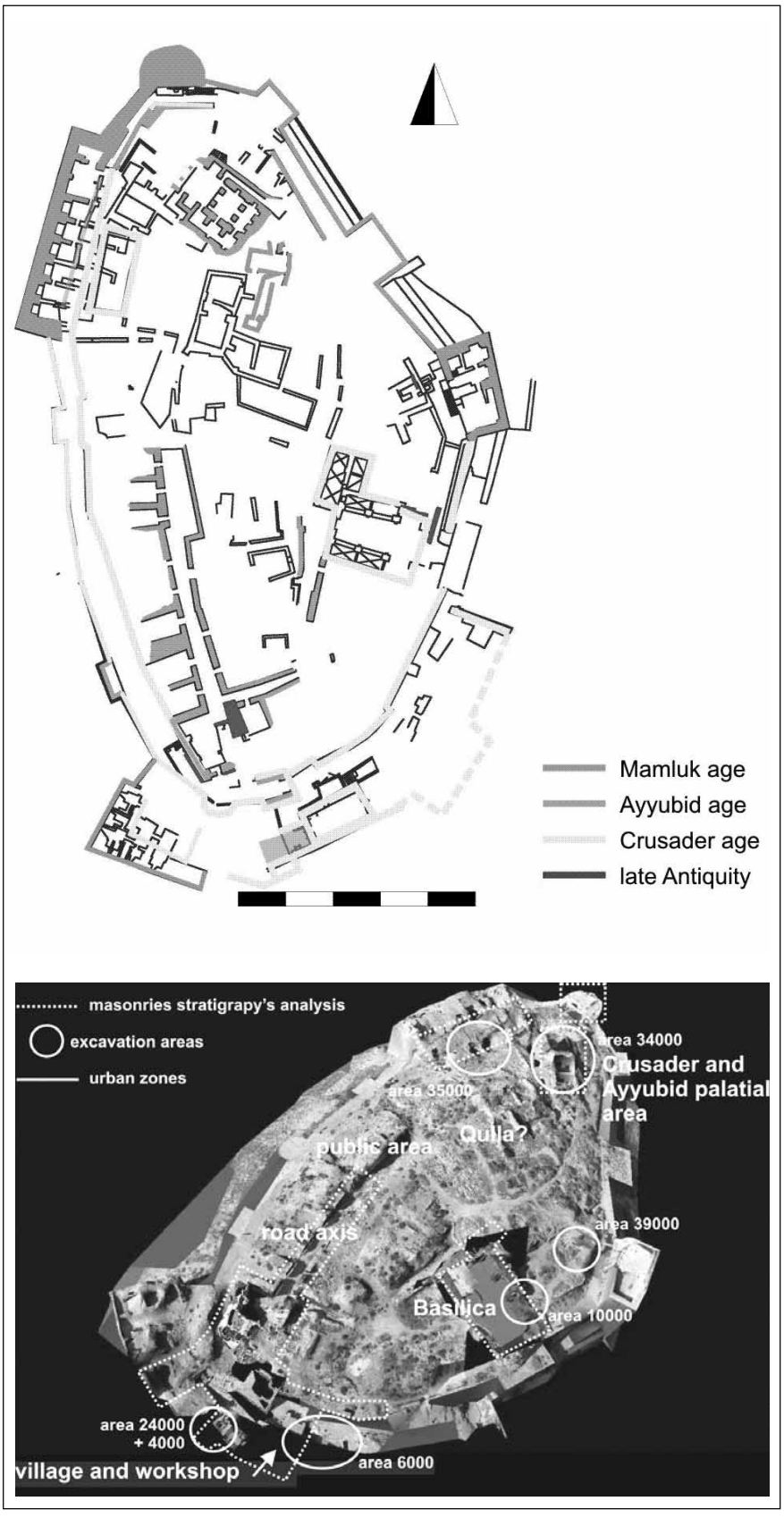
14. The archaeological site of Augustopolis/Udhruḥ, the legionary camp reorganized in diocletian time and possibly the territorial reference point of the limes arabicus since severian time.



15. The frontiers of 'medieval' Shawbak: between Damascus and The Caire (N/S), after the Crusader-Muslim season (E/W).

beyond the specific scientific research (which over the next few years is expected to be involved especially in the stratigraphic exploration of the new 'town' of ash-Shawbak in the Crusader, Ayyubid and early Mamluk period), in relation to the region and through a collaboration including not only the central role of the DoA[10] but also local governmental bodies and other institutions in a 'Public Archaeology' programme **(Fig. 16)**; its aim is to make sure that the site, thus radically reinterpreted, is fully part of contemporary management activities; all this will hopefully be introduced in European programmes for territorial development centred

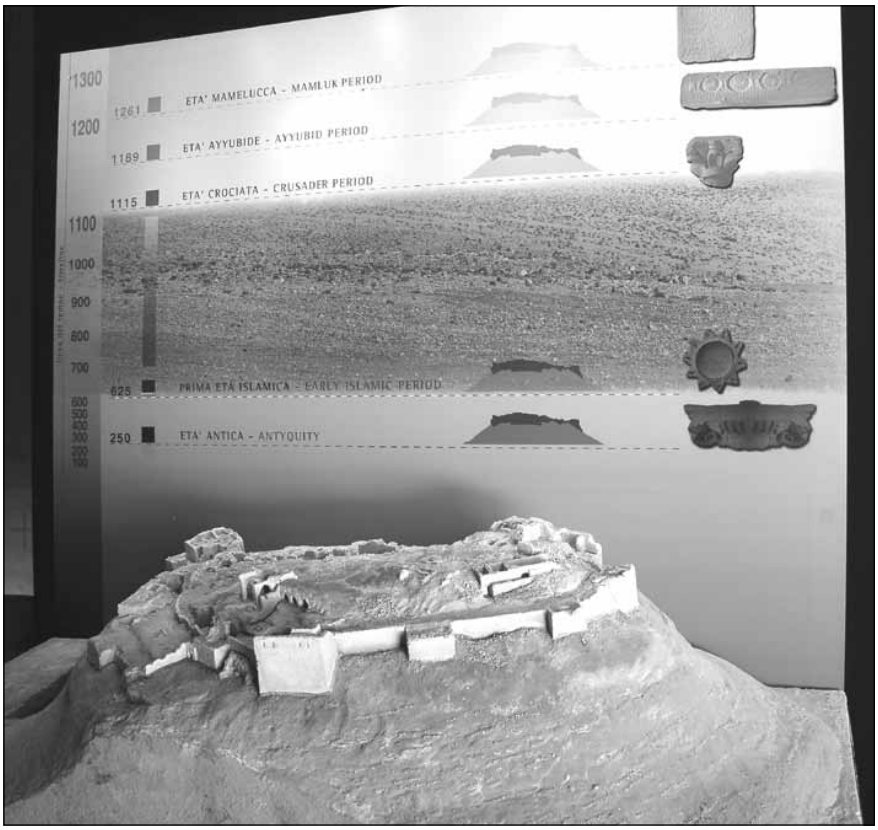
10. I wish to underline the collaborative, friendly and constructive relationship established over time both with the Jordanian authorities and our diplomatic representatives. Just to mention the most recent occasion, the exhibition *Da Petra a Shawbak*, I am first of all grateful to H.M. Queen Rania al-Abdullah of Jordan for the presentation of the Exhibition's catalogue and for her great cultural, and not only, sensibility. I am indebted in particular with the staff of the Department of Antiquities of Jordan through its Director General Dr Fawwaz al-Khraysheh for his commitment and extraordinary efficiency. I am also grateful to the Italian Ambassador in Amman HE Dr Francesco Fransoni who, from the very start of his term in office, has showed an attentive, competent and (if I may say so) tactful attitude regarding our mission and the cultural sector (which is often neglected in its role abroad); in this respect I would like to express sincere admiration for the way in which the First Secretary of the Embassy Dr Stefano Stucci has handled his tasks as Cultural Policies Office, even in situations which were not easy. Finally, I would like to express my gratitude and appreciation for the attention with which they supported our work to the Ambassador of Jordan at Rome H.R.H. Princess Wijdan F. Al-Hashemi and to the Minister of Tourism and Antiquities Maha al-Khatib.



16. Ash-Shawbak: town plan showing the already analyzed buildings and the perspective of the research.

around the direct collaboration between Mediterranean regional communities **(Fig. 17)**[11].

To sum up, one of the main achievements after two decades of studies on 'medieval' Trans-Jordan consists in having recognised, from the events and subsequent new territorial structures of the period between the XII and XIII century, the definition of a 'Crusader-Ayyubid age' which, apart from the corresponding intentions of the protagonists – in the East and in the West – gave rise to a really new historic season for the whole region; in other words, the starting of a tradition – one might say 'medieval' in the Mediterranean sense – to which a specific and relevant contribution could be reasonably attributed at the root of the current identity structures (the palace of the Saladin dynasty in ash-Shawbak, in my opinion, is now fully entitled to be considered a Jordanian 'national monument'). Of course the topic could also seem 'far-fetched' (a 'crusader' site, in the simplified general opinion, and in the Middle East!): however it is a challenge to be taken up, in favour of a non-instrumental use of history, being convinced that the real dimensions of historic knowledge can provide, at the same time, an independent and balanced judgement about our past, leading to the common and virtuous discovery –because it is already shared – of something complex (and possibly contradictory).



17. International exhibition From Petra to Shawbak. Archaeology of a Mediterranean frontier (Florence, Palazzo Pitti, 2009).

11. A European Project for cooperation and support to local development ('CIUDAD'), involving Italian (Tuscany), Jordanian (Municipality of ash-Shawbak) and Armenian (Ararat and Vayots Dzor) regions, which have established a consortium presented following an initiative by our University led by the Tuscan Regional Government (with F.A.R. Maremma, Assogal Toscana), focusing on the economic and administrative impact of the management of cultural heritage in the region and on the exchange of related experiences, has just started. The aim of the project is to foster new local governance and development tools, through a tourist master plan defined on the basis of research, conservation and enhancement of the historic-archaeological assets. For this purpose, as regards the Jordanian-Italian level, a partnership will be established between the Tuscan Regional Government and the Municipality of ash-Shawbak for the organisation and management of the tourism district, also by setting up an integrated communication system involving the creation of an experimental visitor centre in ash-Shawbak (currently under construction by the Jordanian Ministry of Tourism and Antiquities).

As regards a general interpretation of the results of the mission as a whole, the latter can be considered as the beginning of an important reading which renews and reconsiders the data available so far; a wealth of data will be gathered archeologically and it will be interesting to 'match' them with the very different, and thus possibly complementary, approaches adopted, also from a critical perspective: a methodological aspect which, in itself, seems to be a significant innovation within the general scientific scenario of missions in the Middle East **(Fig. 18)**[12].

Project Phases

1986-1988 Designing of the storiographic topics and field tests (territorial, methodology, technical-logistic profiling);

1989-1991 Topographical and archaeological survey between Syria and the Gulf of 'Aqaba; First surveys on the Trans-Jordan frontier of the XII century (al-Karak, at-Tafīlah, Petra, ash-Shawbak, Ayla, Pharaohs' Island); First excavations in the Petra area;

1992-1998 Archaeological exploration of al-Wu'ayra – recognised as key to the fortified system of Petra – using vertical and horizontal stratigraphy; Start of the intensive exploration of the crusader fortification system of the valley; Software design of the project (first version of the PETRA *data* system);

1999-2001 Archaeological analysis to the sec-

18. The Florence Conference (Palazzo della Signoria, 2008), dedicated to Transjordan in 12th and 13th centuries and the 'frontiers' of medieval Mediterranean.

12. This archaeology-based mission, in fact, has produced historic interpretation models for some basic aspects of the organisation of Mediterranean medieval settlements which were discussed during the recent international Conference (featuring 88 speakers from 43 academic institutions in 13 countries) organized by Florence University with the Municipality and the SUM in Florence on 5-8 November 2008 (Palazzo Vecchio-Palazzo Strozzi). The Conference was dedicated to *Trans-Jordan in the XII-XIII century and the medieval Mediterranean 'frontiers'*, providing the scientific basis for the exhibition *From Petra to Shawbak. Archaeology of a Frontier*, held in Florence (Palazzo Pitti, Limonaia del Giardino di Boboli, 13 July-11 October 2009) following an initiative by the University of Florence, the Department of Antiquities of Jordan and organized by the Soprintendenza per il Polo Museale Fiorentino with the support of the Ente Cassa di Risparmio di Firenze (www.frontierarcaeology.eu). The Proceedings of the Florence Conference constitute the first volume of a new Series published by B.A.R. of Oxford ('Limina/Limes. *Archeologie, storie, isole, frontiere nel Mediterraneo (365/1556)*); while, just after the Conference and Exhibition and also as a celebration of the 200 years from Jacob Burckhardt's 'discovery' of Petra, a book is being prepared summarizing the 25 years of research of the Mission of University of Florence (*Shawbak, i castelli di Petra e la Transgiordania crociato-ayyubide. Archeologia e storia di una terra di frontiera*, edited by G. Vannini). The text of this paper was translated by Dr Elena Di Concilio (who also designed the simultaneous translation of the mentioned Conference held in Florence).

ond medieval castle in Petra: al-Ḥabīs; Development of conservation and enhancement programme for the al-Wu'ayra castle and crusader settlement system in Petra;

2002-2008 Extending the archaeological analysis to the crusader sites in Petra (al-Ḥabīs, al-Khubtha, Jabal 'Aṭūf) and starting a collaboration on the 'Crusader' period with some international missions: ACOR (Bayḍā), Unversity of Berlin (Wādī Farasa); Stratigraphic surveys in the archaeological-monumental area of ash-Shawbak castle: surveys, extended essays, analysis of the buildings; Drafting of an intervention plan for the conservation and enhancement of ash-Shawbak castle, based on the Agreement between the DoA and University of Florence.

2009-2011 Further investigations at ash-Shawbak and its environs; start of targeted investigations on the Crusaders sites in light of new data; launch of a European program of 'Public Archaeology' at ash-Shawbak (CIUDAD).

Project Staff (2002-2008)

Project and direction: Guido Vannini (Dip. di Studi storici e geografici).

Archaeological co- director: Michele Nucciotti (Dip. di Studi storici e geografici).

Conservation and restoration: Pietro Ruschi (Un. Pisa).

Computer modelling: Pierre Drap (CNRS-LSIS, Marseille).

Historical analysis: Franco Cardini (SUM, Firenze).

Archaeometric analysis: Roberto Franchi (Lab. Ce.S.Ar., Università di Urbino).

Archaeo-environmental analysis: Paul Mazza (Dip. di Paleontologia).

Survey: Andrea Vanni Desideri (Dip. di Studi storici e geografici).

Topographic modelling: Roberto Gabrielli (CNR-ITABC Montelibretti, Roma).

Archaeo-anthropological analysis: Jerome Rose (University of Arkansas).

Section directors: Elisa Pruno (Dip. di St. storici e geogr., artifacts archaeology), Chiara Marcotulli (Dip. di St. storici e geografici, building archaeology), Chiara Molducci (Dip. di St. storici e geografici, survey), Chiara Bonacchi (UCL, public archaeology), Chiara Corbino (Un. di Siena, archaeo-zoology), Dario Rose (topography), Marco Bini (Dip. di Progettazione dell'architettura; architectural analysis), Giuseppe Ligato (written sources), Alfonso Fiorentino (Museo minerario dell'Amiata; website).

Collaborators: Marianna De Falco, Silvia Leporatti, Riccardo Bargiacchi, Lapo Somigli, Giacomo Gonella, Roberta Sciortino, Alessandro Neri, Eugenio Donato (Un.of Calabria), Amer Bdour (DoA; Archaeologist), Francesca Dotti (École Pratique Des Hautes Études, Paris; Islamic archaeologist), Julien Seinturier (CNRS; computer engineer), Micaela Sinibaldi (Un. of Cardiff; ceramologist), Ezio Burri (Un. d. Aquila, speleologic surveys), Enrico Sodi (structural engineer), Ali Mohammad al-Khatib (DoA), Carlo Mocenni, Lodovico Mocenni, (architects), Mauro Foli, Anna Marx (photo documentation), Piero Bruni (assistant archaeologist).

Guido Vannini
University of Florence

Project Publications

The mission so far has produced more than one hundred scientific titles concerning the results achieved from Archaeology and cross-disciplinary perspective, as regards both its merit and method, published locally, nationally and internationally; by means of example reference should be made to the following:

Ricognizione
1987 Ricognizione agli impianti fortificati di epoca crociata in Transgiordania. Prima relazione. *Castellum* 27/28: 1-32.

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1995 Archaeological Research on Medieval Petra: a Preliminary Report. *ADAJ* 39: 509-540.

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1997 Mediaeval Petra. The Stratigraphic Evidence from Recent Archaeological Excavations at al-Wu'ayra. *SHAJ* VI: 371-384.

Tonghini, C., Desideri, A. V.
1998 The Material Evidence from al-Wu'ayra: a Sample of Pottery. *SHAJ* VII: 707-19.

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dievale. '*Archeologia dei castelli nell'Europa angioina (secoli XIII-XV)*', *Convegno internazionale di Salerno (10-12 novembre 2008)*, Salerno 2011.

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THE PETRA GARDEN AND POOL COMPLEX, 2007 AND 2009

Leigh-Ann Bedal, Kathryn L. Gleason and James G. Schryver

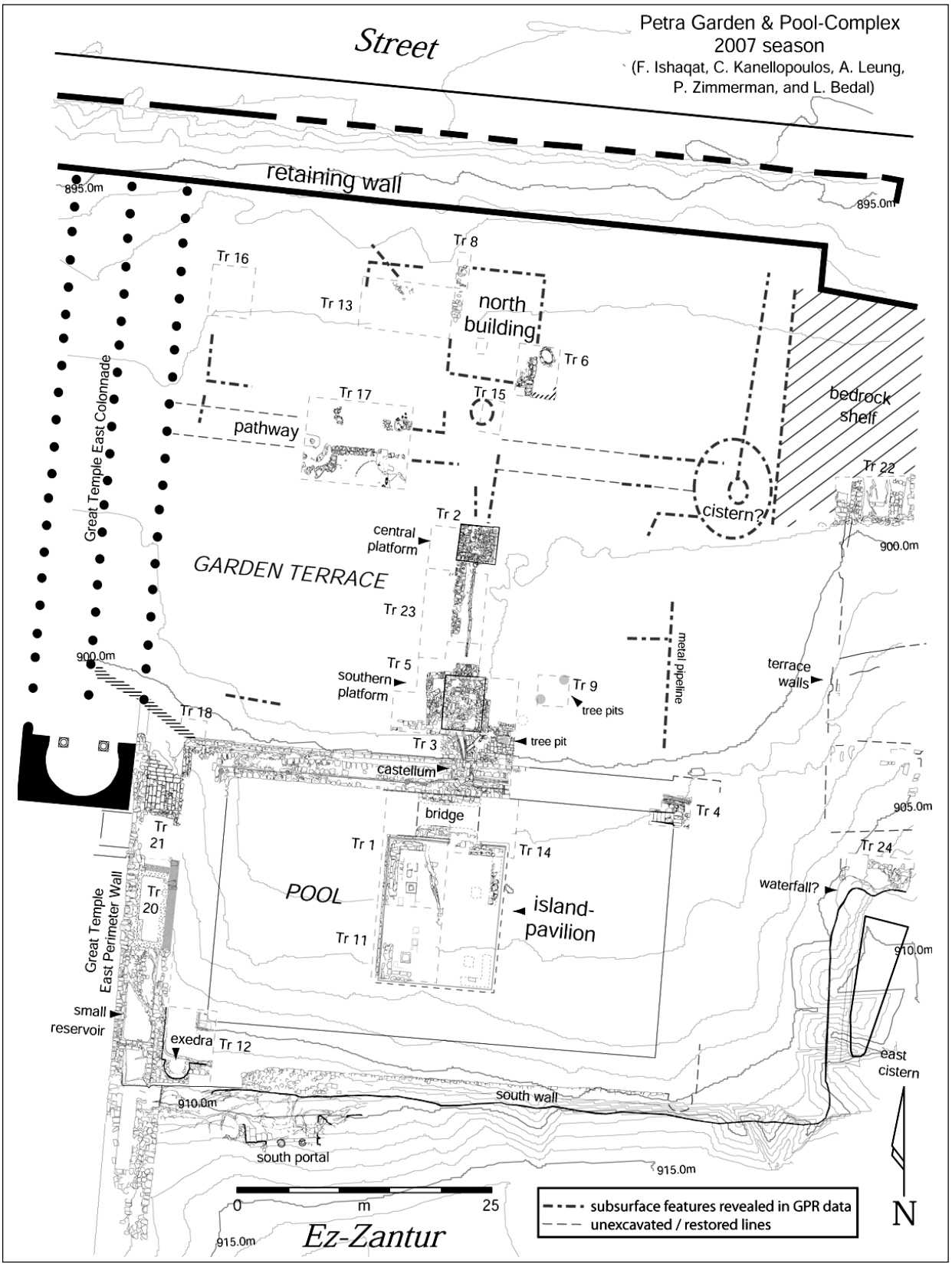
Introduction

A consortium of archaeologists from Penn State Erie / The Behrend College, the University of Minnesota - Morris, the University of British Columbia and Cornell University conducted the 2009 archaeological investigation of the Petra Garden and Pool Complex (PGPC) (**Fig. 1**) over a four-week season during the month of June. The fieldwork was carried out with the support of a number of grants from the same institutions[1]. We would like to thank former Director General of the Department of Antiquities, the late Dr Fawwaz Al-Khraysheh, for his support and granting of the work permit. The project's representative, Samiyah Falahat, was also extremely helpful in making the season run smoothly[2].

The collaborative team is undertaking excavation of the PGPC to explore and develop methods of excavating ancient garden complexes which are often believed to be too ephemeral to be detected after millennia of abandonment. The PGPC is particularly promising for this study as it is well structured with built walks, pavilions and irrigation systems, as well as enclosing architecture and rock cliff faces framing the monumental pool. These features are being successfully explored with the standard excavation techniques and recording systems used at Petra. Furthermore, the work is guided by the results of a particularly finely-gridded ground penetrating radar (GPR) survey, carried out in previous field seasons by Lawrence B. Conyers (Denver University) and reported in earlier publications (Bedal 2002; Conyers *et al.* 2002) . A second dimension to the project is to develop innovative methodologies to explore the cultivated areas of the garden terrace. Designed for the specific conditions of the site, these methods focus on the soils of the terrace, using techniques adapted from environmental archaeology with excavation carried out at a different pace to work on the surrounding architectural features. Kathryn L. Gleason is assisting the co-ordination of this approach, working with the team archaeologists on detecting large organic features, such as pits dug for new plants, evidence for the root systems of plants and the distinctive signatures of stake holes and fence posts. Flower pots (*ollae perforatae*) have been found in the garden soils

1. The 2009 season was funded in part by a University of Minnesota Grant-in-Aid and by other grants from the University of Minnesota, including an Office of International Programs travel grant and the Faculty Research Enhancement Fund. Additional funding was provided by Cornell University's Midas-Croesus Fund and Hirsch Fund for Archaeology, and a Penn State Global Funds award. We are especially grateful for the support of the participants in the University of British Columbia field school.

2. Participants in the 2009 field seasons of the PGPC are as follows: Leigh-Ann Bedal, director (Penn State Erie / The Behrend College), James G. Schryver, assistant director (University of Minnesota, Morris), Kathryn L. Gleason, senior consultant on garden archaeology (Cornell University), Jennifer H. Ramsay, archaeobotanist and field school director (University of British Columbia), Fawwaz Ishaqat, surveyor (Hashemite University), Andrea R. Shelton, ceramicist (North Carolina State University), John E. Foss, soils specialist (Soils Inc.), Catherine M. Kearns, garden archaeologist (Cornell University), Petra Vaiglova, assistant archaeobotanist and archaeologist (University of British Columbia), William A. Caccese, archaeologist, and Miranda L. Angus, registrar. Twelve workmen from the Bedoul tribe were employed, and 15 Canadian and American field-school students offered additional support. Logistical assistance, housing and warm hospitality were provided by the family of Dakhilallah Qoblan of Umm Ṣayḥūn. ACOR graciously provided lodging for the team in Amman.


Petra Garden & Pool-Complex
2007 season
(F. Ishaqat, C. Kanellopoulos, A. Leung, P. Zimmerman, and L. Bedal)
Street
retaining wall
895.0m
895.0m
Tr 8
Tr 16
Tr 13
north building
Tr 6
Tr 17
Tr 15
pathway
Great Temple East Colonnade
bedrock shelf
Tr 22
cistern?
Tr 2
central platform
GARDEN TERRACE
900.0m
Tr 23
900.0m
Tr 5
southern platform
Tr 9
tree pits
metal pipeline
terrace walls
Tr 18
Tr 3
tree pit
castellum
bridge
Tr 4
905.0m
Tr 21
Tr 1
Tr 14
Tr 24
POOL
island-pavilion
waterfall?
Tr 20
Great Temple East Perimeter Wall
Tr 11
910.0m
small reservoir
exedra
Tr 12
east cistern
910.0m
south wall
south portal
915.0m
0
m
25
915.0m
Ez-Zantur
subsurface features revealed in GPR data
unexcavated / restored lines
N

1. Site plan.

and in fills; these aid in both locating plants and in looking at plant trade and distribution, as discussed by Elizabeth Macaulay-Lewis (2006a, b). The team's soil scientist, John E. Foss, provides insights into the deposition of soils on the terrace through both man-made and natural processes. The PGPC garden soils are typically amended with fertilizers and these are being evaluated by Foss and team archaeological botanist, Jennifer H. Ramsay. In addition to identifying the location of plants, the team is tackling the very difficult problem of identifying the garden's plants. A phytolith study conducted by Carlos E. Cordova has shown very promising preliminary results demonstrating the cultivation of date palm trees (*Phoenix dactylifera*) in the Nabataean garden and the presence of Panicoideae grasses which grow only in the summertime in wet areas and therefore suggests frequent irrigation of the gardens during the dry, hot summers[3]. Faunal remains, such as rodents, land snails and other garden inhabitants, are being recovered for study of issues such as degree of cultivation, sunny versus shady areas of the garden and other habitat information. In forthcoming seasons, our goal will be to reconstruct the garden's layout, features and views, as well as revealing something of the character of its vegetation over time. In addition to illuminating this particular watered desert site, these methods contribute to the wider development of the emerging field of international garden archaeology.

Following the results of the previous field seasons (cf. Bedal 1999, 2002, 2004; Bedal *et al*. 2007), work in the PGPC moved forward with the goal of building upon our previous successes. In the pool area, the three-week 2003 field season had been devoted to removing the uppermost meters of heavy overburden across the pool area. In 2004, work in the pool area focused in the south-western corner where it revealed an exedra as well as the pool's south-west corner. Work also revealed more of the island-pavilion. On the garden terrace, the GPR survey and excavations during field seasons between 2001 and 2003 revealed substantial architectural elements, including foundations for a small building (or pavilion) and two platforms, water channels, an east - west gravel pathway, tree pits and associated cultivated soils belonging to the Nabataean period garden (PGPC phase II), as well as fragments of structures of a more domestic nature that predate the construction of the pool and garden terrace. Several of the trenches have been excavated down to bedrock, revealing the gravel and sandy layers of the natural terrace as well as information on the formation of the built terrace structure. These trenches, together with soil cores done by John Foss in 2001 prior to excavation, furthered the broad correlations of soils across the site. In 2005, discovery of flower pot fragments and several pits south of the east - west pathway provided encouraging evidence of plant locations within the garden. By the end of 2005, however, our understanding of the design of the garden and the circumstances of its construction and abandonment required further evidence before interpretation.

2007 and 2009 Field Seasons

The primary objective of the two-week (8-22 July) season in 2007 was to remove the deep overburden that covers the much of the pool area and has hindered excavation progress owing to its great depth and the logistical problems of removing it from the site[4]. The findings of the 2007 field season are reported below under the section titled "The pool complex".

The 2009 season of the PGPC excavations ran for a four week period (30 May - 25 June) with a focus on a number of issues previously raised, while also looking forward and investigating a number of questions aimed at framing future seasons of work. In terms of the latter, the guiding questions relate to the hydraulic systems delivering water from the az-Zanṭūr ridge to the pool, the systems distributing excess water across the garden terrace and the details of the layout of the garden terrace plantings and routes of access. Excavations were carried out in five different areas with the following goals in mind: (1) excavating an area in the south-western cor-

3. Preliminary report by Carlos E. Cordoba (Oklahoma State University) dated February 2011.
4. The project is deeply indebted to the late Dr Fawwaz al-Khraysheh, Director General of the Department of Antiquities, and Sulieman Farajat, Director of the Petra Archaeological Park, for providing a back hoe and dump truck for the duration of the 2007 season. Without this assistance, the tremendous progress in overburden removal could not have been accomplished.

ner of the pool in order to clarify the existence of a late wall or structure only partially defined in 2007, (2) continuing the excavation of a series of rooms along the western edge of the pool terrace that had been uncovered in the 2004 and 2007 campaigns, (3) exploring the existence (or lack thereof) of a hypothetical waterfall on the east escarpment by looking for a catchment basin at its base, (4) investigating the existence of a potential water basin and stone structure in the south-eastern corner of the site and (5) exposing a significant section of an east - west gravel pathway (discovered in 2005) that a GPR survey had indicated bisects the garden terrace in order to better understand its plan and related plantings. Large and small hand tools (hoe, shovel, pick and trowel) were used to excavate the earth which was then removed to the Katute dump site. Care was taken to collect and record material remains which consisted of architectural fragments, pottery sherds, lamps and coins, dating to the Nabataean, Roman, Late Roman - Byzantine, Early Islamic, Crusader and modern periods.

A number of analytical studies were also carried out during the 2009 field season. Soil samples were collected from various loci in all of the trenches for flotation, which was carried out under the direction of Jennifer H. Ramsay. The heavy fractions from the soils were separated out and the collected carbonized botanical remains exported for further study. Soils analyst, John E. Foss, spent a day on the site studying the soil deposits with the goal of understanding better the geological structure of the terrace and to determine the difference between wind-blown deposits, alluvial deposits and cultivated soils. Ceramicist, Andrea Shelton, oversaw the reading of the pottery buckets and initiated a review of ceramic finds from the entire site to contribute to a more precise understanding of the chronological development of the PGPC, as well as the distribution of local and imported ceramics. Fawwaz Ishaqat completed the GPS mapping of all trenches from this season and added this data to the mapping data from previous seasons.

The Pool Complex

Overburden Removal: Pool South and the South Wall

A massive earth removal effort was launched in 2007 in the southern portion of the pool area, between the island-pavilion and south wall (9.2 x 33 m). In this area, the overburden remained up to 4 meters deep above the level of the pool perimeter (previous excavations had worked it down from its original 14 m depth). A deep trench excavated in the south-west corner of the pool area (Trench 12, 2004) showed that the uppermost 2.5 m of the remaining overburden was primarily soft sand, with some large stones from architectural collapse, and showed no stratigraphic changes. Below this was a layer of dense stone collapse debris above a layer of greyish - brown clay and sediment overlying the bedrock of the pool perimeter (elev. 901.4 m). A 2 meter-wide trench (Trench 19) was opened to the south of the island-pavilion, providing an additional section that confirmed a similar makeup further to the east. This trench also exposed the uppermost preserved courses of the island-pavilion's rear (i.e. south) façade. The pavilion's south-east corner is badly damaged but the stones comprising the frame of the south doorway clearly show the triple fasciae that also frames the pavilion's north doorway.

Working from east to west, the sandy fill layer was removed by setting a team of workers to excavate with picks and hoes, followed by the immediate removal of the soil with the help of heavy machinery **(Figs. 2 and 3**). A single course of stones running 6.5 meters east - west near the top of the fill (elev. 903.07 - 903.88 m) was documented and removed. These stones were probably laid down by early *bedouin* as a diversion wall for controlling water runoff. In addition to numerous large stone blocks and other architectural elements (including a complete Nabataean-style capital), material finds consisted of five bronze coins (all illegible except for one Nabataean coin of Aretas IV), several fragments of Nabataean- and Roman-period lamps, and pottery sherds of mixed dates, all of which are presumed to have washed down from az-Zanṭūr. At present, approximately one meter depth of collapse debris and sediment remains covering the pool's southern perimeter.

In removing the overburden during the 2007 season, the nine uppermost courses of the south wall, which is built against the rock face that forms the site's southern border, was exposed along a 33 meter stretch **(Fig. 2).** The south wall face is beautifully preserved up to 4 meters in

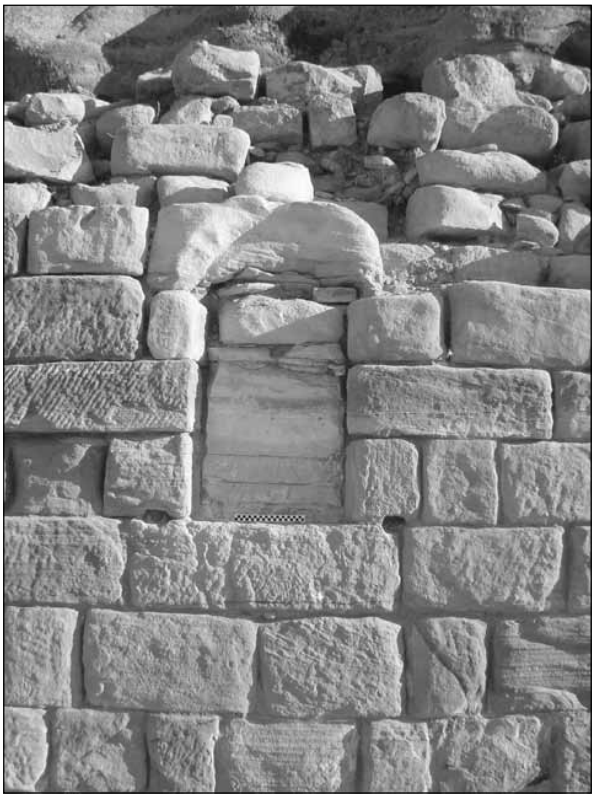
2. Excavating the sandy fill overburden between the island-pavilion (lower right) and south wall.

3. Removal of excavated overburden from the site with a backhoe and dump truck; island-pavilion in foreground.

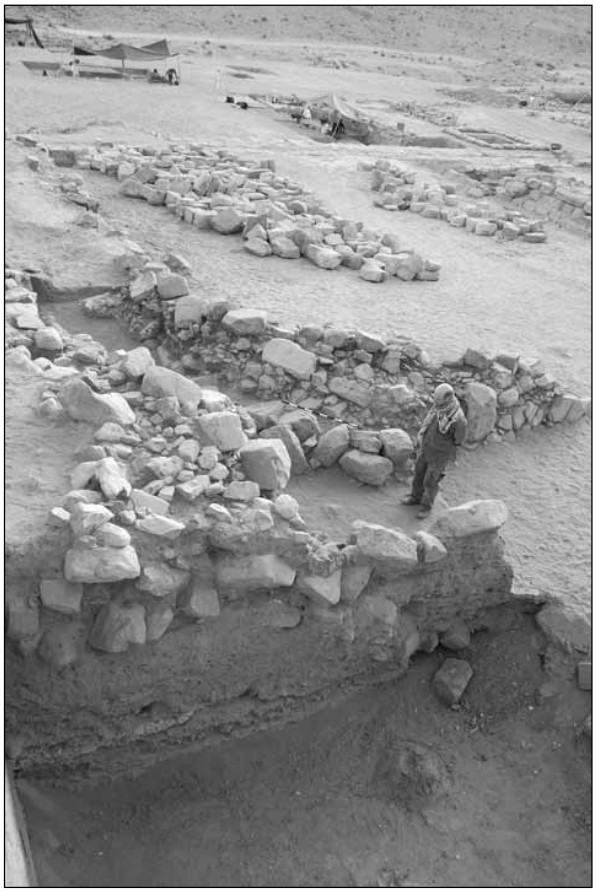
height (the lowest courses remain unexcavated) and creates an imposing backdrop for the pool and garden. If originally covered in white plaster, as we assume, it would have shimmered with the reflections of the light off the water of the pool. At the center of the wall, about 3 meters above the floor level, is a *nefesh* with a simple limestone block set into it and topped by a badly eroded carved arch stone **(Fig. 4)**. Two holes bored into the wall stones near the niche's bottom corners may have been used to hold a shelf, or perhaps a plaque, in position below the niche. The location of this *nefesh*, at the southern terminus of the site's central axis and visible through the island-pavilion's southern doorway, indicates its symbolic importance in the overall design of the garden and pool complex.

Overburden Removal: Pool South-West

The 2009 excavation in pool south-west, supervised by James G. Schryver, consisted of a baulk of overburden composed of alternating



4. Central niche (nefesh) in the south wall façade.



5. Pool south-west: delineation of secondary earthquake collapse (foreground) and the back side of the check dam / diversion wall (center, behind James Schryver).

strata of earth / rubble wash, earthquake collapse and post-Classical walls apparently constructed to retain the accumulated soil and control water runoff from az-Zanṭūr. The defined area (8 x 9 x 4.5 m) is immediately north of Trench 12 (2004) and runs up against the east face of the Great Temple east perimeter wall (GTEP wall). Careful delineation of the stone fall and constructed walls helped to distinguish the strata of rubble debris from two major earthquake collapses and the construction of a late (post-Classical) wall to support the earth - rubble wash that was coming down from az-Zanṭūr and filling the pool area. The wall revealed itself to be built of two faces of large recycled ashlar stones surrounding a core of rubble stones. The southern ashlar face of the upper portion of this wall had collapsed, revealing a packing of smaller stones (**Fig. 5**). Further excavation in this area will be necessary to fully understand just how deep into the fill of the pool this wall extends, thereby determining its date and stratigraphic relationship with the earlier architecture.

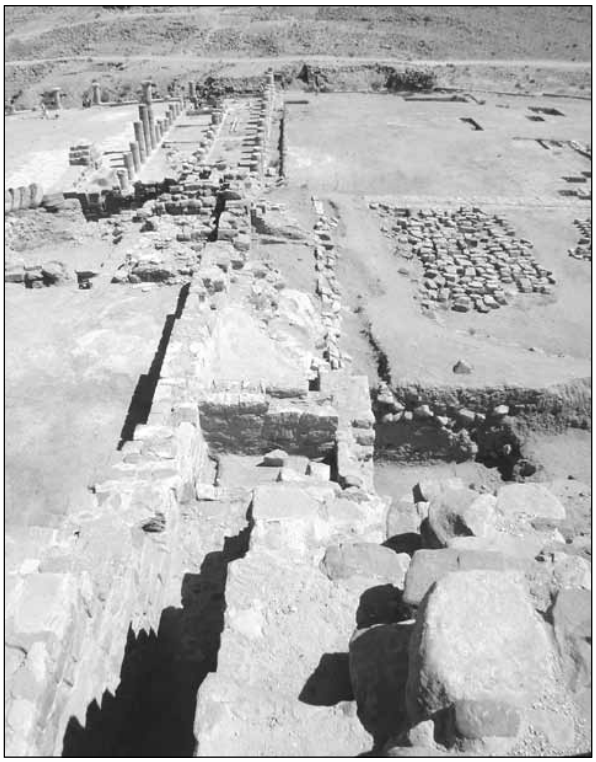
Evidence for this wall serving as a check dam or terrace wall that was a part of a larger system of soil retention across this part of the site came from our soil specialist, John E. Foss, who noted that the fills against the wall were water-lain and that certain surfaces within the fill may have been cultivated. The east - west wall of the check dam was further integrated with a wall running north - south along the western edge of the pool, directly above the pool's west perimeter, apparently to direct and divert water along the western edge of the pool area down to the garden terrace which functioned as an agricultural field in later periods. The construction of this wall may be associated with the collapse of the GTEP wall and the resulting redistribution of soils during the winter floods. The proposed cultivation of these soils seems to have been contemporary with a second collapse, as most of the stones from this collapse seem to have been collected and then thrown up against the base of the northern face of check dam in the form of a convex buttress. A later collapse must

have occurred once the area was no longer being cultivated as those stones were left in place, spread across the ground surface. These activities are all attributed to PGPC Phases V - VIII (Late Roman - Post-Classical / Medieval).

The Great Temple East Perimeter Wall

Another area that required attention during the 2007 and 2009 field seasons was the western boundary of the pool area that adjoins the Great Temple upper temenos (**Fig. 6**). The west face of the GTEP wall was uncovered by the Brown University excavations, along with two of the intermural rooms (Room C and the small reservoir)[5]. However, the continuation of the wall to the north of the small reservoir remained unexcavated.

Trenches 20 and 21 were opened to define the eastern face of the northern extension of the GTEP wall (the southern portion was exposed in 2004, Trench 12) and to begin excavating the intermural spaces. Trench 20 defines a single intermural room immediately to the north of the small reservoir. Work here revealed the upper courses of a baked brick construction that lines the interior walls (dimensions 7.25 x 2.20 m). The walls are single brick width (36 cm) on all sides, with steps measuring a single brick width in the southwest corner (**Fig. 7**). The interior face is lined with a thin coating of plaster. The bricks,



6. The Great Temple east perimeter wall separates the Great Temple upper temenos (left) from the pool complex (right).

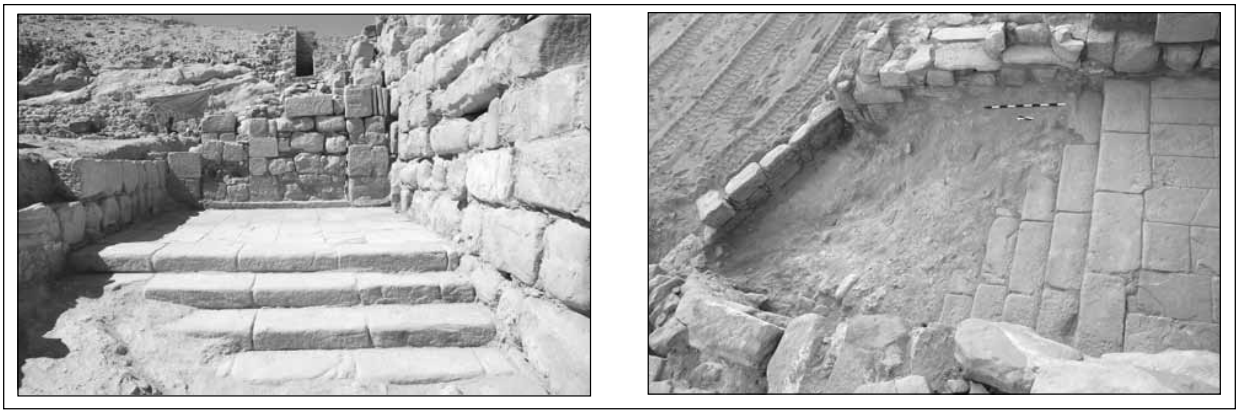
7. Trench 20: the south end of the brick pool (with steps) built inside an intermural space in the Great Temple east perimeter wall.

5. Martha Joukowsky, director of the Brown University Great Temple excavation project, visited the site during our first week in the field and gave us permission to excavate and publish the remaining portion of the Great Temple East Perimeter Wall as it is a shared boundary between the two sites.

which measure 36 x 36 x 6 - 8 cm, are poorly fired with heavy chaff and are cemented with a crumbly grey mortar tempered with small pottery fragments (primarily Nabataean fine ware). Diagnostics include Nabataean painted pottery dating to the second century AD providing a *terminus ante quem* for the construction of this installation in the second quarter of the second century AD. The brick construction is similar to some of the construction in the bath complex west of the Great Temple that has been assigned to the Roman - Byzantine period (Joukowsky 2007: 154-8). It can thus be deduced that the brick feature represents a secondary use of the intermural space within the GTEP Wall dating to the second or third century AD at the earliest. The heavy use of mortar and plaster, in addition to the presence of steps in one corner, suggests its function as a water basin or pool. The center of the basin is badly damaged by a large pit, filled with large stones in a greyish - brown ashy matrix. The trench was closed and sandbagged to protect the poorly preserved bricks pending future study.

Trench 21, located immediately north of Trench 20, measures 3.50 x 11.25 m. Its dimensions are defined by the width of the casemate wall and the length of the space north of Trench 20 to the north face of the pool and the Great Temple east exedra. Excavations began in 2007, defining the line of the east wall and clearing the topsoil and fill and that was heaped up against the west wall. In 2009, excavations continued under the supervision of William A. Caccese and Leigh-Ann Bedal with removal of sandy rubble fill, earthquake collapse and small dividing walls of later date (post-Classical / Medieval) that revealed the remnants of the original Nabataean structure. At the north end, a doorway between the Great Temple's east exedra and the pool leads to a well-preserved staircase constructed of sandstone paving slabs (**Figs. 8a and b**). This staircase provided access from the garden terrace to the pool level. At the top of the stairs is a landing leading to a broad (2 m wide) doorway and a room (foyer) with doors opening to the east - leading to the pool's west promenade - and to the south - leading to the room in Trench 20 described above.

During the Byzantine period, a wall was built up between the Great Temple's east colonnade and the pool wall[6], forming an oblique passageway from the colonnade into the staircase (**Fig. 8b**, far left). It is probably at this time that the doorway between the staircase and the foyer was first narrowed. Subsequent to the construction of the Early Byzantine wall, a greenish - grey clayey deposit, containing a high density of animal bones and pottery sherds, accumulated on the landing, staircase and the floor of the Great Temple's east exedra. Joukowsky notes that this thick grey deposition may be indicative of the use of the closed exedra area as a lime kiln (Joukowsky 2007: 110, Fig. 3.33), however, the nature of the deposit covering only the east half of the top steps and then spreading out across



8a and b. Staircase leading from garden terrace up to the pool-level landing and the door to the foyer (a), which was later narrowed and blocked. A deposit of grey clayey soil covers the lower steps and extends into the Great Temple east exedra.

6. The Byzantine wall was excavated by the Brown University Great Temple excavations in 1998 and was constructed at the same time as other intercolumnar walls and industrial installations on the site (Joukowsky 2007: 100).

the bottom of the stairs (**Fig. 8b**) and the exedra floor, suggests that the material originated from the pool - perhaps an effort to clean rubbish and stagnant water accumulated in the now unmaintained pool - and was thrown (or poured) down to fill the staircase and the exedra. Later the foyer doorway was completely blocked and the staircase landing and foyer spaces partitioned with narrow dividing walls constructed of re-used stones, possibly representing a squatter settlement that likely coincides with the Late Roman - Byzantine squatter settlement (PGPC Phase VI, forth-fifth centuries AD). Above this lies a deep accumulation of collapsed debris consisting of stone rubble and large architectural blocks in a sandy matrix (PGPC Phase VII) (Bedal *et al*. 2007: 166).

With approximately half a meter of fill remaining above floor level, Trench 21 was not completed by the end of the 2009 field season. A study of its full stratigraphy and material contents will commence on its completion in the next field season (planned for 2011) and should provide valuable information about the chronological sequence of construction, re-use, fill and earthquake collapse.

East Stepped Terraces

Along the eastern boundary of the garden - pool complex, excavations were initiated to explore elements of a stepped terrace feature. The terraces, which descend from south to north, are in alignment with the east cistern, located atop the east escarpment overlooking the pool, and a gap in the portico wall facing the Colonnaded Street at the boundary between the 'middle market' and the garden terrace.

Upper Terrace: Cave

Trench 24, under the supervision of Catherine M. Kearns, was opened on the uppermost of the stepped terraces in order to determine if there is a catch basin to collect water falling from the east cistern located directly above, thus testing the hypothesis of the use of a waterfall to channel water from the east cistern down to pool-level. The possible existence of a waterfall at this location was indicated by a number of factors. Firstly, its high elevation (908.731 m, approximately nine meters above the garden terrace) made it visible from many points in the Petra valley and thus would have commanded the attention of passersby. Secondly, for those standing in the pool's island-pavilion, the waterfall would have been along a direct line of sight to the larger waterfall located to the left of the row of the so-called 'Royal Tombs' at the east end of the valley. Finally, the Nabataean preoccupation with water and open display of a feature such as a waterfall would have certainly been in keeping with the theme of conspicuous display that was central to the larger Petra Garden and Pool Complex.

An exploratory sounding measuring 3 x 4 meters was opened at the base of the bedrock escarpment, with all sides confined by rocks and stones (**Fig. 9a**). The fill of this trench was likewise composed of a mix of large boulders and other stones that had fallen down from the east cistern and the bedrock ledge originally supporting its northern end, and wind- and water-born sand that had accumulated over the centu-

9a and b. Trench 24: looking down from the east cistern to the top lip of the cave mouth at center (a). The Nabataean wall runs parallel to the cave mouth. View into the top of the cave / cistern (b).

ries. After removing about a meter of this rubble fill, the top of an alignment of stone ashlars consistent with Nabataean-style masonry was discovered at the northern end of the trench, as were two shallow hearths filled with ash, one of which contained some sherds of coarse cooking ware of the Medieval period. To the south, the top lip of a cave appeared in the vertical face of the bedrock (**Fig. 9b**). This cave may have functioned as a cistern to catch the flow from the waterfall. Another possibility is that the cave functioned as a grotto, a popular feature in Hellenistic - Roman period luxury gardens, used for banquets or revered as sacred or mystical spaces. The possibility of a grotto is compelling. The elevation of this feature provides stimulating views of the pool and garden below and is also within line of sight of important features on the Petra skyline. However, the appearance of the top course of a monumental ashlar wall built east - west across the front of the cave opening reveals that the cave's view was blocked at some point and leads to some doubt of the waterfall hypothesis.

Further excavations in this area were impeded by large stone fall strewn across the area and the small area of the exploratory trench. Due to these logistical limitations and the apparent depth and scope of the cave, the decision was made to close the trench and proceed with excavations in a future season once proper preparations have been made. It is likely that this feature is key to understanding the water management system for the pool and garden terrace and possibly an indicator of social agency at the site.

Lower Terrace: Underground Water Channels

Trench 22, under the supervision of Jennifer H. Ramsay, was strategically placed in order to investigate two of the anomalies that had appeared in the north-west corner of the garden terrace area during the GPR survey conducted in this area in 2001 and refined in 2003 (Bedal *et al*. 2007: fig. 4). Initial interpretations of the radar data indicated that a cistern (appearing in the GPR as a large oval-shaped feature) lay under the ground in this area (Conyers *et al*. 2002a, b). To the east of this feature, the GPR data indicated a large, solid stone feature that defined the terrace's eastern boundary in line with the stepped terraces and was thought to be a well-preserved structure. The trench's southern baulk is defined by a late (post-Classical) field wall that forms the northern boundary of the 'raised field' that occupies the south-eastern quadrant of the garden terrace. Throughout the course of the season it was determined that this wall was indeed late, and that it ran perpendicular to and actually incorporated the northern end of a well-preserved Nabataean wall, constructed of sandstone ashlars, that functions as the west retaining wall for the stepped terraces, It is thought that the ashlar wall discovered in Trench 24 (see above) represents the southern terminus of this retaining wall.

Further excavation to the east of the Nabataean wall in Trench 22 revealed that the 'large stone structure' visible in the GPR data was actually a bedrock shelf that slopes downward from south to north and is cut to form a foundation for the retaining wall and to accommodate an underground water system (**Fig. 10a**). A channel running north - south was cut into the bedrock and covered with capstones of mixed size and shapes supported by arches (**Fig. 11**). The bottom of the channel had not been reached when the trench closed at 1.55 meters depth. Owing to its alignment with the cave / cistern in Trench 24, it is possible that this channel transported water from that water catchment feature down to the Colonnaded Street or the wadi. Two large, cut sandstone blocks were found *in situ* on the bedrock between the channel and the Nabataean wall providing evidence for a pavement (ramp?) or perhaps a staircase constructed over the channel.

Immediately to the west of the Nabatean wall, a second water channel capped with stone slabs (*ca*. 1 meter in length) runs parallel to the exterior (west) face of the Nabataean wall (**Fig. 10b**). A space of several centimeters between the capstones and the top of the soil fill gives a view of approximately two meters northward along the length of the channel interior where it is possible to see the intersection with a third channel that originates from the south-west. The general orientation of this third channel suggests that it may be the outflow from the underground cistern that is indicated by the GPR but eluded us this field season. The channel's capstones are covered by stone packing and a deposit of sandstone chips in a sandy red matrix that represents

10a and b. Trench 22: (a) bedrock with covered east channel (left of Jennifer Ramsay) and in situ paving stones (step?) east of the Nabataean wall (far right); (b) channel with slab capstones west of the Nabataean wall.

the leveling of the garden terrace that is found in other trenches further west. The stone chips are the debris from the quarrying activity that took place in preparation for the construction of the pool complex. Above that is a stratum of yellow sand that is the foundation for the garden soil, also found in other locations in the garden terrace. Segments of ceramic pipe of a form dated to the first century AD ('Amr and al-Momani 2001: fig. 24) were laid out along the west face

11. Trench 22: arch support for capstones on east channel.

of the Nabataean wall but were disturbed by a later pit that dug into the earlier strata. The post-Nabataean periods are represented in this trench by a grey stratum of agricultural soil (PGPC Phase VI, forth-fifth centuries AD) (Bedal *et al*. 2007: 166) found across the lower terrace, topped by a deep layer of rubble fill and the late field boundary that is believed to represent the Medieval / *bedouin* occupation of the site (PGPC Phase VIII-IX) (Bedal *et al*. 2007: 167).

The Garden Terrace

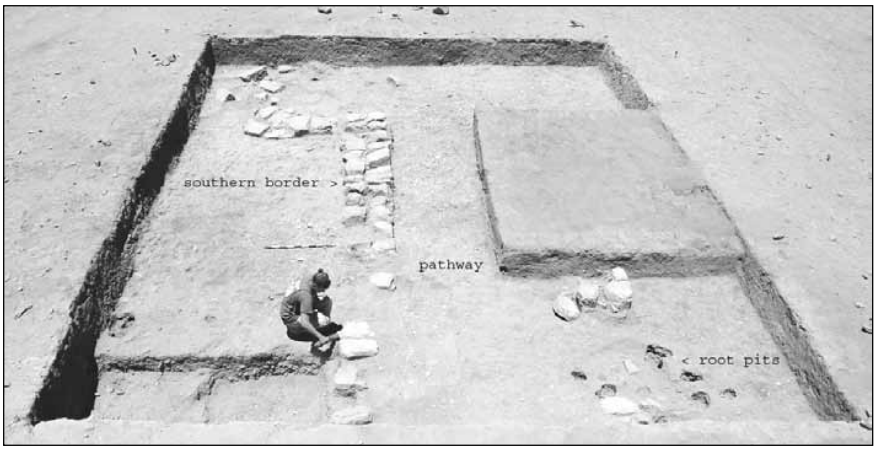
Two trenches were excavated on the garden terrace in 2009. The purpose of these trenches was to seek further information about the garden design and to further investigate some of the sub-surface features visible in the data produced by the ground-penetrating radar (GPR) surveys that were collected in 2001 (Conyers *et al*. 2002; Bedal 2002).

East - West Pathway

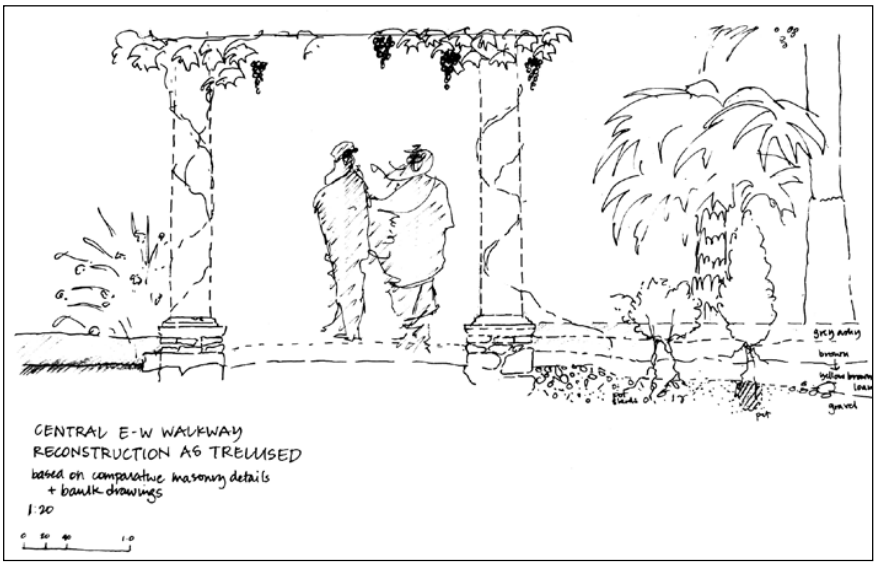
Trench 17, which was first opened in 2005 as a limited sounding (1.5 x 6 m) (Bedal *et al*. 2007: 158), was continued in 2009 under the supervision of Catherine M. Kearns and Kathryn L. Gleason. The goal of the 2005 trench, which was successfully realized, was to confirm the existence of a linear feature, already then thought to be a pathway, which was clearly visible in the 2001 GPR survey. In 2009, the trench was expanded to 8 x 10 m to more fully reveal what had indeed proven to be a gravel stone-lined pathway. Trench 17 revealed that the gravel path, which is two meters wide, was composed of yellow gravels in a sandy matrix retained to the north and south by a rough double course of

stone. The stones of the southern border were traced westward for more than four meters before turning into a semicircular niche on the south side of the path, a feature seen as a break in the line on the GPR plan (**Fig. 12**). The semicircular curve is largely destroyed past the initial arc. The presence of large chunks of grey mortar was unusual in the trench and may suggest that the apse contained a water feature. One mortar fragment has a finished surface on one side and the impression of a stone on the other, suggesting that it lined a pool or basin. The formation of stones on the north side of the path hints at a corresponding space on that side as well, but this feature was not fully excavated in the 2009 season and awaits further investigation. In general, the stones lining the pathway have been robbed out or lost at intervals, which are seen as gaps in the GPR readings. Furthermore, they are too irregular to be the finished edges of the original design. Their width suggests they may be the foundation stones for a more substantial architectural edge, such as might support a line of columns for a trellis or other linear garden architecture (**Fig. 13**). The stones correspond in level and character with the lower course of the central platform (see discussion below).

Another important goal of the excavation of Trench 17 was the recovery of more evidence for garden features such as the planting pits, beds or fragments of flower pots (*ollae perforatae*) associated with the Nabataean surface. This surface is poorly preserved under a deep (*ca* 36 cm) layer of grey agricultural soil that covers the entire terrace and contains evidence for continuous cultivation from the second to forth centuries AD. The brown Nabataean garden surface overlies a stratum of gravel in a yellow sandy



12. Trench 17: looking westward along the east - west pathway; excavated root pits in the lower left corner. Catherine Kearns cleaning.



13. Hypothetical reconstruction of the east - west pathway as a trellised walk (by Kathryn L. Gleason).

matrix that would have provided a solid foundation for the garden, as well as providing additional moisture through condensation.

A meticulous scraping of the surface to the north and south of the pathway revealed several features of interest. At the north edge of the pathway, root cavities appeared as changes in the soil color and these were carefully defined and excavated with small tools. One remarkable grouping was a large pit along the northern border that contained five smaller pits (**Fig. 12**). The large pit initially presented itself as a brown circular area within a break in the stones lining the central walk. It was not initially distinguished from the brown layer above until the last of the upper level was carefully trowelled down. Within it, small areas of soft, moist, brown gravel-free loam became visible and, when this material was excavated down to the level of the gravel, pits ranging in diameter from 10 to 40 cm were clear. Although most contained no pottery, all were sampled for botanical remains, including the collection of separate samples for phytoliths.

Central Axis

Trench 23 was opened in the area along the garden's north - south central axis under the supervision of James G. Schryver in order to explore the relationship between the two stone platforms and the water channeling system associated with these features. Other goals included the search for evidence of plantings and landscape design in this area of the garden and the clarification of chronological phasing. Trench 23 is bordered on the east by the post-Classical field wall that serves as the western boundary for the 'raised field' that dominates the southeastern quadrant of the garden terrace.

In 2005, two sections of a stone conduit were discovered north of the southern platform but disconnected from the platform itself, which has two channels running under it from the south (which originate in the *castellum*) but displays no trace of the emergence of these pipes on the northern side. During the 2009 season, more of the stone conduit was discovered running north - south along the central axis (**Fig. 14**). These stones had not been indicated in the GPR readings and so they provide a good reminder that, even with excellent results, the GPR data may not contain evidence for every feature that is present. The limestone channel was lined with mortar bearing the clear impression of a lead pipe along its preserved length. This suggests that the channel was buried, at least during the time the pipe was functioning. It appears that the channel was not open to the air after the pipe was robbed out, as the mortar impression would have been erased or badly eroded by any water flow or weathering. The northern end of the conduit disappears into the foundation of the central platform. Several stone from the internal packing of the central platform were removed to see if the channel continues through the platform and a small segment of the channel was revealed. However, it remains unclear what direction the channel took once it entered the platform due to a partial dismantling of its interior in antiquity, possibly the result of robbing for lead pipe.

Running parallel to the conduit to the west is a course of roughly dressed sandstones (**Fig. 14**) similar to the pathway border stones in Trench

14. Trench 23: looking south along the central axis toward the pool (background).

17 and probably serving as the western border for a comparable pathway that runs north - south along the central axis, between the pool and the center of the garden terrace. A parallel line of stones revealed in the trench's east baulk, directly underneath the later field wall, likely belongs to this pathway's eastern border. Careful scraping of the yellow - brown soil in a gap in the stone border revealed a patch of darker soil that may be a planting pit. A soil sample was collected and floated for archaeobotanical analysis.

A deeper sounding between the conduit and the east baulk provided information about the garden's subsoil in the northern area of the garden terrace. A deep stratum of yellowish - brown clayey soil overlies wadi gravel. Bedrock was not reached.

Synthesis: The Garden Terrace

The 2009 excavations on the garden terrace shed important new light on the hydraulic system responsible for distributing water throughout the garden terrace, as well as the phasing and details of the construction of the terrace, pavilions, walks and possible water features. Studies in the cultivated areas continued to find evidence of planting, adding to the range of preserved planting features to be anticipated in future work, *viz.* planting pits, multiple and single root cavities, and flower pots. These remains are not preserved as pristinely as in the region of Mount Vesuvius in Italy (cf. Jashemski 1993), but are possible to detect and study nonetheless.

The following discussion interprets the finds from the lowest to the uppermost levels of the site:

Natural Topography and Early Interventions: In consultation with our soil scientist, John E. Foss, we conclude that the southern portions of the garden terrace are composed of alluvial gravels and cobbles that covered the naturally sloping bedrock. At some point, a system of terraces was built into these natural fills. However, before the garden was built in its currently visible form, the soil evidence indicates that a check dam or other retention system was constructed to create a pond on the site of the garden terrace, at least along and to the east of the later central axis. This water feature is clearly indicated by layers of sands and silt loam with a deposition structure characteristic of still water. Such a feature would not naturally occur on a sloping site, thus suggesting the man-made creation of a check dam to capture flood or spring waters. The edges of this water body have yet to be found and there is no masonry floor beneath the deposits to suggest an architecturally built pool such as the one that is preserved in the southern half of the site. This kind of feature has more in common with Hasmonean water management systems and other contemporary eastern forms such as the Indian tank and bund systems than with the better known Roman practices of pools and water channels. These earliest strata have proven difficult to date thus far, with the majority of sherds being too worn to date securely.

To the west of the central axis, layers of well-sorted gravels and cobbles appear to be natural alluvial deposits and only a thin lens of silt has been observed in the south-eastern corner of Trench 17, suggesting a possible limit to the water feature to the east.

Early Garden Phases: the Area Between the Southern and Central Platforms of the Central Axis: The uppermost level of the water deposited strata is a yellow to brownish - yellow silt loam that is the layer into which the first garden cuttings were made and on top of / into which a stone water channel and the foundations for a walkway / pathway were laid. The water channel may originally have carried water in an open channel, but the insertion of the lead pipe indicates that the channel was then covered either by paving or by soil. It is also reasonable to postulate that the stone channel was used from the outset to support the lead pipe across the silty loams. These are stable when dry but unstable when saturated, and this may explain the eventual abandonment of the pipe.

The southern platform was evidently built at the time of the pipes, as its foundation also cuts into the silty loams and features two openings for a water channel visible on its south face. However, neither channel exits in / on the platform on the northern side because a later extension of the platform blocks the channel. The extension thus post-dates the removal of the lead pipe and the termination of this part of the irrigation system.

The garden's central platform does not ac-

commodate the channel at all. The southern end of the central platform is built flush with the top of the water channel with no accommodation for the diameter of the pipe, so while the channel appears to run under it, the entire platform may post-date the robbed channel.

Early Garden Features: East - West Pathway: The exposed area of the east - west pathway was not excavated deep enough to encounter the layered silty loams, so it is difficult to link it to the phasing of the water channel, although it is assumed to post-date the early pond feature. The walk can be phased with the central garden features by the other features and their stratigraphic relationships.

The pathway is well-built of gravel with a compacted surface. It appears likely that the stone edging currently seen along the walk originally was the rough foundation for courses of finer masonry, such as might have supported a colonnade for a trellis or other cover, or simply for a fine wall separating the walks from the beds. A similar wall in the Hasmonean palace complex at Jericho began with a colonnade, which was later filled with stones for a raised bed along the path. To either side, planting features are seen in the gravels and in a mixed gravel / loam with evidence of fertilizer. Remains of a darker brown soil may also have been associated with these planting features. It abuts the stones and only in one area of Trench 22 does it cover them, though incompletely.

One of the exciting finds of recent field seasons is the presence of pits in a range of sizes, from the large diameter pits found in Trench 9, and the smaller pit found in Trench 17 with flower pot sherds within it, to very small dark linear cavities running both vertically and horizontally within the soil, noted easily within the yellow loams and gravels. These cavities and other soil stains and features were excavated extensively in 2009. One remarkable grouping is a large pit in Trench 17, which contained the five smaller pits described above. The area of yellow gravel marking the pathway in the middle of the western third of the trench was left relatively unexplored, but a band of gravel is visible imitating the apsidal curve of the stone feature as well as skirting a large circular pit, suggesting that the gravel of the pathway continued into the apsidal area and might have circumnavigated a tree pit in the center of the pathway.

Some time before the deposition of the grey agricultural layer, any upper layers of stonework were removed, leaving the uneven sub-courses exposed. Gaps contain pits of brown loam, some with small pits, as at the east end of Trench 17, where a mature multi-stemmed shrub or tree seems to have nestled into the stones. The pit and the stones were buried by the grey ashy layer over time.

The Later Evolution of the Garden: We have the strong impression that the garden was cultivated over a long period of time, even after its finer masonry and decorative appointments had weathered away or been removed for re-use elsewhere. For example, the edging of the central walk was robbed of the fine stone courses over time, but there is no evidence of the kind of rubble and debris that comes with the systematic robbing of an abandoned place. The areas of cultivated soil remain without significant debris on the surface. The finer stones were removed yet the pathway and garden continued to function with the garden soils left to either side of the pathway. This is further reflected in the dating of pottery and coins within the garden soils. In many parts of Trench 17, the lower levels of the cultivated garden soil had early dates, while late coinage and pottery was consistently seen in the upper levels. This would be characteristic of stable, mature garden soils with shrubs and trees that would not have been plowed or even hoed deeply owing to their root systems. However, in some areas of other trenches, datable material was mixed throughout. This could indicate deeper hoeing. The introduction of new plants also affords the possibility that later materials were introduced to lower levels of unplowed or hoed soils, either by the act of planting the new tree or shrub, or as artifacts within the soil packed around the roots of the new plant from the nursery (if the plant was not planted bare root). The presence of stratigraphic deposition of datable artifacts suggests that the soil was not turned over deeply. This is consistent with the picture of a mature garden that has emerged from other evidence; one does not tend to deeply hoe soils containing the established root systems of trees and shrubs the way one might a

flower bed. In sum, we need to further chart the stratigraphy of datable pottery and coins to fully assess the age of the garden.

Finally, it appears that soot or other burnt material was introduced to garden soils across the entire terrace, building up the earlier beds and eventually covering the central walk and all but the upper courses of the central platforms. Here again, one has the impression of a steady practice of amendment and gradual change over time. However, it is possible that a single act of bringing in the dark soils could have been carried out to freshen up the grove or to re-use the older garden as a field. This layer then remained stable for the remainder of the site's history. John Foss characterizes this grey level as a buried 'A' surface. Its structure suggests that it is a very old surface, built up over hundreds of years, as it has developed the beginnings of a 'B' horizon below it. Pottery from all cultivated soil layers was unusually encrusted with mineral deposits, indicating that the soil was irrigated through its history.

In sum, by the Early Byzantine period, the garden terrace was either a large shady grove where visitors walked freely among the trees, since the 30 cm of ashy deposit would not be enough to harm mature trees or shrubs. Or the garden was eventually turned over to cultivation as a vineyard or field with the central platforms still exposed. The surface of this ashy level was cultivated by the local Bedoul *bedouin* as a wheat field in the 20th century and no signs of beaten paths or other features to indicate that these uniform layers of dark sooty soils were divided up for planting beds or other uses.

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EXCAVATION OF AN UNDISTURBED DEMI-DOLMEN AND INSIGHTS FROM THE AL-ḤAMMĀM MEGALITHIC FIELD, 2011 SEASON

Kennett Schath, Steven Collins and Hussein al-Jarrah

Abstract

Viewed in the light of data arising from the excavation of Tall al-Ḥammām (TaH) proper – now recognized as the urban nucleus of a significant city-state – along with substantial related research over the past decade, al-Ḥammām Dolmen B (HD.B.B[1]) and its 'stable-mates' in the al-Ḥammām Megalithic Field (HMF) are fostering significant advancements in our understanding of dolmens and of the larger megalithic culture in which they evolved. In this article, we offer new perspectives on dolmens from our analysis of material excavated from two undisturbed dolmens within the HMF. We have augmented this analysis with insights gained over a decade of intensive study and observation in and around the TaH city-state and the HMF. Additionally - with the recognition that dolmens are often related to a variety of megalithic features – new mapping and survey techniques, along with data from the important al-'Umayrī dolmen, will enter into our synthesis of thought on the subject.

(Note: For the purposes of this article, no information regarding the location of specific dolmens is provided. Because the 'night diggers' (site robbers) are bold enough to walk right up to active excavations, or 'spy' across wadis in order to watch teams at work or visitors coming to observe a site, we feel this is justified. Night digging is particularly destructive in the HMF. If you would like geo-documentation, it can be arranged through the Department of Antiquities of Jordan).

Introduction

The Tall al-Ḥammām Excavation Project (TaHEP) is a joint scientific project between Trinity Southwest University, Albuquerque, New Mexico, USA and the Department of Antiquities of the Hashemite Kingdom of Jordan. The goal of TaHEP is to study the relationship of this immense and strategically-located site within its ancient socio-cultural, economic and political contexts, and to ascertain its position, function and influence within those contexts (Collins 2011). A key component of this research is the relationship between Tall al-Ḥammām (TaH) and the contiguous al-Ḥammām Megalithic Field (HMF) to the east, south-east and south of TaH proper. Six field seasons (2006 - 2011) of identification, surveying, excavation and interpretation of al-Ḥammām's discrete megalithic fields and individual features - such as dolmens, menhirs, menhir alignments, henges, stone circles and ritual avenues - have provided significant data for analysis of the socio-cultural dynamics of Bronze Age civilization in the Middle Ghawr.

During Season Five (winter 2010), the excavation of an undisturbed dolmen (HD.A.78) in discrete Field A (the 'Tiberius Group') revealed a long period of 're-entry' for ceremonial purposes of late Chalcolithic, Early Bronze and Intermediate Bronze Age ceramics. Each period (and sub-period) was represented by ritual deposits in chronological multiples over a period of at least 2,200 years. The ceramic repertoire of

1. HD.B.B = al-Ḥammām Dolmen of discrete Sub-Field B, Dolmen B. A new, comprehensive dolmen identification system for the al-Ḥammām Megalithic Field (HMF) is in the offing, which will give GPS coordinates for each ritual monument within the registration number. This new system will replace all of the previous survey identification numbers – done by various researchers over several decades – thereby integrating all previous 'dolmen fields' into the larger HMF which served the Bronze Age city-state centered at TaH. The HMF consists of many related but distinct features such as dolmens (of varying types), menhirs, menhir alignments, stone circles, henges and ritual avenues.

HD.A.78 was a direct reflection of the chronological ceramic sequence of TaH, with which it has a direct (and obvious) visual connection. That HD.A.78 existed within a discrete group of megalithic structures and features in (deliberate?) alignment with the Bronze Age sacred precinct at the geographical center of TaH's lower *tall* approximately 800 m to the west was unmistakable. The arrangement of the discrete Sub-Field A dolmens around a large, central menhir which, itself, faced the TaH sacred precinct squarely, strongly suggested an integral relationship between the 'urbascape' (city proper) and the megalithic landscape. There are numerous other connections that we do not have space to discuss here. Our research is also examining solar, lunar and other possible orientations of the TaH megalithic alignments.

Between TaHEP Seasons Five and Six, during July 2010, the authors – K. Schath, S. Collins and H. al-Jarrah – revisited the HMF to take additional measurements and examine newly-identified megalithic features with obvious visual alignments oriented to TaH. By the end of that on-site assessment, several observations had presented themselves for further study:

1. The HMF seems to have distinct construction clusters, which we now refer to as 'discrete sub-fields'.
2. Discrete sub-fields often contain menhir alignments - with or without associated stone circles - and dolmen groups (two, three or four) positioned in approximate symmetry (often as far as the immediate topography would allow) in relation to the overall arrangement of the sub-field.
3. Given the considerable number of newly-discovered undisturbed dolmens within the HMF, additional excavations could provide uncontaminated data for analysis.
4. When disturbed (robbed-out) dolmens are meticulously examined, artifactual materials such as pottery, bones and stone objects come to light, providing valuable information that can augment *in situ* data derived from excavated, intact dolmens.
5. Dolmens comprise only one component of TaH's extensive 'sacrescape'[2] (Collins 2011: 21-23), which covers a large geographical area and spans more than two thousand years of utilization, all of which requires comprehensive evaluation. Note that Collins' 'necroscape'[3] (Collins 2011: 21-23) is similar to Savage's 'ceremonial landscape' (Savage 2010: 32-46).

These are a sampling of the general observations that set the tone for research activities during the following season.

The 2011 excavation season (Collins 2011) produced yet another undisturbed dolmen – a demi-dolmen designated al-Ḥammām Dolmen B.B (HD.B.B)[4]. We excavated HD.B.B along with 11 additional dolmens – all B types (Zohar 1992) – producing data that, together with the larger excavation on TaH proper, provide significant new understanding of dolmen (megalithic) phenomena that are reflected in questions such as: Who built them, and when? Why did the ancients build them? What societal structure(s) do they suggest? What insights are apparent re-

2. 'Sacrescape' is a term coined by S. Collins to describe all the elements of a city-state landscape utilized by local cult practices (religion) – on behalf of the living and the dead – including both natural (topographical and geological) and artificial (architectural and megalithic) features. He defines 'sacrescape' as "that portion of the landscape utilized, augmented and altered by the collective religious / ritual practices of the city-state community, including many or all of the following components: sacred architecture (such as temples and ritual enclosures), ritual monuments (such as menhirs, stone circles, megalithic alignments and dolmens), sacred places (such as hilltops, groves and other topographical features of ritual significance), the 'necroscape' and the processional thoroughfares by which they are connected and accessed" (Collins 2011: 21-23). Thus, the 'necroscape' (landscape features servicing the dead) is included within the 'sacrescape' along with other cult elements such as sacred precincts and temples within the principal urban center.
3. Collins defines 'necroscape' as "that portion of the landscape utilized, augmented and altered by the collective funerary activities of the city-state community, where the dead are treated, tended, buried and memorialized, including tombs and monuments of all types devoted to the passage, remembrance, or worship of ancestors, such as cave and shaft tombs, dolmens (various types), menhirs (and alignments), stone circles and ritual avenues" (Collins 2011: 21-23).
4. A demi-dolmen consists of both *in situ* natural stone (bedrock) and artificially-placed stones. Currently, our dolmen recording system is undergoing a transformation that will eventually identify each dolmen and dolmen field feature with a number designating its precise coordinates. We are using old designations until the new system is complete. HD.B.B is located in discrete Field B.

garding ritual practices performed in and around them? While this article focuses primarily on the excavation of HD.B.B, we will also suggest interpretations of TaH megalithic phenomena rising from our analysis of them over the past six years.

Geographical and Topographical Context

Tall al-Ḥammām is located 12.6 km north-east of the Dead Sea, 11.7 km east of the Jordan River, 8 km south of the modern village of South ash-Shūna (the location of Tall Nimrīn) and approximately 1 km south-south-west of the al-Kafrayn Dam. This area of the southern Jordan Valley, particularly the eastern half of what should properly be called 'the Jordan Disk'[5] (the circular alluvial area north of the Dead Sea, approximately 25 km in diameter, also called the Middle Ghawr), lies at the crossroads of the region's ancient north-south and east-west trade routes[6].

Several significant sites, all variously occupied during the high points of Levantine Bronze Age[7] civilization, hug the eastern edge of the Jordan Disk beyond the spread of the ancient flood plain, bounded on the north by the throat of the Jordan Valley, and on the south by the rocky terrain of the Dead Sea area – Tall Nimrīn with Tall Bulaybil and Tall al-Muṣṭāḥ in close proximity, and sprawling TaH encircled by Tall aṭ-Ṭāḥūna (north-east), Tall Barakāt (north), Tall al-Kafrayn (north-west), Tall ar-Rāma (south-west), Tall Muways (south-south-west), Tall Iktānū (south-south-east), and several small un-named sites, all within a 0.75 to 2.7 km radius of al-Ḥammām (cf. Glueck 1945; Ibrahim and Yassine 1988; Khouri 1988; Leonard 1992; Chang-Ho and Lee 2002). Although the ancient eastern Jordan Disk towns and villages vary site to site as to periodization, particularly during the Bronze Age, TaH was their connecting common denominator positioned at the center of what must surely be described as a city state – and a relatively large one at that.

Tall al-Ḥammām is the largest of the Jordan Disk sites. It is certainly one of the largest, if not the largest, Bronze Age site in Jordan. The *tall* proper spreads over approximately 36 ha (360 *dunam*), bounded by Wādī al-Kafrayn on the north and Wādī ar-Rawḍa on the south, and by the main road to the east of the *tall*, against the foothills, and the confluence of these two wadis to the west. The site footprint for general settlement is well over 400 *dunam* (>100 acres). These dimensions approximate the areas of the site occupied in more remote antiquity, from at least the Chalcolithic period through to the Middle Bronze Age (a smaller, late Iron Age walled town was built on the upper *tall* after a six or seven century occupational hiatus[8]).

From every angle, TaH and the features of its immediate geography are commensurate with the criteria for a city-state (Collins 2011; cf. Savage *et al.* 2007[9]). S. Collins has identified

5. The wide, circular, flat alluvial area of the southern Jordan Valley immediately north of the Dead Sea is approximately 25 km in diameter, and split down the center by the Jordan River. The Biblical term for this phenomenologically disk-shaped region is *kikkar* (= disk, circle), appearing as *hakikkar* (the disk / circle) and *kikkar hayarden* (disk / circle of the Jordan River). When not used geographically, *kikkar* refers either to a talent (flat, circular weight of metal) or a flat, circular loaf of bread. Although cognate forms of *kikkar* appear in virtually all ANE languages (including Akkadian, Ugaritic and Egyptian), the term is never used in a geographical sense outside the Old Testament, but always refers to a disk-like "talent" or "loaf". The rare, geographical usage of *kikkar* lies at the core of the phrases "Plain (*kikkar*) of the Jordan River" and "Cities of the Plain (*kikkar*)" as seen in Genesis 10-19. The entire area was visible from the highland hilltops near the Jordan Valley west-north-west of Jericho, the location of Bethel and Ai (see Genesis 13:1-12). For a detailed discussion see Collins 2002.
6. There is debate regarding whether or not some kind of traversable road or track existed on or near the eastern and western shores of the Dead Sea by which travelers could move north and south through the Dead Sea valley. Even though much of the terrain was difficult, it is hard to believe that at least some kind of footpath did not exist, affording one the opportunity to move from towns / sites near the Dead Sea shore northward into the Jordan Valley without having to climb up into the high terrain to link up with roads on the Trans- and Cis-jordan plateaus, then descend back down to the Jordan Valley at a location farther to the north. There is also some historical evidence to support the idea of boats traversing a north - south 'shipping' corridor along the eastern side of the Dead Sea.
7. See the new archaeological period abbreviations in section "V. Stratigraphy" in Collins, Hamdan, Byers *et al.* 2009a.
8. The Iron Age occupation, confined mostly to the upper *tall*, covers approximately 12 ha.
9. The conclusions of Savage *et al.* (2007) are based on incomplete data gleaned mostly from past geographical surveys. Indeed, the data from TaH and its surrounding satellite towns, villages and hamlets is almost entirely missing from their analysis. In our opinion, TaH and its neighbors collectively meet or exceed every city-state criterion put forth by scholars over the past 75 years.

five general components of the TaH city-state which occupies approximately 250 square kilometers of the eastern Jordan Disk as follows:

Urbascape

That portion of the landscape utilized, augmented and altered by the principal population of a city-state incorporating political, religious, administrative, economic, domestic and defensive architecture, the perimeter of which is defined by fortifications, the aggregate of which is phenomenologically defined by the city-state's inhabitants as the 'core' of their 'kingdom'.

Agriscape

That portion of the landscape utilized, augmented and altered by the collective agricultural enterprises of the city-state for fields and groves, water management, housing of laborers, processing installations, storage and distribution facilities, and the handling of traded agricultural commodities, including interspersed towns (perhaps fortified), villages and hamlets inhabited by farmers, workmen and their families.

Sacrescape

That portion of the landscape utilized, augmented and altered by the collective religious / ritual practices of the city-state community, including many or all of the following components: sacred architecture (e.g. temples and ritual enclosures), ritual monuments (e.g. menhirs, stone circles, megalithic alignments and dolmens), sacred places (e.g. hilltops, groves and other topographical features of ritual significance), the 'necroscape' and the processional thoroughfares by which they are connected and accessed.

Necroscape

That portion of the landscape utilized, augmented and altered by the collective funerary activities of the city-state community, where the dead are treated, tended, buried and memorialized, including tombs and monuments of all types devoted to the passage, remembrance or worship of ancestors, such as cave and shaft tombs, dolmens (various types), menhirs (plus alignments), stone circles and ritual avenues.

Infrascape

That portion of the landscape utilized, augmented and altered by the collective activities of the city-state population in support of building and maintenance activities, transportation needs, refuse / sanitation management and various industries including stone, earth and clay quarry sites, roadways and production facilities for the manufacture of mud-bricks, ceramics and objects of metal, stone, wood and other materials.

Each of these macro-components of the TaH city-state has a distinct, visual impact on the observer. These are the 'larger than life' physical manifestations of city-state life which incorporate, overlay and sculpt the landscape via the human enterprise of surviving and thriving within a local environment. The al-Ḥammām Megalithic Field is particularly striking in this regard. When spending time in the area getting a 'feel' for the peculiarities of the landscape from a holistic, integrative perspective, one cannot escape the relationship between the religious life of the city and the ritual utilization and modification of the surrounding terrain. We should, in this context, note that the compartmentalization of various facets of city-state life (as given above) is artificial to a certain degree, as the reality of daily life in any society is not so ordered. Indeed, each 'category' crosses into and affects all the others. It is, however, generally convenient to classify observable data (such as architecture and artifacts) into such pigeon-holes for analytical purposes.

In terms of TaH's ritual landscape, the discovery not only of a Bronze Age temple but also an entire sacred district in the center of the fortified EBA / IBA / MBA city, coupled with the massive HMF, is a important step in the direction of unraveling the cultural meaning of the TaH 'sacrescape' (Collins 2011: 21-23). Similarly, S.J. Bourke (2008: 109-160) devotes considerable discussion to Tulaylāt al-Ghasūl's sanctuary area (or temple complex) and alludes to its connection with the adjacent Dāmyah dolmen field. Tulaylāt al-Ghasūl is a mere 5 km south-east of TaH, and the Damyah dolmen field adjoins the al-Quṭṭayn and Maṭābī dolmen fields (now recognized as belonging to the larger HMF). Bourke is correct that the Adeimeh field can no longer be relied upon for data, since it has been lost to development in the area; for this, we must rely on sources such as Stekelis (1961, 1977). To a significant degree, it seems

that Tall al-Ḥammām became the region's principal population center during the late Chalcolithic period, after the collapse of the large agricultural community at Tulaylāt al-Ghasūl owing to the loss of its main water resource(s). From that point, 'dolmen culture' continued unabated from its new center at TaH, lasting all the way through to the Middle Bronze Age. Surely, the 'organic' relationship between the temple precinct and 'necroscape' persisted.

The Tall al-Ḥammām Megalithic Field

From a chronological point of view, there is little doubt that Tall al-Ḥammām exercised a more enduring influence over the area's megalithic culture than did Tulaylāt al-Ghasūl. While many of the HMF dolmens were built during the mid to late Chalcolithic period while Tulaylāt al-Ghasūl dominated the local scene, a significant number were also constructed while TaH was on the rise during the late Chalcolithic, after 4200 BC. By the time Tulaylāt al-Ghasūl collapsed, its namesake Ghasulian Culture had been building dolmens for perhaps 500 years. At the time of its demise toward the end of the Middle Bronze Age, the urban population of Tall al-Ḥammām had been engaging with the megalithic, ritual landscape for over 2,500 years. As the cultural center of the southern Jordan Valley from at least the late Chalcolithic period, TaH long endured as a major player in the evolution – if not in the founding - of megalithic ritual practices in the area. Thus, the name 'al-Ḥammām Megalithic Field' is well justified.

The HMF occupies approximately 17 km^2, including areas known to have been 'leveled' for military, agricultural, commercial and residential development. Just over 500 HMF dolmens are now documented. Based on information from past researchers and the personal accounts of scholars who have worked in the area, we estimate that at least 1,000 dolmens have disappeared as a result of various destructive processes, not the least of which is a major gravel-processing operation just south of Tall Iktānū (2 km south of TaH). The overall HMF is comprised of a dozen or more discrete sub-fields (a subject for future publication) but, again, many are fragmentary or lost altogether. On the bright side, there are several relatively intact, and a few virtually intact, sub-fields that are the subject of continuing analysis from an anthropological standpoint (again, a subject for subsequent publication).

Through three seasons of focused work in the HMF, the material excavated from its dolmens is accumulating into a significant body of new information. Our methodology for handling dolmens and other HMF features continues to evolve, but it remains systematic and meticulous. To date, we have recovered mendable and complete ceramic vessels from three dolmens, significant numbers of diagnostic sherds from several others, and have collected sherd scatters from across the entire field (an ancillary activity during our survey work). Thus far, Chalcolithic forms are well represented, as are vessels from the EBA, IBA and MBA. Not a single sherd dating to the Late Bronze Age or later has emerged from HMF dolmen chambers or in direct association with any of the more than 500 dolmens we have documented and studied in the HMF. However, occasional sherds from both the Iron Age and Roman Period are found on the surface in certain areas, but they are rare - for example, HD.B.B is located very close to Khirbat al-Ḥabbas, which is a well-known Roman site.

Tall al-Ḥammām's Megalithic (Discrete) Sub-Fields

Survey activities in order to identify megalithic configurations and alignments occupied a critical part of Season Six (2011) in the TaH 'necroscape', particularly the detection of discrete sub-fields. We define 'discrete sub-field' as a megalithic configuration that is separable from adjacent clusters or arrangements either by 'unaltered' topographical space, visible barrier(s), organizational pattern(s) or other delineation(s). Based on our observations thus far, discrete subfields seem purposefully determined by factors other than topographical necessity. These factors may include, but are not categorically limited to, societal structures such as tribes, clans and families, or social rank and group affiliation (whether religious or political).

Numerous discrete fields exist within the 17 km^2 of the HMF, all of which are associated with several styles of tombs. The megalithic configurations are generally located on 'flatter', higher terrain above the tombs which are mostly found on the steeper slopes of adjacent

wadis. That there is a relationship between the tombs and the dolmens is relatively clear – as we shall suggest subsequently. The distinction between the function of a tomb and that of a dolmen is determinable, at least in part, on the basis of general location, contents and associated megalithic features (Each season, the 'meaning' of the megalithic monuments has become a bit clearer, but there remains much work to be done in this arena).

TaH Discrete Sub-Field A: the 'Tiberius Group'

During Season Five (winter 2009 / 2010), K. Schath supervised the mapping of discrete Sub-Field A, all of which lies in full view of Tall al-Ḥammām (we have also designated this sub-field as the 'Tiberius Group' in honor of the financial sponsors of this part of our Project. It is roughly ovoid in shape, measuring approximately 100 x 200 m, with the long axis 'piercing' its large, central menhir and, if extended to the west, crossing directly over the sacred precinct at the hub of lower TaH. Its orientation and symmetry seem intentional and beyond coincidence.

In addition to the survey performed by Q. Dasouqi, the 'dolmen team' also took photographs (including boom shots) of its multiple dolmen clusters, menhirs, menhir alignments, stone circles and other features. Interestingly, the 'face' of the central, large menhir of Sub-Field A is distinctly visible from the Bronze Age sacred precinct platform at the heart of the lower *tall*, approximately 800 m to the west. Many of the field's components – particularly its dolmens - are arranged symmetrically around the central menhir with detectible solar, lunar and sacred precinct alignments (checked by on-site, real-time observations and measurements; tbp).

One particular type-B dolmen within this sub-field, HD.A.78, had all the indications of being undisturbed, so we scheduled it for excavation. That assessment was correct. HD.A.78 turned out to be remarkable both for the size of its chamber and for the quantity of deposited goods (mostly ceramic vessels). The date-range of the pottery was also notable: late Chalcolithic, EB1, EB2, EB3 and IB1 / 2. HD.A.78 produced two distinct human bone deposits (interments) in separate 'strata'[10] and over forty ceramic vessels (some whole, some broken but mendable, with others represented by sherd scatter), six stone beads and a small basalt grindstone.

The sheer quantity of data being gathered from Sub-Field A is substantial on a number of fronts – including numerous papers and doctoral dissertations – and will, no doubt, lead to many new insights and interpretations of the phenomena of the TaH megalithic culture. Thus, we will not pursue these data and interpretations here.

TaH Discrete Sub-Field B

Discrete Sub-Field B lies across two wadis and one 'hill' to the north of Sub-Field A, and is quite a bit larger (its arrangement is currently being researched). During the 2011 season, pottery fragments were found in eight of the twelve dolmens studied, several of them in this area, with many of them coming from previously excavated (not by TaHEP) and / or robbed dolmens. However, the soil of the blocking matrices at the entrances of the dolmens seems never to have been excavated (or robbed out) – perhaps an indication of the inadequate nature of methods applied by previous investigators. Our process of excavating previously 'emptied' dolmens has provided a considerable amount of additional data, enhancing our understanding of the dolmen phenomenon. Because of the care we have exercised in selecting subject dolmens, augmented by an intimate understanding of the dolmen architecture found in the HMF, even dolmens previously excavated by professional archaeologists are providing new material for research.

The first dolmen we examined in 2011 had been ravaged long ago. We selected it for an examination of its undisturbed entrance area which yielded four complete vessels. Two were of poor quality, barely fired – found crumbled

10. Stratified material within the context of a dolmen chamber can be a complex matter. Indeed, there is no semblance of horizontal stratification simply because the ceremonial procedure employed for multiple interments over often vast periods of time resulted in the 're-organization' of the chamber as the ancient users made room for new deposits. Because of this, it is not uncommon to find Chalcolithic material side by side with much later Bronze Age goods and bones. Thus, the terms 'stratum' and 'strata' in a dolmen context refer to period-separable materials deposited during different archaeological periods, often covered by blown-in or washed-in sediments (deposited between interments) that are likewise removed or 're-arranged' by subsequent activities in the chamber.

within the hard matrix– and likely manufactured as funerary goods, not for daily use. Each of the type-B dolmens we investigated in Sub-Field B had been robbed out, yet still produced artifacts for study, including numerous pottery sherds, a few small (intact or mendable) vessels and fragments of human bone.

In addition to our examination of the eleven previously 'emptied' dolmens and the systematic excavation of intact dolmen HD.B.B (described below), we started to excavate of a 3 x 3.5 m rectilinear stone structure, the nature of which we have not yet determined. This structure, enclosed by large boulders and presently designated 'funerary monument', is still in the early phases of excavation. What appears to be the upper (surface) portion of the structure has been disturbed by pilfering, but we are relatively optimistic that the matrix underneath may still be intact. At this point we have no conclusive evidence to definitively date its construction and periods of use, but the ceramic mix is suggestive. From the first 30 cm of disturbed material we have collected hundreds of sherds and more than 50 'readable' diagnostics dating from EB3, MB2 and IA2, all periods of major occupation at Tall al-Ḥammām. From the same 30 cm of disturbed matrix we have accumulated hundreds of human bone fragments, some of which appear to be charred. In addition to the bones, excavators sieved out four carnelian beads and a piece of ancient 'wire' (toggle?). A funerary or ritual interpretation for this structure is not out of the question. The excavation of the rectilinear structure will continue during Season Seven (2012).

Excavation of HD.B.B: an Undisturbed Demi-Dolmen

HD.B.B is a demi-dolmen. In this case, 'demi' designates that the builders of this dolmen made use of the natural bedrock as dolmen components for which they would otherwise have used individual, slab-style stones, i.e. orthostats and top-stones. In the case of HD.B.B, the top-stone is a slightly up-thrust slab of bedrock that provides a small space (chamber) underneath, facing the wadi to the south. Thus, it was constructed with the top-stone already in place.

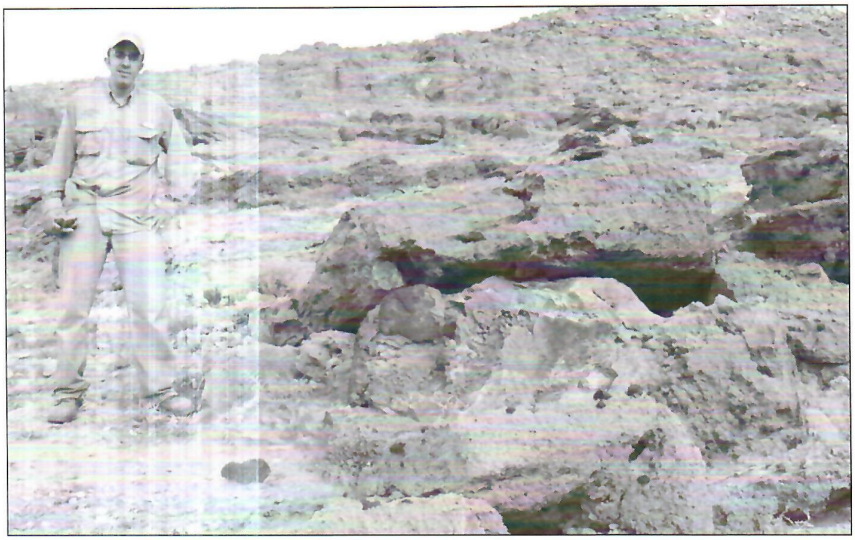
A single orthostat was added underneath the leading edge of the top-stone as a side-wall closing off the chamber. The builders made the chamber larger by cutting out the natural rock towards the back and downward. The floor consists of several stone slabs installed just inside the entrance, providing a surface at the same gradient as the adjacent bedrock inside the chamber. However, the chamber floor is not entirely level. There is a 'window' (gap between the stones) on the south side, quite close to the edge of the wadi (5 m), and a significant drop. From across the wadi, the prominent 'window' is still visible. The chamber was accessed from the west by a narrow entrance, which was subsequently filled with several stones, one a large blocking-stone installed on a leveling-slab.

The 'natural' look of this demi-dolmen had made it difficult to identify, which is probably why No one discovered it during previous surveys (thankfully, it was also 'invisible' to the 'night diggers'). Looking at the photographs of HD.B.B, it is easy to see how difficult the identification was. Figures 1 and 4 show the window and the low profile, as well as the entrance. In Figure 4, the top-stone seems to show several windows and cover multiple chambers; however, there was only one chamber.

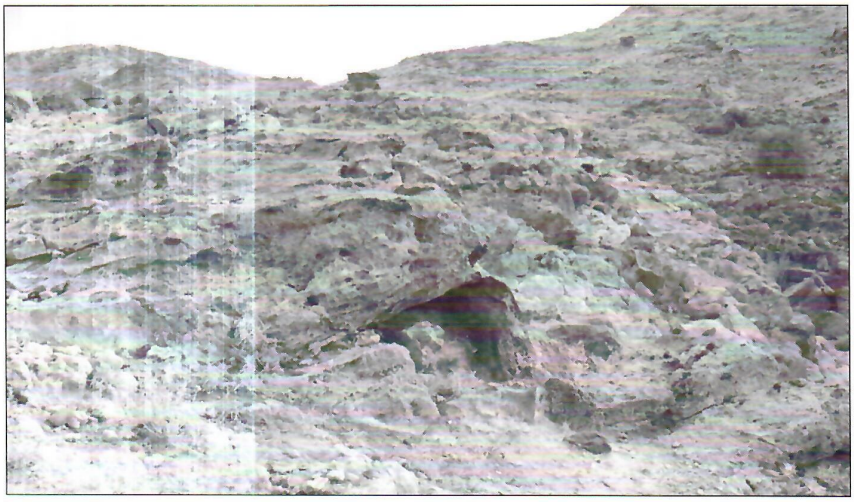
Due to 'night digger' activity in the HMF the previous week, we felt that we had to proceed immediately with the excavation of HD.B.B. Two days were allocated for the excavation, with two armed guards being left at the site overnight (indeed, that evening several men – treasure hunters – arrived to find guards, then left). TaHEP field archaeologist, K. Schath, supervised the excavation, assisted by doctoral students and TaHEP cinematographer, D. Galassini.

To begin the documentation process, four photographs (**Figs. 1-4**) were taken from a distance of four meters looking to the north, east, south and west. TaHEP surveyor, Q. Dasouqi, provided a benchmark and its location on the TaHEP grid. Three stakes were placed, creating a 1 m corner to excavate toward the entrance.

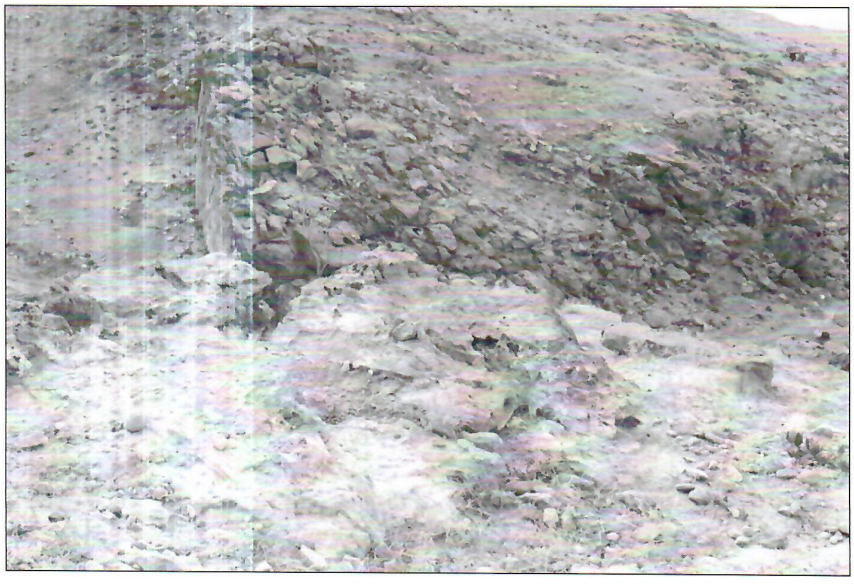
The soil outside the dolmen was removed to bedrock (**Fig. 5**) and screened. Figure 5 also shows the chamber with the large blocking-stone in place, which is removed in Figure 6. Excavation of the blocking-stones was further documented by cinematography, capturing the entire process of removing the three stones blocking the entrance to the chamber. Immediately behind the blocking-stones were five stones placed in a



1. HD.B.B looking north (D. Galassini, TEO16723).



2. HD.B.B looking east (D. Galassini, TEO16724).



3. HD.B.B looking south (D. Galassini, TEO16728).

4. HD.B.B looking west (D. Galassini, TEO16731).

5. HD.B.B entrance (D. Galassini, TEO16746).

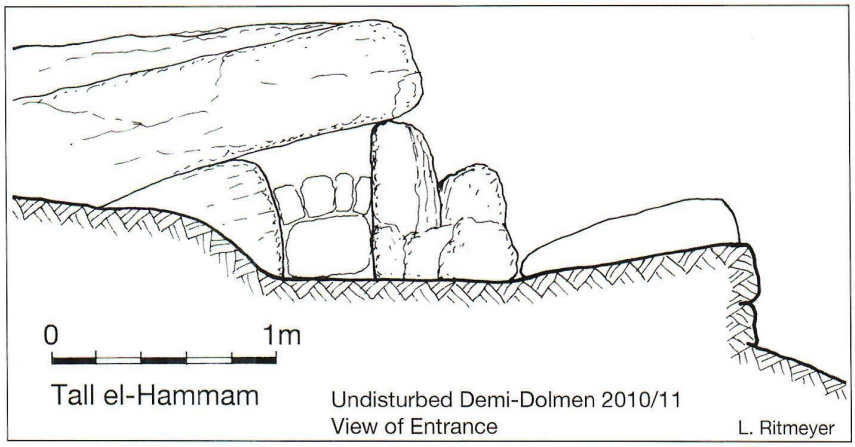
6. HD.B.B entrance at bedrock (D. Galassini, TEO16760).

horizontal arc and held in place with clay-mortar. The section drawing (**Fig.7**) shows the four visible stones in the arc. The blocking-stones, as well as the arc of stones, demonstrate a methodology for 'closing' the dolmen seen in most of the type-B dolmens throughout the HMF.

In securing the chamber post-interment – a process repeated many times over the ritual life of HMF dolmens – a mud-mortar material had been packed into it immediately after the placement of the pottery in the chamber (ritually-placed[11] human bones were also present). Then the blocking-stones were placed in order to seal the entrance. In this case, the ritual closers of the dolmen chamber created the arc of five stones secured in a mud-like matrix before putting the blocking-stones in place. It is likely that this particular dolmen had been cleaned and re-used many times during its 2,500-year history (Chalcolithic to MB2). We can only assume that the re-blocking in each case – a ritual process performed with care – was carried out using methods similar to the final, MB2 interment.

Once the excavation team had removed the blocking-stones and the soft soil had been brushed from the hardened mud material, the first piece of pottery emerged (*in situ* **Fig. 8**). This sherd was located just above the floor (the immediate thought was that it had been left behind during a subsequent clearance of the chamber). Then the arc of stones was removed and the soil excavated to the floor. Just behind the stone arc, another stone was present, seemingly placed as a marker of some sort, yet nothing was discovered under or around it. Then a vessel emerged (**Fig. 9**) – in fact, it was a vessel minus the sherd seen in Figure 8.

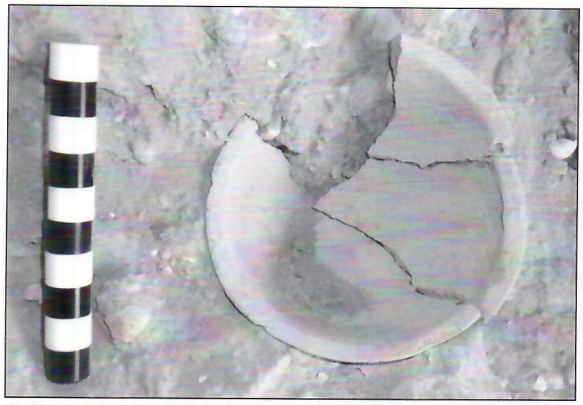
The chamber was excavated from front (i.e. entrance) to back in 10 cm increments[12]. It was relatively small, with a horizontal depth of 1.5



7. Section drawing: view of entrance (L. Ritmeyer).

11. That the 'selected' human bones had been placed in the dolmen chamber during a ritual process is virtually a given. The building of the monuments themselves and intermittent opening of chambers to receive new 'memorial' objects and / or 'ancestral' bones were certainly driven by formalized religious practices pursued over many centuries. The sheer number of dolmens and associated megalithic phenomena in the HMF attests to the power of the religious beliefs which motivated their continued ritual significance over more than two millennia.
12. We have developed a distinct philosophy of dolmen excavation designed to provide the most logical "reversal" of chronological interment activities. From our now-extensive experience with HMF dolmens, it is a general rule that dolmen chambers were not "filled" in a horizontal manner that might have resulted in some kind of correlation between vertical levels and chronology. The excavation of dolmen HD.A.78 is instructive in this regard. In that large chamber, Chalcolithic material "shared" the floor with later material, and earlier material was not infrequently found "above" later items, having been pushed aside, up and over them in a subsequent cleaning (or "reorganization") in preparation for another interment. Thus, the resultant "strata" of the chamber consisted of a complex "shuffling" that could only be sorted out by the utilization of ceramic typology. Further, we have observed that, if there is a chorological "rhyme or reason" to a dolmen chamber, it is usually represented in a "back-to-entrance" fashion, with older material positioned toward the deeper recesses away from the entry, and later material deposited (progressively) closer to the entrance. This is only a general rule of thumb, and is not strictly the overall case by any means. However, since "back-to-entry" is generally more representative of "earlier-to-later" than "bottom-to-top," we have chosen, whenever possible, to proceed from the entry horizontally to the back of the chamber.

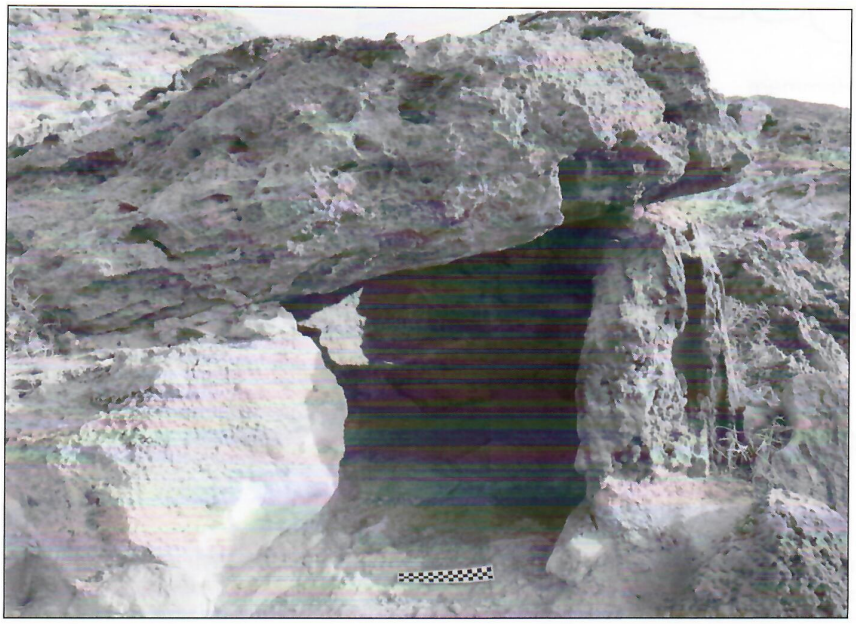
8. Sherd in situ (D. Galassini, TEO16769).



9. Vessel in situ (K. Schath, DSC00952).

m on the floor, and a vertical depth of only 70 cm at the highest point (As a result, the excavation was accomplished from a prone position.)

Figure 10 shows the chamber completely excavated. The orthostat had several leveling-stones placed under it in order to bring it up to the level of the top-stone. The original installation of the orthostat and the creation of the hewn chamber had certainly been a time-consuming process as the ancient builders produced a unique monument of the dolmen style. The volume of the chamber had certainly been dictated by the formation of the natural rock layers, lim-

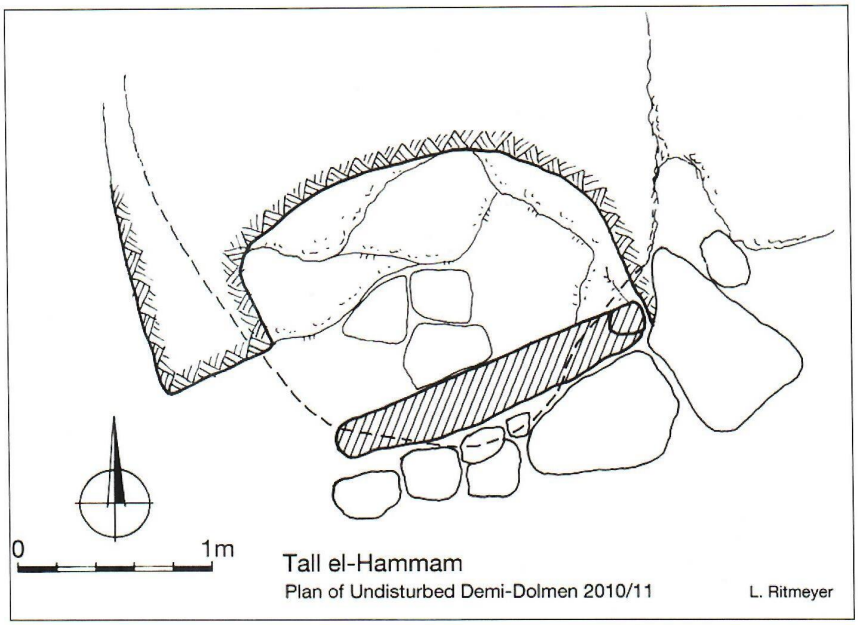


10. HD.B.B excavated (D. Galassini, TEO16814).

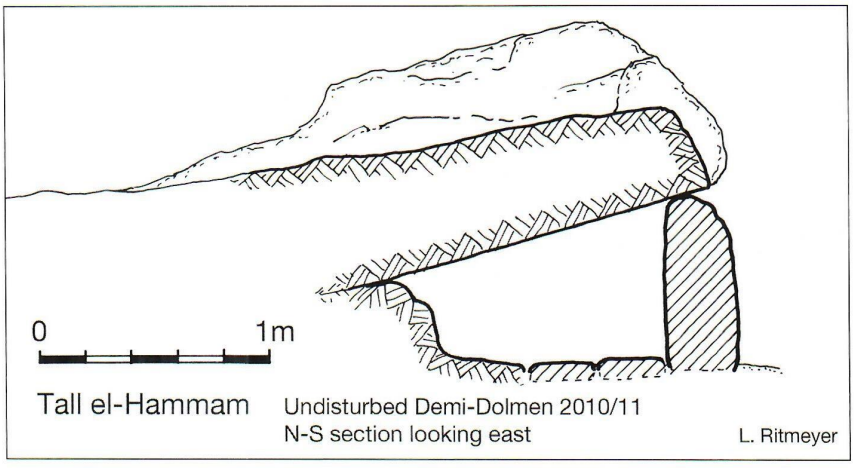
iting the size of the demi-dolmen (**Figs. 11, 12**).

In the chamber, sherds belonging to four different ceramic vessels were found. As stated previously, the first came from just under the stone arc at the chamber entrance, at a depth of 33 cm below the benchmark. The second was discovered approximately 10 cm back at a depth of 38 cm. The third emerged just under the window at a depth of 1 cm, and the fourth was found on the floor far into the chamber at a depth of 43 cm. (**Figs. 13, 14, 15 and 16** show the four vessels excavated from HD.B.B; Figure 9 shows one of the vessels *in situ*).

One observation made throughout the excavation of dolmen HD.B.B (and HD.A.78) is the lack of stratification relating to the date of the pottery (indicating that serial interments were not layered-in over previously deposited materials). Looking at the chronological space between the four vessels in HD.B.B (EB1 - MB2) we theorize that, with the re-use of the dolmen, the 'ritual' called for the preparation of the chamber in a manner that often required previously deposited objects to be moved or removed - not infrequently smashing older bowls and juglets – even to the extent of clearing out the chamber altogether, perhaps leaving behind only a few stray sherds. This same observation is made by Dubis and Dabrowski (2002: 172) in connection with the al-'Umayrī dolmen. In the case of HD.A.78's ceramics (over 40 vessels), the earlier (Chalcolithic and EB1) ves-



11. Section drawing: plan of undisturbed demi-dolmen HD.B.B (L. Ritmeyer).

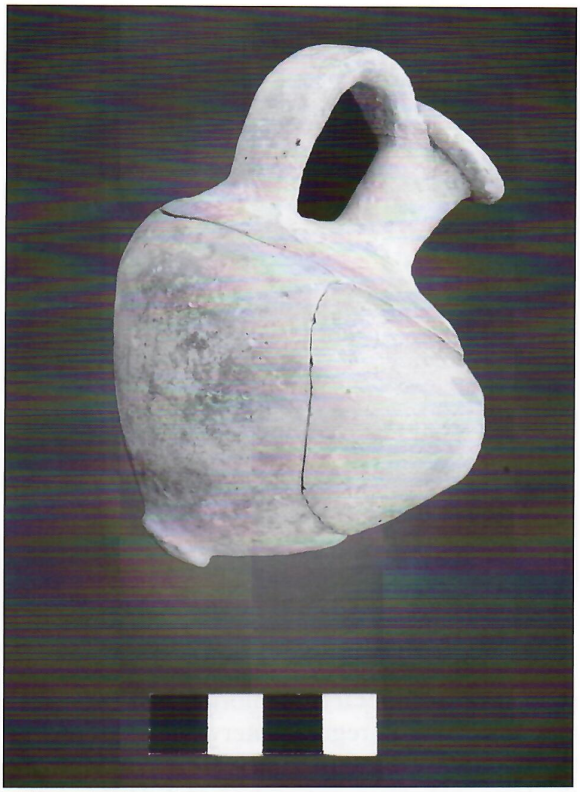


12. Section drawing: north - south section looking east (L. Ritmeyer).

13. Ceramic vessel, HD.B.B, Early Bronze 1 (M. Luddeni, C123).

14. Ceramic vessel, HD.B.B, Early Bronze 3 (M. Luddeni, C125).

15. Ceramic vessel, HD.B.B, Middle Bronze 1 (M. Luddeni, C126).



16. Ceramic vessel, HD.B.B, Middle Bronze 2 (M. Luddeni, C120).

sels were severely damaged or broken, while the later (EB2, EB3, IB1) vessels were generally in much better shape, many of them intact. Of course, HD.A.78's chamber was about three times larger than that of HD.B.B, suggesting that there was ample room for moving earlier articles around rather than removing them in order to make room for a new interment.

Only two fragments of human bone were discovered in HD.B.B (**Fig. 17**). They were together and near the floor toward the rear of the chamber. Again, with the re-use of the chamber, it seems that only a symbolic deposit of (ancestral?) bone had been made. In the HMF chambers, no large bones or complete skulls have been found[13]. However, in five of the twelve dolmens examined during the 2011 season, human bone fragments were present. At least three of the five had been excavated previously[14]. The frequent occurrence of human bone fragments

13. With regard to the so-called Adeimah Field, Stekelis used 'cist', 'cella' and 'dolmen' almost interchangeably; but this was a fundamental error. Contrary to Stekelis' thinking, it is almost certain that cist / cella tombs did not evolve into dolmens. They were functionally different. In fact, whole skeletons, including skulls, were only found in cist / cella tombs, but never in HMF dolmen chambers.

17. Human bones, HD.B.B (M. Luddeni, C117).

in the chambers of HMF dolmens demonstrates some sort of funerary, memorial, and / or ritual use (occurring at regular intervals?) over an extremely long period of time – all in parallel with the long, unbroken occupation at TaH (from the late Chalcolithic to MB2).

Insights and Conclusions

Interpreting the socio-religio-cultural implications represented by the features of the al-Ḥammām Megalithic Field is anything but an exact science. Without ancient written documents explaining how the HMF worked in the daily and ritual life of its builders / users, we are left to piece together an approximate, theoretical understanding from mute architecture and artifacts. But, to a large degree, this is the nature of the disciplines of archaeology and anthropology. We offer the consequent ideas tentatively, but with reasonable confidence that we are, over the whole of this complex subject, 'in the ballpark'.

In our comments below, one must realize that, while we are focusing on the HMF dolmens in particular, there is the typical danger of compartmentalization in ignoring other important (and equally impressive) features of the megalithic culture, e.g. menhirs, menhir alignments, stone circles, henges, ritual avenues. Let us state here that we recognize the organic, integral relationship between all of these megalithic phenomena and their (likely) simultaneous employment within the religio-ritual activities carried out upon the 'sacrescape' and 'necroscape' belonging to the al-Ḥammām city-state. The inter-relationships between dolmens and dolmen rituals, associated megalithic features and nearby tombs are assumed in our discussion below; however, we do not have space here to address the subject adequately (The larger matter is being developed separately for publication).

Who Built the Dolmens, and When?

Tulaylāt al-Ghasūl dominated the cultural life of the eastern Jordan Disk for roughly the first half of the Chalcolithic period, but after 4000 BC Tall al-Ḥammām had advanced to that position and retained its dominance over the area for the next 23 centuries or more (until MB2). The development of the area's megalithic culture began at about this mid-point in the Chalcolithic period, and continued into and through the transition from the large, open agricultural settlement (Tulaylāt al-Ghasūl) to the rise of fortified urban sprawl and the evolution of a full-blown city-state (Tall al-Ḥammām).

HMF dolmen ceramics range from the late Chalcolithic to MB2, a mirror-image of the occupational profile of Tall al-Ḥammām and its 'stable' of satellite towns and villages (considered collectively). In light of the fact that TaH preserves several lines of evidence for a consistent, unbroken occupation across this extensive time span, it is tempting to suggest that its 2,500 year history was marked by ethno-cultural continuity to a considerable degree. This would mean that the people(s) of the area's Ghasulian Culture – who provided the initial impetus in the development of the HMF – were the seedbed for the ensuing EBA, IBA and MBA population of the TaH city-state. Their ethno-linguistic identity is presently unknown; however, the ceramic repertoire of TaH and the HMF is commensurate with the Cisjordan Bronze Age Canaanite culture typical of most sites in the Jordan Valley. The fact that the HMF dolmens continued in use as ceremonial monuments through the MB2 – until the termination of Jordan Disk Bronze Age

14. Dajani and Swauger excavated and studied these three dolmens.

civilization – is also a noteworthy indicator of cultural continuity.

As it stands, the ceramic evidence seems to favor the idea that the HMF dolmens continued to be built over a considerable period of time, throughout the Early Bronze Age, Intermediate Bronze Age and Middle Bronze Age. After the first monuments came into existence, additional dolmens were added 'as needed' according to the perceived necessities of local religious practices.

Why Did the Ancients Build Dolmens?

It appears logical to theorize that the evolution of the megalithic dimension of the local culture was, in large part, a function of the consolidation of religious power, influence and oversight within a formalized ritual community concentrated in one or more local sacred precincts from which a priestly class (including a high priest?) dictated the evolution of physical / visual manifestations of reverence across the surrounding landscape. The end result was a 'sacrescape' (inclusive of its 'necroscape') of impressive proportions.

Why dolmens? Perhaps we will never be able to answer this question with any degree of satisfaction. Certainly, the availability of 'dolmen-friendly' stones is one factor. It is relatively clear that the transportation of large stones in order to build dolmens in 'stoneless' areas did not occur in the HMF. They built dolmens where stones of appropriate size and shape were readily available. In areas where such stones did not exist, there are no dolmens. It is safe to say that, if dolmen-ready stones had not been available in and around the HMF, the dolmen phenomenon would not have evolved at all. It is reasonable to posit that a large, aggressive population superimposed the socio-religious energies of its collective ritual will upon the available landscape, altering it in conformation to their metaphysical worldview. Unquestionably, their worldview fostered the creation of visually (physically) impressive structures which satisfied a ritual need to memorialize the dead (ancestors), probably according to a ceremonial calendar. (Again, if there had been no stones for dolmen building, they would have developed another means of ritual manifestation.)

No doubt, ritual function(s) motivated dolmen design (the old anthropological adage "form follows function"). For example, it is easy to build below ground-level cist (cella) enclosures that would accomplish the same 'repository' purpose as dolmen chambers. So, why the massive top-stones? "Because they wanted to and could" is not a suitable answer, at least not from an anthropologist's perspective. Whether or not we can (eventually) provide a definitive answer to this question remains to be seen. However, it is entirely plausible that dolmen chambers were topped by large 'table' stones for some distinctive ritual function[15], and that that function was, in some organic manner, related to the ceremonial deposits found within the chamber underneath. Indeed, what would one do with such a large (typically 2 - 3m) top-stone? Was it merely placed as a roof, or did it also function as a ritual 'platform' upon which (token? food?) offerings were placed? Could the dolmen table-top have served as a desiccation platform upon which a deceased family member was exposed to the elements for a period of 'defleshing' (not unlike later Zoroastrian funerary practices)?

We may find answers to the above questions not by focusing on dolmens alone, but by seeing them as part of a larger complex of HMF features, which includes various tomb styles, menhirs, stone alignments, stone circles, henges and ritual avenues. It is instructive that the vast majority of EBA tombs contain mostly large and long ('cleaned') bones (skulls, femurs etc.) and not whole skeletons, suggesting that a defleshing

15. This discussion must also consider whether or not dolmens were 'free-standing' or covered by a tumulus (earthen mound) or cairn (stone mound) as they generally were in Europe (Giot 1979). Their European counterparts (of approximately the same chronological period) were constructed as artificial 'caves' in the creation of 'passage' tombs – also associated with menhirs (Sellier 1991), as in the HMF. However, our close examination of the 500 or more surviving dolmens in the HMF reveals virtually no evidence that they had ever been covered by tumuli or cairns. While there are indications that the ground around and against some dolmens (particularly B-types) had been artificially raised up to within a few centimeters of the undersurface of the top-stone, there seems to be no evidence that any of the HMF dolmens had its table-stone covered by any kind of mound. We take from this that in antiquity, across the entire HMF, dolmen tops were always entirely exposed and standing in clear view above the natural terrain (particularly A-types which tend to be taller than B-types).

(ritual) process had taken place prior to tomb interments (usually with associated objects). It is not at all unreasonable to propose that such desiccation practices may have taken place on the platforms provided by dolmen top-stones. There also is an apparent relationship between the sheer numbers of HMF dolmens – the largest such assemblage of such ceremonial monuments in the southern Levant – and the immense Bronze Age population centered on Tall al-Ḥammām. Such a thriving civilization would have necessitated a commensurately-sized 'necroscape' – in this case including the HMF.

It is a short step to conclude that the construction of the dolmens themselves was a function of ritual need, and that the large numbers of dolmens in the HMF (estimated at 1,500 original monuments) was a function of population size and concentration.

What Societal Structure(s) Do Dolmens Suggest?

The HMF contains numerous, separable dolmen clusters between the series of ridges and wadis extending north from Wādī Ḥisbān to Wādī al-Kafrayn. We theorize that each of these discrete megalithic fields was likely a segment of the al-Ḥammām 'necroscape' utilized by a given clan. It follows, then, that an individual dolmen may represent an extended family unit. Interestingly, the demographic computations of this conjecture work quite well.

With a moderate estimate of 360 people per hectare (= 150 per acre), the 36 hectare size of Bronze Age Tall al-Ḥammām proper – exclusive of the smaller sites within 0.5 km of its city walls, not to mention several satellite towns and villages within a 3 km radius – would yield a population of approximately 13,000. If each extended family had an average of ten individuals (say, one grandparent, two parents and seven children), this would translate into 1,300 representative dolmens. If each extended family had an average of fifteen individuals (say, one grandparent, two older parents with seven children, and five grandchildren), this would translate into 867 representative dolmens. Given the close proximity of additional towns, villages, and hamlets, a total of 1,500 family dolmens – the actual estimate of dolmens originally in the HMF – would constitute a reasonable reflection of the area's population at any given time from the Early Bronze Age to the Middle Bronze Age.

Further, we have thus far (conservatively) identified between fifteen and twenty five discrete sub-fields, each containing an average of 30 to 50 dolmens. The higher computation – which is probably reasonable given the large percentage of obliterated dolmens in the HMF – yields a total of 1,250 dolmens grouped into 25 sub-fields. Presently (research is ongoing and evolving), we estimate that about 80 - 85% of HMF dolmens exist(ed) within sub-field groups, with 15 - 20% standing in smaller clusters (2 - 10 dolmens) or as solitary monuments. If discrete megalithic fields represented clans, then it would appear that an average clan had between 30 and 50 extended families consisting of between ten to fifteen individuals each. The 15 - 20% of dolmens not belonging to discrete subfields may be interpreted as monuments owned / used by poorer area residents (clans or multiple family 'co-operatives'), reflecting the fact that the enterprise of dolmen building and usage required both significant labor and financial expenditures.

During the July 2010 visit to the HMF, our team realized that many of the dolmens classed as trilithon (A-type) dolmens by previous observers were actually B-type dolmens. Many of these dolmens are partially below ground and have subtle orthostats and passages. The study of these design features is important because this type of dolmen required considerably more planning, material and energy to construct. They also demonstrate a kind of 'planned distribution' over the discrete field. These data could suggest that the more complex B-type dolmens belonged to families higher on the social 'ladder' than those who built the simpler A-type. That social status would have driven the size and type of monuments existing within a clan sub-field is neither surprising nor unpredicted.

The undisturbed dolmens identified in this article – HD.A.78 and HD.B.B, each belonging to a different discrete field – have similar and distinct features which suggest that they may have belonged to families of different social status. While they both seem to occupy a prominent place within their respective discrete fields, the HD.A.78 chamber is four times the volume of the demi-dolmen HD.B.B. While they were both

re-used and re-sealed many times, the number of remaining vessels in the larger chamber was ten times greater than in the other. The passages of each had been closed with care. For both, there was a sense of chaos within the chamber as offering vessels had been pushed around, yet a few intact vessels remained. Both were used over a very long period of time. From these two dolmens we sense not only a ritual continuity through time, regardless of social standing, but also we detect a distinct difference in the hierarchical ranking of the two 'families' that maintained them.

In the midst of both discrete fields A and B is a large, distinct menhir, but only the menhir in Sub-Field A has direct line of sight to the Bronze Age sacred precinct on Tall al-Ḥammām proper. Circular alignments of stones (with radii from 5 to 10 m) also exist in both sub-fields, but each is visually distinct enough to imply original design. Another important visual factor is the proximity to TaH which is less than 500 m for HD.B.B (in Sub-Field B) and 600 m for HD.A.78 (in Sub-Field A). While both discrete fields are closer to the main city than the city's own east - west diameter of over 750 m, only in Sub-Field A do all the megalithic elements have line of sight to TaH's sacred precinct. Some of the more prominent dolmens of Sub-Field B do have a view of the Bronze Age temple area, but not all of them, and one cannot see the TaH sacred complex from most of Sub-Field B's megalithic features. Sociological implications of these observations include: (1) the clan of Sub-Field A had greater social prominence than that of B, (2) the clan that developed Sub-Field A selected its megalithic site-with-a-view well before the creators of Sub-Field B chose theirs, suggesting that the clan of A was older and more influential in the social scheme of things than the clan of B and (3) some of B's dolmens have a view of the TaH sacred precinct while some do not, suggesting that older and / or more prominent families were able to secure a 'plot-with-a-view' because of chronological and / or social advantage. These ideas are minimal and suggestive, but they recognize that the al-Ḥammām Megalithic Field was a sacred landscape wrought not only by ritual necessity, but also by the social structures and hierarchical layering of the local population.

What Insights are Apparent Regarding Ritual Practices Performed in and Around Dolmens?

Without written texts describing Bronze Age rituals within a megalithic context, any definitive description of such practices must remain speculative[16]. Nonetheless, recurring data and observations from the HMF give rise to a number of reasonable conjectures. We are in the process of producing a much more comprehensive analysis of HMF ritual phenomena, but the following ideas can serve as a 'springboard' for discussion of the subject.

Regarding dolmens, one question that researchers have continuously wrestled with is: Did dolmens function as tombs or did they have another ritual purpose? In the comments that follow, we will not speculate about dolmens outside the HMF, but will confine ourselves to that for which we have extensive, first-hand experience.

Stekelis (1977: 827) expressed a certainty that cist tombs in the vicinity were burials. The cists near Tall Adeimeh (beginning 3 km south of TaH) were, according to Stekelis, an early dolmen form (we disagree with this idea) associated with the Chalcolithic settlement at Tulaylāt al-Ghasūl. Adeimeh was also in close proximity

16. Interestingly, there is a specific Biblical reference in Genesis 50: 7-13 to ritual activities performed in the vicinity of the al-Ḥammām Megalithic Field. The site of "Abel of the Egyptians" was the location Joseph chose for a seven-day ritual mourning of his father, Jacob. Abel means "place of mourning". This Abel is the same as later Abel - Shittim ("acacias of mourning") in the Moses story. Abel is also found on Egyptian map lists of the New Kingdom as the final landmark on the Transjordan route from Egypt to the Jordan River north of the Dead Sea, and has been identified by a number of scholars as Tall al-Ḥammām (Krahmalkov 1994; Kitchen 1979: 11, 260, 15, nos. 10-13; Simons 1937: 111-115, 157-159, 174), by far the most logical choice. However, the story implies that Abel was not a settlement or city at the time, but simply a place of solemn ceremonial significance. This strongly suggests that the mourning of Jacob occurred after the terminal MB2 destruction of TaH proper, and that the massive, ancient HMF still remained (which it did) as a well-known, regionally important ritual center. It should be noted that traveling to Abel in Transjordan was a strange, circuitous route for getting to their final, Cisjordan highlands destination near Hebron, unless there had been a powerful (ritual) reason for visiting there. The complex, impressive ritual landscape of the HMF would have provided the 'ceremonial gravity' for such an event.

to the dolmen fields of al-Quṭṭayn (now incorporated within the HMF). Swauger (1966: 106) had worked there and also concluded that the dolmens had been built for burials. When Dajani (1967) excavated in the same dolmen field, he discovered human bones. But in no case were more than a few 'disparate' bones found in any dolmen chamber. By contrast, the area tombs of various kinds – cave, rock-cut, cist, cella, shaft – typically contain greater quantities of bones, particularly long bones and skulls, likely deposited as burials, perhaps after a period of deflesh-ing since complete skeletons are extremely rare, particularly in the EBA tombs.

Stekelis used the term 'interments' in his articles. However, when he found skeletons they were from cella or cist tombs rather than the dolmens in the area. The large al-'Umayrī Dolmen, which we examined in January 2011, is an excellent example of a dolmen related to a settlement with a diverse funerary history. The dolmen sits in a cemetery with several types of tombs. Shaft tombs exist all along the base of the rock hill of the settlement. The dating of the burials are EB to MB (similar to the HMF) and demonstrate differing customs (Herr *et al.* 2002; Dubis and Gorniak 1997, 1999). In the al-'Umayrī Dolmen, excavators found the bones of up to 20 individuals. They described the bones as semi-disarticulated, and skulls were also present in the chamber. The discovery of skulls in the al-'Umayrī chamber seems to imply a funerary use of the dolmen rather than a ceremonial purpose, as is likely the case with HMF dolmens. It should also be noted that the al-'Umayrī Dolmen was found without its topstone (perhaps it had had a wooden rather than a stone roof), and is of singular design among associated tombs. Its contents and setting suggest a purpose distinct from 'true' dolmens of the HMF - i.e. funerary rather than memorial.

In comparison to the quantities of human bones found in HMF area tombs, the meagre dolmen bone deposits signal a ceremonial as opposed to a funerary function. HD.B.B produced only two fragments of human bone, but these pieces are significant in light of bones found in other HMF dolmens. HD.B.B and HD.A.78 are special dolmens because they were both undisturbed (extremely rare at this time in history). They both contained bones and pottery. But the absence of heavy bones in all of the dolmens explored in the HMF brings into question the nature of the rituals associated with them. One thing seems clear: these human bone deposits are not primary burials. There seem to be only symbolic, 'token' bones deposited in dolmen chambers. The ritual placement of smaller bones – ribs, radius or ulna, or fragments – and periodic 'cleaning' of the chambers could explain why the discovery of bones is rare in dolmen contexts. But why 'token' bones and small vessels (mainly juglets and bowls)? What was their ceremonial significance? Perhaps something like the following occurred in antiquity (cf. Scheltema 2008: 49).

For practical (and obvious) reasons, the dead were housed, honored and memorialized at some distance from cities and settlements. Death was ever-present, inescapable. Ancestor 'worship' and / or 'memorializing' must have been a prominent feature of society in general, engendered by the sight of frequent ceremonial processionals from the city into the surrounding hills where tombs held the dead and obligatory burial goods. Dolmen chambers received memorial offerings and 'token' ancestral bones ceremonially lifted from nearby family tombs; solitary menhirs stood to represent the gods (or ancestral 'great ones'); menhir alignments reflected the ritual calendar, marking the movement of the sun at solstices and equinoxes and the moon through its courses and phases; stone circles delineated sacred spaces (for ritual dancing, singing and chanting?); henges (a circle of ancestors?) stood in silent witness to the power of death in forging family / clan continuity and unity in the never-ending struggle for survival in a harsh and often unforgiving environment.

Conjectural? – yes. Far-fetched? – not in the least. The HMF ritual landscape has a marvelously human quality to it, and abounds in ethnographic parallels. Our principal point here is that the dolmen phenomenon cannot be isolated from other, equally important, HMF features. We must take them all in concert, with an integrative, holistic eye. Past research mostly focused on dolmens, likely for at least three reasons: (1) they were visually impressive, (2) they were repositories of pottery, objects and human bones and (3) they were readily accessible (and thus a favorite target of treasure hunters). How-

ever, such a 'tunnel-vision' approach is insufficient. Dolmens are only one component within a highly complex, organized system of ceremonial monuments with interrelated functions and symbolisms. Thus, all of TaHEP's work in the HMF is proceeding from a holistic perspective in attempting not only to ascertain the ritual significance of the HMF itself, but also to study its interconnectedness with the life and culture of the TaH urban population and supporting communities within the area.

Thus, a funerary – memorial sequence of events may have looked something like this: (1) the 'prepared' body was moved from an urban home or sacred precinct, through a city gate, up a ritual avenue to the 'family' dolmen within a 'clan' section (discrete field) of the HMF, (2) the deceased's body was ceremonially laid on top of the family dolmen, (3) the body remained on the dolmen top for a period during which the flesh was 'returned' to the elements (similar to Zoroastrian practice), (4) after the period of defleshing, the remaining bones were ritually gathered and placed with funerary objects into the family cave or shaft tomb and (5) periodically, according to a ritual calendar, the family returned to the tomb, ceremonially selected a token ancestral bone, or piece of bone, and proceeded to the family dolmen where the chamber had been prepared to receive the bone and a small ritual offering in memory of the ancestor(s). Periodically, the entire HMF may also have been used collectively by the community during larger annual celebrations associated with solstice and equinox events. The entire complex of HMF features certainly had family, clan and societal functions.

Summary Comments

The excavation of two undisturbed dolmens in two separate, defined areas – containing menhirs, stone circles, menhir alignments and other features – leads to the conclusion that complex, sacred practices were carried out amid the HMF monuments. The organization of the HMF into discrete fields suggests that the society's clan structure may have been responsible for that particular feature. The ceramic chronology reveals that the HMF and its dolmens remained a prominent feature of the local culture for over 2,500 years. Certainly, related rituals evolved over time, but the duration of usage still argues for a remarkable cultural continuity through time. The scarcity of human bones in association with dolmen pottery indicates 'symbolic' deposits rather than funerary rituals.

The HMF dolmens were unmistakably tied to the rituals of life and death, but at this point cannot be interpreted as primary burials. Care was not exercised when placing the bones and vessels in the chamber; prior deposits were pushed around or even removed in order to create space for the most recent ritual objects. The chamber was not cleaned, or even made neat, for the next deposit. Between deposits, the build-up of soil in the chambers leads us to believe that extended periods of time (perhaps as much as several decades) passed between one deposit and the next. Thus, the collective phenomena of the HMF likely comprised a well-used sacred landscape ('sacrescape' and 'necroscape') utilizing a long-term ritual calendar in which dolmen deposits served as one component of the larger ceremonial life of the local population.

Indeed, our theories about the nature of the HMF are continuing to evolve.

Acknowledgments

First author Mr Kennett Schath, wishes to thank Tall al-Ḥammām Excavation Project co-directors, Dr Steven Collins of Trinity Southwest University and Mr Hussein al-Jarrah of the Department of Antiquities, for their leadership and expertise in studying the HMF. Of our three collaborators, Schath has contributed the material regarding dolmen excavations in the HMF, along with many observations on its features and organization, al-Jarrah has provided his intimate knowledge of the HMF as a result of his surveying projects there, and Collins has provided his critical eye on all of the data presented herein, particularly the theoretical, anthropological interpretations of those data. We have also appreciated the consultations provided by TaHEP senior anthropologist, Ms Lucy Clayton, the expertise of Dr Leen Ritmeyer in producing the technical drawings, and the artistic acumen of TaHEP photographer, Mr Michael Luddeni, and cinematographer, Mr Daniel Galassini. Further, we wish to acknowledge the Department of Antiquities of Jordan under the direction of Dr Ziad al-Saad who has personally exhibited an

interest in TaH and the HMF. Finally, the entire staff and volunteers that contribute to the Tall al-Ḥammām Excavation Project, both in and out of the field, are to be commended.

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PRELIMINARY REPORT ON THE 2011 SEASON OF THE MADABA PLAINS PROJECT: TALL JALŪL EXCAVATIONS 2011

Paul Gregor, Paul Ray, Randall Younker and Constance E. Gane

Introduction

The 2011 season at Tall Jalūl and the Jalūl Islamic village, conducted by Andrews University, took place between 7 May and 17 June 2011. The excavations on the *tall* were directed by Randall Younker, Constance Gane, Paul Gregor and Paul Ray, of the Institute of Archaeology at Andrews University. The excavation in the Islamic village was directed by Reem al-Shqour[1]. Around 40 faculty, students and volunteers joined more than 20 Jordanian workers during the excavations this season[2].

Excavations at the site of Tall Jalūl began in 1992, with excavations in the Jalūl Islamic village beginning in 2008. For background information on Tall Jalūl, the Jalūl Islamic village and the history of the excavations at the site, see Gane *et al*. 2010; Gregor 2009; Gregor and Gregor 2009 and 2010; Herr *et al*. 1994, 1996 and 1997; Younker *et al*. 1993, 1996, 1997, 2007 and 2009; Younker, Gane and Shqour 2007; Younker and Merling 2000; and Younker and Shqour 2008.

Results of the 2011 Season at Tall Jalūl

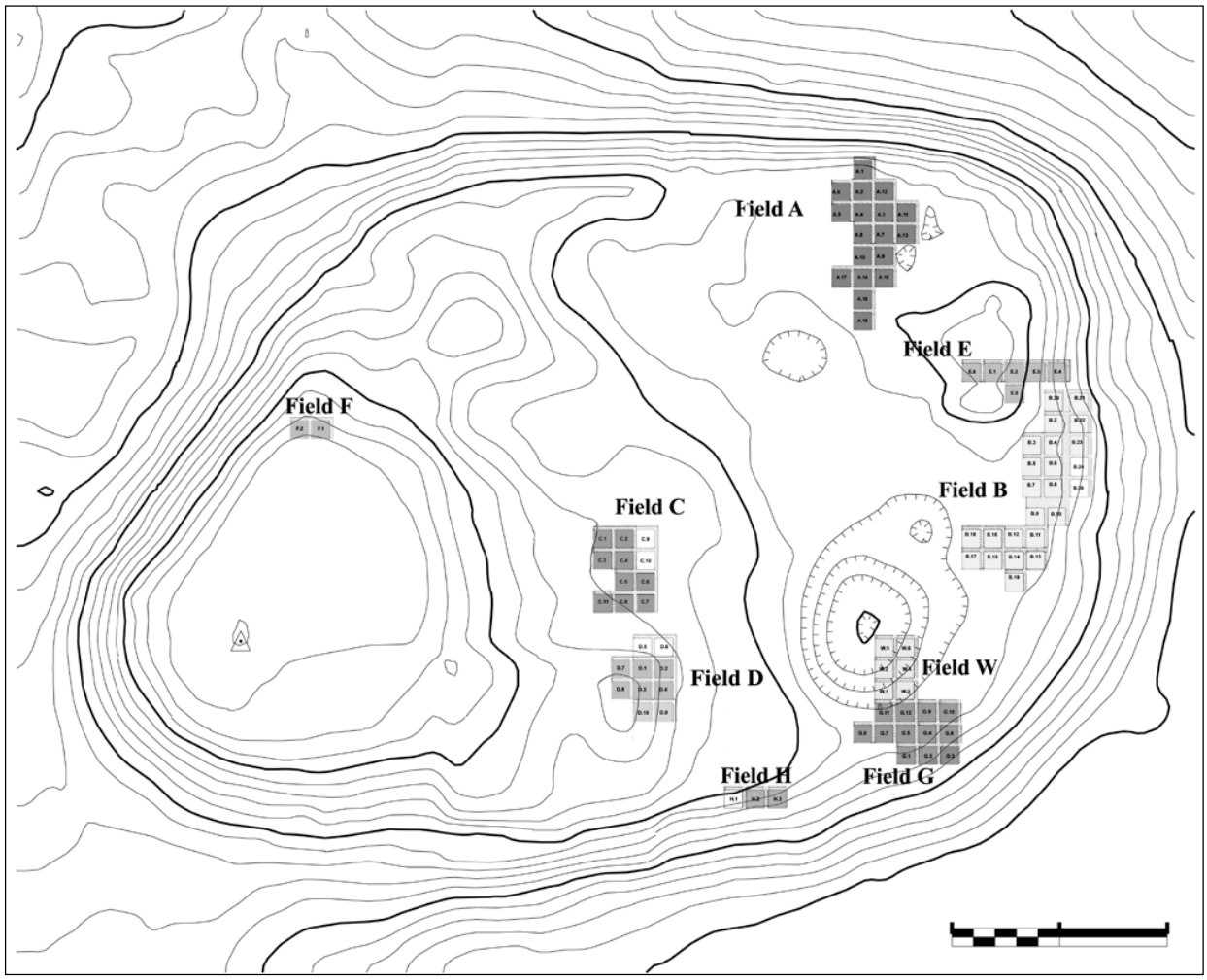
The 2011 season was designed to wrap up the first phase of excavations at the *tall*, in preparation for the publication of the excavations and discoveries that had been made up to this point. Excavations in Fields A, B and E on the north and east sides of the *tall* (**Fig. 1**) were completed some time ago, with excavations in more recent years concentrating on the southern and western sides (the latter just below the acropolis). Excavations on the *tall* during the 2011 season were conducted only in Fields C, G and W (water system).

Field C: Building Complexes (Paul Ray, Andrews University)

Excavations in Field C (**Fig. 1**) were begun in 1994 and focused on the remains of a pillared house, parts of which covered the original four squares (C.1 - 4) of the field. Unfortunately, owing to stone robbing, the western wall of this

1. Reem al-Shqour, Research Associate in Archaeology at the Institute of Archaeology at Andrews University, will present a separate report on the 2011 season at the Islamic village.

2. We wish to thank Dr Ziad al-Saad, Director General, and his staff at the Department of Antiquities of Jordan for their support of the project this season. We would also like to thank Barbara Porter and Chris Tuttle of the American Center of Oriental Research (ACOR) for their usual assistance. Finally, we appreciate the help of Hanadi al-Taher, of the Department of Antiquities of Jordan, who served as our departmental representative. Staff for the 2011 season included director Randall W. Younker and co-directors Paul Z. Gregor, Paul Ray and Constance E. Gane. Reem al-Shqour directed the excavations at the Jalul Islamic village. Theodore Bergh served as assistant to the director. Sabal Zaben was pottery formator and helped with a number of logistical issues. The field supervisors this season were Paul Gregor (Fields G and W) and Paul Ray (Field C). Paul Ray also served as object registrar; Christie Chadwick was the pottery registrar. Paul Ray and Carina Prestes served as architects, and Stephanie Elkins and Erika Fortin as photographers. Jacob Moody oversaw GPS readings on the *tall* and at the Islamic village.
Square supervisors for Field C included Christie Chadwick, Audrey Shaffer and Jennifer Shrestha. Square supervisors for Field G were Abalardo Rivas and Jeffrey Hudon. Square supervisors for Field W included Paula Arrais, Tiago Arrais, Carina Prestes and Denis Fortin. Square supervisors for the Islamic village were Elisabeth Lesnes and Jacob Moody.
Volunteers included Miguel Albarran, Jehieli Calderon, Maria Collazo, Arnold Deene, Seneque Edmond, Zoe Feliciano, Claribel Feliz, Erika Fortin, Rebekah Gauthier, Danilo Giordano, Sergio Soto-Gonzalez, Madeliz Guiterrez, Jake Heffington, Carlos Marrero, Courtney Merchant, Lyxelis Navarro, Mary Peoples, Vladimir Popovicheff, Nanyeli Quiles, Efren Reyes, Hector Rubert, Ramona Silsbee and Yomara Torres.



1. Topographic map of Tall Jalūl, with excavated fields.

building was removed not long after it went out of use. In an effort to locate the southern end of the building, a new square (C.5) was opened in that direction in 1996. Not only was this side of the building found, but parts of two walls of another building were also exposed. Hence, while the general shape of pillared house has been known since the late 1990s, with most of it excavated to bedrock, the intriguing nature of the new building, lack of personnel and other logistical issues dictated that operations in this field move laterally, to the south. Work has been concentrated in this part of the field for the last few seasons, where a large 'public' building has been excavated.

During a short three-week mini-season in 2010, which focused primarily on other sections of the *tall*, the supervisor of this field, who has also functioned on and off as site architect, was drawing walls in this part of the field and discovered that the balk of one of the northernmost squares had eroded over the decade that had elapsed since it was last worked, exposing several stones that appeared to be part of a wall. Theorizing that this could be part of the previously unexcavated northern wall of the pillared building, plans were made in the 2011 season to completely uncover the last remaining section of this structure.

The objectives for Field C in the 2011 season were therefore to clarify the architectural plans of the two major buildings[3] previously found in

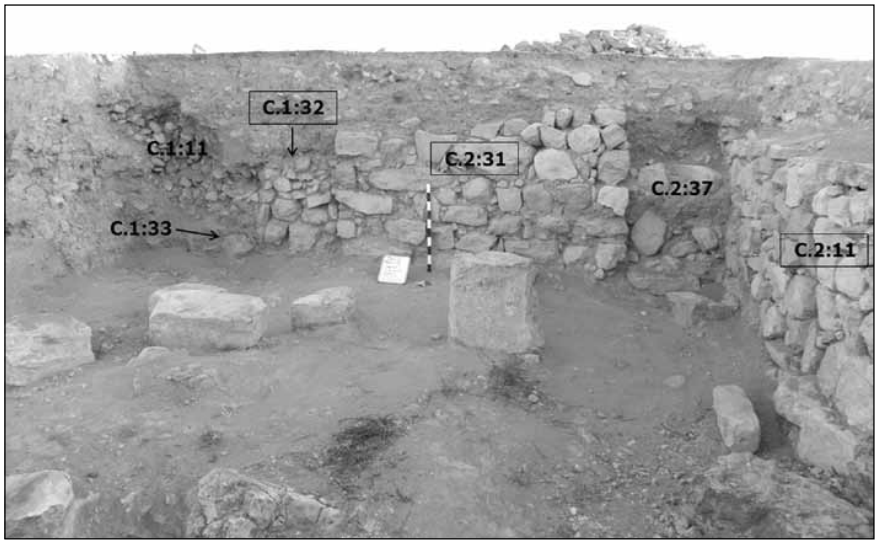
3. One wall of a third building was found in the field to the south-east of the pillared house, in Square 6; another was found west of the pillared house, in Square 3, and was presumably associated with another building.

the field: the pillared house at the northern end and the public building at the southern end.

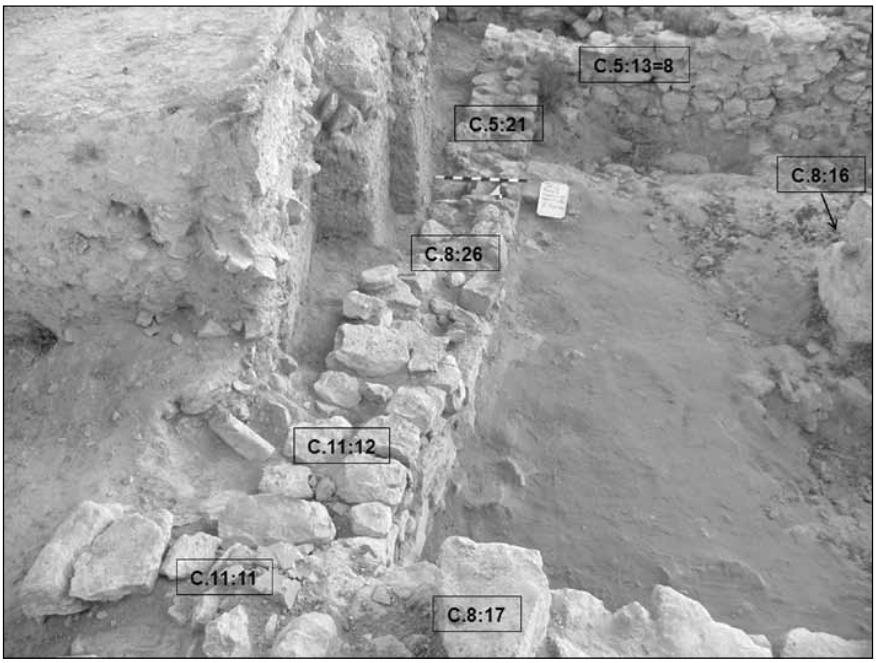
In the northern part of the field, two of the previously opened squares (C.1 - 2) were worked. The north balks of each of these squares were removed, exposing the northern wall (C.2:31) of the pillared building (**Fig. 2**). It was a free-standing wall with entrances (C.1:32 and C.2:37) at each end (west and east respectively). The ceramics found on the floor (C.1:23 and 24 = C.2:19 = 28) associated with the wall date to the Iron Age II (7th century BC), which confirms the dating from earlier seasons for the earliest phase (field phase 9) of this building. The western entrance (C.1:32) of the north wall was blocked during the Persian period re-use (field phase 8) of the building. The eastern entrance (C.2:37) was left unexcavated in the hope of preserving the continuity of the northern and eastern walls without further consolidation at this time. A large flat stone at the very bottom of this entrance may have served as its threshold, but without further excavation this remains a hypothesis. To the west of the blocked western entrance (C.1:32), the remains of a robber trench (C.1:11) excavated to remove stones from the western wall can still be seen in the north balk of Square C.1 (**Fig. 2**). Within the robber trench are numerous small to medium-sized boulders and cobbles, which probably belonged to the upper portion of the Persian period wall blocking this entrance. To the west of the blocked entrance and in front of the robber trench, as seen in the balk, is one large stone (C.1:33) which may have been a remnant of the robbed western wall of the house.

In the southern, public building (in Squares C.5 - 8, 11), the southern wall (C.8:17) was more fully exposed by the removal of part of the south balk in Square 11. The newly revealed section of the wall (C.11:11) is now seen to form a bonded corner with the western wall of the building (C.11:12). Removal of the east balk of Square 11 exposed the remainder of the western wall of the building complex. This wall (C.5:21 = C.8:26 = C.11:12) is now fully exposed and forms bonded corners with the north (C.5:8 = 13 = C.6:21) and south walls (C.8:17 = C.11:11) of the building. Hence, three walls of the public building are now fully exposed (**Fig. 3**). On the east side of the building, a small stretch of the wall (C.7:14) was found, although the south-eastern corner where it should tie in with the southern wall has not been located. The rest of the east wall appears to have been robbed out. The absence of a door in any of the three completely excavated walls suggests that the entrance(s) to the public building were in the eastern wall, on one or both sides of the partition wall (C.7:12 = C.8:16) between the two large rooms of the complex. The pottery, as in previous seasons, suggests an Iron Age II C / Persian period date for this building.

In addition to completing the excavation of the two major buildings in Field C, the space between the southern wall (C.5:44 = C.6:19) of a third building (east of the pillared house) and the public building to the south has now been completely exposed. Above this, in earlier



2. Wall C.2:31 and related features in Field C, Squares 1 and 2.



3. Newly excavated walls in Field C, Squares 8 and 11.

seasons, at least two Iron IIC / Persian period cobble stone streets (C.5:37 = C.6:8 and C.5:39 = C.6:11) belonging to field phase 4 were exposed. Wall C.5:44 = C.6:19 of the eastern building appeared to meet the east wall (C.2:11 = C.4:10 = 20) of the pillared house at an awkward, curved angle. While the two walls seemed to be connected, there were a number of large stones lying exposed near this potential 'join'; it is therefore possible that some of these stones had simply fallen from one or both of these walls during an earthquake, with the joining of the walls actually being an illusion. After the lower part of the east balk of Square 5 was completely removed, the decision was made to disassemble part of wall C5.44 = C.6:19 to see whether the two walls actually joined. In so doing, it became clear that the two buildings were indeed bonded together. It would appear that the eastern wall of the Iron Age II pillared building was definitely re-used, forming the western wall of the new building to its east when it was built in the Iron II C / Persian period. The dating of the latter building is based on the ceramics found in the foundation trench (C.6:28) of its southern wall (C.5:44 = C.6:19).

This season's excavations in Field C wrap up the first phase of excavation on this part of the *tall*, answering all of the remaining questions associated with the two major buildings in this field.

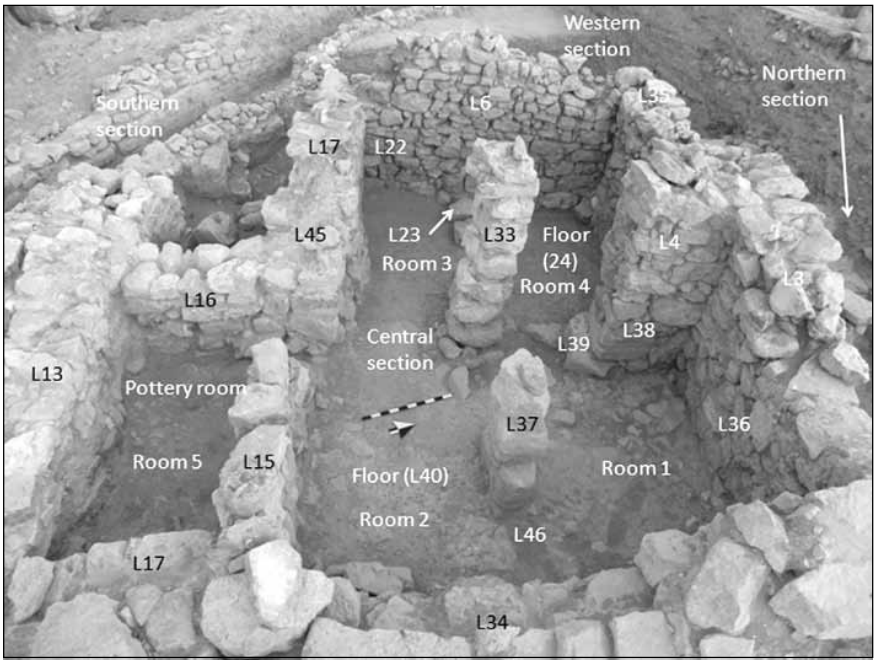
Field G: Pillared Building (Paul Gregor, Andrews University)

During the 2011 season of excavation at Tall Jalūl, two squares were excavated in Field G. Work continued in Square 9 which was opened in 2009 (**Fig. 1**). At that time work was conducted in this square for only a few days, at the end of the season. In spite of the short period of excavation, two occupational phases were discovered. The Persian period was represented by Wall G.9:2 and 7th century BC occupation by Walls G.9:3 and 4. Two additional occupational phases were discovered during the 2011 season, dating to the 9th and 8th centuries BC; these were represented by both walls and floors. This season a new square (G.12) was opened, east of Square 11, where a water channel had previously been revealed, and north of Square 5, where the pillared building was located together with the water channel (**Fig. 1**). Square 12 produced four consecutive phases dating to the 9th, 8th and 7th centuries BC, and the Persian period. These four occupational phases are represented in both squares, interrupted by destruction and abandonment layers.

Occupational Phase 1 (9th century BC)

Phase 1 in Field G was present in both squares, where remains of the pillared building were discovered. The entire building complex

was constructed during 9th century BC and consists of several sections (**Fig. 4**). The northern section, which consists of one large room, was found in Square G.9 and is supported by a pillar (G.9:28) located in the middle of the room. This rectangular room is surrounded by two long walls, one on the north (Wall G.9:31) and one on the south (Wall G.9:36), and by two short walls, one on the west (Wall G.9:19) and one on the east (Wall G.9:34) (**Fig. 5**). The eastern wall also functioned as part of the eastern section of the city wall. The room is approximately 6 m long and 3 m wide. All of the walls were made of roughly hewn, medium to large limestone boulders, stabilized with smaller chink stones, laid in two parallel rows to create walls 1 m thick. The only exception to this construction technique is the southern wall, which separates this room from the central section of the building and is 0.6 m wide. This room was con-



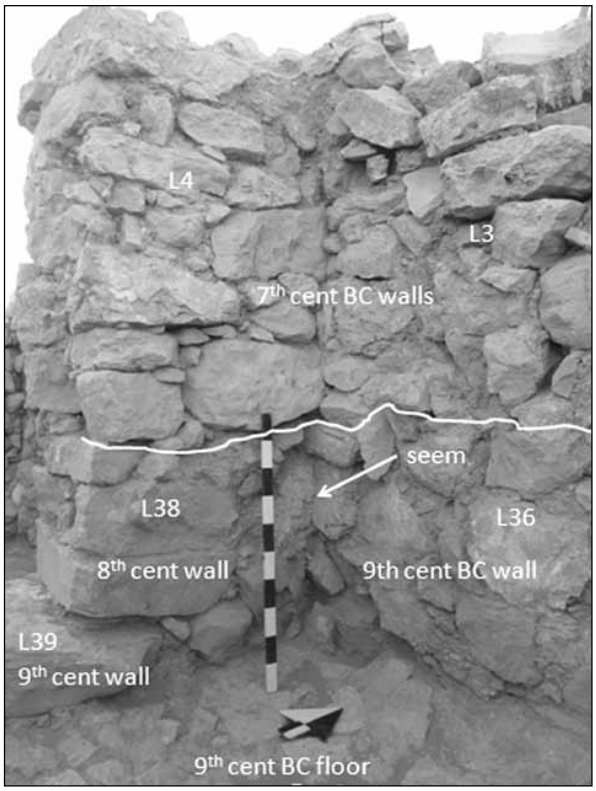
4. Field G: central section of the building, looking west.

5. Field G: building complex, looking south.

nected to the central section by a door located in the south-western corner of the room. The door was 1 m wide and was blocked by Wall G.9:35 during the 7th century BC (**Fig. 5**) The pillar, located in the middle of the room, was preserved up to 1.2 m in height with five stones sitting on top of each other. This pillar probably supported a central beam connecting the western and eastern walls, thereby providing adequate support for a second story or the roof of the building. East of the pillar, a door socket was discovered in situ imbedded in the floor of the room, surrounded by one flagstone to the south and two flagstones to the north, suggesting that the room was probably sub-divided at one time. This line of flagstones with a door socket may outline a possible wall (Wall G.9:29), creating a small back room on the eastern side of the north room. The floor (Locus 37) of the room was made of beaten earth, neatly spread throughout the room.

Part of the central section, which is located in the middle of the building complex, had been discovered the previous season (2009); it was completely uncovered this season (2011). The central part of building complex consists of five rooms (**Fig. 4**). For clarity we have assigned them separate numbers (1-5). Room 1 is located in the north-eastern part of this central section, while Room 2 represents its south-eastern part. Room 3 is located to the south-west, while Room 4 occupies the north-western part. Room 5 is also known as the pottery cache room, as an enormous quantity of pottery was found there during the 2009 season. This Room 5 is located south of Room 2.

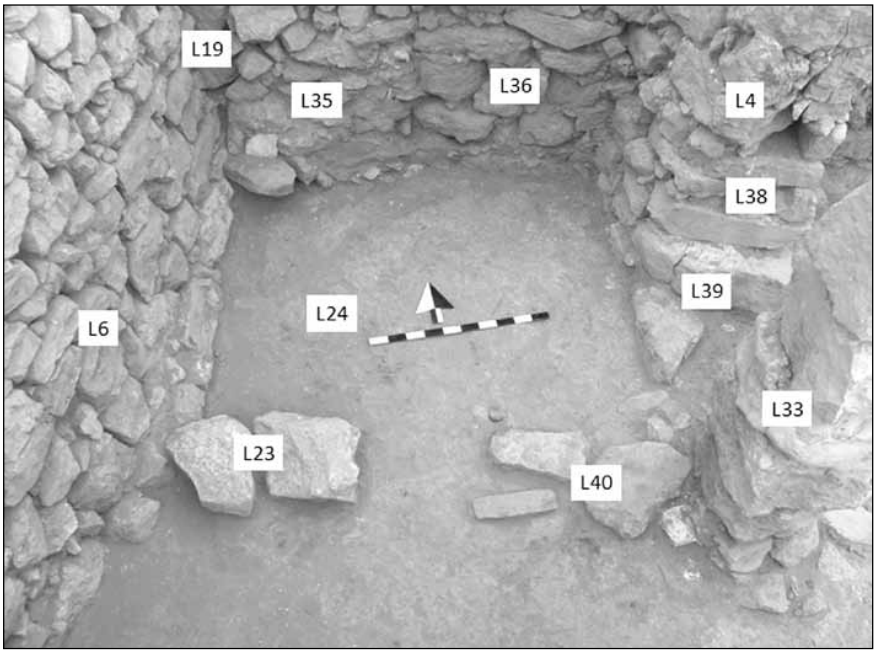
Room 1 is 2 m wide and 3 m long, and is surrounded by three stone walls. One of these walls is a long wall (Wall G.9:36) on the north side; it is 0.6 m thick and built of roughly-hewn, medium-sized limestone blocks, with a fill of chinking stones. The eastern wall (Wall G.9:34), which is 2 m long, also served as part of the city wall and is 1 m thick, built of larger limestone blocks in the same fashion as the northern wall. The western wall (Wall G.9:39) is not well-preserved because the building was re-modeled during the 8th century BC, with this wall undergoing the most changes. Only a few stones are visible to indicate that it once existed (**Fig. 6**). The southern wall included a pillar (Locus 37), which was positioned in such a way that the space between it and the western wall (Wall G.9:39) of the room served as a doorway, while the space between the pillar and eastern wall (Wall G.9:34) was filled with a narrow wall (Wall G.9:46) to enclose the area. The pillar is partially preserved with three roughly-hewn, medium-sized stones still standing, creating a pillar 1.5 m high. Room 2 is similar in size to Room 1 and is located between Rooms 1 and 5, to the north and south respectively. Room 3 is rectangular in size, and is located to the west of Room 2 and south of Room 4. It is a narrow room, 1.5 m wide and 3 m long, with its entrance on the eastern side. The room is surrounded by a long wall (Wall G.5:17 = G.4:45) to the south, constructed with medium to large boulders and filled with chink stones. It is well-preserved, in some places standing up to 2 m in height. The western wall (Wall G.12:22) is similarly constructed and is only partially preserved, being visible only in one corner where it is approximately 3 m high. The northern wall (Wall G.12:23 and G.9:40) served as a divider between Rooms 3 and 4 (**Fig. 7**). During the 8th century BC remodeling, it was almost entirely removed



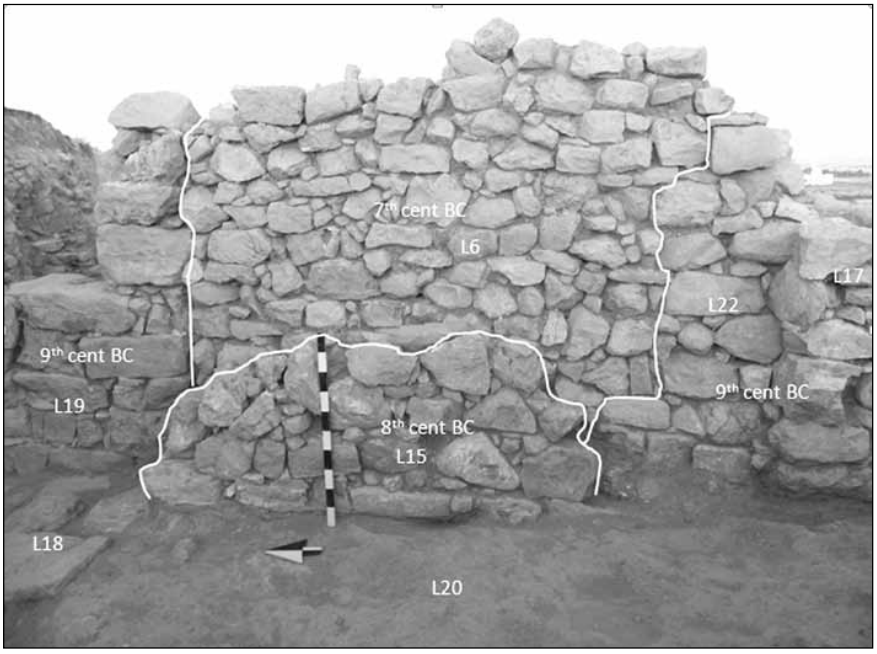
6. Walls in Room 1, representing all three occupational phases.

except for the first layer of stones, which are the sole reminder of its presence. There was a small entrance located in the middle of this wall which connected Rooms 3 and 4. Room 4 is almost square in shape, measuring approximately 2.5 m across. Another door was located in its north-western corner, connecting the central and northern sections. There is a possibility that the western wall of this room also contained a doorway, connecting this and the western sections of the complex[4]. The central section, represented by five rooms, had a beaten earth floor filled with patches of small stones.

The western section was mainly revealed in Square G.12. Owing to the fact that a few flagstones of a floor were discovered (Loci 17 and 18), it is possible that it served as an open courtyard (**Fig. 8**). Much of this section was totally



7. Room 3, looking north.



8. Square G.12, looking east.

4. Room 5 was described in Younker *et al*. 2009: 30, as it was fully excavated in the 2009 season.

obliterated by the later construction of the water channel during the 7th century BC. It is also possible that the western and southern sections were connected by a door. The southern section suffered greater destruction from the 7th century BC channel than the western section.

Occupational Phase 2 (8th century BC)

Sometime during the 8th century BC, the building complex was re-modeled. This is evident in both squares (G.9 and G.12). The 9th century BC floor was raised by a fill some 20 to 30 cm thick. The elevation of the floor is visible in the northern section, excavated in Square G.9 and represented by Locus 22. The size of the northern section of the building complex was reduced by a wall (Wall G.9:30) which was laid on a new surface. All the other walls in this section were re-used during this phase. Wall G.9:30 runs parallel to Wall G.9:31, used in the earlier phase, and is 1 m thick, consisting of large limestone boulders which were partially hewn (**Fig. 5**). At this time the space between the pillar (Locus 28) and Wall G.9:31, which belonged to the previous occupational phase, was filled and the pillar seemingly re-used to sub-divide this long room into two smaller rooms. The room was approximately 6 m wide (as it had been during the earlier phase), but its width was reduced to 1.8 m. Wall G.9:30 cuts through Wall G.12:19 and continues to the western section of the building complex. Its eastern part was robbed during the Byzantine or Islamic periods and it is not known how it originally connected with the eastern wall (Wall G.9:34).

The central section of the building complex suffered the most changes during the remodeling which occurred sometime during the early part of the 8th century BC. The five rooms which existed during the 9th century BC phase were reduced to 3 rooms in the 8th century BC. Room 5 (the pottery cache room) was left untouched and was still in use, with an elevated floor, as were all other rooms. The wall which separated Rooms 1 and 2 was removed, but the pillar (Locus 37) was now in the middle of the room and served as a support for the upper floor of the building. In this manner a larger, square room was created that was approximately 4 m long and 4 m wide (**Fig. 4**). Rooms 3 and 4 also went through significant changes. Walls G.12:23 and G.9:40, which separated these two rooms, were removed with the exception of their first courses. The floor was elevated to cover these remaining stones and a larger room was created. It is 3.5 m wide and approximately 2.5 m long. The eastern wall (Wall G.9:39) was removed and a new pillar (Locus 33) was erected. The pillar is entirely preserved, with its lintel still in place. In addition, a new wall (Wall G.9:38) was built which abutted against the northern wall (Wall G.9:36). The pillar (Locus 33) served to support the ceiling and upper floor. In this way, the room was accessible from both sides of the pillar. The door located in the north-western corner still existed in this phase, providing access to the northern section of the building complex.

Although the central section was connected to the western section by a possible door during the previous phase, at this time the entire section was blocked by Wall G.12:15, located in Square G.12 (**Fig. 8**). It was built of stones similar to Wall 30 in Square G.9. Wall G.12:15 was built on the existing 9th century BC pavement, and probably was connected with Wall G.9:30 at a right angle.

This phase ended abruptly during the last part of the 8th century BC. Burnt material, mixed with fallen bricks from the upper level, covered the floor throughout the entire building complex. The best preservation of this destruction was evident in the central section of the complex, especially in Room 5, where a large amount of pottery (dated to the end of 8th century BC) was found in 2009. As well as burnt material, the other rooms also contained a significant amount of pottery, very similar to that found in Room 5. In addition, an intact, small chalice (Object No. 869) and a fairly-well preserved, small cosmetic bowl (Object No. 868) were discovered.

Occupational Phase 3 (7th century BC)

After the 8th century BC destruction, the building complex went through significant changes. Fallen debris (approximately 1 m thick) from the upper floor was very extensive, indicating a near-total destruction of the entire building complex. Furthermore, the western and southern sections of the building were severely damaged by construction of the water channel which was built shortly after the destruction of the 8th century BC structures. The channel was

0.5 m wide and was built with small and medium-sized stones. The walls of the channel were 0.3 m thick and plastered on their inner sides. At some places the channel walls were preserved to a height of more than 1 m. The channel was built from the south-eastern corner of the city wall and, circumventing the central building section, cut through the southern and western sections. It then extends further north, passing by the eastern side of the depression of the water reservoir. The walls of the channel are well-preserved except at its northernmost section (in Field W), where they were partially robbed out. It is lies just a few centimeters under the present ground surface.

During construction of the channel, the remainder of the western and southern sections of the building were filled and leveled with debris to support the outside walls of the channel and to create a new surface. The northern section was also abandoned and infilled to the same level. The central section of the complex was the only part which was reconstructed and used during the 7th century BC. Rebuilding occurred in all rooms except Room 5, which was abandoned and leveled, as were the other parts of this complex.

Walls G.4:15 and G.5:17 = G.4:45 became the southern wall of the 7th century BC building, which was re-used from previous phases. Wall G.9:34 was still used as the eastern wall, without any visible change. Pillars 33 and 37, located in the middle of the section, likewise continued in use (**Fig. 4**). The floor of the building was also elevated to the same level as the rest of the complex. The northern wall underwent extensive changes. The door which connected the central section with the northern part was blocked by Wall G.9:35; Walls G.9:36 and 38, from the previous phase, were replaced by Walls G.9:3 and 4 respectively (**Fig. 5**). The stones used in this phase were smaller and the structure itself was not as well-built as the previous one. On the western side, Wall G.12:15 was replaced by Wall G.12:6 (**Fig. 8**) which was built with a similar type of stone as the other walls from this phase. The entire structure was abandoned at the end of the 7th century BC.

Occupational Phase 3 (Persian period)

This period of occupation is not well represented in Field G. Evidence from this period of settlement was found in Square G.9, where only a poorly-constructed portion of a wall (Wall G.9:2) survived. Like Square G.9, G.12 produced evidence of Persian period occupation in the form of portions of two small walls (Walls G.12:3 and 5) associated with that settlement.

Field W: Water System (Paul Gregor, Andrews University)

Field W was carefully laid out on the south-eastern ridge of the large depression. Work in this field started during the 2010 season, when four squares were opened. The squares were opened in order to find the continuation of the water channel, anticipating that it would run straight to the depression where the remains of a water system were expected to be found. The excavation of these four squares brought the desired results and the continuation of the channel was revealed. However, it turned out that the channel does not run into the water system, but rather passes the depression on its eastern ridge, going further north. By the end of the season, 33.5 m of the water channel were exposed, but the northernmost section of the channel was destroyed by ancient stone robbers.

This season (2011), work continued in Field W. In addition to Squares W.2, W.3 and W.4, two additional squares (W.5 and W.6) were opened, situated north of Squares W.2 and W.4 respectively (**Fig. 1**). The goals of this season for Field W were to discover the possible continuation of the water channel in Square W.6, and to see if the water system existed in the great earth depression in Square W.5. After the second season of excavation, Field W yielded three occupational phases consisting of structures next to the water system.

Phase 1 (9th century BC)

This phase was present in Squares W.2 and W.5, represented by floors and walls. Floor W.2:17, made of beaten earth and packed with pebbles (**Fig. 9**), was built over a fill which represents an abandonment phase of the 10th century BC. The pottery excavated under Floor W.2:25 was mainly Iron Age I, with the occasional presence of early Iron Age II sherds. Since the floor was not properly leveled it was covered with a fill and re-surfaced, thereby cre-

9. Squares W.2 and W.4, looking east.

ating a new floor (W.2: 23) made of lime plaster. On the northern side of Square W.2, the fill was 0.5 m high, while the southern side of the square revealed that these same two floors (25 and 23) joined together and were actually the same floor. Since Floor 23 was more level and made of lime plaster, it created a much smoother surface than the previous one. Both floors were constructed during the 9th century BC, displaying evidence for repair or remodeling. They probably represent surfaces created as walkways or streets.

Square W.5 revealed the presence of the same phase, with the discovery of the water reservoir which was partially exposed. As the earth depression where the reservoir was discovered measures more than 50 m in diameter at its rim, it is obvious that Square W.5 has revealed only a fraction of this feature. Four meters of debris have been removed so far. At this point, the wall (W.5:11 = W.2:19) is at least 2 m high and 1 m thick at the rim (**Fig. 10**). The inner wall is covered with several layers of plaster, which was

10. Reservoir.

also applied to its floor (W.5:16). The plaster was made of lime mixed with finely crushed stones. It is very compact, creating a hard surface which could have contained water for a long time. The reservoir surface was re-plastered at least four times and is 0.35 m thick in its final form. Dates for re-plastering are not known since the plaster did not contain any dateable material. The first layer was placed either on the paved surface or on the bedrock.

The reservoir was constructed by the 9th century BC, if not earlier, and was probably in use until at least the end of the 7th century BC. Floors W.2:23 and 25 seem to have been sealed against the highest stones of the reservoir's wall, suggesting that these floors and the wall belong to the same phase. The pottery which was found in the bottom of the reservoir was not abundant, but included the remains of holemouth kraters, pythoi, cups and bowls, all dating to Late Iron Age II. There is no evidence of destruction. Burnt deposits containing smashed vessels are totally absent, suggesting that this phase ended with a smooth transaction to the next one.

Occupational Phase 2 (8th century BC)

The presence of the 8th century BC occupation continues in Squares W.2 and W.5, at which time the area surrounding the water reservoir was remodeled. A small wall was built on top of Floor W.2:23 (**Fig. 9**). Owing to stone robbing, only a fraction of this wall (W.2:12=28) survives. The wall continues into Square W.5 as Locus 17, where it seems to be slightly better preserved. It is made of a single line of small limestone rocks, stands up to 1 m high and is located about 1 m east of the reservoir, running along its rim.

Floor 23 from the previous phase was filled with soil 0.6 m thick in some places. A new floor (Locus 17) was constructed on top of the fill. It was made of compact beaten earth, containing small pebbles, and sealed against the short wall (Wall W.2:12 = 28 = W.5:17). The floor and the wall, which may also have served as a protecting ramp, were used as a walkway or street, making the approach to the reservoir safer and more accessible (**Fig. 9**).

Unlike Field G, which produced substantial evidence for the complete destruction of the 8th century BC settlement, Field W did not yield any material to suggest that this phase ended violently. The reason for this might be found in the fact that this was a water reservoir that was not attached to any domestic or administrative structures.

Occupational Phase 3 (7th century BC)

After the 8th century BC phase, 0.5 m of fill accumulated on Floor W.2:17, above which the 7th century BC water channel was constructed. Even though the channel runs parallel to the reservoir, so far it is located about 6 m to its east. Square W.6 revealed a small section (Locus 10) of the channel in the north-east corner of the square, indicating that that it continues further north. So far the channel has been excavated for about 40 meters. Up to this point it is not connected in any way with the reservoir, even though the pottery found in the bottom of the reservoir indicates that they co-existed.

In addition to the channel, a wall (W.4:10 = W.6:9) was found in these squares (**Fig. 9**). The wall runs east of and almost parallel to the channel. It was built of roughly-hewn limestone blocks laid in two rows. The stones are mainly small and medium-sized boulders filled with chink stones. It is approximately 8 m long and disappears into the east balk of Square W.6. On the southern side of Square W.4 it joins with another wall (W.4:17), creating the south-western corner of a building. The entire floor (Locus 16) of the building is paved with limestone slabs. The function of this building is presently unknown since only a limited area has been excavated. The building and the channel were built at the same level, suggesting that both were in use at the same time. In addition, preliminary reading of the pottery found on the floor dates it to the 7th century BC.

Conclusions

The results of the 2011 season have tied up a number of loose ends regarding the architectural integrity of the buildings in Fields C and G, bringing the first phase of excavation at Tall Jalūl to a relatively smooth conclusion. A number of artifacts with domestic (e.g. mortars, pestles, grinders, pounders, weights, stone bowls, whetstones), jewelry (e.g. beads), textile (e.g. spindles, spindle whorls, awls) recreational (e.g. rattle) and possibly cultic (e.g. figurine frag-

ments) functions were also found this season.

However, the latest part of the water channel and newly discovered section of the reservoir are features which require additional attention along with other, as yet unidentified, research questions. These remain to be tackled in the forthcoming second phase of excavation at the site.

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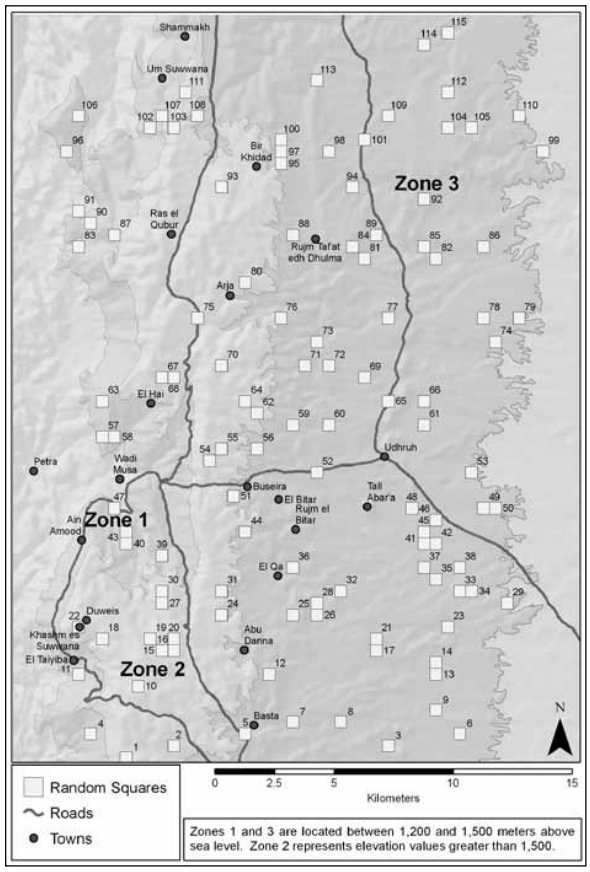
THE SHAMMĀKH TO AYL ARCHAEOLOGICAL SURVEY, SOUTHERN JORDAN: SECOND SEASON 2011

Burton MacDonald, Larry G. Herr, D. Scott Quaintance, Wael al-Hajaj and Aurélie Jouvenel

Introduction

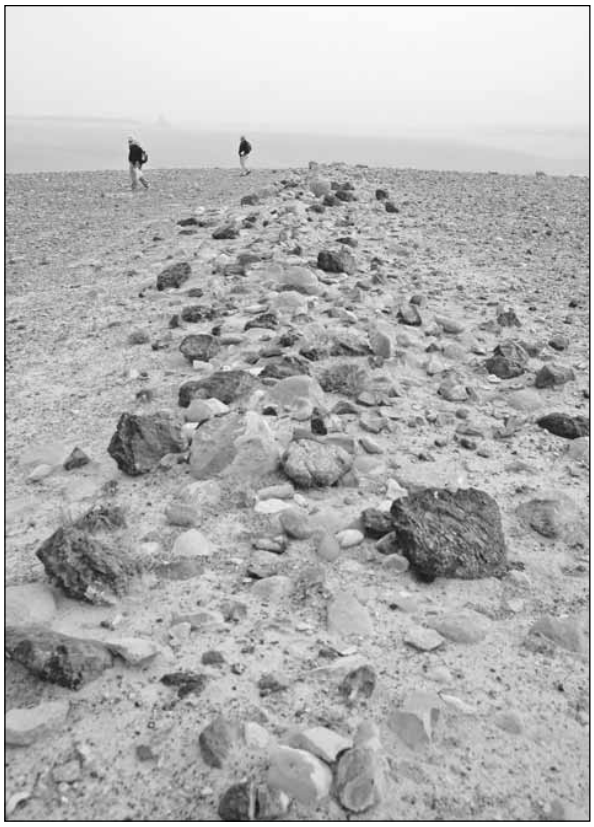
The second season of the Shammākh to Ayl Archaeological Survey project (SAAS) in southern Jordan was in the field from 24 April to 8 June 2011[1]. Team members for the season included the authors of this article and Sate Massadeh, representative of the Department of Antiquities of Jordan[2].

The main objective of the SAAS project is to discover, record and interpret archaeological sites in an area of approximately 600km^2 (**Fig. 1**). Other objectives are to determine the area's settlement patterns from the Lower Paleolithic (*ca* 1.4 mya) to the end of the Late Islamic period (AD 1918), to investigate Pleistocene (as late as *ca* 10,000 BC) sediments and lakes in the eastern segment of the survey territory, to document the many farms, hamlets and villages that provisioned the major international sites of the area, e.g. ash-Shawbak, Petra and Udhruḥ, to investigate further the *Khaṭṭ Shabīb* or Shabib's Wall, a low stone wall running in a generally north-south direction (**Fig. 2**), to record the inscriptions, rock drawings and *wusūm* (tribal markings) within the area, and to link up with previous work that the project director and others have carried out in southern Jordan (e.g. Abudanh 2004, 2006; 'Amr *et al*. 1996, 1997, 1998, 2000; 'Amr and al-Momani 2001; Findlater 2000; Glueck 1935, 1939; Graf 1979; Hart and Falkner 1985; Hart 1987, 1989; MacDonald *et al*. 1988, 1992, 2004, 2011; Tholbecq 2001; Whiting *et al*. 2009)[3]. Accomplishment of the above-mentioned objectives will contribute towards the writing of an archaeological history of southern Jordan from Wādī al-Ḥasā in the north to Rās an-Naqab in the south.



1. The Shammākh to Ayl Archaeological Survey: ecological zones and random squares.

1. For reports on the 2010 season of the project see MacDonald *et al*. 2010a and b.
2. Team members and their roles for the 2011 season were: Burton MacDonald, director, Larry G. Herr, ceramic specialist, D. Scott Quaintance, photography and mapping, GPS, and database and website manager, Wael al-Hajaj, lithic analyst, Aurélie Jouvenel, GPS, GIS, mapping and artifact registrar and Sate Massadeh, representative of the Department of Antiquities of Jordan.
3. For an overview of the contribution of some of the above-listed surveyors to the archaeology of southern Jordan see MacDonald *et al*. 2010a.



2. Site 267: a segment of the Khaṭṭ Shabīb cutting through RS 92.

The territory being investigated is part of the southern segment of the Transjordanian plateau, that is, the so-called Edomite Plateau. It includes the area from just north of the village of Ayl in the south to Shammākh in the north, from the 1200m contour line in the west to the 1200m contour line in the east, i.e. into the Jordanian desert immediately west of the city of Ma'ān. The area is *ca* 30km (north-south) by *ca* 20km (east-west). As **Fig. 1** indicates, however, the survey territory is not rectilinear but follows the 1200m contour line in both the west and east.

Altitudes vary within the territory: 1200m on the western and eastern boundaries, 1521m just south-east of Shammākh, 1736m in the central segment and 1506m at Ayl in the south-central area, immediately south of the survey territory. Much of the western half of the survey area is part of Jabal ash-Sharāh, the mountain range which extends from ash-Shawbak in the north to Rās an-Naqab in the south.

Present annual rainfall in the area varies from a high of around 300mm to less than 100mm: *ca* 300mm in the ash-Shawbak-Nijil region (elevations of *ca* 1500m or more), *ca* 200mm immediately to the east and west (elevations of *ca* 1500-1300m) and 100mm in the area between Udhruḥ and Ma'ān in the eastern portion of the territory. Thus, the eastern segment is located in the steppe, that is, the area between 'the desert and the sown', where evidence of pastoral activity is present in many archaeological periods.

Methodology

For archaeological investigative purposes, the survey territory is divided into three topographical zones: Zone 1 (the western segment) lies in the area where elevations are between 1200 and 1500m; Zone 2 (the west-central segment) is the mountainous region where elevations values are greater than 1500m (actually, as indicated above, part of Jabal ash-Sharāh); Zone 3 (the eastern segment) is the area between the 1500m and 1200m contour lines (see **Fig. 1**).

The principal method for discovering archaeological materials, including sites, is a technique based on recording the remains collected while transecting randomly-chosen squares (500 x 500m) in the three topographical zones of the survey territory. A Geographic Information System (GIS) database randomly selected the 115 squares which represent about five percent of the total area of each of the topographical zones in the survey territory.

Investigation of these random squares in each zone performs three primary functions: (1) it provides a baseline, against which artifactual material collected from archaeological sites in the region may be compared, (2) it forces survey team members into all areas of the territory, eliminating any sampling bias the team may have toward easily accessed areas and (3) recording random squares has proven to be an effective means of discovering sites, within, adjacent to and while traveling to / from the squares. In essence, the recording of random squares provides access to a statistically valid sample of archaeological materials, including sites, within the territory (Herr and Christopherson 1998: 52).

The GIS database provides the co-ordinates for each of the 115 randomly-chosen squares. Team members use a Global Positioning System (GPS) to locate one corner of a square. Once it is located, they (five persons) position themselves, usually at a distance of *ca* 50m apart (the visibil-

ity in the region is generally good) along one of the lines of the square. With the help of a compass to maintain a straight line, team members transect the square, picking up lithics, sherds, glass and other portable artifactual materials. For each 500 x 500m square, team members walked two transects.

The recording of a random square involves recording data on the 'Random Square Data Sheet'. The transecting and recording of each square takes approximately two-person hours (excluding the time spent locating and getting to the square).

When an archaeological site, i.e. individual features that combine in a variety of ways to form a single unit, is discovered within the square, it is recorded separately on a 'Survey Site Sheet'.

Once the random square and any archaeological sites within it are recorded, survey team members turn their attention to the surrounding area in their search for sites. We spend a fair amount of time searching for and recording any archaeological sites in the vicinity of the square. In addition, we speak with the people living and / or working in the area, e.g. farmers and shepherds, about the whereabouts of sites. Moreover, while driving to / from the square, team members are on the lookout for sites. When located, they are also recorded on 'Survey Site Sheets'.

Once a site is 'discovered', it is 'sherded' for artifacts, described and plotted on a map using the co-ordinates obtained from the GPS unit. Survey data sheets are filled out initially in the field. All collected materials are labeled before being placed in the vehicle. Additional information is being added as analyses progresses.

Digital photographs are taken of the topography of all random squares and the features of all sites. These are added to the project's database and are used while analyzing the artifactual materials from squares and sites; some will be published in black and white format in survey reports, and all will be put on a DVD which will be part of the project's final report.

Each day, preliminary washing and registering of the collected artifacts is done, 'Survey Artifact Forms' are completed, photographs are taken of significant artifacts, and descriptions of the random squares transected and sites investigated are entered into the project's database.

Following the field season, selected artifacts, *viz.* lithics and sherds, are shipped with the Department of Antiquities' permission to the home universities of the director and his collaborators. These are further analyzed, drawn, photographed and prepared for publication.

Work Accomplished

During the 2011 season, SAAS team members concentrated their efforts on the northern half of the survey territory, that is, from the area immediately to the north of random squares RS 55-56 and 57-58. In this area, they transected 50 random squares: four in Zone 1, 10 in Zone 2 and 36 in Zone 3 (**Table 1**).

SAAS team members were not able, for various reasons, to transect seven squares this season. Owing to time constraints and difficulties encountered in accessing them, SAAS team members did not transect RS 83, 90, 91, 96 and 106 in Zone 1. They spent three and a half days in their attempts to transect these squares. On 6 May 2011, they attempted to reach the area of RS 83, 87, 90 and 91. Although team members did not reach any of these squares on that day, they did record seven sites, *viz.* Sites 211-217. On 7 May 2011, two SAAS team members drove down the Bayḍā-Wādī 'Arabah road with the intention of finding a way into these four squares as well as RS 96 and 106. However, they were unsuccessful in finding a route into the squares. On 16 May 2011, SAAS team members, with the aid of maps from Google Earth, transected RS 87. In addition, they documented six sites, *viz.* Sites 260-265. Two of these, namely Sites

Table 1: List of Random Squares transected in each Topographical Zone – 2011 Season.

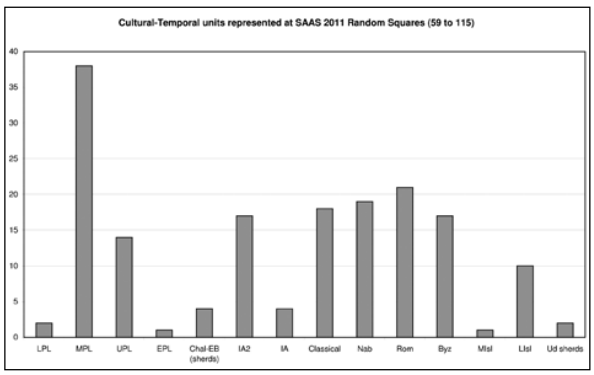
Zone 1: 63; 87; 102; 107 (n=4);
Zone 2: 62; 64; 70; 75; 67; 68; 80; 93; 103; 111 (n=10);
Zone 3: 59; 60; 61; 65; 66; 69; 71; 72; 73; 77; 76; 74; 78; 79; 81; 84; 89; 94; 98; 101; 88; 82; 85; 86; 95; 97; 100; 92; 99; 105; 109; 114; 108; 110; 113; and 115 (n=36).

264 and 265, were near RS 87. On 25 May 2011, SAAS team members, with the aid of maps from Google Earth, again attempted to transect RS 83, 90 and 91. However, due to wash-outs in the wadis, we were not able to reach them by vehicle and time did not allow us to walk to them and adequately transect them that same day. We did, however, document seven sites, *viz*. Sites 305-311. After these attempts, SAAS team members, owing to other priorities, gave up on their attempts to transect the squares in question. Nevertheless, as indicated above, attempts to reach these squares in Zone 1 resulted in the 'discovery' and documentation of 20 sites. These RS in Zone 1 can, of course, be transected by back-packing into the area and devoting the personnel, time and energy to this end.

Because of the location of modern farms and orchards, SAAS team members could not transect RS 104 and 112 in Zone 3. The reason is that both of these squares fall within farms which are guarded and enclosed by 2m high fences.

On the basis of preliminary analyses to date, materials, i.e. lithics and sherds, which survey team members collected in the 50 random squares, range in date from the Lower Paleolithic to the Late Islamic period. However, not all cultural-temporal units are represented. Of those that are, the best-represented cultural-temporal units / periods are: Middle Paleolithic (in 76% of the squares), Iron 2 (in 34%); Classical-Hellenistic-Byzantine (in 36%), Nabataean (in 38%), Roman (in 42%), Byzantine (in 34%) and Late Islamic (in 20%) (**Fig. 3**).

Survey-team members collected lithics and sherds from 92 percent of the 50 random squares. However, it should not necessarily be concluded that SAAS team members collected both in the same squares.



3. Cultural-temporal units represented in SAAS 2011 random squares (RS 59-115).

The lithic materials collected are typical of surface finds. They include bifaces, borers, burins, cleavers, cores (a variety from several periods), Levallois flakes, points and blades, perforators (some with notches) and scrapers (end, side and transverse).

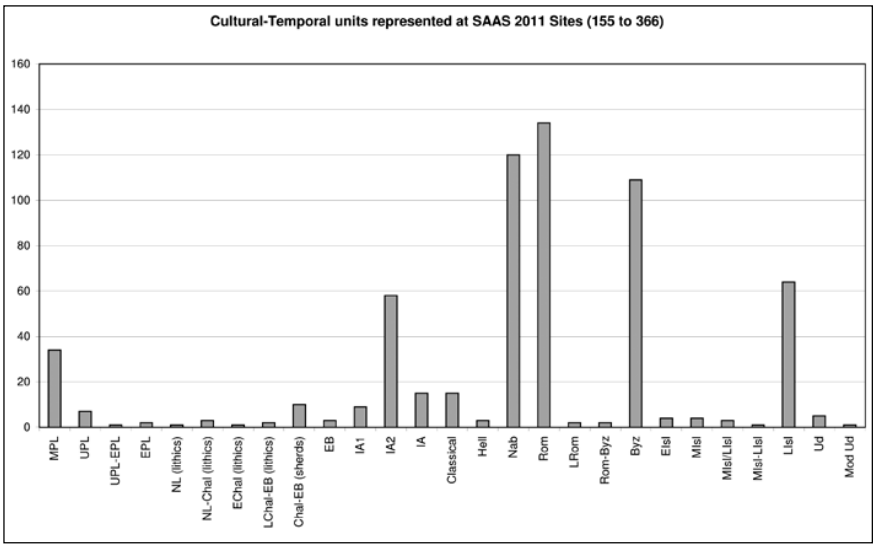
It ought to be noted that RS 67 and 68 in Zone 2 and RS 74, 78, 79, 82, 99, 105 and 110 in Zone 3 produced an especially heavy concentration of lithics. Thus, these squares, which could have been production and / or knapping areas, ought to come in for further study on the part of lithic specialists.

The Zone 3 RS listed in the previous paragraph, which have an especially high density of lithics, are in barren areas presently devoid of any appreciable vegetation. Thus, it seems safe to conclude that the environment in these areas would have been significantly different during the Paleolithic periods. It is also in these areas that Pleistocene lakes would have been located.

Survey team members recorded 212 sites, *viz*. Sites 155-366, during the 2011 season (**Table 2**). Thirty three (or 16%) of these 212 sites are within the 50 transected random squares, while 39 (or 18%) of them are nearby. Thus, it is probable that some of these 72 sites would not have been 'discovered' if team members had used a methodology that did not rely on the transecting of randomly chosen squares.

The cultural-temporal units / periods best represented at the 212 sites are the same as those for the random squares: Middle Paleolithic (at 16% of the sites), Iron 2 (at 27%), Classical (at 7%), Nabataean (at 57%), Roman (at 63%), Byzantine (at 51%) and Late Islamic (at 30%) (**Fig. 4**). Again, it must be noted that not all cultural-temporal units, e.g. Middle and Late Bronze, are represented.

Using Google Earth, David Kennedy (University of Western Australia, Perth) identified and labeled (Google Earth (KML file 7/21/2010)) a number of sites on the Bīr Khidād map (Sheet 3150 IV, Series K737, 1:50,000), almost the entire area of which is within the SAAS territory. SAAS team members recorded 41 of these as sites (**Table 3**), several of which they would not have otherwise 'found'. They are among the 212 which survey team members recorded this season.



4. Cultural-temporal units represented at SAAS 2011 sites (Sites 155-366).

Table 2: The Shammākh to Ayl Archaeological Survey project: list of sites, 2011.

Site#	UTM Coordinates*	Site Name	Function**
155	0751179/3359463		Tomb (?)
156	0752238/3360171		Seasonal camp (?)
157	0749376/3359837		Milestone fragments
158	0748366/3359222		Quarry
159	0745477/3359615		Seasonal camp (?)
160	0744652/3360524	Umm Ṭirān	Agricultural village
161	0744052/3361803	Mulghān West	Agricultural village
162	0744344/3361565	Mulghān East	Fort (?)
163	0744297/3360194		Agricultural tower (?)
164	0744036/3360419		Seasonal camp – agricultural (?)
165	0743870/3360733		Road
166	0743775/3360917		Agricultural village
167	0744169/3360851		Road
168	0742928/3362243	Kh. al-Manāsib	Agricultural village
169	0742626/3366039		Agricultural features
170	0737851/3361309		Farm (?)
171	0737883/3361435		Agricultural village/hamlet
172	0739025/3360726	Al-Ḥay	Traditional, south-Jordan agricultural village
173	0739967/3360661		Agricultural village
174	0742533/3358311	Kennedy's Khidād	Ruins 4 Agricultural complex
175	0742241/3358649		Seasonal pastoralists' camp
176	0742226/3359274		Agricultural village
177	0741899/3364003		Defensive site (?) along *Via Nova Traiana*
178	0741783/3364526		Waystation (?) along *Via Nova Traiana*
179	0741316/3361482		Fort (?) along *Via Nova Traiana*
180	0739906/3361641		Agricultural village
181	0740068/3362022		Seasonal camp for farmers and pastoralists
182	0740425/3361215		Agricultural village/hamlet
183	0740939/3362051		Farmers' and/or pastoralists seasonal camp
184	0740876/3361182		Agricultural village (?)

185	0740808/3360535		Tower (?)
186	0742064/3360132		Agricultural village
187	0742106/3360299		Agricultural village
188	0740901/3361552		*Via Nova Traiana* - segment
189	0746870/3363296		Agricultural village
190	0746091/3363109		Tower (?)
191	0746353/3363280		Water installation for pastoralists
192	0744838/3362936		Enclosure and tomb
193	0749472/3358115		Church
194	0748917/3356320	Tall Abū ar-Ra‘a	Observation point
195	0748745/3355154	Udhruḥ Qanat 2	Water-channeling system
196	0748693/3361771		Water management system (?); tombs (?)
197	0748479/3358117	Kennedy’s Circle 5	Unknown
198	0748479/3358117		Road
199	0749534/3364483		Tombs (?);water management system (?)
200	0746812/3365359	Rujm Abū al-‘Alaq	Watchtower
201	0747178/3365332		Caves – corrals and former dwellings (?)
202	0745474/3364030		Agricultural tower (?); seasonal camp (?)
203	0744788/3364149		Seasonal camp
204	0745158/3364019		Arabic inscriptions
205	0744541/3364741	Kh. al-‘Arja	Agricultural village
206	0745803/3364822	‘Arja Caves	Dwellings (?) and corrals
207	0743084/3365161	‘Arja	Traditional, south-Jordan agricultural village
208	0743911/3365534		Observation point
209	0744238/3365920	Kh. ad-Dabba	Agricultural village
210	0743358/3365532		Farm
211	0738211/3371205		Farm
212	0738649/3371473		Agricultural facility – farm (?)
213	0739071/3370824		Agricultural village
214	0738809/3370503		Cave- dwelling and animal pen
215	0739709/3370484		Agricultural village
216	0739947/3372228	Kh. al-Kur	Agricultural village
217	0739986/3372947	‘Ayn al-‘Irāq	Spring area
218	0755504/3364332		*Wusm*
219	0754572/3364460		Seasonal pastoralist’s and/or hunter’s camp
220	0750590/3366757		Knapping area and more recent residence
221	0749887/3363687	Kennedy’s Circle 6	Unknown
222	0754570/3364464		Enclosures, pastoralists’ seasonal camps
223	743717/3366057	Khazzān aṣ-Ṣuwayyah	Cistern; mill (?); storage area (?)
224	743650/3366272	Kh. aṣ-Ṣuwayyah	Agricultural village
225	743616/3366542	Tall ar-Rumayl	Agricultural village
226	744334/3366435	Kh. Bīr ar-Rumayl	Agricultural village
227	743422/3366299		Retaining wall – unknown
228	744700/3367057	Kh. ar-Rumaylāt	Agricultural facilities site
229	744651/3367965	Kh. Umm Ḥayyānah	Agricultural village
230	744972/3366371		Agricultural facilities site
231	744897/3366051		Agricultural village/hamlet
232	744800/3366132		Farm (?)
233	744568/3365728		Agricultural village
234	747293/3371037		Lithic production area and rock art

235	747319/3371087		Quarry
236	746697/3371180		Defensive site (?)
237	746676/3371297		Rock art
238	747101/3371434		Pastoralists' seasonal camp
239	747312/3371510		Pastoralists' seasonal camp
240	746674/3371447		Farm building (?)
241	750532/3362473	Kh. Jarba	Agricultural town
242	746685/3367544	Al-Kuwayz	Agricultural facility
243	746707/3367021	Al-Qulayb ash-Sharqī	(East) Agricultural village
244	746764/3367186		Corrals and habitation site
245	746359/3367011	Al- Qulayb al-Gharbī	(West) Cemetery (?); enclosures; cistern (?)
246	745648/3367740		Pastoralist's seasonal camp
247	743585/3368489		Enclosure around a cistern
248	743436/3368460		Caves –function unknown
249	743272/3368275		Enclosures; cisterns; habitation (?) cave
250	743453/3368134		Water preservation area; habitation cave
251	742852/3368808		Agricultural village and defensive site
252	753523/3367325		Pastoralists' seasonal camp
253	755638/3368266		Pastoralists' seasonal camp and lithic production site
254	744232/3370650	Kh. Bīr Khidād	Traditional, south-Jordan agricultural village
255	744668/3369899	Kh. at-Tīn	Defensive – observation point
256	745247/3372401	Kh. ar-Rafāy'ah	Agricultural village
257	744786/3366920		Pastoralists' seasonal camp
258	744853/3366432		Tower and associated (?) wall
259	743100/3369626		Pastoralists' shelters and cisterns
260	743143/3370441		Agricultural facilities
261	741166/3369436	Kh. Maqdis Umm Ṣuwwān	Agricultural village
262	740822/3368953	Ṭābiyat Umm al-Qubūr	Defensive tower; pastoralists' dwelling
263	740467/3368193		Pastoralists' family complex
264	739154/3367794		Pastoralists' seasonal camp
265	738840/3367718		Pastoralists'/family seasonal camp
266	737914/3364633		Traditional dwelling and other structures
267	751460/3369302	*Khaṭṭ Shabīb*	Boundary wall
268	751178/3369394		Pastoralists' seasonal camp
269	750819/3367760		Towers – defensive
270	740662/3372347		Farm
271	739748/3372446		Pastoralists' seasonal camp
272	739633/3372438		Pastoralists' seasonal camps
273	739522/3372428		Pastoralists' seasonal camp
274	739925/3373052	Kh. al-'Irāq al-Junūbiyya	Agricultural village
275	739993/3373372	Kh. al-'Irāq ash-Shamāliyya	Agricultural village
276	741498/3373795		Pastoralists' seasonal camp
277	741380/3373892		Farm buildings (?)
278	740897/3373420	Rujm al-Minṭār	Observation tower
279	741429/3374241		Agricultural hamlet (?)
280	740196/3374334	Al-Junaynah	Traditional, south-Jordan agricultural village
281	740255/3374489	Kh. al-Junaynah	Agricultural village (?)
282	740157/3375612		Agricultural hamlet or farm
283	740049/3376175	Rafāy'ah	Traditional, south-Jordan agricultural village

284	753318/3372498		Lithic production centre and hunters' and/or pastoralists' seasonal camp
285	753323/3372125		Pastoralists' seasonal camp
286	752745/3372662		Pastoralists' seasonal camp
287	752651/3372783		Inscription
288	753036/3371930		Rock art and inscription(s) (?)
289	738892/3352349		Observation/defensive tower (?)
290	739000/3352274		Agricultural village (?)
291	741161/3372399		Farm building or dwelling (?)
292	740843/3371615	Kh. al-Fajaj	Farm buildings, tomb, observation point
293	740918/3372696	Kh. Ḥawāla	Traditional, south-Jordan agricultural village
294	742362/3372897	Ghunayma	Agricultural village
295	741680/3371502	Kh. Umm Ṣuwwāna	Complex associated with *Via Nova Traiana*
296	742520/3373254		Agricultural village
297	742995/3372317	Kh. ash-Shurayf ash-Shamāliyya	Features associated with *Via Nova Traiana*
298	742955/3371999	Kh. ash-Shurayf al-Janūbiyya	Features associated with *Via Nova Traiana*
299	741177/3376120	ʻAyn Shammākh	Spring
300	741249/3375732	Shammākh	Traditional, south-Jordan agricultural village
301	746772/3374633		Tower, enclosures, and caves
302	746773/3374267		Pastoralists' seasonal camp
303	750367/3362140		Tower – observation – defensive
304	742735/3362271		Farm building (?)
305	738120/3368907		Agricultural facilities
306	739310/3368660		Agricultural village
307	738516/3367975		Farm or agricultural hamlet
308	737921/3368187		Agricultural facilities
309	737919/3367496		Cave – corral and dwelling (?)
310	737600/3367451		Agricultural village or hamlet
311	737300/3367350		Caves – extended family complex (?)
312	739516/3367699	Kh. al-Bagīdra	Agricultural village
313	739752/3358756		Observation/defensive site
314	739756/3359193		Farm building (?)
315	740162/3359518		Quarry
316	740047/3359933		Pastoralists' seasonal camp
317	742993/3362007		Residential and pastoralists' site
318	742970/3361761		Farm (?); observation site (?)
319	743328/3362002		Spring
320	741365/3359172		Watchtower
321	741236/3358536	Kh. Mudayrij aṭ-Ṭuwaysī	Agricultural village (?)
322	744200/3347034	Kh. Basṭa	Traditional, south-Jordan agricultural village
323	744141/3346801	Kh. Jabal Basṭa	Agricultural village
	324	741907/3365597	Kh. Maqtal al-Thawr Fort
325	741822/3365888	Sadr Abū ʻAyadah	Cave; cistern (?); tomb
326	741568/3365786	ʻAnabah	Agicultural village
327	740989/3366305	Kh. ash-Shuʻaybah	Corrals; cave dwelling
328	742353/3365004	Kh. Injaṣah	Agricultural facilities
329	745538/3363568	Kh. Ifnayn	Agricultural village
330	745166/3363367		Cave dwelling
331	739965/3364916		Agricultural village or hamlet
332	742201/3353476		Observation tower and tombs

333	742506/3353691		Farmers and pastoralists' facilities
334	742221/3353906		Observation tower and corrals
335	742243/3354149		Pastoralists' camp – seasonal
336	742168/3354488		Pastoralists' camp – seasonal
337	742151/3354913		Cistern; enclosure; major wall
338	742145/3355402		Farmers and pastoralists' facilities
339	742407/3355621		Farmers and pastoralists' facilities
340	742086/3350609		Farmers and pastoralists' camp
341	742559/3350814		Pastoralists' seasonal camp
342	742806/3350644		Pastoralists' seasonal camp
343	743545/3350711		Pastoralists' seasonal camp
344	743684/3351299		Pastoralists' seasonal camp
345	742711/3351486		Agricultural village
346	740526/3366233		Way station along *Via Nova Traiana* (?)
347	741537/3350501	Rujum al-Baṭṭāḥ	Tower and/or small fort
348	741344/3350893	Kh. al-Baṭṭāḥ	Agricultural village
349	741517/3350837		Pastoralists' seasonal camp
350	740360/3367011		Farm (?)
351	740291/3366992		Agricultural village
352	740227/3367010		Farm (?)
353	739143/3366732		Agricultural village
354	739045/3366441		Observation point
355	738782/3366190		Agricultural village
356	738338/3366057	Al-Heleen	Watch tower
357	738965/3364541		Way station
358	739081/3357818	Kh. an-Nawāfla	Traditional, south-Jordan agricultural village
359	738912/3358203	Ṭuwaylān	Agricultural village
360	738602/3358651	Kh. al-Muzayra'a/Kh. al-Qarār' a	Agricultural village
361	744866/3356926		Farm
362	744370/3356954		Rock shelter
363	744219/3356822		Fort
364	743078/3354152		Farmers and pastoralists' facilities
365	750665/3356532	Udhruḥ Qanats 1	Water-channeling system
366	752462/3355891	Fuqayy Qanats 1	Water-channeling system

* The coordinates system is UTM Zone 36N, European Datum 1950.

** Of course, the determination of "function" on the part of SAAS team members must be tentative at this stage of investigation. Generally, it is only with the excavation of the site in question will it be possible to determine, with greater certainty, its function(s).

Two of Kennedy's sites, Circle 5 (SAAS Site 197) and Circle 6 (SAAS Site 221), are of particular interest owing to their uniqueness. The former lies on the western edge of the village of Udhruḥ, near a road junction. The latter is located west of the north-south road between Udhruḥ and ash-Shawbak. It is *ca* 5km north of the former. Both circles are near-perfect and almost exactly 400m in diameter. There are no traces of internal structures within them. The results of SAAS team members' preliminary analysis of the collected materials from within and near Circle 5 are Late Chalcolithic-Early Bronze lithics, Iron 2, Nabataean, Roman and Late Islamic; for Circle 6 they are Epipaleolithic and Chalcolithic-Early Bronze lithics, Iron 2, Roman and Late Islamic. The function of the circles is unknown.

The ceramic specialist read and handled the pottery in much the same way as he did for the 'Tafila-Busayra Archaeological Survey 1999-2001' in west-central Jordan (MacDonald *et al.*

Table 3: SAAS sites and Kennedy's designators for the same sites on the Bīr Khidād map (KML file 7/21/2010).

SAAS Site #	Kennedy's Designation	SAAS Site #	Kennedy's Designation
156	Khidād Ruin 27	230	Khidād Ruin 31
157	Milestones ?	241	Khidād Jarba
158	Udhruḥ Quarries (Roman)	253	Khidād Stone Circle
160	Khidād Ruins 22	294	Khidād Ruin 28
161	Khidād Ruins 21	297	Khidād Ruin 29
162	Fort	298	Khidād Ruin 47
174	Khidād Ruins 4	334	Khidād Tower 2
179	"Tower"	337	Khidād Ruins 41
185	"Tower" (?)	338	Khidād Ruins 9
186	Khidād Ruins 1	339	Khidād Ruins 8
187	Khidād Ruins 39	341	Khidād Ruins 16
188	"Road"	342	Khidād Ruins 17
189	Khidād Ruins 35	343	Khidād Ruins 43
190	Khidād Ruins 37	344	Khidād Ruin 18
191	Khidād Ruin 48	347	Khidād Ruin 12
194	Tall Abū ar-Ra'a	348	Khidād Ruin 13
195	Udhruḥ Qanat 2	349	Khidād Ruin 42
197	Circle 5	363	Khidād Ruin 7
221	Circle 6	365	Khidād Udhruḥ Qanat 1
225	Khidād Ruin 30	366	Fuqayy Qanats 1
226	Khidād Ruin 46		

2004) and the 'Ayl to Ras an-Naqab Archaeological Survey 2005-2007' in southern Jordan (MacDonald *et al*. 2011). Diagnostics were preregistered and then saved and shipped to Canada for sawing, drawing, ware description and plate preparation. They will be published, along with their respective random squares and sites, as part of the final report on the SAAS project.

We had been requested to break some of the broad periods, e.g. the Byzantine period, into sub-periods. After considerable thought, we have retained the previous system of naming only the broad periods. We feel we need to avoid problems that arise when there are too many transitions. Some pottery may be isolated to a single sub-period, but others span two periods etc.. We felt that breaking the pottery into sub-periods would have made the readings too subtle for many database searches to handle easily and could skew the results of future researchers. We believe it is better to let researchers find all 'Byzantine' vessels and to decide themselves what the precise range of the forms allow.

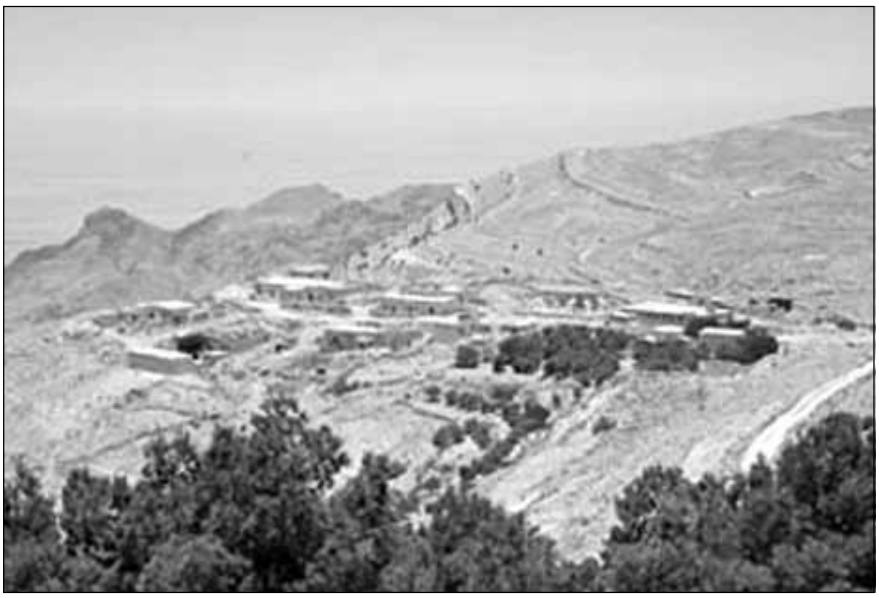
As in the previous two surveys carried out by the director and his colleagues, the term 'Nabataean'-as used in the cultural-temporal designations-refers more to a cultural assemblage than a chronological one. It implies the typical pottery of Petra. As such, some 'Nabataean' pieces can go as late as the Late Roman period. A 'Roman' reading usually means Late Roman, but could also include forms that began in the first century AD.

The imported pottery which team members collected includes African Red Slip Ware (at Sites 236, 245 and 328) and *terra sigillata* (at Site 229). This indicates that international trade impacted not only the city of Petra but also nearby areas.

The type of sites documented include agricultural hamlets and villages, aqueducts, a church, enclosures-many of which are circular and probably seasonal pastoralists' camps, farms, forts (**Fig. 5**), graves / tombs, inscriptions, rock art and *wusūm* (tribal markings), lithic and sherd scatters, rectilinear structures, roads-including segments of the *Via Nova Traiana*, traditional, south Jordan agricultural villages, e.g. Shammākh (**Fig. 6**), watchtowers and winnowing areas (see **Table 2**).

Among the sites recorded, we judged 45 of them to be former agricultural villages or hamlets. In addition, we recorded nine traditional, south Jordan agricultural villages. They are Al-Ḥay (Site 172), 'Arja (Site 207), al-Junaynah

5. Site 363: north wall of a (?) fort in the area where the sown meets the desert.



6. Site 300: part of Shammākh,a traditional, south Jordan agricultural village.

(Site 280), Kh. Bīr Khidād (Site 254), Rafay'ah (Site 283), Kh. Ḥawāla (Site 293), Shammākh (Site 300), Kh. Basṭa (Site 322) and Kh. an-Nawāfla (Site 358). These are sites at which there are a number of traditional stone-built houses with mud plaster still standing. Some of these former villages are completely abandoned, e.g. Rafay'ah. Others are close to modern villages, e.g. Kh. Bīr Khidād. In the latter case, as is the case for many of these villages, the traditional buildings are now generally used for storage and / or penning goats and sheep. One of these villages, Kh. an-Nawāfla (`Amr *et al.* 2000), has been transformed into the modern five-star hotel of Beit Zaman.

We judged at least 31 of our recorded sites to be pastoralists' camps. They are found in all three topographical zones of the SAAS territory. Many of them are in the form of an enclosure or a number of associated enclosures, some of which appear, especially from a distance, to be circular (hence the common nomenclature, 'circular enclosure'). It is likely that shepherds would have used these camps seasonally. There were probably many more of these structures within the survey territory in the recent past. However, they could have been easily removed, especially by bulldozing,

in development associated, for example, with field clearance.

Other sites, e.g. Sites 338-340, have enclosures as one of their features. However, they appear to be much more than just seasonal pastoralists' camps since they have features that appear to be temporary residential areas. These sites therefore give the impression that they could have been used both by farmers and pastoralists, though not necessarily at the same time. We have therefore labeled them 'farmers and pastoralists' facilities / camps'.

The impression received from survey work is that the area was extensively used for pastoral and farming pursuits. However, only further study, including excavations, will determine how many of these sites were in use in any particular cultural-temporal unit. This, in turn, will lead to understanding how dense the population was and how extensively the resources of the area were exploited at any given time.

A number of the 2011, SAAS-recorded sites have been excavated. Among them are a church at Udhruḥ (Falahat 2007) (SAAS Site 193), Kh. ad-Dabba (Whiting *et al*. 2008) (SAAS Site 209), Kh. al-'Irāq ash-Shamāliyya (Smith 2009: 302-07) (SAAS Site 275), Kh. al-Kur (Smith 2009: 296-302) (SAAS Site 216), Kh. an-Nawāfla ('Amr *et al*. 2000) (SAAS Site 358) and Ṭuwaylān (Bennett and Bienkowski 1995; Smith 2009: 307-13) (SAAS Site 359). The interested reader will find more information on these sites in the cited references.

Concluding remarks

The area of the SAAS project is one in which field clearance and the building and maintenance of terrace walls has gone on for millennia. As a result, there are numerous stone piles, some of them with impressive and imposing retaining walls, and heavily eroded terraces throughout the territory. Although these are the result of human activity, we did not record them as archaeological sites. Nevertheless, if they occur within a random square or near a site, they are generally noted in our random square and / or site description.

Jordan is undergoing rapid development in most areas of the country. This development is leading to the destruction of many archaeological sites. Thus, the findings of the survey are being communicated immediately to the Department of Antiquities of Jordan in order that important sites may be 'salvaged' and as much information as possible obtained from them before further damage is done.

The lithics and sherds not shipped to Canada for further analyses are stored in the Department of Antiquities' storerooms at ash-Shawbak castle. They are thus available, with the Department of Antiquities' permission, to researchers.

This publication serves as an invitation to researchers to follow up on these preliminary findings by carrying out further investigation of the areas in which the random squares and sites of the SAAS project are located. SAAS survey team members welcome further investigation, with permission of the Department of Antiquities, of the area and its sites.

Acknowledgements

SAAS team members would like to thank Dr Ziad al-Saad, former Director General of the Department of Antiquities of Jordan, for permission to carry out this season of work. In addition, special thanks are extended to Sate Massadeh, the Department's representative to the project, and other members of the Department of Antiquities' staff at its office in Amman. Hani Falahat, Chief Inspector of the Department of Antiquities' office at Ma'an, provided assistance throughout the season. Drs Barbara Porter and Chris Tuttle, Director and Associate Director respectively of ACOR, and all ACOR staff members made sure that the team members got into the field and were provided with the necessities to carry out a fruitful season. SAAS team members express gratitude to David Kennedy (University of Western Australia, Perth) for his identification, using Google Earth, and labeling of a number of sites within the survey territory. Finally, Gary L. Christopherson (University of Arizona, Tucson) is thanked for his work on the Geographic Information System database and the map (**Fig. 1**) used in this publication.

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TALL ABŪ AL-KHARAZ: THE SWEDISH JORDAN EXPEDITION 2010, THIRTEENTH SEASON PRELIMINARY EXCAVATION REPORT

Peter M. Fischer and Rainer Feldbacher
With Contributions by T. Bürge, A. Gustafsson and J. Azzopardi

Introduction

The thirteenth season of excavation at Tall Abū al-Kharaz was carried out with the kind support of the Department of Antiquities and its new director Dr Ziad al-Saad between 20 September and 20 October 2010. This year's field work was a direct continuation of a research project which started in 2008 and continued in 2009 (see Fischer *et al*. 2009, 2010), which is mainly devoted to the Iron Age occupation of the site (see earlier publications on the Early, Middle and Late Bronze Ages in Fischer 2006, 2008; Fischer ed. 2006). The excavations were continued in order to explore the earliest Iron Age occupation of Tall Abū al-Kharaz and to study new material for a refined stratigraphy to be published in the next volume, namely, that on the Iron Age (Fischer forthcoming). Excavations concentrated on Area 9, where very well-preserved, undisturbed contexts dating to the Iron Age I period were discovered in 2009 (for map see Fischer 2010: Fig. 1, Trench LI). The recovery of good radiocarbon samples from sealed floor contexts had, as usual, high priority.

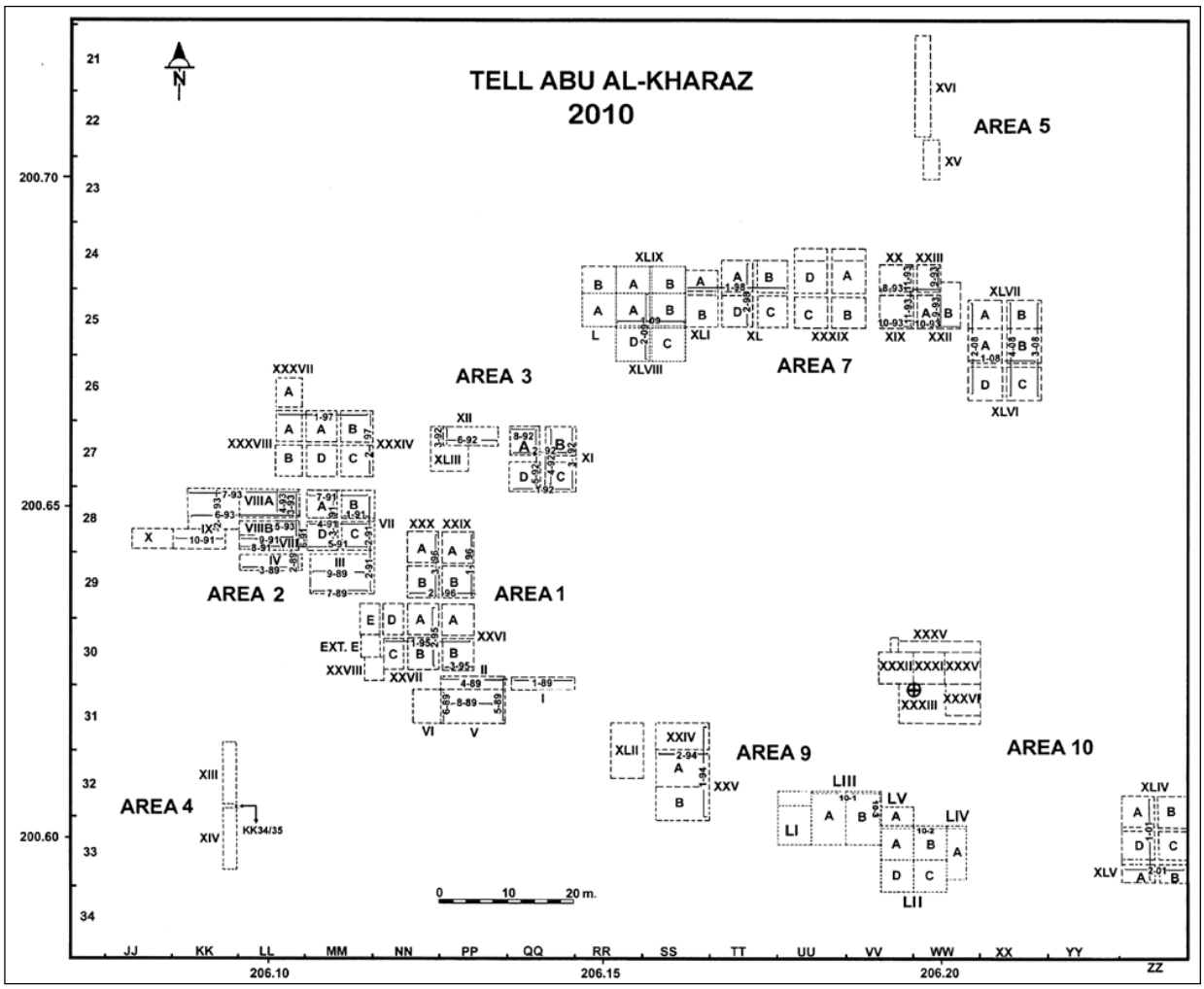
The 2010 team consisted of 35 individuals, including P. M. Fischer (director), R. Feldbacher (assistant field director), H. Ta'ani (foreman, trench supervisor), M. al-Bataineh (surveyor, draughtsperson). Trench supervisors were J. Azzopardi, D. Blattner, T. Bürge, L. Franz, A. Gustafsson, N. Monschein, M. Pehrson and P. Täuber. Assistant trench supervisors were I. Fischer, L. Längström, R. Lundh, S. Lundh, J. Martinell, S. Martinell, L. Nyström and M. Werngren. The Department of Antiquities representative was Mohammed al-Shalabi. The expedition was further strengthened by the new inspector of Pella, Nasser Khasawneh. Additional support was provided by Samir Esbeihat (cook), Deeb Jawahreh (pottery washing) and Musa Mohammed Ahmad (transport). Ten local workers from Pella, al-Mashāri' and al-Yābis were engaged in the excavations.

The Royal Court, represented by T.R.H. Prince Raad bin Zaid and Princess Majda Raad, and the Swedish Embassy headed by H.E. C. Sparre again showed interest in our work and provided valuable support. The Department of Archaeology and Anthropology of Yarmouk University in Irbid, headed by Dean Professor Z. Kafafi, supported the expedition in many ways and also organised a public lecture at Yarmouk University, where the results from Tall Abū al-Kharaz were presented and discussed in a wider forum. Amongst our visitors were those from the Department of Antiquities, American Center of Oriental Research, the German Protestant Institute and Yarmouk University.

Results from the 2010 Excavations in Area 9: Trenches LII-LV (Fig. 1)

Background

At the end of the 2009 season of field work it was intended to clean and consolidate the Early Bronze Age to Abbasid city walls in Area 9. We were able to expose and clean some 30 m of defensive systems of all periods in Area 9, east of the trenches which were excavated in 1994 and 1995. Walls visible on the surface were recorded by total station in order to present them digitally in three-dimensions; some were also consolidated. During cleaning, a near-square structure, 4.4 m x 4.2 m in size (outer dimensions), built on top of the MB / LB city wall and projecting southwards was exposed (see Fischer 2010). Two strata of Iron Age occupation were



1. Location of Trenches LI-LV in Area 9.

discovered, *viz*. Strata 1B and 1C[1], of which the oldest, Stratum 1C, yielded twenty three complete earthenware vessels and many other finds of metal, stone and organic material in an excellent, primary context. Six radiocarbon dates from the floor of Stratum 1C are all between roughly 1200 - 1000 BC. This encouraged us to extend the excavations to the east; a total of 28 m represented by Trenches LI - LV was opened during these two seasons. The area of excavation slopes 1.18 m in 28 m from east to west.

Unfortunately three deep looters' pits, approx. 3 m wide, had been dug into the area. Other areas also suffered from extensive looting. As the *tall* is privately owned and not the property of the Department of Antiquities, no guard has been placed on the site to date.

Stratum 1A

The architectural remains of this phase, most of them visible on surface or just below a thin layer of colluvial soil, were badly preserved. Only the northern part of this compound provided some interpretable structures (Walls 629, 615 and 617). The western structure is fairly well-preserved and approx. 11 m (east - west) x 5 m (north - south) in size. A 4 m wide (?) gate separates it from the eastern structure, of which only one wall (W618) and a stone pavement were exposed. The function of these two buildings is difficult to assess. Nevertheless, the large size of the western structure and its proximity to

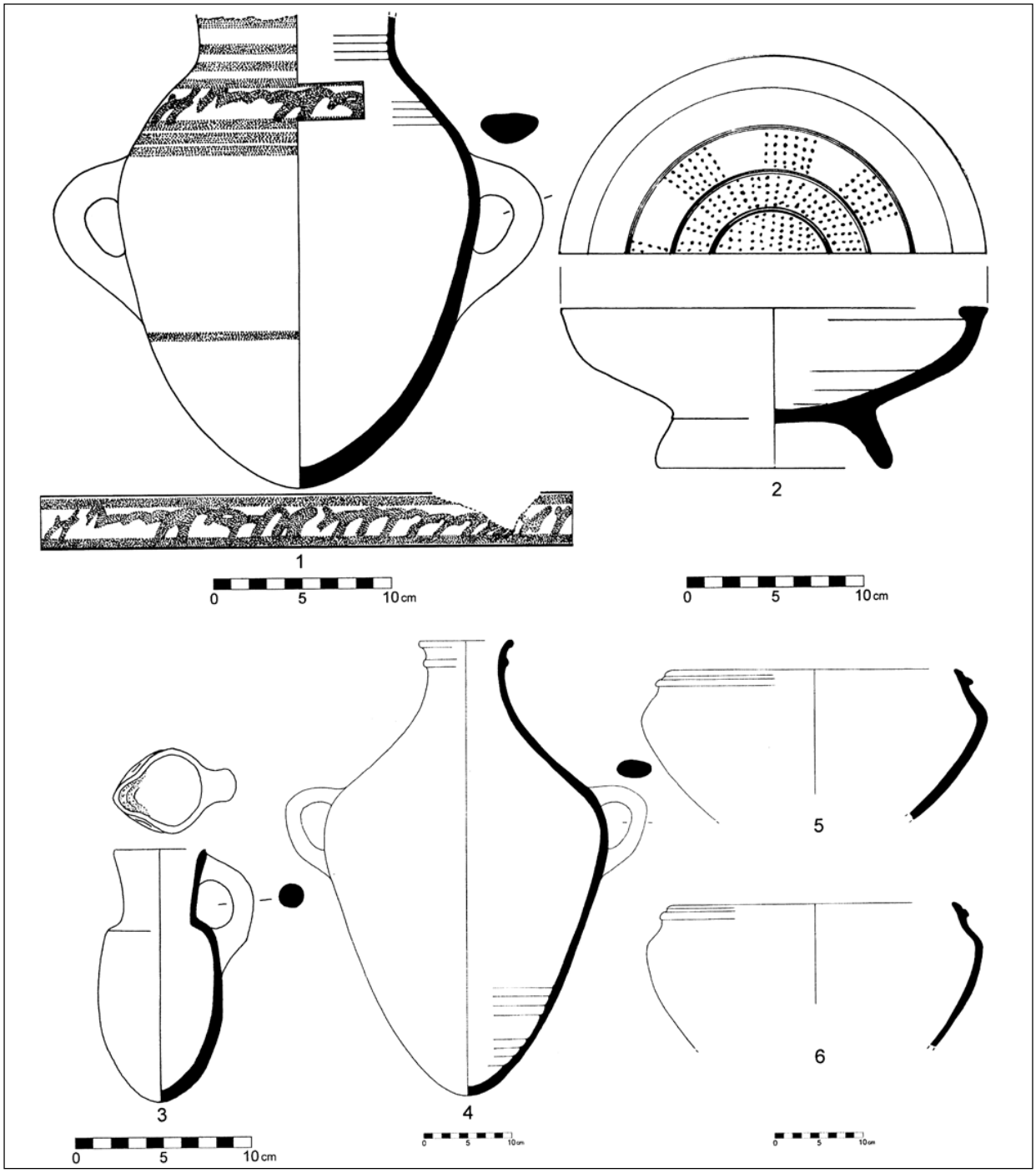
1. The preliminary stratigraphy is from the top down, i.e. Stratum 1A, 1B etc., regardless of area. This means that Stratum 1B in Area 7, for example, need not necessarily correspond with Stratum 1B in any of the other areas.

the summit of the *tall* makes it likely that it had an administrative function. The 4 m wide opening between the two buildings is suggestive of a portion of the city gate.

The majority of sherds are from the second part of the Iron Age, but a few intrusive sherds dating to the late Roman / Byzantine and Abbasid periods were also found. There are no other finds of significance except for a typical Iron Age loom weight of unfired clay.

Strata 1B1 and 1B2 (**Fig. 2**)

The exposed compound is at least 22 m wide (east - west) and 8 m long (north - south), and



2. Phase 1B (Iron Age I/IIA): selected pottery.

contains nine walled spaces. These are bordered to the south by the array of city walls from earlier periods which were re-used as foundations for new structures. The uppermost of these re-used and modified walls is W616. Two sub-phases can be distinguished in the eastern portion. Whereas the structures of the western part remained unchanged throughout the period represented by Stratum 1B, the structures of the eastern part indicate two sub-phases, the more recent Stratum 1B1 and earlier Stratum 1B2.

In the west is the largest walled space, 6 m x 5m large. It is most likely a courtyard which was partly stone-paved. There are three stone-lined installations along the southern wall (W632) which are associated with food preparation. In the north is a displaced limestone door socket. On the floor is a substantial layer of burned debris and ash. Finds from the floor level and fill above it include a black juglet (N1323), a plain juglet (N1333), two ceramic spindle whorls of recycled pottery sherds (N1325, N1331) and an arrow head of bronze (N1335). To the north-east of the eastern wall bordering the courtyard were three additional finds: a recycled spindle whorl (N1326), part of a basalt bowl and a partially preserved bronze handle of a sword or large dagger (N1328).

The next eight spaces were likewise covered with debris and ash but are smaller, being in the region of 2 - 3 m x 2 m. Two central spaces are partially stone-paved, the southern one of which is disturbed by a sewer (L196). The sewer dates to the Abbasid period and functioned as a drain for rainwater from higher up the *tall*, leading it out of the city through the array of city walls from earlier periods. Large pieces of a black jar with the typical white Abbasid decoration were found imbedded into the sewer. The central rooms contained numerous pieces of leather-hard, unfired, mainly larger vessels, which is indicative of local pottery production. The northern of the next pair of rooms to the east contained quite a large, roughly circular installation which is most likely a pottery kiln. Opposite the kiln is a clay bench and south of it a small fire place built of mud-bricks. Amongst the finds are a fishing hook (N1322), a basalt millstone (N1324), a limestone mortar (N1385), a cylindrical clay lid (N1342), a carnelian bead (N1344), a tool or pendent of terracotta (N1393) and a decorated jar with a pattern encircling the entire shoulder (N1400; **Fig. 2:1**). The pattern on the shoulder of the decorated jar gives the impression that the potter was trying to imitate script. According to K. Jaros (pers. comm. 29 October 2010), the most frequently appearing 'sign' resembles a *waw*; others look like *kaph*, *samech* and *taw*. However, the pattern cannot be read and it may be the case that an illiterate potter tried to imitate letters, because it is difficult to see it as mere decoration. This example is completely different to other similar vessels, on which the decoration is much more accurately executed. Cooking pots typically have triangular rim sections (**Fig. 2: 5, 6**) and storage jars show often neck ridges (**Fig. 2: 4**).

The earlier sub-phase is apparent in the four eastern rooms, where in one of the northern rooms two *ṭābūns* preceded the kiln. There are also clay installations and a millstone, all of which point to food preparation. Finds from these eight spaces are relatively scarce, which suggests either that the people resettling in the later part of Iron Age 'cleaned' the area or that the area was looted after the conflagration and probable attack. It is obvious from the thick layer of debris and the ash that Stratum 1B suffered from a severe catastrophe.

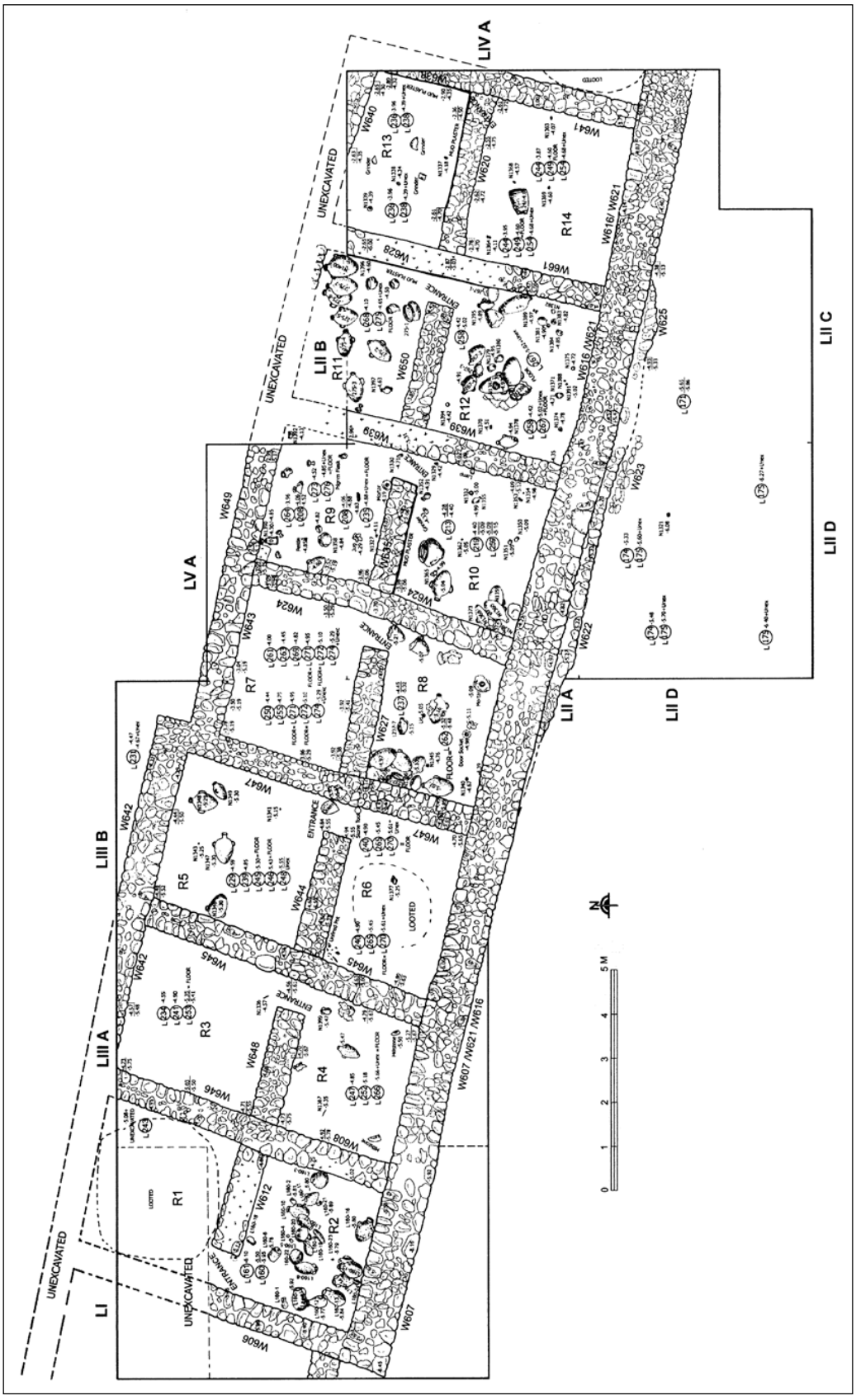
According to the pottery and radiocarbon dates, this stratum belongs to the end of Iron Age I or possibly the beginning of Iron Age II.

Stratum 1C (**Fig. 3**)

During the second half of the excavation season, we reached the stratum corresponding with the partially exposed building from the 2009 excavations which was so rewarding in terms of its state of preservation and numerous finds (see above and Fischer 2010; Locus 160). Regrettably, three of the looters' pits had reached Stratum 1C and seriously disturbed its contexts. One pit was in the northern room of the most westerly pair (Room 1), the second in the southern room of the third pair (Room 6) and the third east of the seventh pair, i.e. outside the opened-up area to the south[2].

After removing debris with a total depth of

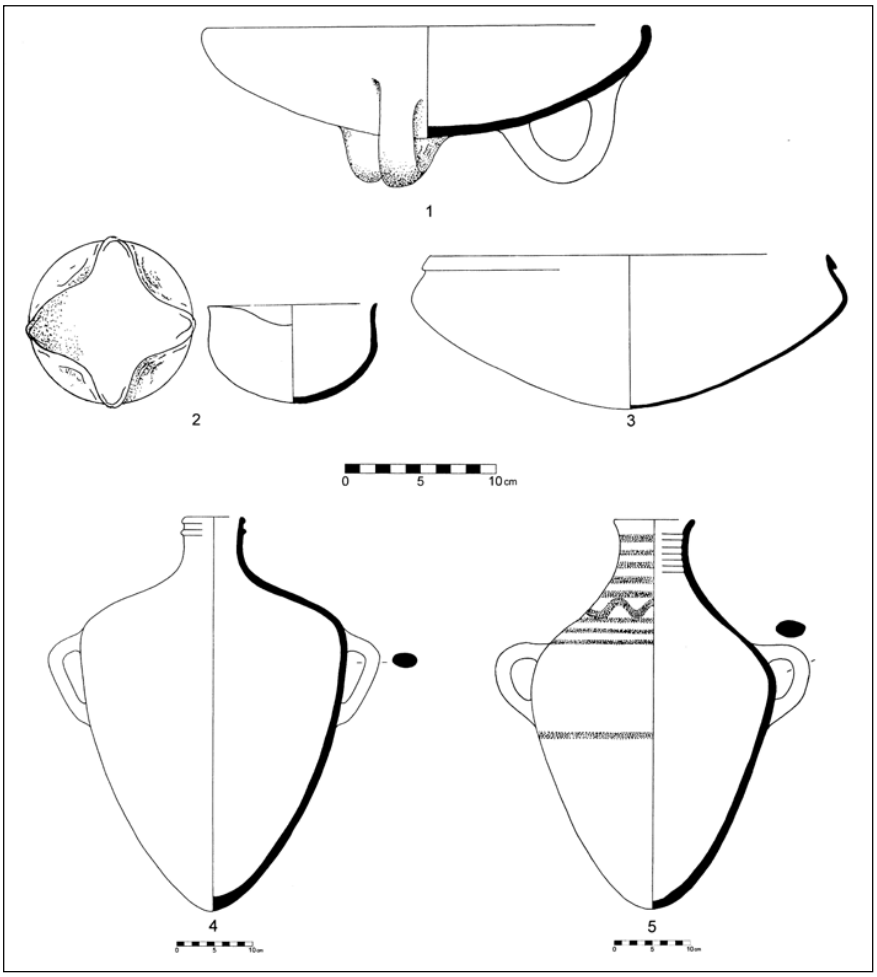
2. The rooms are here numbered 1 to 14; Room 1 is north of Room 2, Room 3 north of Room 4 etc.



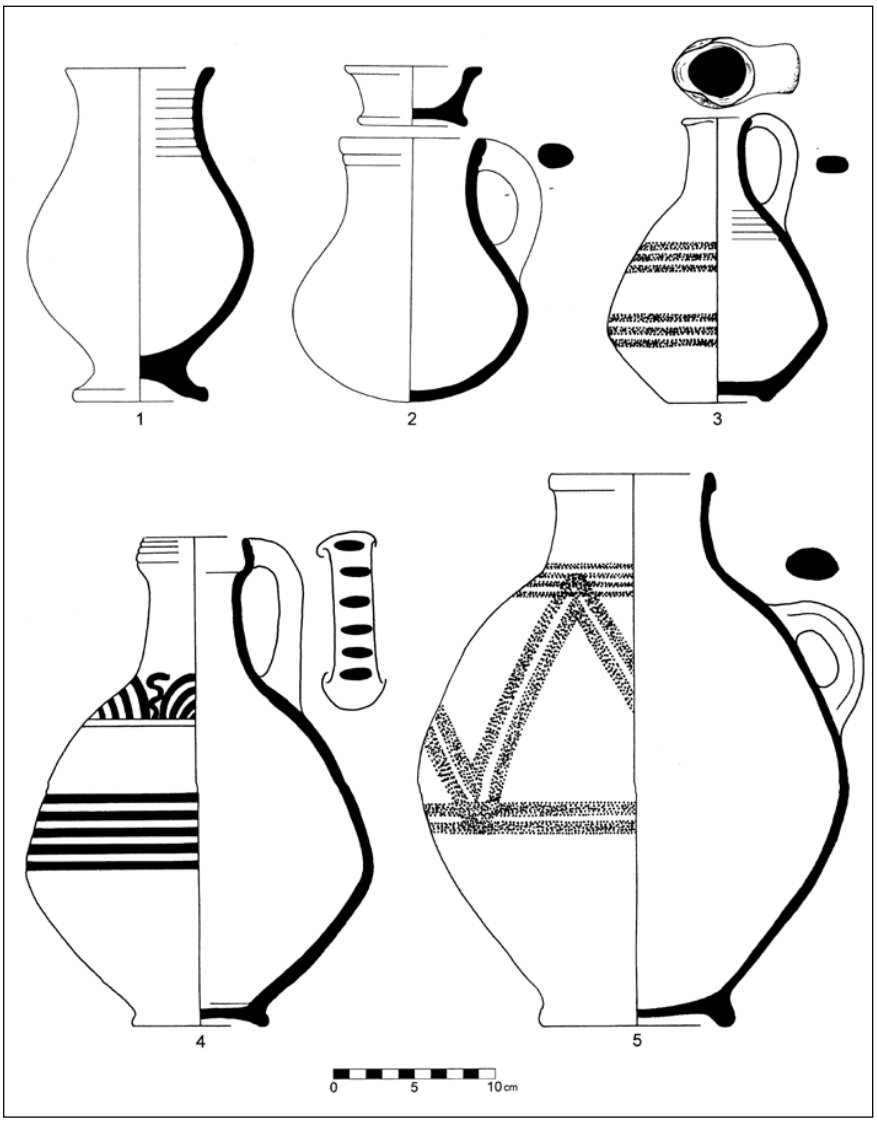
3. Phase 1C (Iron Age I): overview over compound with 14 rooms built against city wall (excavated 2009 and 2010).

almost 1 m and up to 0.5 m of burned roofing materials, we were able to expose a compound extending approx. 28 m east - west and 8 m north - south (2009 and 2010 seasons). The compound consists of seven pairs of rooms (R1 - 14 in **Fig. 3**) which gives a strong impression of centrally supervised town planning. The 14 rooms are fairly standardized, ranging from 2.5 m x 3 m to 3 m x 3 m in size. The walls of the compound are typically 0.6 - 0.7 m thick, except for the city wall which is approx. 1 m thick and against which the compound is built to the south. All seven pairs of rooms are connected to each other through standardized entrances which are 0.6 m wide. These entrances are always to the east, except for the most westerly pair of rooms which had the entrance to the west. Some entrances have a threshold of clay, because the northern row of rooms is somewhat higher up the *tall* than the southern row. All rooms were plastered on the inside with a layer of fine clay.

The floor contexts of the 12 undisturbed rooms were amongst the most rewarding of all those excavated over the past 20 years. Room 1 was looted and Room 2 is the space which was excavated in 2009 and which was crowded with finds. Rooms 3 and 7 were unexpectedly devoid of finds of special interest in comparison with the contents of the other rooms. Room 4 contained a cooking pot (N1399) and bronze pin (N1367), and Room 5 four complete storage jars. Room 6 was partially looted: only a broken basalt bowl (N1377) and numerous pieces of unfired vessels remained. Room 8, which was clearly a storage and working facility, was again full of finds: storage jars, typical early Iron Age cooking pots with triangular rims (see **Fig. 4: 3**), jugs - one still sealed with a lid and containing flint blades (N1397 in **Fig. 5: 2**), mortars, two spindle whorls (N1340, N1376), a basalt pestle (N1345) and a juglet (N1386). The next two rooms, Rooms 9 and 10, were also packed



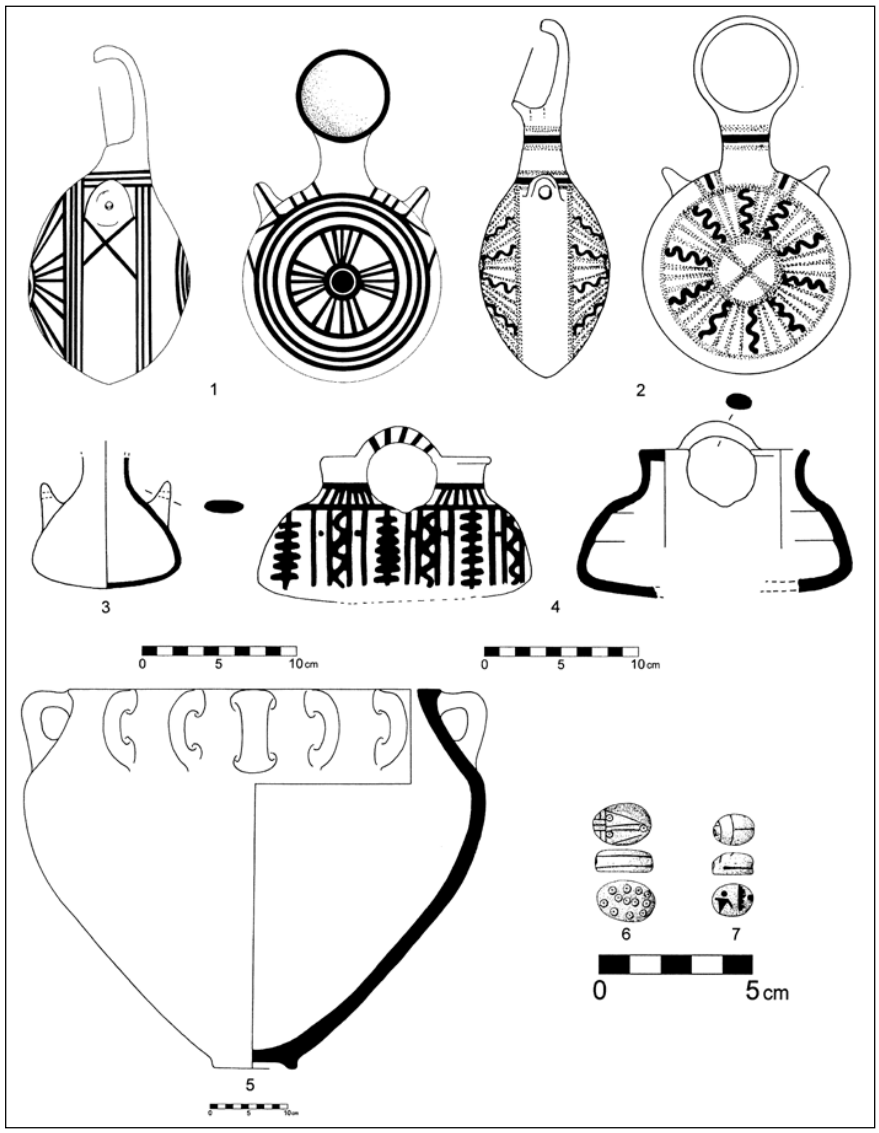
4. Phase 1C (Iron Age I): selected pottery.



5. Phase 1C (Iron Age I): selected pottery.

with finds which included some imports: one is a large jug from Room 9 (**Fig. 9:1**). This is a 'pilgrim-flask' of excellent craftsmanship, with bichrome decoration on a burnished red background, most likely an import from the Phoenician cultural sphere. This room also contained an upright stand / incense burner (N1390; **Fig. 7: 1, 2**) with a lid in the shape of a chalice, all *in situ* (see appendix by T. Bürge). Other finds are an unusually shaped cooking pot (N1358), a pilgrim flask, pyxis (N1392) and stone tools including a mortar and pestle. The southern Room 10 was entered through an aperture in the south-east of Room 9. This room was also packed with finds. In the south-west corner of the room, storage jars were leaning against the walls (N1359, N1360, N1361, N1366). Other finds from Room 10 are kraters (e.g. N1356), pilgrim flasks (e.g. N1350), a double-pyxis (N1365; **Fig. 6: 4**), a pyxis (N1351; **Fig. 6: 3**), various juglets (e.g. N1355), lamps - one of which is four-spouted (N1352; **Fig. 4: 2**), and a variety of stone tools. There are at least two vessels which were definitely imported: first, from the south-west corner, is a large, shallow, white-slipped and burnished bowl standing on three loop handles (N1372; **Fig. 4: 1**) and, second, a large, monochrome, decorated jug with a thick white, burnished slip (N1352; **Fig. 5: 4**). The latter in particular has a strong resemblance to Philistine jugs.

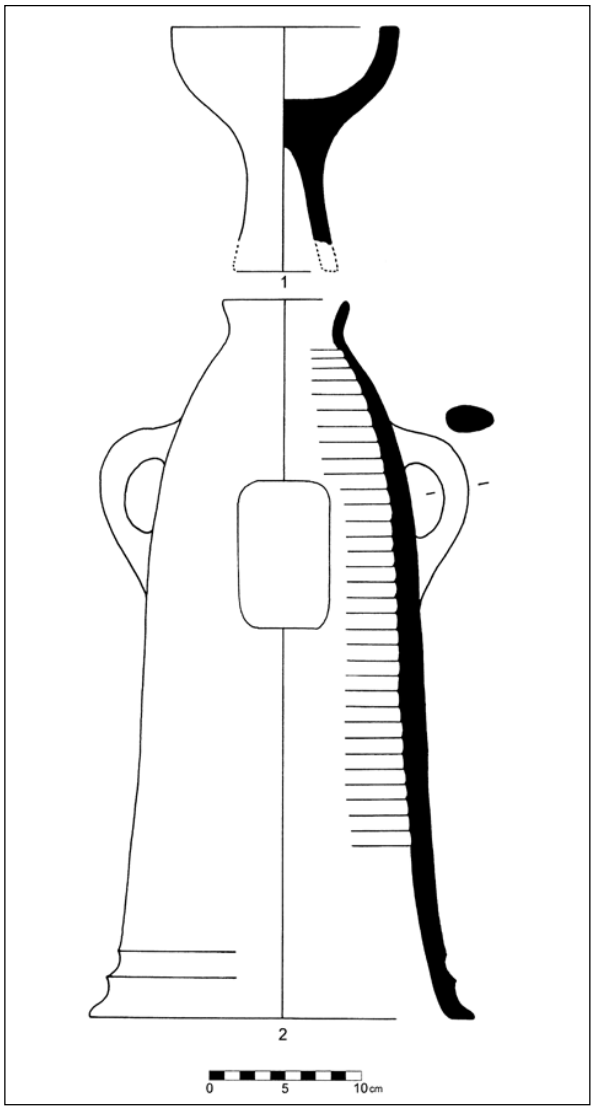
The next pair of connected rooms, Rooms 11



6. Phase 1C (Iron Age I): selected pottery and other finds.

and 12, likewise contained a multitude of objects, some imported. The northern Room 11 contained seven storage jars (e.g. N1400), four cooking pots, a chalice and two large 'goblets' (e.g. N1397; **Fig. 5: 1**). Room 12 to the south contained, *inter alia*, nine storage jars, jugs, juglets and a lamp (N1371). There are also two elaborate pilgrim flasks in Room 12 (L267-3; **Fig. 6: 1**, N1381; **Fig. 6: 2**). Other finds include a steatite scaraboid with a stylised representation of a horse's head instead of the more common representation of a beetle's pronotum and wings, and drilled circular decorations on the base (N1388; **Fig. 6: 6**). There was also a paste scarab with the possible throne name of Tuthmosis III (N1389; **Fig. 6: 7**)[3]. One of the small vessels is of calcite in the shape of a pyxis (N1382). Room 13, the northern of the next pair of rooms, is remarkably well-preserved; its well-constructed walls still stand to a height of more than 2 m. Rooms 13 and 14 did not contain the same quantity of finds as the rooms to the west. Nevertheless, a number of stone tools and a complete *tannūr* in Room 14 deserve mention.

3. A. Ahrens, German Archaeological Institute, Damascus wrote on 26 October 2010: "... a rather mediocre version of "Men - Kheper – Re" (= Tuthmose III throne name)... However, this is not clear beyond doubt, and one of the signs could also read "user / woser"... Since the hieroglyphs are locally executed, a definite reading is always difficult...".



7. Phase 1C (Iron Age I): stand and chalice-lid from Room 9.

The *tannūr* lay on its side with heavy roofing material on top.

Four radiocarbon samples were recovered from the corresponding Stratum 1C during the 2009 excavations (Locus 160, the southern of the most westerly pairs of rooms, i.e. Room 2). One of the dates is a Middle Bronze Age outlier, but the remaining three all range from 1200 to 1000 BC (2σ), or roughly 1130 to 1000 BC (1σ). The pottery and other finds confirm the radiocarbon dates, i.e. Iron Age I, most likely the latter part of that period.

Future Objectives

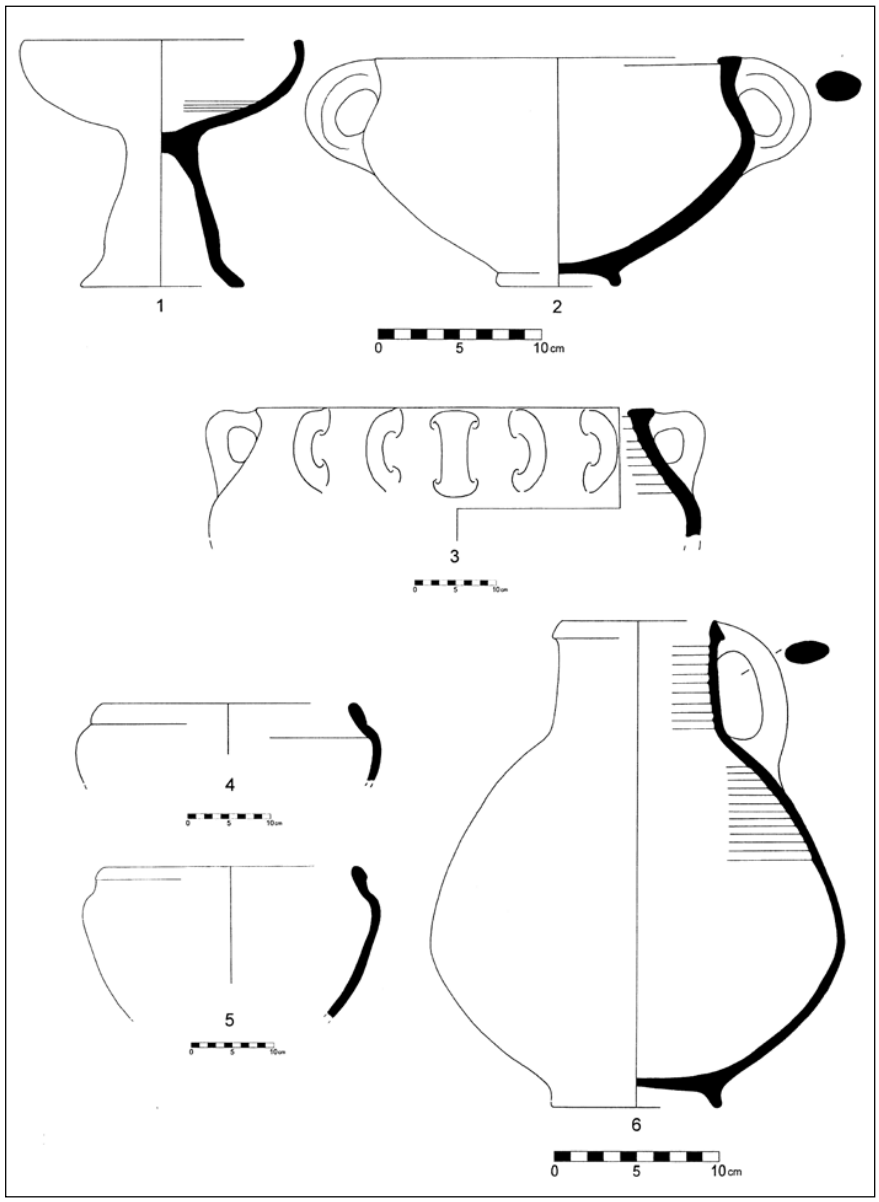
Protection and guarding of the site has been approved by the Department of Antiquities, which will facilitate continuation of the project. Consolidation of the well-preserved architectural remains is a priority and has already been initiated. Extension of the areas opened in 2009 and 2010 to the north, i.e. to the centre of the city, is an objective for forthcoming seasons, so as to further investigate these remarkable remains of the early Iron Age.

Appendix 1: A Note on an Early Iron Age Stand from the Excavations at Tall abū al-Kharaz, 2010 (T. Bürge)

Material and Context

During the 2010 season at Tall Abū al-Kharaz, a stand (N1390/1; **Fig. 7: 2**) was discovered in an early Iron Age compound. It was found *in situ* in the north-west corner of Room 9 in Trench LVA (see **Fig. 1**). The dimensions of Room 9 are 3 m x 2.5 m, the thickness of the walls being 0.6 m (western wall W624), 0.6 m (southern wall W635), 0.65 m (northern wall W649) and 0.6 m (eastern wall W639). Their preserved heights are 1.35 m (W649; total height 2.25 m, upper portion re-used in Phase 1B), 2.10 m (W624), around 2 m (W639 - not completely exposed) and 1.10 m (W635). Room 9 is connected to Room 10 to the south through a 0.55 m wide gap between the eastern end of W635 and wall W639.

The stand consists of two pieces, the stand itself and its lid, a chalice. The stand is 47 cm high; its basal diameter is 24 cm, narrowing to 12 cm at the top. It is double-fenestrated and of cylindrical shape, flaring slightly out towards the double-carinated base. It has two vertical handles slightly above and between two rectangular windows with rounded corners, each 6 cm wide and 8 cm high. The everted and rounded rim is worn and only a small part of it is preserved. The stand is wheel made, hard fired, its fabric yellowish - brown, coarse with mainly grey inclusions; the slip is light reddish - yellow. It has no decoration, but dark grey patches are visible from top to bottom - probably the remains of an oily substance which had flowed down the object. A chalice was placed on top, in the opening of the stand (N1390/2; **Fig. 7: 1**). Apparently it was secondarily used as a lid, as its base was cut in order to fit into the top open-



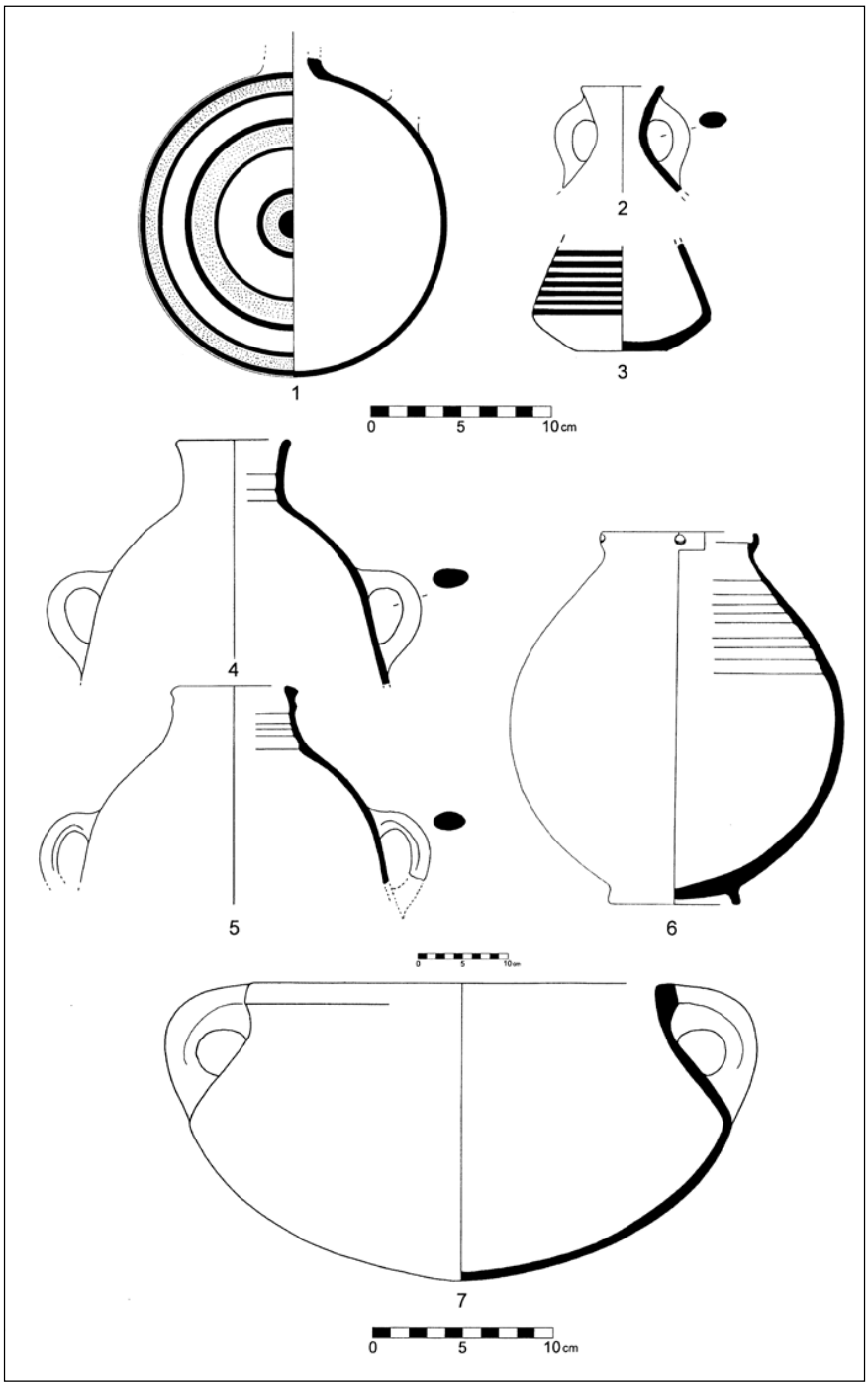
8. Phase 1C (Iron Age I): selected pottery from Room 9.

ing. The preserved height of the chalice is 15 cm and the diameter of the rim is 17 cm. The fabric is about the same as the stand. There are darker spots on the interior of the bowl - possibly also remains of oil.

The stand was found next to a rectangular mud-brick platform (surface approx. 24 cm x 32 cm; height around 15 cm) in the north-west corner of Room 9. A complete chalice (L273-4; **Fig. 8: 1**) was discovered just south-east of the stand. Other finds in the same room were a number of complete or near-complete vessels, *viz*. a cooking pot (N1358; **Fig. 9: 7**), three jars (L208-4, L208-5 and L273-3; **Figs. 9: 4, 5, 6**), a small krater (L273-2; **Fig. 8: 2**), a jug (L273-1; **Fig. 8: 6**), a pyxis (N1392; **Fig. 9: 3**), parts of a pilgrim flask (L264-1; **Fig. 9: 2**), three kraters (L264-2, L208-1 and L208-2; **Figs. 8: 3, 4, 5**) and a number of stone tools, amongst them two pestles and one mortar (N1330/1-3). Of special interest is a high-quality, bichrome-decorated, globular jug of Phoenician provenance (L208-6; **Fig. 9: 1**, see main report).

Selected References

Stands of cylindrical shape are found all over the ancient Near East, dating roughly from the third millennium BC onwards. They are espe-



9. Phase 1C (Iron Age I): selected pottery from Room 9.

cially frequent in the Levant between the Middle Bronze Age and 10th century BC (Mazar 1980: 93) and fall into two types. The body of the first type is finished as a bowl, resembling an elaboration of a chalice. It is rare in comparison to the second type, a cylindrical stand open top and bottom like the item under discussion here (Mazar 1980: 94). In contrast to our stand, many show decorations such as paintings or applied human or animal figures. The number of openings varies, as does their shape: rectangular, oval, triangular and small circular windows are known from the same period. Vertical handles were very common in Palestine between the Middle Bronze Age and 11th century BC (Mazar 1980: 94 ff.).

Another stand (N114) from Tall Abū al-Kharaz comes from Area 2. It was discovered in the Phase VII temple, which dates to the Late Bronze Age IC (Fischer 2006: 141, fig. 154; 151, figs. 163, 1-2; chronology table 70, 374). Together with a fenestrated stand from Pella with crudely painted human figures and a variety of animals and plants, which was found in an offering pit in a Late Bronze Age II temple (Bourke 2004: 16-18, fig. 12), this is the geographically closest parallel.

Examples from the Iron Age I can be found at Hazor (Yadin *et al*. pl. 204, 2), *viz*. a stand decorated with rope ornament, and from Iron Age IC at Tell Qasile (Mazar 1980: 87-89, figs. 23, 25-27, pl. 32, 1-2, pl. 33, 1; all painted examples). Most similar to our stand are two examples from Megiddo VIA. One has plastic decoration in the form of small balls below the ridge (Arie 2006: figs. 13.41 and 13.62.11), while the second - so far the closest parallel to our stand (Finkelstein *et al*. 2000: 267, fig. 11.17, 7; Loud 1948: fig. 80, 9) – is an undecorated tubular example with two (comparatively small) rectangular windows and the remains of two vertical handles.

Suggested Function

Stands of this type are often referred to as 'incense burners' or 'incense stands', in the belief that frankincense or other aromatics were burned at the bottom of the stand (cf. Andrae 1938: 111; Schaeffer 1949: 260-261, fig. 11, 1; Devries 1976: passim; Nielsen 1986: 42-46) and / or in the bowl that covered the stand. However, the absence of traces of burning - see also our stand - makes their function as incense burners unlikely (Lapp 1969: 44; Fowler 1984: 185). Several seals show stands of cylindrical shape being used in worship rituals (e.g. Bikai 1978: 77-79, who notes that these were probably made of metal). Their use as holders for sacred plants in fertility rituals has been suggested by Rowe (1940: 52-54), as has their use for the presentation of food and drink offerings (with Egyptian analogies, cf. Nagel 1938: 176-181; depicted on seals and reliefs, e.g. Keel 1996: 158, fig. 242; food offering cf. Mazar 1980: 96; libation funnel, e.g. Schaeffer 1936: 110).

The association of such stands with cultic activities can also be questioned. Fowler (1984: 184) regards at least some of them as braziers for heating in winter, and also suggests other secular uses such as heating water, keeping food or drink warm and using incense as a perfume to counteract unpleasant odours (Fowler 1985: passim). Possibly the smoke from burning substances served to keep away flies and mosquitoes. The missing evidence of combustion still remains a problem.

Discussion

One should avoid assigning an exclusively cultic context to Room 9 solely on the strength of the presence of such a stand. The aforementioned possible remains of oil on the stand and chalice make it very likely that it was used for liquids – whether in a secular way, as suggested by Fowler (1984: 184 and 1985: passim) and noted above, or in a cultic context as a libation vessel. The latter interpretation is supported by the presence of the adjacent raised platform and chalice (L273-4). Three stands from Tell Qasile – all from a temple building – were found leaning against a similar platform (stands nos. 3446, 3255 and 3604, found in Shrine 300, Mazar 1980: 27) supporting a sacrifice bowl. Thus, a private domestic sanctuary in Room 9 is at least conceivable (see also Mazar 1980: 94).

Obviously the effort put into the manufacture of our undecorated stand with its re-used lid is relatively low compared to other, more elaborate objects of the same period. The context in which one of the stands from Megiddo (Arie 2006: fig. 13.62.11; for context see Arie 2006: 234, fig. 13.46) was found, *viz*. a storage area, is interesting. According to Arie (2006: 247), cultic activities may have been performed with it in favour of the stored goods or it may simply have been stored there in between rituals – a suggestion that could be applicable to the stand from Tall Abū al-Kharaz.

Appendix 2: Interpretation of an Early Iron Age Room Uncovered in 2010 (A. Gustafsson and J. Azzopardi)

Material and Context

The roughly square Room 8 in Trench LIIIB is 3 m x 2.4 m in size, the widths of the walls being 0.6 m (northern wall W627), 0.5 m (eastern wall W624), 0.85 m (southern city wall W621) and 0.6 m (western wall W647). The walls are

preserved to heights of up to 1.4 m. All of these walls had remnants of pinkish-brown mud plaster attached to their surface. In the north-east corner in W627 there is an entrance, 0.5 m wide, leading to Room 7 to the North.

To the south of the entrance, leaning against W624, are two storage jars which were broken when the roof collapsed. In the western part of Room 8 were six badly damaged storage jars leaning against Wall 647, likewise broken by the collapse of the roof. A complete juglet (N1386) containing carbonized chickpeas was located below the storage jars. Another complete vessel, an obviously unused cooking pot (L237-5), was leaning vertically against W627. A decorated jug (L237-7) was lying alongside W627. It is decorated with brownish - red bands on the neck and lower part of the body, bordering the double zigzag lines which cover the body itself. An incomplete rim of a cooking pot (L237-8) was found next to the entrance, along W627. Other, almost complete finds discovered nearer the centre of the room were two lids of unfired clay, two jars (L237-1, L237-6), a krater (L237-2), a carinated bowl (L237-3) and a jug with decorations (L237-4). Approximately 25 additional broken storage vessels were scattered around the room as a whole.

Two mortars were found alongside W621. One of them, found upside down in the south-east corner, was broken at the base; it was larger (37 cm wide) than the other (18 cm wide) which was found in the centre of the southern half of the room. Between these two mortars were four basalt pestles; a fifth basalt pestle (N1345) was found in the western part of the room. Alongside W621 was a spindle whorl (N1340); a second spindle whorl (N1376) was located in the north-western corner. At least three fired mud-bricks were close to W624. Additional finds included a couple of polished bones and a river clam shell. A large amount of roof debris and ash covered all finds.

Discussion

Room 8 can be interpreted in several ways. It contained a considerable number of storage jars leaning against the walls. These and the juglet containing chickpeas suggest a storage area for food and liquids. The pestles and mortars found close to the city wall indicate food processing. The necessity of a light source is obvious, yet a lamp was not found. The fact that they were found against the city wall hints at the possibility of a small hole or slit to allow light to enter the room. Spindle whorls and polished bones, possibly used to wind thread, indicate – at the very least – production or mending of textiles, or a storage area for these items. All these findings point to a storage room which also was used for certain activities and which was accessed from the floor above by a ladder. The slits or holes in the city wall, not large enough for large projectiles or humans to pass through, would have been the only source of natural light. The presence of a floor above, at street level, would also explain the scattered textile production tools, which fell down when it collapsed.

Ash was found everywhere in this space. The fact that so many vessels and items were left behind indicates a hasty retreat from a building on fire, as well as no return to the debris to recover surviving food and artefacts.

Conclusion

The results described above are suggestive of the basement of a domestic structure. The main function of this space would have been storage of liquids and food. It seems also to have been used as a workshop for textile production or at least the mending of clothes, and for food processing. Some of the vessels and tools most likely fell down from the floor above. Of particular importance is the fact that the former inhabitants never returned to their home after the conflagration, which does not seem to have been caused by an earthquake on the evidence of the substantial preserved heights of the walls.

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MADABA PLAINS PROJECT: EXCAVATIONS AT TALL AL-'UMAYRĪ, 2010

Douglas R. Clark and Kent V. Bramlett

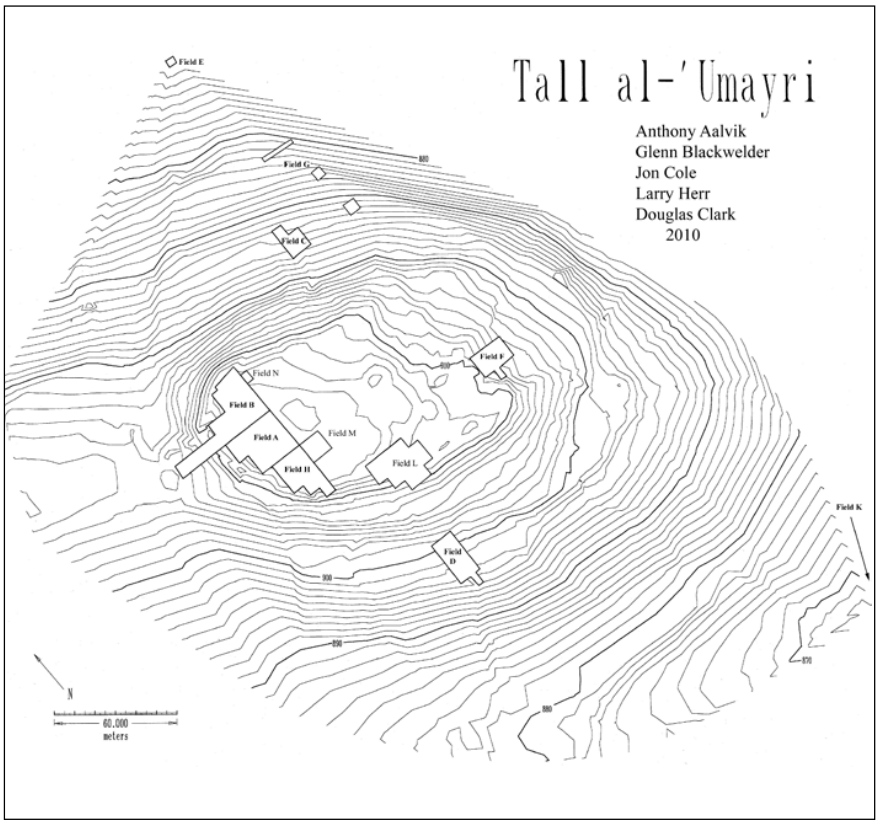
Introduction

A thirteenth season of excavation by the Madaba Plains Project at Tall al-'Umayrī occurred between 23 June and 28 July 2010. It was sponsored by La Sierra University, in consortium with Andrews University School of Architecture (Michigan, USA), Canadian University College (Alberta, Canada), Mount Royal College (Alberta, Canada) and Walla Walla University (Washington State, USA). Full reports have already been published for the first five seasons: (first season (1984): Geraty *et al*. eds 1989, second season (1987): Herr *et al*. eds 1991, third season (1989): Herr *et al*. eds 1997, fourth season (1992): Herr *et al*. eds 2000 and fifth season (1994): Herr *et al*. eds 2002). The sixth (1996 - 1998) is in press and the seventh (2000) is being edited. Preliminary reports have also been published (first season (1984): Geraty 1985, Geraty *et al*. 1986, 1987, second season (1987): Geraty *et al*. 1988, 1989, 1990, third season (1989): Younker *et al*. 1990, Herr *et al*. 1991, LaBianca *et al*. 1995, fourth season (1992): Younker *et al*. 1993, Herr *et al*. 1994, fifth season (1994): Younker *et al*. 1996, Herr *et al*. 1996, sixth season (1996): Younker *et al*. 1997, Herr *et al*. 1997, seventh season (1998): Herr *et al*. 1999, 2000, eighth season (2000): Herr, Clark and Trenchard 2001, 2002, ninth season (2002): Herr and Clark 2003, 2004, tenth season (2004): Herr and Clark 2005a, 2005b, eleventh season (2006): Herr and Clark 2008a, 2008b and twelfth season (2008): Herr and Clark, in press. For a summary report of the first 12 seasons (1984 - 2008), see Clark (2011) and Herr in Clark *et al*. (2011).

In the 2010 season, a team of 16 Jordanians and 38 foreigners participated in the fieldwork and camp activities of the interdisciplinary project at 'Umayrī, located 12 km south of Amman's Seventh Circle on the Queen Alia Airport Highway at the turn-off for Amman National Park (**Fig. 1**).

In the first season (1984) four fields of excavation were opened (Fields A, B, C and D) (**Fig. 2**). During the second season (1987) three of the four were expanded (Fields A, B and D), one was completed to bedrock (Field C) and two new fields were opened (Fields E and F). In the third season (1989) one field expanded (Field A), three fields re-opened old squares and expanded slightly (Fields B, D and F), another reduced excavation from two squares to one (Field E) and a new field was opened on the northern slope as a series of three soundings (Field G). In the fourth season (1992) three fields deepened previously opened squares (Fields A, D and F), one deepened existing squares while expanding by one square (Field B) and two fields were discontinued (Fields E and G). During the fifth season (1994) one field deepened (Field A), another expanded and deepened (Field B) and one was added (Field H). In the sixth season (1996) three fields expanded (Fields A, B and H). The tomb excavations on the south-eastern slopes of the tall, already begun under the hinterland survey in 1994, became part of the 'Umayrī tall excavations as Field K. During the seventh season (1998) two fields deepened their squares (Fields A and B), two expanded (Fields H and K) and a new field was opened on the southern lip of the site (Field L). In the eighth season (2000) we deepened three fields (Fields A, B and H) and expanded and deepened in two fields (Fields K and L). During the ninth season (2002) Field A was not worked, while Field B expanded to the north and continued in two other squares; Field H limited itself to the large plastered and cobbled courtyard near the northern extent of the

1. Al-ʻUmayrī aerial photo (photo David Kennedy).

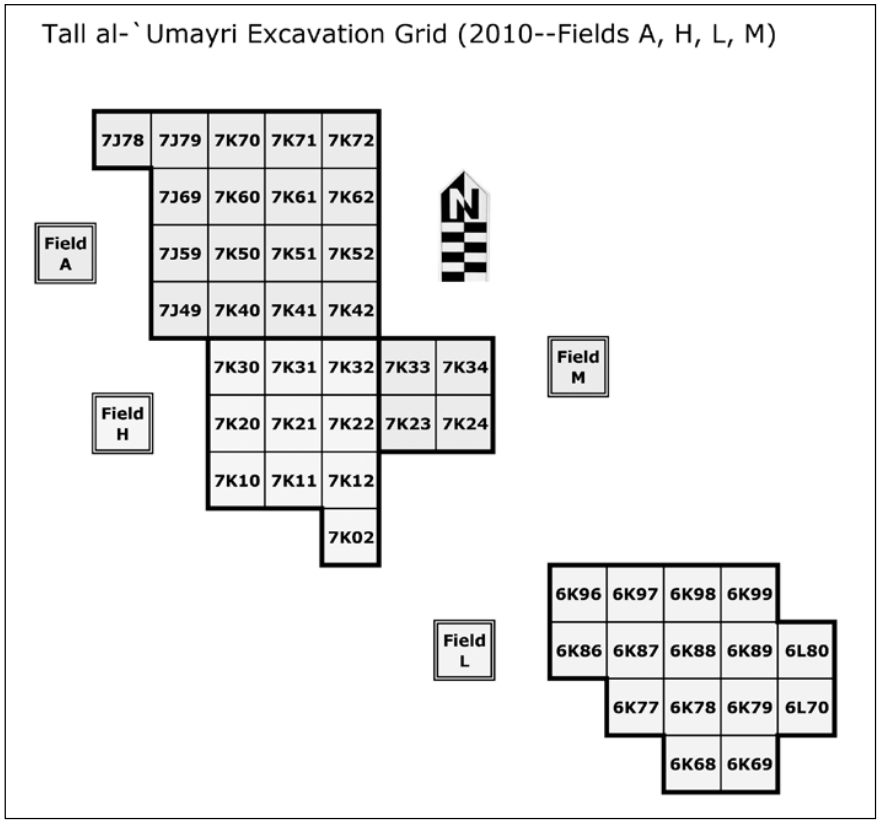


2. Topographic map of tall.

field (next to Field A); in Field L we exposed more of the Hellenistic structure by opening two new squares and re-opening one other. During the tenth season (2004) Field A deepened squares begun in the 1980s, Field B deepened three earlier squares and expanded to the north to intersect the northern edge of the site, Field H deepened earlier squares in its northern part and Field L deepened three previous squares and opened one new square. During the eleventh season (2006) Field A concentrated on removing balks and small areas between walls to deepen the western part of the field to late Iron I levels; one square was opened at the south-west corner of the field to examine the possible existence of a gateway. In Field B excavation concentrated on uncovering the floors of the northern extent of the remarkably preserved LB building. Excavation in Field H concentrated on bringing the southern part of the open-air sanctuary down to late Iron I levels. Field L, on the southern lip of the site, expanded to the east and north with three new squares.

The 2008 season saw Field A expose the third LB / Iron I house in the southern part of the field by going deeper in most squares. Field B completed the excavation of the LB building and added a square to the east with a new field designation, Field N. Field H went deeper in four squares, exposing the top of the LB / Iron I levels and locating the bottom of the southern portion of the perimeter wall. Field L went lower in three squares and added two more squares to the west. Additionally, a new field was opened, Field M, east of Field H in our overall goal of connecting Fields H and L. This season also marked the initiation of the use of high-resolution GPS for the location of fields, squares and architecture. It forced a slight change of orientation to align all our squares with true north and we chose to locate squares on primary grid lines, causing some squares to be smaller in their east-west measurements.

The thirteenth field season (2010) continued work in four fields (Fields A, H, L and M) (**Fig. 3**). Field A extended the exposure of LB / Iron I domestic structures, clearing the third building and uncovering the major portion of a fourth. The clearance of the late Iron I sacred precinct in Field H brought the team to domes-



3. Grid of Fields A, H, L and M.

tic structures post-dating the Early Iron I buildings in Field A, but preceding the precinct. Field L cleared Hellenistic remains in several balks, clarifying in the process the function of an Iron II oil press, and exposing the tops of several Iron II walls. Field M cleared late Iron II paved plaza levels surrounding what appear to be domestic buildings.

After 12 seasons, we can be confident talking about final stratum numbers for the site. We think, reasonably, that no new significant settlements will be discovered beyond those we have already found. We thus include a stratigraphic chart (**Fig. 4**).

Field A: The Western Acropolis (Stephanie Brown, University of California, Berkeley)

Field A is located on the western acropolis of Tall al-'Umayrī, and has been excavated in eleven previous seasons (1984, 1987, 1989, 1992, 1994, 1996, 1998, 2000, 2004, 2006 and 2008). Seasons 1984 - 1996 focused on the Late Iron II / Persian period of occupation in the eastern part of the field. Here a large Ammonite administrative complex was identified and excavated. Seasons 1998 - 2008 focused on the LB / Iron I occupation in the western part of the field. Here the excavators realized the relationship between the LB / Iron I (*ca.* 1200 BC) architecture and its subsequent destruction in the north-western area of Field A and south-western area of Field B. This architecture includes Field B's Building B, al-'Umayrī's well-known 'four-room house' (Clark MPP 5: 57-100). During the 2008 season excavators attempted to bring most of Field A into phase with the 'four-room house' in Field B. However, by the end of the 2008 season this goal was only partially achieved.

Tall al-`Umayri

Comprehensive Strata Chart
(1984-2010)

Stratum 22 (Chalcolithic Period) – 4500-3300 BC
Hiatus
Stratum 21 (Early Bronze Age IB) – 3200-3000 BC
Stratum 20 (Early Bronze Age II) – 3000-2600 BC
Stratum 19 (Early Bronze Age III) – 2600-2300 BC
Stratum 18 (Early Bronze Age IV) – 2300-2250 BC
Stratum 17 (Early Bronze Age IV) – 2250-2200 BC
Hiatus
Stratum 16 (Middle Bronze Age IIC) – 1650-1600 BC
Stratum 15 (Middle Bronze Age IIC) – 1600-1550 BC
Hiatus
Stratum 14 (Late Bronze Age II) – 1350-1230 BC
Stratum 13 (Late Bronze IIB/Early Iron I) – 1230-1200 BC
Stratum 12B (Late Bronze IIB/Early Iron I) – 1200-1150 BC
Stratum 12A (Late Bronze IIB/Early Iron I) – 1200-1150 BC
Hiatus
Stratum 11 (Iron IB) – 1100-1050 BC
Stratum 10 (Iron IB) – 1050-1000 BC
Stratum 9 (Iron IIA) – 1000-850 BC
Stratum 8 (Iron IIA) – 850-600 BC
Stratum 7 (Late Iron II/Persian – 600-550 BC
Stratum 6 (Late Iron II/Persian) – 550-500 BC
Stratum 5 (Persian) – 500-400 BC
Hiatus
Stratum 4 (Hellenistic) – 200-50 BC
Stratum 3 (Early Roman) – 50 BC - AD 135
Hiatus
Stratum 2 (Byzantine) – AD 350-650
Stratum 1 (Islamic) – AD 650-present

4. Al-'Umayrī strata chart.

During the 2010 excavations at Tall al-'Umayrī four squares were excavated in Field A: 7J69, 7J78, 7J79 and 7K70. Squares 7J78, 7J79 and 7K70 incorporate three rooms in Building C, an LB / Iron I domestic dwelling whose north wall equates with the south wall of Building A in Field B. From west to east these rooms are C1, C2 and C3. Portions of these rooms were excavated in 2008, but the surface had only been identified in a small part of room C1. Square 7J69 is directly south of Square 7J79 and its associated architecture is likely part of Building D, another LB / Iron I domestic dwelling.

The primary objective in Field A for the 2010 season was to locate and expose the LB / Iron I surfaces in each square. These surfaces were thought to exist underneath a massive destruction layer, attested from earlier excavations in both Field A and Field B. This objective was achieved during the last week of the 2010 season; by the end of the season the LB / Iron I surfaces in each square were exposed (**Fig. 5**).

Stratum 14 (LB II - Field A phase 14)

Previous excavations exposed several phase 12 foundation trenches and walls in Squares 7K70 and 7J69. Beneath these was an earth layer, 7K70:77. Further excavation is needed to understand the extent of this layer and its relationship to other LB II loci.

5. Four Field A buildings (photo John McDowell).

Stratum 12 (LB / Iron I - Field A phase 12)

The phasing for the four squares excavated in 2010 was clearly identified in previous seasons when their relationship to Buildings A and B in Field B was determined. Buildings A, B, C and D were all discovered beneath a massive destruction layer that was dated to the LB / Iron I period.

Of the Field A squares excavated during the 2010 season this destruction seemed to be the most dynamic in Square 7J69. In this square there was *ca*. 1.4 m of destruction above the surface, consisting of layers of rubble, black ash, dark reddish - brown mud-brick and dark yellowish - brown clay roofing material. Above the *ca* 0.20 m of fallen roofing material there rested an extremely large grindstone, *ca* 1 m x 0.50 m in size, which had clearly fallen from a second storey. On the surface of this structure (Building D) the remains of at least two large pithoi and several odd, naturally-shaped stone objects were found (**Fig. 6**). Building D appears to have been a domestic building.

Building C was excavated and described in detail in previous seasons (see Bates MPP 10, forthcoming) (**Fig. 7**). Portions of its rooms were exposed in 2008, but the surface had only been identified in a small part of Room C1. Most of the destruction which leveled Building C was excavated during the 2008 season, its depth decreasing as the rooms extended to the east. Found within this destruction were several

6. Field A Building D remains (photo #10A69315, John McDowell).

7. Field A Building C (photo John McDowell).

household objects, including at least five hand-held grindstones, three spindle whorls, several jar stoppers, a gaming piece (A100036), a metal arrowhead (A100290) and two broken bronze plates (A100146 and A100147).

During the 2010 season two phases of an LB / Iron I plaster surface were found in Rooms C2 and C3. The surface in Room C1 appears to have been made of beaten earth rather than plaster. It appears that the earlier surface was continually re-plastered, perhaps annually, thereby creating multiple layers of plaster. To complicate matters, it appears that several installations were used without alteration throughout both phases, while others were used exclusively in one phase or the other.

In 2010, Room C1 yielded the remains of at least two collared pithoi, bringing the total to eight when added to previous excavation results. In addition to all of the large storage jars, a saddle kern atop a mud-brick grinding installation, which seemed to serve as a small table (found in 2008), was supplemented in 2010 with the discovery of a sizeable stone table abutting the western perimeter wall (**Fig. 8**).

Abutting the grinding installation was a small, semi-circular stone hearth (**Fig. 9**), associated with a great deal of ash. A small north - south limestone curtain wall abutted the hearth. The existence of the storage jars found in Room C1 during the 2008 season, the grindstone and grinding installation, the stone table and the small hearth all support the likelihood that the room was used for food preparation.

8. Field A Building C stone table (photo #10A78156, John McDowell).

9. Field A Building C hearth (photo #10A79102, John McDowell).

Room C2, a long, hall-like room measuring almost five meters in length, yielded little in the way of artifacts. However, the southern wall of Rooms C2 and C3 was exposed for 6 m until it disappeared beneath later structural remains from phase 8.

Room C3 exhibited the least amount of destruction debris, save some mud-brick fragments and some ash deposits in the east side of the room. Furthermore, there were very few artifacts associated with this room, leaving its specific function in question. A small bin in the north-west corner suggests food storage.

As with Buildings A and B in Field B, the purpose of both LB / Iron I buildings in Field A (Buildings C and D) appears to have been domestic. Most of the finds appeared to be common household objects, *viz.* upper and lower grindstones, flints and ceramic remains. The installations (hearth, table, grinding mound etc.) found in Building C also support the interpretation of these buildings as domestic. Even the relatively small number of collared pithoi (n = *ca.* 12 in total from Field A) imply that nothing beyond ordinary day-to-day domestic life was occurring in the two LB / Iron I buildings in Field A.

Questions remain about how Buildings C and D related to each other, given different ground-floor levels and the precise line of the perimeter wall at this location. Further excavation is required to help clarify several issues.

Stratum 8 (Iron IIB - Field A phase 8B)

Previous excavations exposed Wall 7J69:52, cleared in 2006, but a short segment of the wall remained in adjacent Square 7J79. The 2010 season saw the removal of this remaining portion, exposing phase 12 Wall 7J79:58.

Field H: The South-Western Acropolis (Monique Vincent, University of Chicago)

Field H is located on the south-western corner of Tall al-ʻUmayrī, with several of the squares

located partially over the brow of the hill. Excavations during the early seasons, beginning in 1994, concentrated on the numerous phases of an open-air, cobbled courtyard sanctuary in use from the Late Iron I to the Persian periods. Model shrine and ceramic figurine fragments found between layers of the cobbled floors indicated a cultic function for the courtyard in at least some of its periods of use. In the 2008 season we focused on excavating the rooms south of this courtyard in order to study their relationship with the courtyard's main area. We also excavated the Late Iron I preparatory fill layers of the courtyard, studied particularly in the 2006 season, to reach LB / Iron I levels in the central part of the field. Having established the stratigraphy of the southern rooms, we removed the walls of the rooms so that in 2010 we could excavate this area down to the LB / Iron I period as well.

In 2010 we set out to remove the large western wall associated with the Late Iron I courtyard, as it sat on top of LB / Iron I architecture and post-abandonment debris. The wall's removal opened up the space between the central area and the perimeter wall to the west, connecting a series of LB / Iron I rooms excavated in 1996 to our current excavations. We also removed the final fill layers and cobbled surfaces associated with the courtyard sanctuary phases, primarily from Square 7K32. Excavations against the southern wall of the courtyard sanctuary determined that it was founded in the Late Iron I period. Finally, we turned our attention to excavating the post-abandonment debris from the Early Iron I building, ultimately reaching the surfaces in four of its rooms.

Stratum 12A (LB / Iron I - Field H phase 12)

Excavation of this phase previously concentrated in separate probes around Field H, mainly a series of rooms in 7K30 and 7K20, the domestic room in 7K31, and some walls and surfaces in the north of 7K32. This season we were able to connect some of these areas through our excavations in 7K21, though more work is necessary to completely reveal the phase across the field. Currently, however, we can outline a large, complex building spreading across most of the field, Building M (**Fig. 10**). The substantially larger outer walls of the building, consistently two rows and several courses of medium and large boulders, are from an earlier phase, re-used in phase 12 by people who consistently built an early form of quoin and pier or single-row walls to divide the large space into inner rooms.

While we have not yet found a substantial southern wall matching the construction of these walls, the central area was divided into a living space resembling the floor plan of a four-room or pillared house, with three long rooms excavated this season (Rooms 1 - 3) and a possible broad room (Room 4) starting to appear in the south. The outer areas between parallel walls appear to be opportunistic additions surrounding the four-

10. Field H four-room building (photo John McDowell).

room central area to the north and west (Rooms 5 - 11, all previously excavated except Room 7, which we excavated more fully this season, and Room 5, which remains to be excavated).

Room M1

The central room of the structure was accessed from the north through an entrance between two east - west walls. Looking from this doorway south, one faces the central long room of a four-room house plan, with quoin and pier walls separating it from eastern and western long rooms and a southern broad room. Directly opposite the doorway, an east - west quoin and pier wall defines the southern boundary of the room. A cobble floor covers part of the room, the only remnant of any intentional flooring in Room 1. Several patches of ash were found throughout Room 1, most likely build-up on the surfaces associated with the use of an oven. The initial surface of Room 1 was uneven and ill-formed, re-using earlier debris accumulations as an exposure surface.

Room M2

The eastern long room is entered from Room 1 by a doorway between the northern wall of the building and the north - south dividing wall. Further walls to the south continue the separation of Room 2 from Room 1, including a low wall segment which blocked the doorway between them in a later sub-phase. And while the eastern wall to the room and building survives to several courses, an anticipated southern wall has not been excavated. A cobble surface covered the space between these walls, though it is very rough and uneven. A basalt hand grinder and limestone mortar were found lying between cobbles in the northern half of the room.

Coming from this room's living surface were a model door, reworked from a pithos sherd and complete with hinges and a small hole cut out in one side (**Fig. 11**), and a small tuff pendant (**Fig. 12**). Apart from these two objects, the room would have served perfectly to house animals, with the rough cobble floor, the low wall blocking an earlier threshold and the narrow doorway just off the main entrance.

Room M3

The western room was entered from Room 1 through a large opening between two walls. Opposite the doorway, the western wall of the room separated Room 3 from Rooms 9 and 10

11. Field H model door (B100015; photo Jillian Logee).

12. Field H pendant seal (B100013; photo Jillian Logee).

further to the west. In the northern wall of the room a doorway led into Room 6, though the surface is higher in Room 6 by roughly 0.2 m. Four stones immediately inside the doorway in Room 3 could have served as steps, or - as the four stones sit on a layer of dirt on top of the cobble floor in Room 3 - they could be the last remnants of a later cobble surface. Most of the room was cobble-paved.

Room M4

The potential broad room is not yet fully excavated, and awaits removal of a later wall before further exposure.

Rooms M5 - M11

Through its north-western doorway, Room 3 gives access to Room 6, the first of a series of small rooms accessed from the central rooms of the building. None of these peripheral rooms has obvious doorways in their partition walls, which tend to have been preserved to only a single course high. It is possible these partition walls were never more than small barriers easily walked over, or the superstructure of the walls left a gap above the single course for passage. Three rooms, 9 - 11, were cobble-paved. The two ovens, hearth, stone hand tools, weaving implements and numerous cooking pot fragments indicate that most of these rooms served a domestic purpose where the inhabitants lived and worked to feed and clothe themselves.

The hard-packed, unburned mud-brick debris layers above the surface build-up show that no fiery conflagration burned through the rooms to destroy them. Instead, the mud-brick walls reconsolidated into a bricky mass after collapsing in on the rooms, probably after the rooms had been abandoned. There is no evidence at this point to indicate that Building M had two storeys; the amount of debris seems to indicate a single-storey, ground-level building with stone and mud-brick walls.

Compacted mud-brick detritus contained numerous hand grinders, millstones and ceramic spindle whorls, as well as a pendant seal and metal needle. Unlike the LB / Iron I transitional houses in Fields B and A to the north, no evidence of sudden evacuation or widespread destruction were found in the rooms. The floors were mostly clean of objects except for several chert hammerstones, a ceramic whirligig, three hand grinders, four millstones and three ceramic spindle whorls. The greatest depth of the fill layers covered most of the interior dividing walls. For the most part, the interior rooms of this phase were covered after the building's abandonment and only the outer eastern, western and northern walls were re-used in the next phase.

Stratum 11 (Iron IB - Field H phase 11)

In 2006 the first evidence of phase 11 was revealed by a wall and exposure surfaces in Squares 7K21 and 7K31, as well as extensive boulder tumble throughout the field. Excavation of architectural elements in the southern part of the field this season showed that instead of belonging to an earlier phase, as proposed in 2008, all of these remains, including an additional wall and pillar base, actually belong to this phase.

After the abandonment and collapse of the Early Iron I building, in which the mud-brick walls tumbled and reconsolidated into a hard mass of earth, the builders of Phase 11 used the hard earth as a foundation for building new walls in the west and in the south, while re-using the still visible northern and eastern walls. Since the northern walls do not form a continuous wall, it may be that the northern side of the structure was left open for entry during this phase.

The majority of the area contained within these walls was left open, without any internal divisions or roofing support apparent. In the southern third, however, the architectural elements suggest they could have supported a roof or superstructure, given the presence of three potential pillar bases. These three pillar bases are in line with each other and mark off the boundaries of a southern area, perhaps a room, in this phase, which in later phases developed into a walled area with several shifting internal divisions.

Three abutting walls created a small corner room in the south-west area of the larger space. The purpose of this room, no more than 1 m^2 in size, is unclear. Further excavation to the south may clear up this uncertainty.

This phase's beaten earth and exposure surfaces suggest a short time span of use before the design culminated in the extensive preparatory plaster earth layers and cobble floors of the following phase. Remnants of a cobble floor in the

southern portion of the field suggest that at least the southern area was paved in this phase, though preservation is poor. The open-air courtyard pattern, with a separate southern area, suggests that the structure was designed for a use necessary not only to the inhabitants of this phase, but also those of subsequent phases. No cultic objects were found for this phase, so a sanctuary use is unsupported except by argument of comparison with the later cultic levels. The fill of this early structure had only a few domestic items such as spindle whorls and hand grinders. In light of the similarity between the outline of this structure and those that followed, it would seem this area was continuously used and improved through a succession of many phases.

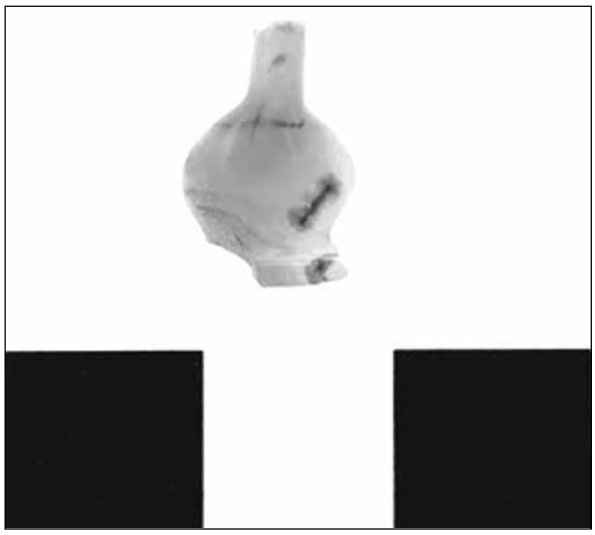
Stratum 10 (Iron IB - Field H phase 10B)

This earliest phase of the cobbled floor courtyard has been well explained and documented in earlier field reports. Our work this season removed the last vestiges of cobble and plaster floors from the east balk of 7K32 and 7K31, and their supporting fill layers, completing removal of Phase 10B from the field. In the process of completing these excavations, we discovered a pit filled with loose earth and pottery with a greenish cast to it, perhaps from some organic material thrown into the pit.

Stratum 10 (Iron IB - Field H phase 10A)

The second sub-phase of the cobbled floor courtyard was completely removed this season after excavating remaining surfaces and walls. Excavation produced a number of objects and bones, including a cowry shell, metal needle, two carnelian beads, a carnelian lotus-seed vessel pendant (**Fig. 13**), a basalt hand grinder, a basalt millstone and an ostrich egg shell fragment. This rich assortment is not datable to any specific phase of the wall from which it was taken, as it was found between the stones of the wall and could have fallen into the wall at any point during its use. The lotus-seed vessel pendant resembles one found in 1996 (#6047) in the topsoil of 7K21 (MPP6). These are the only two flat examples from al-'Umayrī excavated thus far, though three of the rounded lotus-seed vessel pendants have been found in Iron I and Iron II contexts in Fields A and B.

Our goals this season included removing the final remains of the courtyard sanctuary phases and further exploring the complex Early Iron I structure. Our goals for future excavation will include final removal of the northern and southern walls, though we will need to re-open excavation of the southern half of Squares 7K11 and 7K12 before this can be accomplished for the southern wall. Questions to investigate include the chronological relationship of this structure with the transitional period domestic buildings further north on the tall, as well as the relationship of this phase with earlier phases of use of the substantial walls of the building. The size of the building's walls in parallel with the Late Bronze temple / palace on the north-west corner of the tall, and the frequency of Late Bronze pottery mixed with the Iron I in the layers excavated, hint at a Late Bronze origin, but only future probes will tall.



13. Field H lotus-seed vessel pendant (B100014; photo Jillian Logee).

Field L: The South-Eastern Acropolis (Carrie Elaine Duncan, University of North Carolina at Chapel Hill)

Field L was opened on the south-eastern edge of Tall al-'Umayrī's acropolis in the 1998 excavation season. The initial purpose of the field was to explore the various architectural features visible in the transition from the top of the tall to the southern slope. Excavators posited a continuation in Field L of the Early Bronze Age remains found in Field D, located lower on the southern edge of the tall. Ensuing seasons of excavation have identified significant architec-

tural and material culture remains from the Iron I, Late Iron II / Persian and Hellenistic periods, corresponding to site-wide Strata 12, 7 and 4 respectively.

The previously excavated Iron I remains in Field L consist of a massive wall running roughly east - west the length of three squares (6L80, 6K89 and 6K88). Additional Iron I material was found on the north side of this wall at its westernmost exposure (Square 6K98), although the relationship between the wall and this additional material is not yet clear. From the wall's width of *ca*. 1.5 - 1.75 m we infer that it comprises part of a monumental, non-domestic architectural feature, comparable – and perhaps related – to similar discoveries in Fields A and H.

Earlier seasons' excavation of Late Iron II / Persian material in Field L revealed the southwest corner of a domestic structure at the eastern end of the field with associated occupation surfaces. Pillar bases were thought to divide a courtyard containing a *ṭābūn* to the south from a room open to the courtyard, but poorly preserved in Square 6L80. The phasing of the Late Iron II / Persian material was unclear, due in large part to perceived Hellenistic disturbance.

The Hellenistic remains in Field L are extensive and have been the focus of excavation for many seasons. The farmstead complex appears bound by major walls on the north, west and south. The eastern wall of the farmstead structure is not currently extant, either because it lies to the east of the excavated area or because of the poor preservation apparent on the eastern sides of Squares 6L80 and 6L70. Several of the rooms associated with this complex had plaster floors. Scattered remains of agricultural production equipment and facilities found in Squares 6L80, 6L70 and 6K79, including press weights, pithos installations and a drain were interpreted as an olive or wine press associated with the Hellenistic farmstead. The 2010 season's excavation has led to a revision of the date assigned to the drain and other press features, which will be discussed below.

The 2010 season of excavation in Field L had two main foci: first, to remove a series of balks in the eastern section of the field (Squares 6K79 and 6K89) in order to uncover fully the Hellenistic farmstead and to begin removal of its associated walls, better exposing the Late Iron II structures in this area; second, to continue the project started in the 2008 season of expanding Field L to the west and north towards Fields H and M by opening two new squares at the west edge of the field (Squares 6K86 and 6K96) (**Fig. 14**).

Given that excavation occurred exclusively in balks, topsoil and sub-topsoil this season, it is not surprising that no new major architectural features were discerned. Nevertheless, several longstanding questions were answered and the field's phasing as a whole became clearer. Findings include (1) continuity of the Hellenistic plaster surface unifying the eastern room of the Hellenistic farmstead, (2) a stone surface related to the Late Iron II / Persian pressing installation and (3) the continuation of Late Iron II / Persian architecture in the western part of the field.

Stratum 12 (Iron I - Field L phase 7)

During the removal of the east balk in Square 6K89, a gap was noticed between two of the large stones in the one visible course of Wall 6K89:10's southern row. This gap suggested a possible original doorway blocked in a later period. Excavation of later fill material against the

14. Field L aerial photo (photo David Kennedy).

wall's face revealed an unbroken second course of stones. The apparent gap is best explained by the robbing out of chink stones.

Stratum 7 (Late Iron II / Persian - Field L phase 6)

The Late Iron II / Persian period is represented in two field phases (6 and 5) in Field L. However, no earth layers associated with phase 6 were excavated in the 2010 season. The multiple phases of Iron II / Persian occupation are attested by several phase 6 features being robbed out and covered over or reused by phase 5 structures.

Thus, several walls in 6K79 and 6K89 appear to have been built in phase 6 of Late Iron II / Persian construction and comprise the extant walls of the phase 6 Late Iron II / Persian building in Field L. No eastern wall of this building has been found as of yet. It is possible that the building's east wall could be outside the current excavation area, but it is equally possible that this wall fell victim to the poor preservation apparent in the eastern portion of the field. As noted above, no earth layers associated with the phase 6 occupation of this building were excavated this season, leaving unanswered questions of the building's use and the precise date in this phase.

At the west edge of Field L a large wall was found in a newly opened square (7K86). Although excavation of the wall has exposed only one course thus far, it has been assigned to the Late Iron II / Persian period based on its association with a contemporary wall line in 6K87 to the east (**Fig. 15**), with which it shares alignment and megalithic construction techniques. Further excavation is needed before we can assign the wall to phase 6 with certainty.

Stratum 7 (Late Iron II / Persian - Field L phase 5)

Numerous elements related to the Phase 5 occupation in Field L were found during the course of balk removal in Squares 6K79 and 6K89. In most cases, these finds could be connected to previously excavated architectural or installation elements, although preservation was not always such that their function could be clearly discerned.

During the 2006 season of excavation, three large pressing weights were discovered in Square 6L80, which were interpreted as indications of an oil or grape pressing installation. Neither pressing surface nor beam anchor wall was found in association with the weights

15. Field L aerial Photo West (photo David Kennedy).

during that or the subsequent season. Possible remnants of both, however, were identified this season, albeit in a poor state of preservation. An installation consisting of a round, flat piece of limestone, *ca*. 0.42 m in diameter and 0.20 m thick, was set in a poorly preserved plaster bed. The installation surface is sealed against on the south by an earth layer. Immediately to the east, an installation wall runs between the pressing surface and the weights (**Fig. 16**). On the north side of the stone surface is a jar set into a plaster layer, while to the east an earth layer preserves significant portions of a pithos jar set into a plaster and earth surface.

These elements should combine to form a complete pressing installation in phase 5 of the Late Iron II / Persian occupation. However, the installation wall is composed of unhewn stones set in a haphazard manner and stands between the weights and surface, causing concern about how this wall could aid in the placement of a pressing beam; the surface preserves no mechanism for the channeling of pressed liquid and, finally, the suggestively located ceramics cannot be collection vessels themselves nor stands for such vessels. Therefore, although all the necessary elements for a pressing installation have been found in proximity to one another, no coherent picture of how the installation functioned can be drawn.

The central section of a drain in 6K79 was identified during balk removal, establishing a continuous, *ca*. 6.7 m line from the drain's southwest terminus in a wall in 6K79 to its north-east extent in 6L70. As elsewhere, the drain section excavated this season was lined with stones on the sides and top (**Fig. 17**). Although this drain was associated initially with the Hellenistic occupation at al-ʻUmayrī, its location beneath a Hellenistic surface and the presence of Late Iron II / Persian pottery in drain fill argue for the drain's placement in phase 5. Despite the excellent preservation of the drain itself, discerning how the drain functioned has proved difficult. What exactly was being drained, whence and whither remains unclear.

16. Field L pressing surface and weights (photo John McDowell).

Stratum 4 (Hellenistic - Field L phase 4)

Excavation in the north and east balks of Square 6K79 and the east balk of Square 6K89 has unified the Hellenistic room bounded by walls in both squares on the west, south and north sides, by stratigraphically linking the plaster surfaces uncovered in 6K79, 6K89, 6L70 and 6L80 which cover, albeit patchily, the entirety of the extant room.

Stratum 4 (Hellenistic - Field L phase 3)

The later phase of the east room of the Hellenistic farmstead is represented in the south-east corner by a surface, on which a figurine fragment was found. The abandonment of the Hellenistic phases appears to be marked by earth and tumble in 6K89.

Stratum 1 (Islamic - Modern - Field L phase 2)

Work in sub-topsoil layers in 6K96 exposed a thick deposit of stone tumble and ceramic debris in a loose matrix of soil. Although the tall begins to slope sharply to the south in the area of 6K96, the dense deposit of stones and pottery in this square cannot be accounted for by natural processes. Rather, this accumulation would seem to result from deliberate clearing of debris from the top of the tall, perhaps for agricultural purposes. In addition to the thick accumulation

17. Field L drain channel (photo John McDowell).

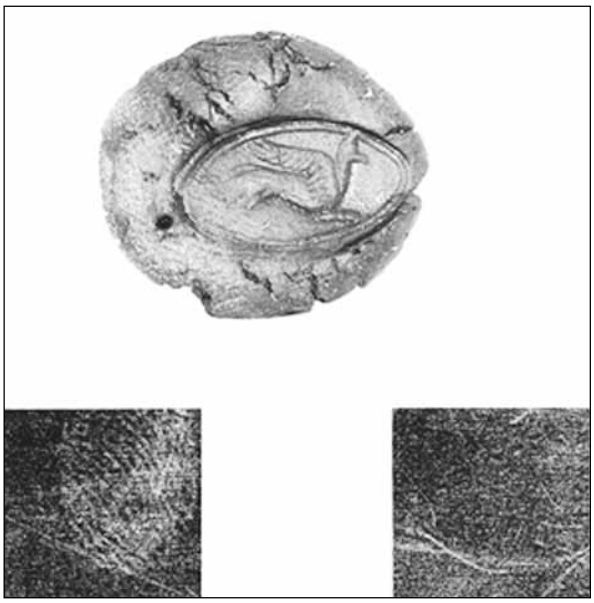
of rocks and pottery, the sub-topsoil layers of 6K96 were characterized by a scatter of very large, *ex situ* boulders.

Several objects were excavated as part of the sub-topsoil in squares 6K86 and 6K96, including two beads (B100021 and B100023), three figurine fragments (B100017, B100018 and B100019) and a metal ring (B100022).

Stratum 1 (Islamic - Modern - Field L phase 1)

As is often the case, topsoil in a plow zone can produce a trove of artifacts. Field L was no exception to this rule. Objects included a stamp seal, two seal impressions (**Fig. 18**), two beads and a cowry shell.

Our goals for Field L in the 2010 season included the removal of balks and walls associated with the Hellenistic farmstead and the expansion of the field to the west. Progress has been made on each of these fronts. Balk removal in Squares 6K79 and 6K89 improved our understanding of the Late Iron II / Persian and Hellenistic stratigraphy in these and adjacent squares. Removal of topsoil and sub-topsoil layers in Squares 6K96 and 6K86 has cleared the way for excavation of stratigraphically significant loci and architectural features.



18. Field L griffin seal impression (B100005; photo Jillian Logee).

Field M: The West-Central Acropolis (Elizabeth Brown, Andrews University)

Field M is located on the west-central acropolis of Tall al-ʻUmayrī. It was first opened in 2008 directly east of Field H with four squares: 7K23 (south-west) square, 7K24 (south-east) square, 7K33 (north-west) square and 7K34 (north-east) square.

In 2008 the new squares yielded a Late Iron II / Persian building (Building A) in the southern half of the field and several surfaces covering most of the eastern and northern part of the field, also dating to Late Iron II / Persian. However, it was difficult to see how these different features related to each other from square to square, given the lack of stratigraphic connection due to extant balks.

In 2010 excavation resumed in these four squares (**Fig. 19**), the main objective being the removal of all four interior balks. This would expose the multiple surfaces in 7K24, 7K34 and

19. Field M (photo David Kennedy).

7K33 and would also more fully expose Room A1 (Building A) in 7K23 and 7K24. The aim was to gain a better understanding of how these architectural features and surfaces related to each other.

Stratum 8 (Iron II - Field M phase 4)

Phase 4 was the earliest phase reached in Field M in the 2010 season. While the architecture in this phase was used through later phases, it seems that the lower courses of the walls that make up Building A, as seen in Room A1, were constructed in this phase and added to in Phase 3b. Building A, only partially exposed in the south-west and southern part of Field M, was dug into the ground. The room was 4.5 x 2.5 m in size.

In 2010 a flagstone and beaten earth surface was exposed. The surface covers the entirety of Room A1 and is approximately 65 percent flagstone and 35 percent beaten earth with the beaten earth section mostly near the stairs. Flagstones in the center of the room formed a hollow circle, directly in front of a possible domestic press that is resting on the surface along the southern wall (**Fig. 20**).

Wall construction is unusual, the upper course formed of a single row of limestone megaliths that is inconsistent with the rubble construction of the lower courses. In addition, the eastern and southern walls of the room do not appear to have the second phase of construction and seem to be of another style altogether.

Stratum 7 (Late Iron II / Persian - Field M phase 3b)

A series of walls in 7K33 and 7K24, once thought to have come from the Hellenistic period, were linked stratigraphically by means of a surface in 2010 and clearly date to the Late Iron II / Persian period based on ceramic evidence. Room A1 saw a second phase of use with the appearance of a subsequent surface level and the addition of stairs into the building.

The relationships between several surfaces in Squares 7K24, 7K33 and 7K34 became clear only after removal of all interior field balks. There were, in fact, two separate surfaces dating to Phase 3b, based on ceramic evidence discovered within and above them. The surfaces cover a large area in the eastern and northern parts of the field. This suggests some sort of large courtyard. The entire set of surfaces is also sloping to the north-east.

A cobble surface was exposed in the northwest corner of Square 7K33. Uneven and possibly damaged, the surface seems to match with the other surfaces running across the field.

Stratum 6 (Late Iron II / Persian - Field M phase 3a)

Phase 3a is the second phase within the Late Iron II / Persian period. It seems that most of the architecture that was in use across the field in Phase 3b was no longer being utilized. Room A1 was filled with rubble and the extensive courtyard surfaces in the north-eastern part of

20. Room A1 (photo John McDowell).

the field were cut through by a pit.

Marking the end of use of the uppermost surfaces in Squares 7K24, 7K33 and 7K34, a large pit was dug, cutting through all the surface layers. Filled with loose, dark yellowish - brown soil, the pit contained little pottery. However, a possible architectural model (B100025) was found in the fill.

Strata 2 - 1 (Byzantine - Islamic - Field M phase 2)

Topsoil was excavated in the 2010 season during balk removal in the north and east balks of 7K23, north balk of 7K24 and east balk of 7K33, producing little in the way of finds.

The 2010 season in Field M clarified many questions that were left unanswered from the 2008 season. The relationships between the surfaces in 7K24, 7K33 and 7K34 were finally revealed, giving a new dating for much of the architecture in the field; an earlier date was established for at least Room A1 of Building A.

Plans for 2011

The project is planning a small study season during the month of July 2011 in order to expose what remains of an emerging 'four-room' house in Field H. Excavation over the past two seasons, in 2008 and 2010, has revealed part of a large domestic structure dated by ceramics to the Early Iron I period. Several well-preserved domestic buildings from transitional LB / Iron I strata in Fields A and B have been uncovered, but the Field H ceramics suggest that this building is slightly later. The 2011 research will focus on the nature of the domestic structure in Field H, exploring architectural features in order to understand social and economic patterns.

Acknowledgements

The authors of this report are especially indebted to Dr Ziad al-Saad, Director General of the Department of Antiquities. Romel Gharid served us extremely well as representative of the Department of Antiquities. We also wish to thank other members of the Department of Antiquities who facilitated our project at several junctures, including Khalil Hamdan and Catreena Hamarneh. The American Center of Oriental Research in Amman, directed by Barbara Porter and assisted by Chris Tuttle, provided invaluable help. The excavation staff was housed in Muqabalayn at the Amman Training College, an UNWRA vocational college for Palestinians. We give special thanks to its Principal, Dr Ahmad Ayyadi, for making our safe and secure stay a genuine pleasure, to Chief Operations Officer, Hussam Shahroor, who worked with us on a daily basis, and to our cook, Muhammad Ahmaru, for overseeing excellent meals. Vickie Khano of Guiding Star Travel Agency helped with many logistical concerns. The Committee on Archaeological Policy of the American Schools of Oriental Research approved the scientific goals and procedures of the project. Thanks are also due to each member of the 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, director and chief archaeologist of the project. Field supervisors appear as authors of sections of this report. Finally, we could not have accomplished our work without the generous support of land owners Dr Raouf Abu Jaber and Mr Jebril Abu Aisha, consortium fees from the member institutions of MPP- al-'Umayrī and the donations of a large number of friends of the project, including a grant from the Versafund foundation in Riverside, California.

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UN NOUVEAU PLAN POUR JARASH/GERASA (JORDANIE)[1]

Thomas Lepaon
Avec la collaboration de Tristan Moriceau

«Un plan de *Gerasa*? Encore? Pour quoi faire?». Ces questions furent les premiers mots d'un chercheur travaillant activement à Jarash. Ces remarques ne sont toutefois pas dénuées de sens car, en effet, depuis près de deux siècles, les vestiges de l'antique *Gerasa* de la Décapole ont fait l'objet de nombreuses représentations planimétriques. Toutefois, malgré ces nombreux travaux, un double constat s'impose : d'une part, l'ensemble des plans actuellement disponibles sont soit dépassés (bien que très complet, le plan publié en 1938 est dépourvu des nombreuses découvertes réalisées dans le cadre du Jarash Archaeological Project débuté il y a près de 30 ans), soit incomplet (l'ensemble des plans publiés depuis ces quinze dernières années sont démunis d'informations essentielles telle que la topographie ou le cadastre moderne, lesquels sont essentiels à la bonne compréhension du site). D'autre part, il n'existe, à notre connaissance, aucun plan informatisé permettant de travailler aussi bien à l'échelle des espaces composant les édifices présents sur l'ensemble du parc archéologique que des quartiers au sein desquels ils sont insérés. Ce dernier point, essentiel pour qui prétend réaliser un travail archéologique et architectural à Jarash, nous à conduit à amorcer le projet d'un nouveau plan de l'ancienne cité de *Gerasa*.

Représenter la ville, c'est nécessairement aborder le délicat problème de l'urbanisme qui peut être défini comme l'ensemble des études et des conceptions ayant pour objet l'implantation et l'aménagement des villes[2]. Cette large définition indique que l'étude urbaine renvoie à une assez large gamme de professions : architectes, ingénieurs, paysagistes, économistes, sociologues, géographes, *etc*. Chacune de ces pratiques possède sa propre définition de la ville et tente de mieux comprendre celle-ci par des méthodologies adaptées. L'archéologue, pour sa part, base sa réflexion par l'étude des vestiges matériels laissés dans l'espace et dans temps par l'occupation humaine. Par cette approche, il dispose de deux axes de recherche lui permettant d'appréhender la ville.

La première approche, essentiellement spatiale, consiste à étudier l'évolution des divers

1. Ce travail n'aurait pu se faire sans le soutien constant du directeur du département des antiquités de Jordanie (DoA) M. Fawwaz Al-Khraysheh. Qu'il soit ici remercié une nouvelle fois pour sa confiance et son aide sans retenue. De même, que soit remercié l'ensemble des autorités de Jarash qui ont facilité notre travail: M. Mohammad Abu Abeyleh, représentant, à Jarash, du directeur du département des antiquités de Jordanie et M. Abdel Majid Mujally, responsable des restaurations sur le site de Jarash. De même, nous souhaitons ici remercier une nouvelle fois M. … de la municipalité qui a mis à notre disposition les bases de référence indispensable à notre étude et sans qui ce travail n'aurait probablement jamais vu le jour. Nous souhaitons également adresser nos remerciements les plus sincères à M. François Burgat, directeur de l'Institut Français du Proche-Orient (IFPO) et M. Marc Griesheimer, directeur scientifique du département archéologie et histoire de l'antiquité à l'IFPO, pour le soutien qu'ils ont apportés à ce travail. De même, que soit ici remerciée Mme Pauline Piraud-Fournet, chercheur associé à l'Institut français du Proche-Orient en poste à Damas, qui à réussi à mettre à notre disposition tout le matériel indispensable à ce travail. Enfin, je souhaiterai adresser mes plus vifs remerciements à M. Jacques Seigne, directeur de la mission archéologique de Jarash et actuel représentant du directeur de l'Ifpo à Amman, qui m'a toujours fait confiance. Enfin, il serait malhonnête de tenter de faire croire qu'un tel travail serait le fait d'un seul homme. Je souhaite adresser mes plus vifs remerciements aux membres de la mission de Jarash 2007 qui m'ont suivi dans ce projet: Claire Hasenohr, Gabriel Humbert, Bastien Simier, Guillaume Krysman, Tristan Moriceau, Daniel Morleghem et Sandie Poisson.
2. Concernant l'évolution urbaine de *Gerasa*, voir Seigne 1992: 331-341.

ensembles construits composant la ville c'est-à-dire le tissu urbain lequel est «l'expression physique de la forme urbaine» si l'on suit la définition de P. Merlin[3]. De manière plus précise, l'auteur ajoute que le tissu urbain « est constitué par l'ensemble des éléments qui contribue à celle-ci [forme urbaine] – le site[4], le réseau viaire, la division parcellaire, le rapport bâtis et non bâtis – et par les rapports qui relient ces éléments. […] La notion de tissu urbain est donc à la fois statique (état des formes urbaines à un moment donné) et dynamique (porteuse de possibilités d'évolution de ces forme urbaines»[5]. L'étude du tissu urbain permet de saisir l'imbrication spatiale et chronologique des constructions composant la ville auxquelles l'archéologue va tenter de donner du sens en déterminant leur fonction.

La seconde approche correspond à l'analyse des formes de la ville c'est-à-dire l'étude de la morphologique urbaine. Malgré une certaine imprécision du concept, qui ne permet pas de proposer une définition claire de ce type d'étude, P. Merlin retient trois conditions, fixées par B. Hillier en 1983, à sa réalisation:

«1. l'objet central de réflexion théorique est la forme physique et spatiale de la ville.
2. Il doit y avoir une discipline analytique, et si possible scientifique, de la forme urbaine.
3. La morphologie soit le tissu urbain suppose la réunification de l'architecture et de l'urbanisme en une discipline unique ou l'architecture retrouverait sa dimension analytique et l'urbanisme son intérêt pour la dimension physique et spatiale».[6]

Dans le domaine de l'archéologie, si les premières recherches consistaient simplement en la reconnaissance des formes disparues par l'étude des cadastres plus ou moins anciens[7], l'étude de morphologie urbaine s'attache aujourd'hui à tenter de retrouver leur dynamique. Dans sa thèse récemment soutenue, B. Lefebvre remarquait à juste titre que «si les études s'appuie sur des plans parcellaires, elles ne prennent que très rarement en compte le bâti […]»[8]. Les études architecturales demeurent aujourd'hui les seules à tenter de réels travaux volumiques des bâtiments comme l'illustre parfaitement les travaux réalisés à ʻIrāq al-Amīr[9]. Malheureusement, ces études traitent le plus souvent un bâtiment isolés ou décontextualisés de son tissu urbain. L'étude morphologique urbaine, fondée sur l'analyse de l'évolution du tissu urbain et sur l'étude de la forme des bâtiments qui le compose, constitue un outil supplémentaire qui ne peut être négligé de la réflexion visant à établir un nouvel outil d'analyse des problèmes de l'évolution urbaine.

Bien que théoriques, ces concepts illustrent bien la complexité de la réalité urbaine observée à partir des sources archéologique et obligent à effectuer un travail dépassant largement la réalisation d'un simple document planimétrique. L'analyse du tissu urbain et de sa morphologie ne peut se faire sans une connaissance précise de ses constituants corrélatifs impliquant, de fait, leur formalisation, leur décomposition et la structuration des données qui les définissent.

Propre à l'étude archéologique, cette double approche diachronique de la ville peut être considérée comme un système interactif dynamique au sein duquel chaque élément occupe une place indépendante mais dont la relation avec les autres ensembles compose la cité. Avant d'étudier ces ensembles formés d'entités et de relation, il convient de formaliser les données disponibles c'est-à-dire de définir un traitement transformant les informations brutes hétérogènes issue d'étude diverses (architecture, épigraphie, fouilles archéologiques, *etc*.) en données homogènes comparables.

La première étape de ce travail consiste à « déconstruire » le tissu urbain afin de traiter ses constituants individuellement (site, réseau viaire, division parcellaire et le rapport bâtis et non bâtis). En premier lieu, le site de la ville, c'est-à-dire essentiellement la topographie laquelle est représentée par des courbes de niveau, considérée comme Unité de Terrain (UT). Le réseau viaire est analysé comme tout bâtiment possédant ses entités et son histoire propre. Ainsi,

3. Merlin et Choay 2000: 826.
4. Ici défini dans le cadre de géographie urbaine c'est-à-dire: «[qu'] il désigne l'emplacement de la fondation ou de l'extension d'une ville; choisi en fonction de ses caractères topographiques adaptés aux besoins de l'époque […] » (Merlin et Choay 2000: 773).
5. Merlin et Choay 2000: 826-827.
6. Merlin et Choay 2000: 528.
7. A ce sujet, voir Conzen 1968.
8. Lefebvre 2008: 61.
9. Larché 2005.

chaque partie de la trame viaire a été décomposée en Unité Architecturale (UA) qui peut se définir comme étant la plus petite entité composant un Ensemble Architectural (EA) soit la voie dans le cas de la trame viaire. La division parcellaire « représente […] l'ensemble du système d'appropriation foncière d'un espace »[10] et se démarque donc de l'ensemble des autres constituants du tissu urbain par son absence totale de matérialité et par son caractère purement administratif. Chaque parcelle va donc être appréhendée comme une Entité parcellaire (EP). Enfin, le rapport bâti et non bâti correspond aux bâtiments lesquels sont composés de structures architecturales enserrant des espaces couvert (bâtis) et non couvert (non bâtis). À l'image des voies, ces deux composantes sont divisées en Unité Architecturale (UA) formant un Ensemble Architectural (EA). Dans le cas présent, les espaces sont considérés comme des Unités Architecturales, et non comme des Entités Spatiales, car ils font partie intégrante de l'ensemble architectural.

Bien que correspondant à différentes échelles d'analyses et disposant chacune de champs descriptifs particuliers, ces subdivisions s'associe pleinement par leur capacité à répondre aux questions de base de l'étude du tissu urbain : Où ? Quand ? Quoi ? Cette triple définition, définie par D. Peuquet[11], demeure aujourd'hui la base de tout enregistrement archéologique. Ces trois propriétés fondamentales sont considérées comme indispensables pour la définition de chaque élément et le changement de l'une de ces caractéristiques (espace, temps, fonction) abouti à la création d'une nouvelle entité et donc un nouvel enregistrement.

L'application de ce modèle conduit nécessairement à envisager l'utilisation de l'outil informatique, aujourd'hui relativement abordable, qui a considérablement accru les moyens techniques disponibles des chercheurs désirant traiter les données qu'ils exploitent. Ces progrès techniques indéniables conduisent toutefois assez souvent à la réalisation de travaux particulièrement complexes, inadapté aux réalités du travail archéologique et finalement inutilisable par d'autres personnes que l'opérateur qui créa le modèle.

La détermination des besoins actuels et futurs à donc guidé l'exécution du modèle proposé dans cet article. Ainsi, au delà de permettre une étude du tissu urbain (par la possibilité de formaliser, décomposer, structurer et interroger les données) et de sa morphologie (traitement en trois dimension des mêmes données composant le tissu urbain), l'application numérique doit également permettre un traitement multi-échelle et interdisciplinaire des données. En effet, d'une part, la pratique actuelle de l'archéologie à Jarashs'apparente à une mosaïque d'opérations méthodologiquement indépendantes notamment en raison de sujets d'étude nécessitant des échelles d'analyse différente.

D'autre part, depuis ces 10 dernières années, l'emploi d'outils tels que les Système d'Information Géographique (SIG)[12] ou la réalité virtuelle[13] connaît un remarquable essor dans la pratique de l'archéologie. A Jarash, la réalisation de SIG fut déjà expérimentée aussi bien à l'échelle du quartier[14] qu'à celle du territoire de la cité[15]. En ce qui concerne la réalité virtuelle, seul le théâtre sud semble avoir bénéficié de cette approche[16]. Permettant une approche complémentaire des vestiges archéologiques, ces études novatrices et les contraintes qu'elle suppose doivent être prise en compte en amont de la mise en place d'un modèle numérique et notamment lors du choix de la plateforme logicielle.

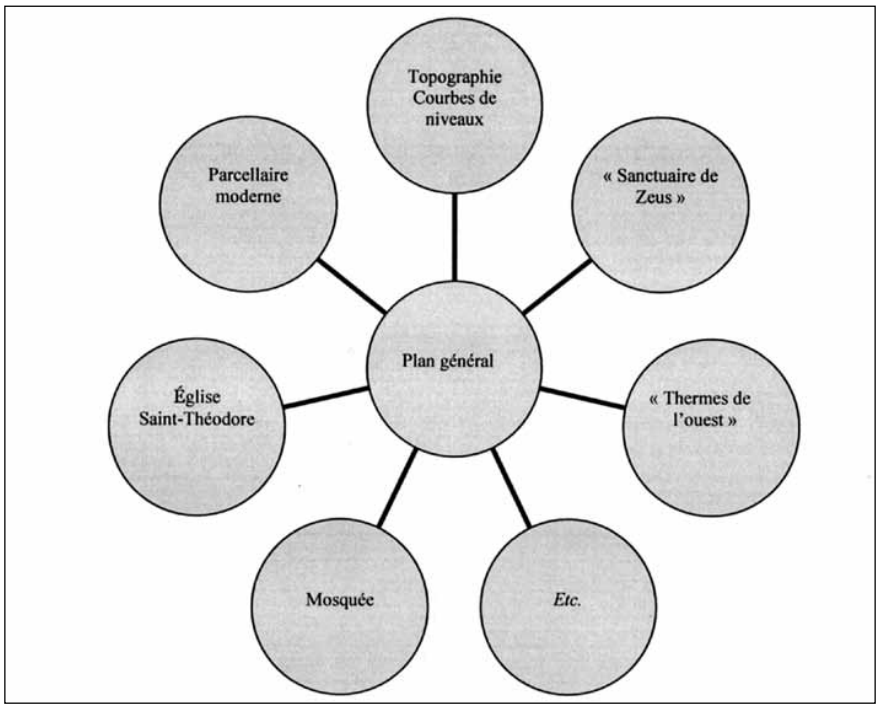
Malheureusement, la réalisation de cet ambitieux programme scientifique se heurte aujourd'hui à un problème majeur : il n'existe,

10. Merlin 2000: 573.
11. Peuquet 1994: 449.
12. Sur l'appréhension de la ville par les archéologues, voir l'essai d'H. Galinié *Ville, espace urbain et archéologie* (2000) et les différents travaux menés par le Laboratoire Archéologie et Territoire (L.A.T.) de Tours (Rodier, Saligny, Lefebvre et Pouliot 2009). En application de sur cette théorie, on peut relever les travaux conduits par B. Lefèvre portant sur la fabrique urbaine d'Angers du IIIe au XIIIe siècle. Des travaux similaires furent également mené à Alexandrie par J. L. Arnaud (2002) et N. Martin (2002, 2003).
13. A ce sujet, voir les travaux présentés dans le cadre de divers colloques internationaux (Vergnieux et Delevoie ed. 2004, 2006 et 2008; Haselberger et Humphrey 2006). Toutefois, sur la place de la réalité virtuelle en archéologie, on s'intéressera surtout à l'article de L. Pujol Tost et M. Sureda Jubany (2007).
14. Voir les travaux et la réalisation d'un SIG par I. Simpson (2007) sur le quartier de la mosquée.
15. Voir les travaux et la réalisation d'un SIG par D. Kennedy (2008) sur le territoire de Jarash
16. Voir les travaux de réalité virtuelle réalisé sur le théâtre Sud par de F. Sear et A. Hutson (2004).

à notre connaissance, aucun outil informatique permettant, à lui seul, de réaliser une telle étude exhaustive[17]. Cette limite logicielle nécessita la mise en place d'un système technique impliquant plusieurs logiciels.

La première étape à donc consisté à permettre la collecte de l'ensemble des données (archéologique, architectural, topographique, épigraphique, *etc*.) au sein d'un même environnement numérique ou ces informations seront formalisées, décomposées et structurées (au sein d'une banque de donnée) suivant la méthodologie présentée précédemment. Cette opération fut réalisée à l'aide de l'outil de Conception Assisté par Ordinateur Vectorworks, logiciel d'architecture, similaire à Autocad, mais plus ergonomique, plus abordable et disposant de fonctionnalités non intégrée à ce dernier[18]. La méthodologie employée afin de traiter des nombreux édifices présents à Jarash est dite « par perle » c'est-à-dire que chacun de ces ensembles est traité individuellement, en 2D comme en 3D, puis est relié au plan général par l'intermédiaire d'un lien dynamique (**Fig. 1**).

Dans le cadre de notre travail, la première étape a consisté à installer un canevas topographique par l'implantation de bases de référence calées sur le système géographique



1. Schéma représentant la méthode dite «par perle».

17. Les outils informatiques ou logiciels couramment utilisés en archéologie peuvent être classé selon quatre type et possèdent chacun leurs atouts et leurs limites:
1. Les outils de D.A.O. (Dessin Assisté par Ordinateur) de type Illustrator, par la richesse de leurs possibilités graphiques, sont parfaitement utilisables pour la réalisation des dessins en vue de publications, ils ne permettent toutefois pas de véritable traitement de données.
2. Les outils de CAO (Conception Assistée par Ordinateur) de type Autocad ou Vectorworks gèrent les données aussi bien en deux et trois dimensions toutefois, ces derniers n'ont pas été développés afin de gérer des bases de donnés complexes, seules des banques de données internes ou des bases de données externes peuvent être utilisée.
3. Les outils S.I.G. (Système d'Information Géographique) de type Arc Gis possèdent de très nombreux atouts en ce qui concerne l'analyse spatiale mais ils présentent le très gros inconvénient de très mal gérer la troisième dimension. Nous renvoyons aux travaux de B. Lefebvre (2008) qui a bien montré dans sa thèse la complexité et finalement l'impossibilité de traiter des données 3D en raison, non seulement, de la complexité de leur mise en œuvre, mais surtout, de leur mise à jour.
4. les outils de réalité virtuelle dit « modeleurs » de type 3Dstudiomax, cinema4D ou Blender ont été développés pour le cinéma et les jeux vidéo. Si la qualité de rendu graphique est saisissante, les possibilités d'interrogations de données et d'analyse spatiale sont quasiment inexistantes.

18. Par exemple, Vectorworks offre une double structure d'organisation des documents, en couches et classes, qui permet de caractériser en profondeur les objets du modèle sans recourir à un nombre élevé de calques

« Palestine 1923 » (projection transverse mercator). Le choix de ce système fut guidé par le fait qu'il s'agit du système de projection actuellement utilisé par les autorités de Jarash. Ainsi, l'utilisation du même système de coordonnées permettait un échange aisé des données notamment issu des nombreux travaux réalisés de nos jours par la municipalité sans toutefois compromettre nos propres travaux.

Une fois établi, ce canevas servi de base afin de recaler, dans un premier temps, les cartes topographiques disponibles pour Jarash et sa région[19] et. Dans un deuxième temps, chacun des bâtiments a été indépendamment numérisé, soit par la réalisation de nouveaux relevés, soit à partir des plans déjà existants (voir **Annexe 1**), avant d'être relié au plan général (**Fig. 2**). Enfin, le parcellaire réalisé par la municipalité de Jarash fut également inséré au sein de ce plan.

Correspondant à la réalité du travail archéologique actuel à Jarash, ce système permet d'assurer l'indépendance des chercheurs[20]. Cette autonomie est renforcée par nature du lien dynamique qui relie l'ensemble des travaux au sein du plan général. En effet, il est possible définir exactement les données impliquées par cette « passerelle » et ainsi d'exporter les données de base à l'échelle de la ville sans insérer le détail des données issue de la fouille intégrées au sein du document d'origine. Cette fonctionnalité offre donc la possibilité indispensable de travailler à l'échelle de la fouille (micro-échelle), du quartier (méso-échelle) et/ou de la ville (macro-échelle) à partir du même corpus de données. De plus, la structuration des données réalisées au sein de chacun des projets individuels est préservée lors de l'export permettant leur interrogation quelque soit l'échelle d'analyse. Enfin, assurant l'intégrité du modèle, le lien dynamique permet d'effectuer, automatiquement ou manuellement, les modifications tant graphiques que sémantiques réalisées dans le document source au sein du plan général.

Toutefois, ce système n'est pas exhaustif car malgré toutes ces possibilités, la réalisation d'analyses spatiales développées ou d'animations virtuelles ne peuvent être effectuée sous cet outil et l'emploi de logiciels développés à ces fins est indispensable. Le choix de Vectorworks comme outil numérique fut également orienté en raison des multiples possibilités d'export direct des données traitées depuis cette plateforme numérique vers les logiciels adaptés et couramment utilisé en archéologie (**Fig. 3**).

Ainsi, l'ensemble des données planimétriques peuvent être directement exportées dans un logiciel d'analyse spatiale tel qu'ArcGis. Non seulement l'ensemble des données cartographiques est préservé (géométries des entités, système de projection, *etc*.), mais surtout, les informations entrées dans la banque de données de Vectorworks sont immédiatement transférées dans les tables attributaires correspondantes du logiciel d'analyse spatiale permettant ainsi la réalisation de requêtes spatiale, temporelle et fonctionnelle.

Par ailleurs, bien qu'il soit possible de travailler en trois dimensions au sein de Vectorworks, l'outil employé ne peut se substituer à un véritable logiciel de réalité virtuelle. Toutefois,

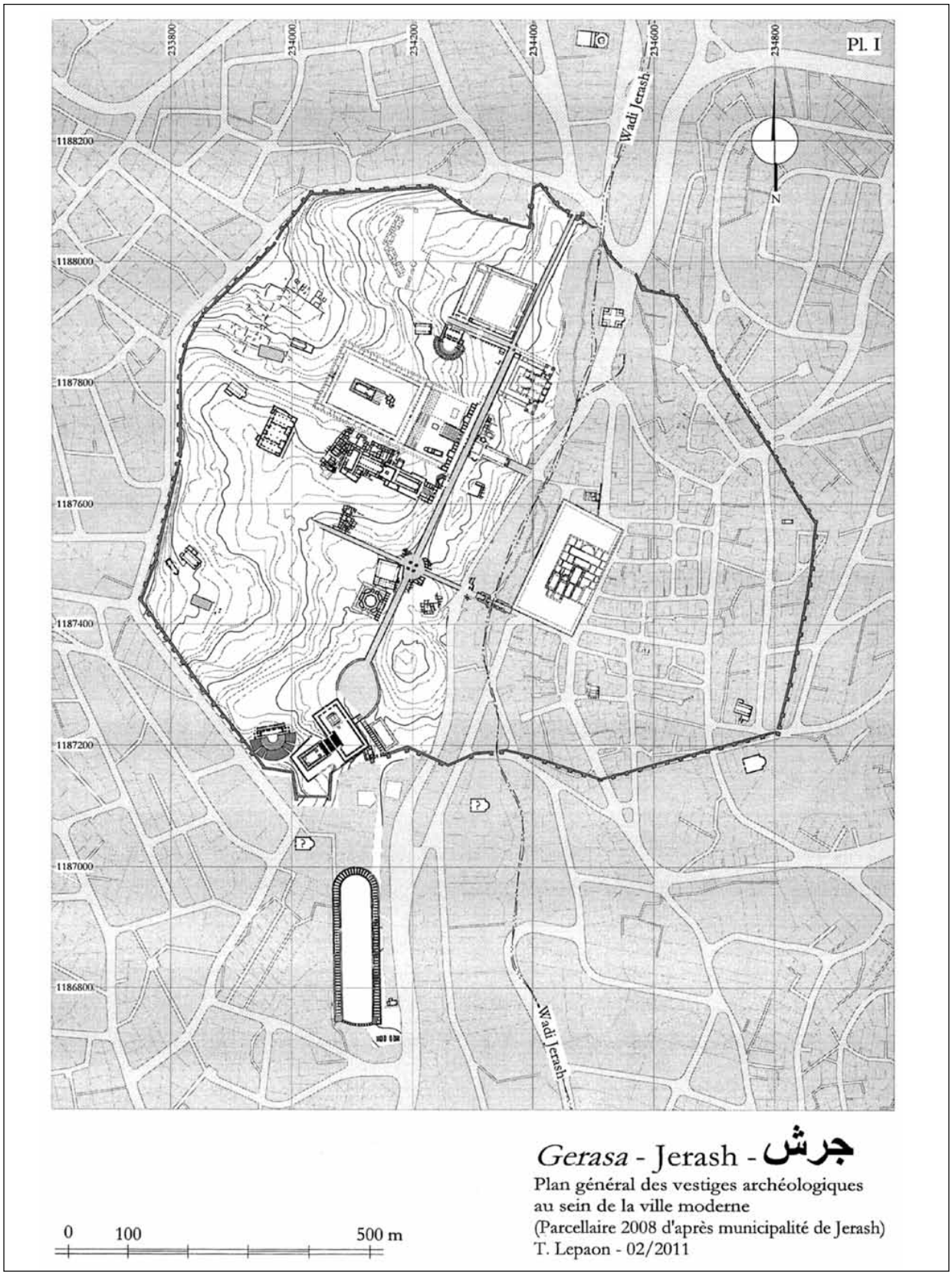
19. Les informations topographiques correspondant à l'emprise de l'ancienne cité de Gerasa encerclée par son rempart byzantin ont été obtenues par la numérisation du plan établi à l'échelle 1/1000e réalisé par le Jordan Survey Office (Amman) en 1966. En ce qui concerne le territoire de Gerasa, la même méthodologie fut employée à partir des plans au 1/10000 réalisé en 1950 sous la direction du « Department of Lands and Surveys of the Jordan ».
20. Ainsi, les travaux réalisés par l'équipe danoise sur le secteur sud du *tetratetrakoines* ont pu être insérés directement au sein de ce plan général (voir article dirigé par A. Walmsley dans ce volume). Réalisé de concert avec H. Barnes, architecte-topographe de la mission danoise, l'opération a d'abord consisté au rattachement du secteur de travail dédié à la mission danoise au canevas topographique, puis, à l'échange direct d'une partie des relevés planimétrique numérisé vers le plan général. Je tiens ici à remercier A. Walmsley, directeur de la mission danoise, et H. Barnes pour la confiance et le soutien qu'ils ont apportés à ce projet. Par ailleurs, une collaboration étroite a été établie avec les représentants du département des antiquités de Jordanie à Jarash chargés de superviser les fouilles de sauvetages consécutives soit aux travaux modernes (aménagement d'une voie routière sur rive ouest du wādī Jarash), soit aux fouilles sauvages fréquentes à Jarash malgré la vigilance du département des antiquités (fouille de deux tombes de la nécropole ouest, voir l'article de M. Abu Abeyleh dans ce volume). En collaboration avec les autorités jordaniennes, l'emploi de la méthodologie exposée précédemment permis, non seulement, de repérer spatialement ces structures avant leur inévitable destruction au sein du plan général de la ville, mais surtout, d'intégrer formellement ces découvertes au sein de la banque de donnée documentant l'ensemble des structures actuellement connue à Jarash.

ANNEXE 1

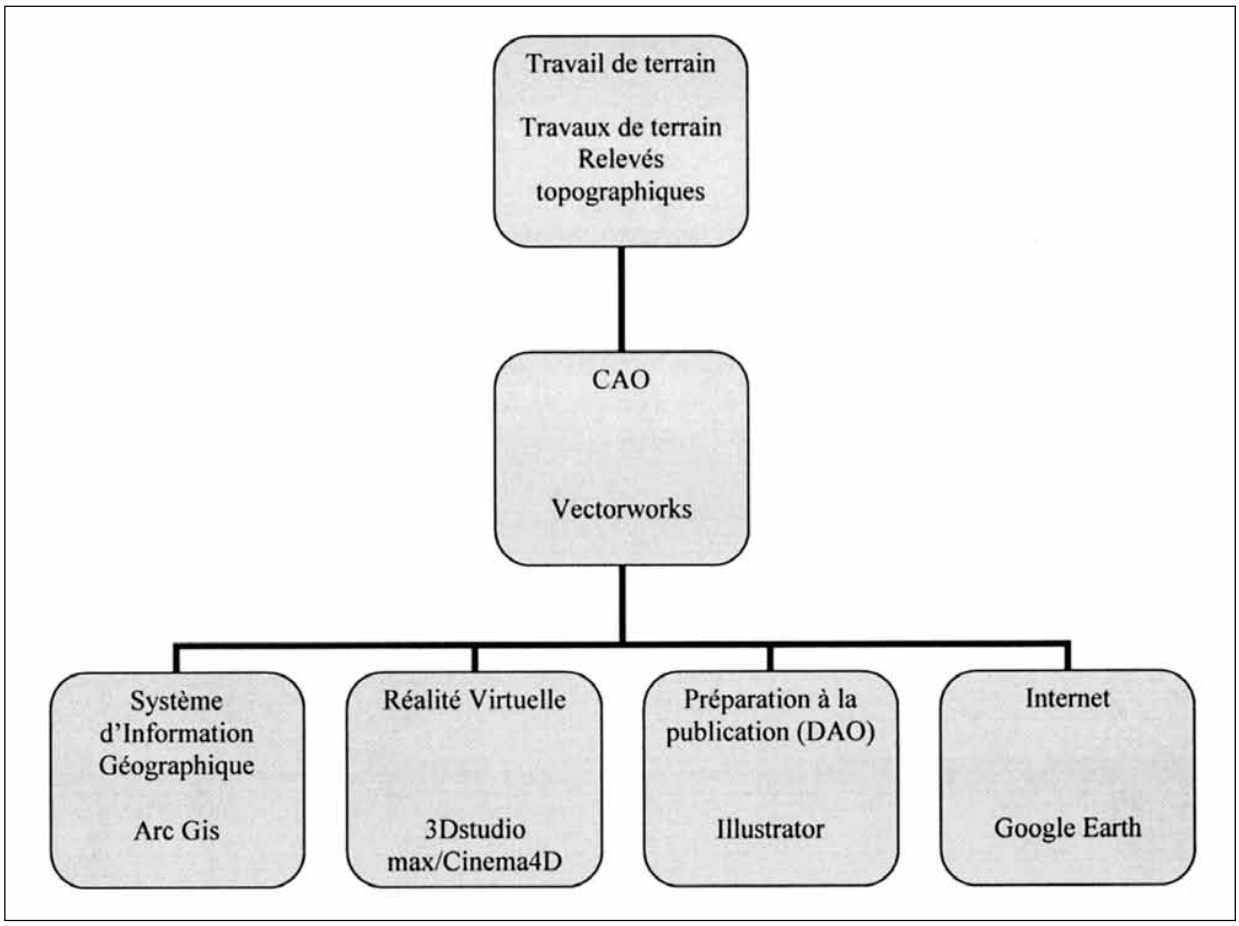
Numéro d'inventaire des édifices	Nom usuel d'édifice	Source documentaire
1	«Arc d'Hadrien»	Kraeling 1938: Pl. II.
2	«Hippodrome»	Ostrasz 1989: Fig.3.
3	«Église de Marianos»	Gawlikowski, Musa 1986: Fig. 2.
4	«Rempart»	Kraeling 1938: Pl. I; Parapetti 1983: Pl. 1 et Seigne, inédit.
5	«Porte sud»	Seigne *et al*. 1986: Fig. 12.
6	«Souk romain/quartier militaire»	Seigne *et al*. 1986: Fig. 7.
7	«Souk est»	Lepaon 2010: Inédit.
8	«Place Ovale»	Seigne, Inédit.
9	«Temple de Zeus, terrasse inférieure»	Seigne 1989: Fig. 1.
10	«Temple de Zeus, terrasse supérieure»	Seigne 1989: Fig. 2.
11	«Théatre sud»	Sear 1996: Fig. 7.
12	«voie principale/Cardo»	Parapetti 1983: Pl. II, IV, VII.
13	«Macellum»	Martin-Bueno 1989: Fig. 1.
14	«Thermes du centre/Mosquée»	Barnes 2009: inédit.
15	«Maison des bleus»	Barnes 2009: inédit.
16	«Église Saints Pierre et Paul»	Piccirello 1992: Fig. 554.
17	«Chapelle funéraire»	Piccirello 1992: Fig. 578.
18	«Tetratetrakoines»	Kraeling 1938: Pl. XII.
19	«Voie secondaire/Decumanus sud»	Parapetti 1983: Pl. V et VI.
20	«Maisons Omeyyades»	Gawlikowski 1986: Fig. 1.
21	«Cathédrale»	Jäggi, Meier, Brenk *et al*. 1998: Fig. 4; et Kraeling 1938: Pl. XXIX.
22	«Thermes de la Glass Court»	Lepaon 2008: inédit.
23	«Eglise Saint Théodore et court de la fontaine»	Kraeling 1938: Pl. XXXIII.
24	«Bains de Placcus»	Lepaon (a) 2010: à paraître.
25	«Maison du clergé»	Kraeling 1938: Pl. XLV.
26	«Aire Ouest de l'église Saint Théodore»	Kraeling 1938: Pl. XLVI.
27	«Temple C»	Kraeling 1938: Pl. XXII.
28	«Église Saint George»	Piccirello 1992: Fig. 535.
29	«Église Saint John»	Piccirello 1992: Fig. 535.
30	«Église Saints Cosme et Damien»	Piccirello 1992: Fig. 535.
31	«Église de l'évèque Génésius»	Kraeling 1938: Pl. XXXVIII.
32	«Nymphée»	Kraeling 1938: Pl. XXIII.

33	«Maison byzantino-omeyyade»	Lepaon 2010; d'après Malkawi, inédit
34	«Temple d'Artémis»	Parapetti 1983: Pl. X.
35	«Chapelle de la terrase d'Artémis»	Parapetti 1983: Pl. X.
36	«Scierie hydraulique»	Seigne 2009: fig. 1.
37	«Église de la synagogue»	Piccirello 1992: Fig. 546 et Fig. 553.
38	«Église des Propylées»	Kraeling 1938: Pl. XXXV et Piccirello 1992: 297 Fig. 575.
39	«Maison romaine/Umayyad Mosque»	Seigne 1997: Fig. 2.
40	«Thermes de l'Ouest»	Lepaon (b) 2008: à paraître.
41	«Area B»	Ball, Bowsher, Kehrberg, Warmsley, Watson 1986: Fig. 8. et 10.
42	«Théatre Nord»	Clark, Bowsher, stewart et al. 1986: Fig. 1. et Seigne, Agusta-Boularot 2005: Fig. 7.
43	«Église d'Isaïe»	Piccirello 1992: Fig. 566.
44	«Tetrapyle»	Ball, Bowsher, Kehrberg, Warmsley, Watson 1986: Fig. 11.
45	«Voie secondaire/Decumanus nord»	Parapetti 1983: Pl. III.
46	«Agora»	Agusta-Boularot, Seigne 2005: Fig. 2.
47	«Basilique civile»	Agusta-Boularot, Seigne 2005: Fig. 3.
48	«Porte nord»	Detweiler 1933: inédit.
49	«Pont sud»	Parapetti 1983: Pl. VI.
50	«Pont des propylées»	Parapetti 1983: Pl. X.
51	«Water gate»	Schumacher 1902: Pl. 6 et Seigne, inédit.
52	«Église de Procope»	Piccirello 1992: Fig. 560.
53	«Église aux mosaïques»	Seigne et Boutheroue Desmarais 1986: inédit.
54	«Palais byzantin»	Z'ubi *et al*. 1994: fig. 1.
55	«Vestiges de la Rive ouest du wadi »	Lepaon 2009 inédit.
56	«Grands thermes de l'est»	Agusta-Boularot, Gatier, Lepaon, Seigne, à paraître.
57	«Petits thermes de l'est»	Lepaon 2007: fig. 14.
58	«Chapelle d'Elie, Marie et Soreg»	Seigne, inédit.
59	«Maison des Muses et des poètes»	Piccirello 1993: p. 516.
60	«Église des prophètes, apôtres et Martyrs»	Kraeling 1938: Pl. XLI.

A	«Resthouse»	Pillen 1986.
B	«Visitors' center»	Seigne, inédit
C	«Musée archéologique»	Seigne,inédit
D	«Camp archéologique»	F. Morin et Seigne, 1982: inédit.



2. Plan général des vestiges archéologique au sein de la ville moderne.



3. Schéma représentant le système technique et les possibilités d'exports directs des données informatiques entre les différents outils numériques.

l'export de maquettes, plus ou moins finalisées dans Vectorworks, peut être directement et aisément réalisé vers des logiciels dits « modeleurs » couramment utilisé par les infographistes tels que 3DstudioMax ou Cinema4D. En outre, la réalisation de ce travail permettra, peut-être, de palier au manque de discussion entre les différents acteurs scientifique et/ou médiatique, manque conduisant parfois à la réalisation de restitution erronée à la simple lecture des vestiges *in situ*.

Enfin, la présentation et la diffusion des informations constituent le but ultime de toute recherche. Si la communication scientifique est, le plus souvent, matérialisée par la publication d'article ou d'ouvrages imprimés, internet constitue aujourd'hui le vecteur essentiel de diffusion de l'information au « grand public ». Malgré cet important bouleversement, il demeure essentiel de permettre la production d'une documentation variée et adaptable à tous les supports de diffusion. Ainsi, d'une part, les documents destinés à être publiés « traditionnellement » et nécessitant un ajustement esthétique peuvent être exportés directement vers le logiciel Illustrator très couramment utilisé. D'autre part, dans le cas d'une diffusion sur internet, en plus des documents classiques, la diffusion des maquettes en trois dimensions peut être envisagée. En effet, les modèles en trois dimensions réalisés sous Vectorworks peuvent être directement exportés vers GoogleEarth assurant ainsi, non seulement, une très large diffusion de ces travaux, mais surtout, le contrôle, tant que faire se peut, de la fiabilité des restitutions proposée au « grand public ».

L'ambition de ce travail n'est donc pas de mettre en place un « monstre » informatique inutilisable dans le cadre de la pratique actuelle de l'archéologie à Jarash. Cet outil a été développé afin de permettre une collaboration aisée entre les chercheurs en mettant à leur disposi-

tion un outil ou chaque composant de l'ancienne Gerasa est spatialement, chronologiquement et fonctionnellement renseigné. De même, le système a été développé afin d'ouvrir les portes vers de nouveaux axes de recherches encore peu exploité à Jarash tels que l'analyse spatiale ou la réalité virtuelle raisonnée. Enfin, ce travail d'abord scientifique à vocation à être le plus largement diffusé, que ce soit par l'intermédiaire de publication scientifique, de présentation muséographique ou de vulgarisation sur internet.

Le travail présenté dans cet article n'est en aucun cas définitif car, non seulement, il continuera de s'enrichir grâce à la poursuite des nombreuses recherches actuellement en cours[21], mais surtout, il servira de base à de nouveaux travaux explorant des facettes plus ou moins ancienne de l'histoire de Jarash, ancienne Gerasa, cité de la Décapole.

Thomas Lepaon

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21. Particulièrement méconnues à Jarash, les nécropoles font actuellement l'objet de plusieurs recherches universitaires sous la direction de Jacques Seigne. Elles seront progressivement intégrées à ce travail.

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ARCHAEOLOGICAL SURVEY AND EXCAVATIONS AT WĀDĪ AL-YUTUM AND THE AL-MAGAṢṢ AREA, 'AQABA (ASEYM): A PRELIMINARY REPORT ON THE EXCAVATIONS AT TALL ḤUJAYRAT AL-GHUZLĀN IN 2008 AND 2010

Lutfi Khalil and Klaus Schmidt

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Introduction

The ASEYM project was established in 1998 as a joint project between the Institute of Archaeology, University of Jordan and the Oriental Department of the German Archaeological Institute in Berlin. Since 2002, field work has been focused on the site of Tall Ḥujayrat al-Ghuzlān and surrounding areas. The survey and excavation results of the 1985 and 1990 seasons at Tall al-Magaṣṣ, as well as those of the 1998, 2000, 2002, 2003, 2004 and 2005 seasons, have recently all been published (Khalil and Schmidt 2009).

The 2008 excavations took place between 21 January and 12 March; the 2010 season took place between 26 January and 18 March. The team during both seasons included the above-mentioned authors and contributors. I. al-Zabn and M. Bosouni represented the Department of Antiquities in 2008, and M. Basouni and S. al-Fakhri in 2010. U. Siegel was the architect in both seasons, supported by J. Sempf (2010) and M. Merz and A. Pieritz (2008). M. Ady was part-time photographer (2008 and 2010), N. Jetawih and F. Höflmeyer participated in the 2010 season on a part-time basis.

The principal aims of the 2008 and 2010 seasons were as follows:

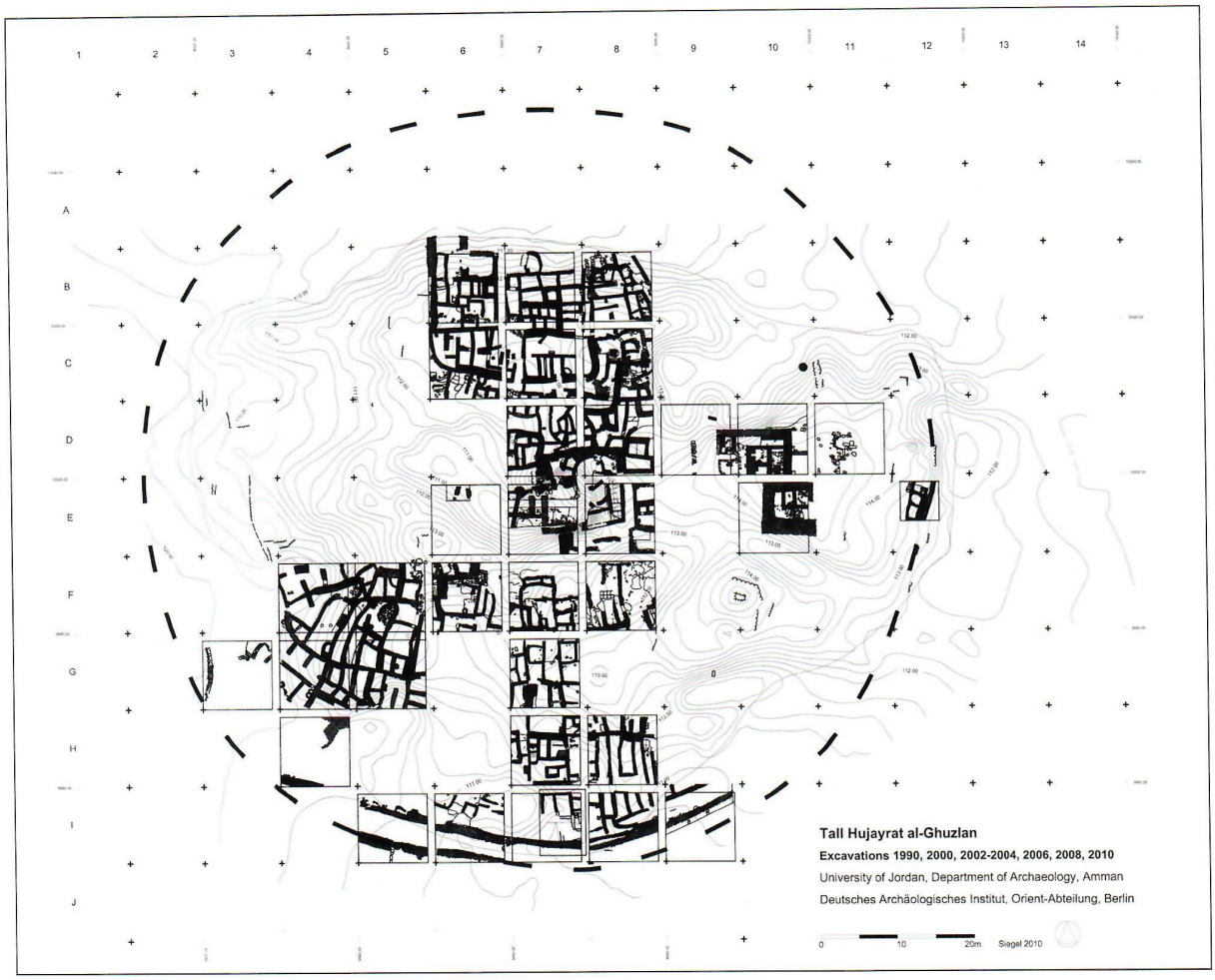
1. To continue to excavate in the squares of previous seasons in order to reach the lowest occupation layers lying directly over the natural alluvial sand and pebbles of Wādī al-Yutum, and to understand the various phases of occupation.
2. To extend the excavation horizontally in order to:
   - A. Expose more architectural features in the vicinity of Building D in the western part of the site.
   - B. To trace the 'town wall' in the southern part of the site.
3. To examine the center of the site for architectural correlations between stone-built Building A and mud-brick walls.

In order to achieve the above-mentioned objectives, during the eighth (2008) season, excavations were carried out in several trenches of the previous season, i.e. F4, C6, C8, D7, D8, E7 and I8. In addition, new trenches, i.e. D9, D10, D11, E10, E11, I9 and I10 were opened, as was a 2 x 9 m trench in the center of the mound. During the ninth season (2010), digging continued in seven squares from previous seasons, i.e. F4, F5, G4, G5, I6, I7 and I8, and three new squares were opened, i.e. G3, H4 and I5 (**Fig. 1**).

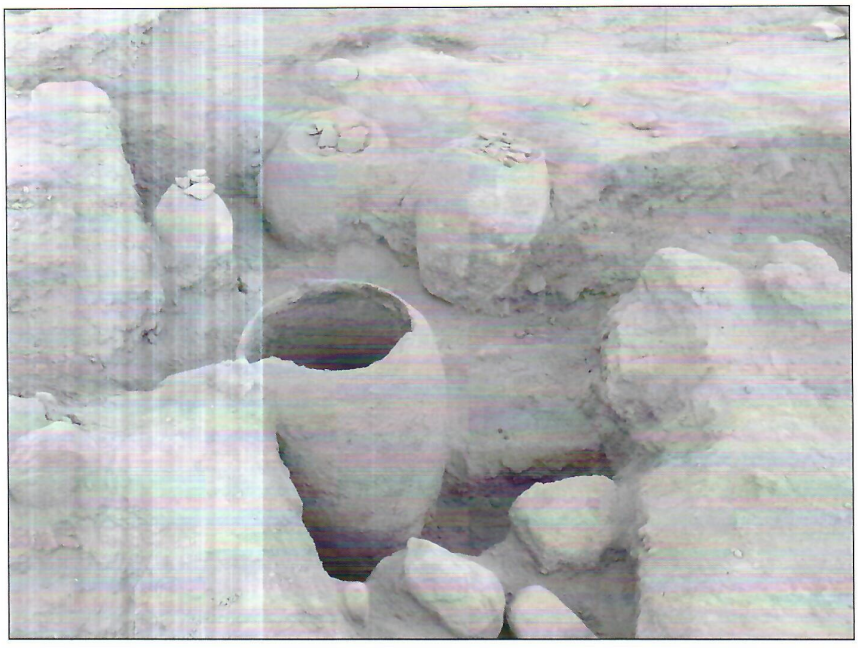
Architecture and Stratigraphy

Excavations were started in squares C6 and C8 during the 2002 season, and these werre continued in 2004 (Eichmann *et al.* 2009: 17-77). In 2008, during excavations at the south-west part of square C6, four large vessels (loci 86, 87, 88 and 89) were uncoverd *in situ* in room locus 85 (**Fig. 2**). In a nearby room, a major discovery was made, namely a female figurine of baked clay (**Fig. 3**). In the southern part of the square a small wooden beam, covered by a thick layer of clay, was found still adhering to the western and eastern walls of a narrow room (locus 114); this was probably associated with an upper floor of the building.

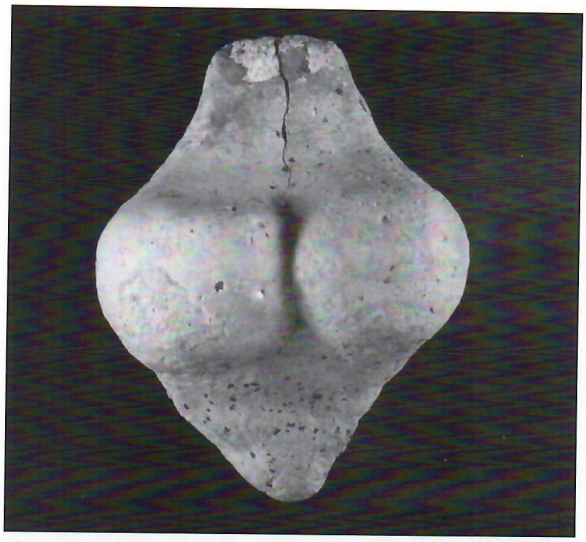
In square C8, excavation revealed a large



1. Topographic plan of Ḥujayrat al-Ghuzlān showing during squares excavated in various seasons.



2. Pottery vessels (loci 86, 87, 88 and 89) found in situ in square C8.



3. Lower part of female clay figurine.

conical vessel and two heavy stone bowls in association with the bases of massive ceramic vessels. This suggests that an *in situ* assemblage on an upper floor crashed down when an earthquake destroyed the building. In the same room, a hard layer of white gypsum-like material was discovered. In the eastern wall, there was a window-like opening with the remains of soot, which suggests that it may have been used as a niche in which to place a lamp.

In square D8, there was the northern corner of stone-built Building A, a large, rectangular structure with massive walls. In locus 57 a mud-brick bearing the imprint of a left human foot was found; it was extremely fragile, so was left *in situ* and covered over with earth.

Squares D9, D10, D11, E10 and E11 were newly opened in the north-eastern area of the *tall*. A large stone alignment was visible when removing topsoil.

Square E7 is located more or less in the centre of the site, where an area measuring *ca* 4 x 7 m had been damaged by looters. They used a bulldozer to destroy the south-west part of the central, stone-built Building A. A 2 x 9 m sounding was excavated in this area, all the way down to the natural Wādī al-Yutum deposits. In the western part of the sounding, a pit was discovered. This was lined with mud plaster and contained a near-complete jar. Natural was reached at 108.20 m asl, which means that the depth of archaeological deposit was *ca* 4 meters. This had been anticipated, as natural was reached in a small sounding in square E6 during the 2000 season. The new section provides a large (11 m) view of the stratigraphic and architectural sequence in the middle of the site (**Fig. 4**). Square E8 was opened in 2004; continued excavations during the 2008 season revealed two massive mud-brick walls which form the southern corner of Building A (locus 52). The walls forming Room 1 (loci 3, 5, 6, 8 and 9) were also exca-

4. Section through the middle of the site showing stratigraphic and architectural sequence.

vated.

During the 1990 season, a small, 3 x 3 m sounding -A1- was excavated (Khalil 1995: 77); this was included in the area of square E8 of 2008. In a room-like structure, a greenish-brown deposit containing crushed copper ore and pieces of copper was discovered. This space may therefore have been used for crushing copper ore prior to smelting. Below the greenish-brown layer was a clay floor with a channel-like feature (locus 51). Close to the latter, several vessels were found *in situ*; the lower part of one vessel (locus 30) contained copper slag.

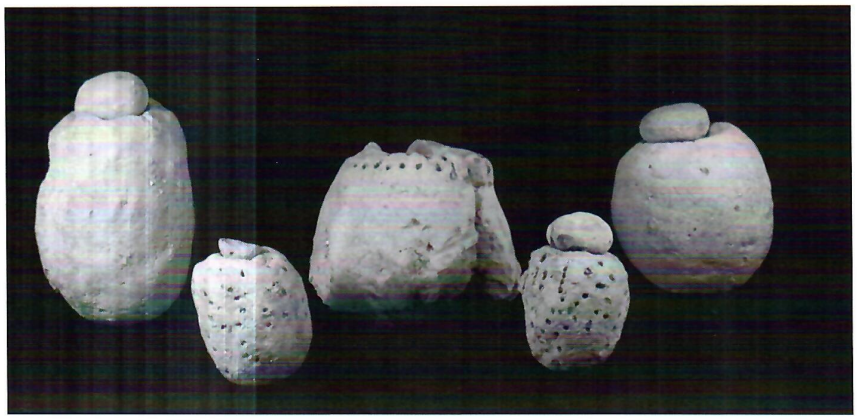
Squares F4, F5 and F6 are located in the western part of the site, where wall decorations had previously been discovered (Schmidt 2009; Gebel and Mahasneh 2009).

The 2008 excavations in F4 started with the removal of *ca* 30 cm of sand that had been hurredly dumped into the square during the February 2006 floods. This was done to prevent too-rapid drying out, which may have caused damage to the decorated walls located in the square. The aim of the renewed work in F4 was to expose the floors of the so-called room-like structures, the mud-brick walls of which are the same decorated walls discovered in previous seasons. Under the west wall of one room-like structure, five miniature pottery vessels were discovered. These were hand-made, crude and unfired; each miniature jar had a ball-shaped lid of the same clay as the jar. It is possible that these jars may have been deposited under one of the walls of Building D as a foundation deposit (**Fig. 5**). In addition, a large number of horncores still attached to skull fragments were found in the same room-like structure. Zooarchaeological studies will be undertaken in due course, but for now at least two different taxa can be identified. The larger horncores may be of *Capra ibex*, and the smaller of domestic goats or possibly gazelle. As the miniature jars and horncores are both associated with Building D, of the decorated walls, it may be suggested that they had some ritual function. Excavation in the north-west part of square F4 reached the floor of the so-called room at 107.40 m asl, which rested on the natural alluvial sands of Wādī al-Yutum.

Square H7 was mainly excavated during the 2003 and 2004 seasons, with only its south-western part being excavated in 2008.

Squares I8, I9 and I10 are located in the southern part of the site, where parts of the 'town wall' were discovered. Approximately 0.5 m of 2006 flood deposits were removed from the southern part of square I8. The northern part of the square, closer to the summit of the site, was not affected by the flooding. Excavation in the three above-mentioned squares exposed more of the 'town wall' structure. It extends south to south-west, which may indicate that it was built to protect the town from the floodwaters of Wādī al-Yutum.

During the 2010 season, excavations in squares I5, I6, I7 and I8 exposed *ca* 50 metres of the 'town wall' (**Fig. 6**). The wall consists of multiple courses of medium-sized undressed stones. There are actually two walls with a space between them, which could be interpreted as being part of a system of retaining walls designed to protect the town against flooding. If, for example, the water flooded over the outer of the two walls, it would drain into the channel be-



5. Miniature clay jars from square F4.

6. Aerial view of the 'town wall'.

hind and be diverted away from the town.

The aim of the 2010 excavations at the south-west part of the site was to investigate Building D in squares F4, F5, G3, G4, G5 and H4. Many mud-brick walls were discovered; they were built on top of walls of medium and large boulders which were used as foundations. These stone foundations were sitting directly on top of the underlying natural deposits.

The mud-brick walls formed many rooms, some of which were large in size with doorways and windows. Door lintels consisted of wooden beams, some of where were still well-preserved owing to the dry, hot climate of the Aqaba area. Other lintels were made of stones and mud.

Digging in the northern part of square F5 revealed a platform-like structure with five stone steps, possibly a sanctuary altar (**Fig. 7**). A number of unusual artifacts were discovered around the lowest step, including decorated stones, ochre and an unusual sealed jar containing a large number of beads.

7. Stepped, platform-like structure in northern part of square F5.

Pottery and Small Finds

Rich assemblages of pottery and small finds were recovered during the 2008 and 2010 seasons, especially from Building D. These included common types of pottery, flint, stone, shell, bone and archaeometallurgical remains.

A number of complete pottery vessels and a large number of sherds were discovered, primarily of hand-made coarse wares. The common types are v-shaped bowls, cups, platters and small, medium and large jars (**Fig. 8A-E**); unusual ring-shaped pot stands were also discovered (**Fig. 8D**). Copper pot stands are known from Nahal Mishmar (Bar Adon 1980: 24, 'copper crowns' esp. nos 11-16). Further analysis of pottery from the lower layers is required, in order to assess potential differences in forms, fabrics and decoration across the site.

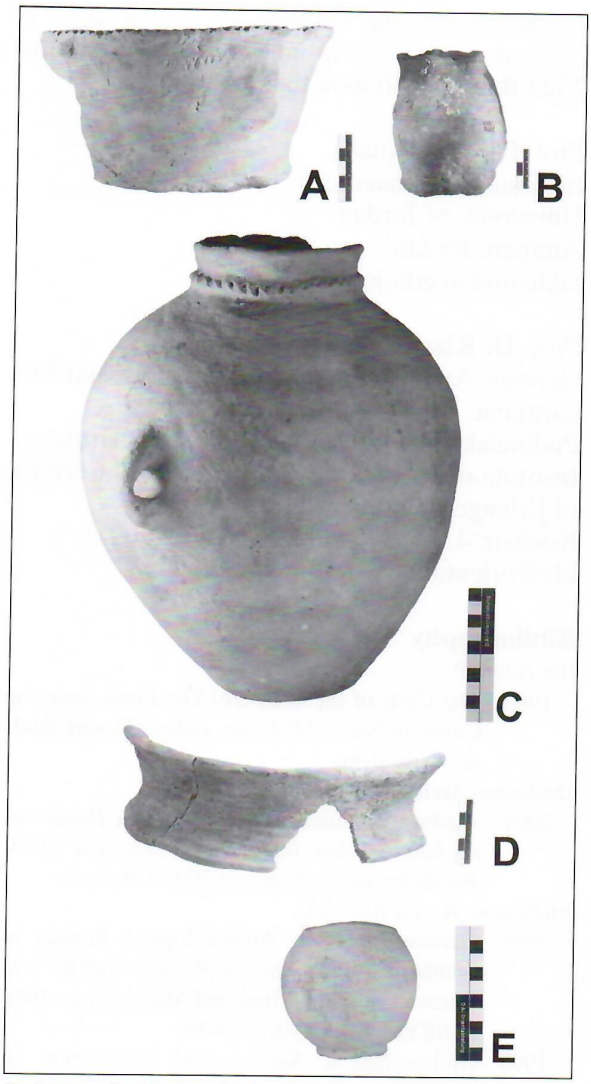
A large number of lithic artifacts were recovered, including cortex tools, sickles, plain blades and Canaanean blades (**Fig. 9**). Several categories of ground stone tool were found, including grinding slabs, mortars, hammers and mace heads (**Fig. 10A-C**). Mace heads were also made from the heavy shells of giant clams (*Tridacna gigas*); a few unfinished examples were discovered, which indicates that they were manufactured at the site. Shell ornaments, mainly on spider conch (*Lambis lambis*) shells, and bone awls and points were also recovered.

Archaeometallurgical remains from all stages of the copper production process were discovered, including rich copper ores, slag, shapeless copper lumps and a mace-head fragment. In addition, two pottery crucible fragments were also found. The latter are socketed (Magass-type); the socket would have held a wooden shaft to enable the blacksmith to maintain a safe distance from temperatures in excess of 1084°C during the copper smelting process. A large number of mould fragments of various types were discovered, confirming the importance of Tall Ḥujayrat al-Ghuzlān in the history of copper metallurgy in the southern Levant.

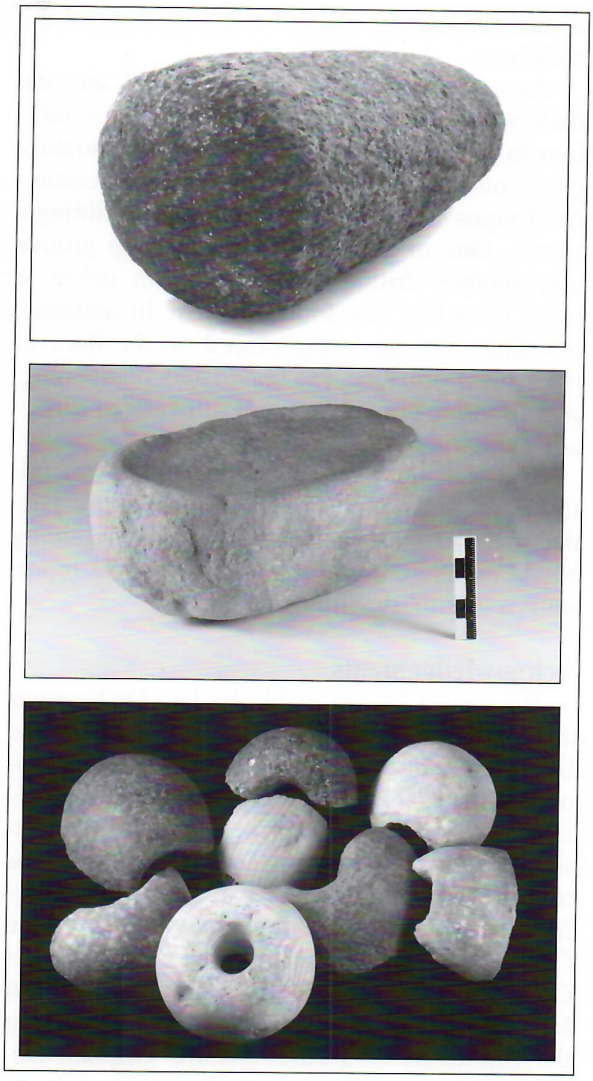
As mentioned above, a female figurine of baked clay was found during cleaning in the northern part of square C6. The figurine's head, arms and breasts are missing (**Fig. 3**); only the lower part of the body is well-preserved (Deutsches Archäologisches Institut 2009: 294, fig. 8). Female figurines mostly represent fertility; the significance of this symbolism in the ancient Near East was related to agriculture or activities such as storage of cereals (Yakar 1994: 68). A detailed study of the figurine is forthcoming.

Conclusion

During the 8th and 9th seasons of excavation at Tall Ḥujayrat al-Ghuzlān, systematic documentation of all architectural features was completed. Complete information was recorded in this architectural inventory, which will be an important tool in gaining an understanding



8. Assorted pottery vessels.



10. Assorted stone tools

9. Flint atrifacts on cortical flakes.

of the layout and phases of occupation of the buildings.

As mentioned above, a number of unusual finds were concentrated in Building D. In addition to the wall decorations and five miniature jars, a number of stones decorated with geometric designs were found in one of the building's rooms. One of these stones has a deep groove and another drilled dots filled with ochre; a lump of ochre was found nearby. In addition, five fine-ware jars were placed on the floor of the same room. One was sealed and, on opening, was found to contain a hoard of beads of different shapes and sizes (**Fig. 11**).

The wall decorations, stepped platform (altar?) and small finds including miniature jars, decorated stones, ochre and the jar containing beads together suggest that Building D represents a sanctuary with ritual remains.

Acknowledgements

We would like to thank the late Dr Fawwaz al-Khraysheh, former Director-General of the Department of Antiquities, for his generous support of the ASEYM project. Also, we are grateful to Dr Sawsan al-Fakhri and Mrs Manal Basouni from the Department of Antiquities office in Aqaba for their assistance and help. We gratefully acknowledge the financial support of the German Research foundation (DFG), the Higher Council of Science and Technology (HCST) of Jordan, the Deanship of Scientific Research at the University of Jordan and the Oriental Department of the German Archaeological Institute (DAI) in Berlin. In addition, many thanks are due to the Director and employees of the German Protestant Institute for Archaeology in Amman for their help and cooperation, and to Nico Becker who took the photographs.

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11. Jar containing bead hoard.

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THE BROWN UNIVERSITY PETRA ARCHAEOLOGICAL PROJECT: 2010 EXCAVATIONS AT ISLAMIC BAYḌĀ

Micaela Sinibaldi and Christopher A. Tuttle

Introduction: Project Aims and Fieldwork Methodology

The Brown University Petra Archaeological Project (BUPAP) is a multidisciplinary research initiative that was launched in 2010. The project is aimed at increasing our diachronic understanding of the ancient city of Petra and its relationships to its neighboring hinterlands, with a specific focus at present on the northern and northwestern areas toward and including Bayḍā.[1] The BUPAP research program is designed around the use in tandem of systematic and intensive landscape surveys[2] with targeted excavations, geophysical research, and other specialist studies.

The focus of the BUPAP excavation team in 2010 season was primarily to develop a more specific understanding of the nature and chronology of the Islamic Bayḍā settlement. This report is intended to summarize the main goals and methodology of this first campaign as well as present some of the preliminary results.[3] The excavation design, methodology and preliminary interpretation sprang naturally from the results of previous research at the site — the field survey and archaeological excavations conducted by the Beidha Documentation Project directed by Dr Patricia M. Bikai[4] and a preliminary study of the ceramics from this earlier project (Sinibaldi 2009, 2010).[5]

The initial hypothesis of an Islamic period settlement in the area formulated by the Beidha Documentation Project has been confirmed by the study of ceramic finds, and this combined work has allowed the archaeological evidence at the site to be interpreted as representing a rural

1. With respect to the transliteration of Arabic place names into English, BUPAP has chosen to follow the system used by the International Journal of Middle East Studies (IJMES). We are thus using Bayḍā in contrast to a variety of other spellings that may be found in the literature (e.g., Beida, Beidha, etc.). For additional information see Knodell and Alcock, footnote 1, in this volume.
2. The Petra Area and Wādī Sulaysil Survey (PAWS), for the first preliminary report of this BUPAP project component, see Knodell and Alcock in this volume.
3. The 2010 excavation was directed in the field by Dr. Christopher A. Tuttle (ACOR and Brown University) and Micaela Sinibaldi (Cardiff University). The report was drafted by Micaela Sinibaldi, who is alone responsible for sections 3 and 4 on the pottery and historical interpretation. The excavators included Katherine Harrington and Harrison Stark (Brown University), and a team of workers from the Bdul and Ammarin tribes. We thank in particular Katherine Harrington for her hard work and welcome presence in the field. Timothy Sandiford (Brown University) and Dr. Ian B. Straughn (Brown University) were part of the surveying team focused on mapping Islamic Bayḍā. We also want to thank warmly Dr. Patricia M. Bikai for her participation in the excavations at Islamic Bayḍā as a Project Consultant, for her sharing of data from her earlier Beidha Documentation Project, and for her continuous and generous support. The pottery of the Middle and Late Islamic Periods from the excavations conducted at Islamic Bayḍā is being studied by Micaela Sinibaldi. All sections and top plans were inked by Qais Twaissi. The authors and members of the BUPAP team want to express our gratitude to the Department of Antiquities and the staff of the Petra Archaeological Park, in particular to Dr. Emad Hijazeen, Eng. Tahani al-Salhi, and Hyeam Twassi, for their contribution to the success of this fieldwork season. We thank Dr. Susan E. Alcock for her detailed comments and editing. We are also grateful for useful comments from Dr. Khairieh ʻAmr, Dr. Alison McQuitty and Dr. Carol Palmer.
4. The Beidha Documentation Project was carried out in six campaigns between 2003 and 2008. See Bikai, Kanellopoulos and Saunders 2005, 2006, and 2007.
5. The final publication of the ceramic material is currently in progress (The Pottery from the Islamic Period from Excavations of the Beidha Documentation Project. Working Title, Final Project Report Chapter).

settlement with a long occupation throughout the Islamic period.

Some of this material can be safely assigned to the period between the 11th and 14th centuries (Sinibaldi 2010).

The presence of material from the Early Islamic period recovered by the Beidha Documentation Project team suggests that the village occupation extended in the area for most or all of the Islamic Period. The evidence of a very long life for the entire area as a settlement is not surprising given the importance of the location for its agricultural resources and the availability of water due to its proximity to the Jibāl ash-Sharāh.

The site structures extend roughly E–W between as-Sīq al-Bārid and the Nabataean structures excavated by the Beidha Documentation Project, and N–S between the modern road to as-Sīq al-Bārid and the wadi south of it (**Fig. 1**). The two BUPAP trenches were strategically positioned using data from the earlier project in combination with observations deriving from the associated ceramic study. This information allowed taking into account elements such as the depth, complexity, and type of stratigraphic deposits, as well as their potential for ceramic finds.

Prior to commencing the excavation activities, a preliminary survey of the village structures was conducted by members of the BUPAP team in order to facilitate the planning and placing of the new trenches. The survey recorded a portion of the remains of the visible structures, as well as a substantial amount of illegal digging throughout a large portion of the village, especially in the western sector (area I).[6] The BUPAP survey of the Islamic Bayḍā structures has highlighted an aspect first noticed by the Beidha Documentation Project: the presence of several clusters of built areas in the village, which seemed to differ in their building techniques and architectural plan.[7] These data were one of the chief elements taken into account in placing the new excavation trenches, for one of our main aims was to start testing whether such variations have, for example, either a chronological or a functional meaning. The strategy adopted for this season was to physically connect to the test trenches of the Beidha Documentation Project in order to maximize the information gathered by both projects.

Trench A was placed with the double purpose of obtaining a specific understanding of

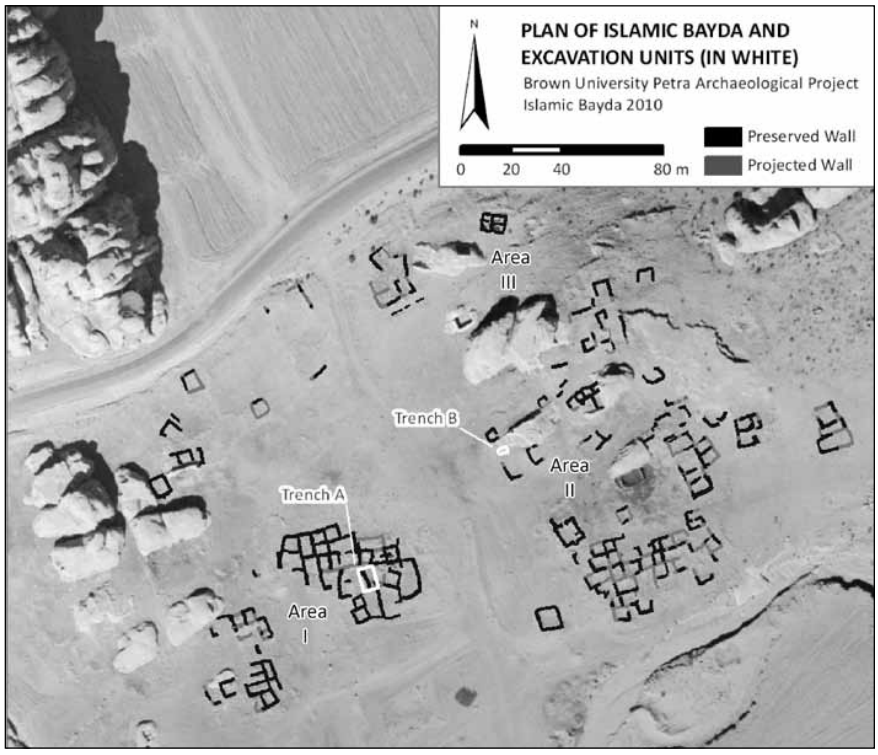
1. Aerial photo showing an overview of the Bayḍā area, looking NW (photo by D. Kennedy).

6. In particular, we have noticed the digging activity to be focused close to walls and doorsteps, which are, unfortunately, often the most meaningful features for archaeological phasing.
7. The new survey of structures at Islamic Bayḍā was conducted by the BUPAP team members Timothy Sandiford (Brown University) and Dr. Ian B. Straughn (Brown University) with the assistance of Micaela Sinibaldi (Cardiff University), who had also assisted with the analyses of the different building techniques and architecture as a team member on the earlier Beidha Documentation Project.

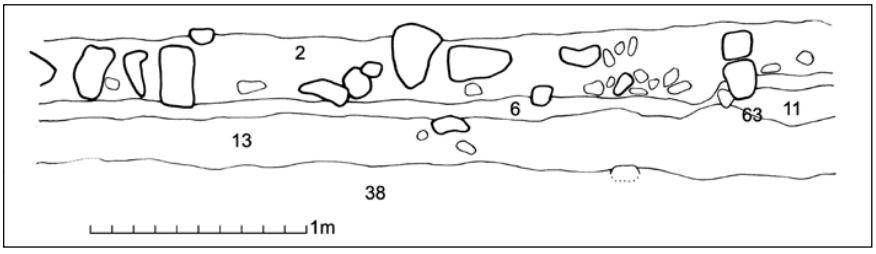
the character and function of the western part of the village (an area extending roughly for about 50 meters N–S and 50 meters E–W, southeast of the entrance to as-Sīq al-Bārid). This area, named area I by the BUPAP excavation team, is one of the most intensely built-up sectors (**Fig. 2**). The specific location of trench A (4 x 6m) allowed the testing of an area free of any robbers' disturbance, as well as an opportunity to position a trench next to one opened by Dr. Bikai's excavations, and to explore another area in what appeared to be the same architectural complex. With these aims in mind, Trench A was placed to observe what appeared to be an open area south of the entrance of Spatial Unit 3, one of the structures excavated by the Beidha Documentation Project in 2004. During the 2010 season excavations in Trench A reached in all a depth of about 80 cm extended over an area of four by six meters (**Fig. 3**).

Trench B was opened in the eastern part of the village, which is designated area II by the BUPAP team. Area II is located east of area I and southeast of the rock-cut church documented by the Beidha Documentation Project. It extends across a sector that is roughly 100 meters square and is characterized by structures of various dimensions, a substantial number of which also make use of the numerous pre-existent rock-cut features.

The decision to place Trench B in this area, also in close proximity to a trench from the Beidha Documentation Project, was again based on results gleaned from analyzing the combined data from the earlier field project and the observations from the 2010 campaign's survey work. The first reason was that the area appeared to contain architecture constructed using different



2. Top plan of surveyed structures with trenches and areas (Map by T. Sandiford).



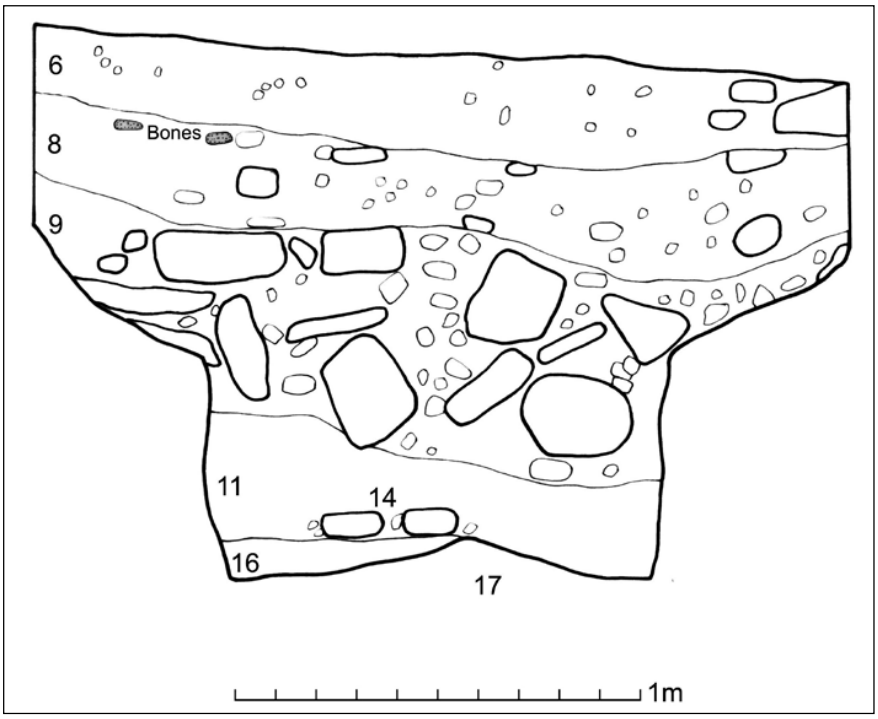
3. The east section of trench A at the end of the excavation (drawing by K. Harrington and H. Stark).

building techniques than those employed in the buildings in area I. The second reason is that the location also contains a deeper stratigraphic deposit with the potential to provide substantial relative chronological information. The earlier excavation project had already recovered large quantities of well-preserved pottery from stratified deposits nearby, and it was deemed important to expand the available data from the area in order to further develop our understanding of their context. This was especially important since the earlier project recovered some of the most diagnostic ceramic fragments for the entire site from BUPAP's area II (imports with a chronology from the 11th to 14th centuries).[8]

Trench B (2 x 4 m) was opened immediately south of one dug by the Beidha Documentation Project in 2004 that exposed a small structure in which several levels of collapse had been distinguished. The aim was to explore a similar and connected structure which was built partially on natural rock. During the 2010 campaign season, the excavators recorded a stratigraphic deposit of about 1.5 meters, consisting of a clear series of collapses containing occupational material and wall stones, some of which were partially exposed (**Fig. 4**). Since this trench was opened at a later stage in our campaign, and because the deep stratigraphy allowed the team only to reach — but not yet to excavate — the latest phase of occupation in the structure, it is preferable to postpone the report on this area until more data is available from our 2011 campaign season. This report will therefore focus on summarizing the preliminary results from Trench A.

It is planned that work will be continued next season in order to reach the bottom of the stratigraphy in the selected areas. To prevent contamination of the unexcavated stratigraphy, the trenches were backfilled at the end of this first season using sandbags and screened soils.

The fieldwork methodology adopted by the team during this first excavation campaign reflects the broader aims of the Islamic Bayḍā component of the BUPAP project, among which is the intent to gather a large amount of information by making use of several archaeological methods. In the specific case of Islamic Bayḍā, in addition to stratigraphic excavation, the project includes the aforementioned new survey of structures, as well as analysis of the building techniques and the stratigraphy of standing structures. Moreover, phytolithic analysis, flotation collection, and dendrochronological studies



4. East section of trench B (drawing by C.A. Tuttle).

8. For ceramic examples already described from the same area, see Sinibaldi 2009: 450.

are being incorporated into the overall study. Finally, a policy of 100% dry screening was adopted during this season, in order to maximize the recovery of small finds which might prove to be relevant for chronological interpretation. This approach was adopted after considering both the specific methodological needs of the study of an Islamic-period site of a rural nature in Southern Jordan and the paucity of available data for this subject for the Petra area.

Of particular importance to the planning and implementation of the excavation field methodology was the data obtained from the intensive landscape survey conducted by the BUPAP Petra Area and Wādī Sulaysil Survey (PAWS) team, which included a systematic collection of surface ceramic finds across the Islamic Bayḍā site. Elucidation of the excavation results and, in general, the interpretation of the occupation chronology for Islamic Bayḍā greatly benefited from the combined work of the landscape survey and excavation teams. Research projects employing a combination of these field methodologies have been rare in Petra, and none have focused such a coordinated effort on the Islamic period remains in the region. We are optimistic that the BUPAP results from this multidisciplinary approach will provide a high resolution picture in terms of collected data. Our hope is that this work will not only help us gain a better understanding of the chronology and nature of the excavated structures at Islamic Bayḍā, but also substantially improve our general understanding about many different aspects of human interaction with this landscape during the Islamic periods — a topic which remains largely unexplored in our region.

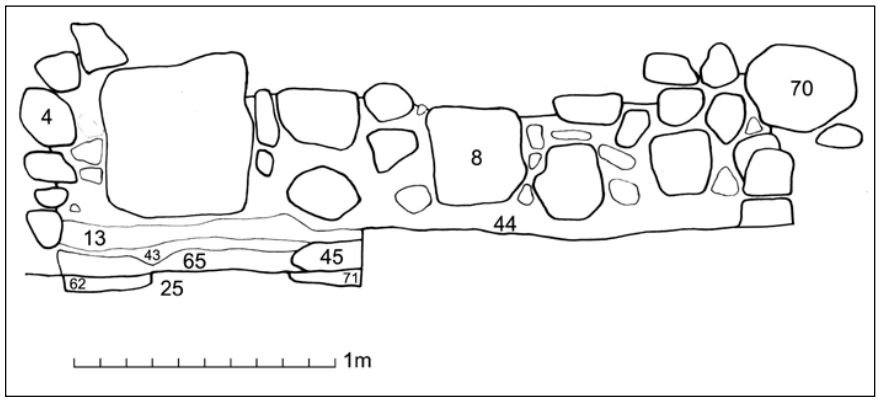
Trench A: Preliminary Stratigraphic Phasing

The analysis of stratigraphy recorded thus far in trench A has distinguished three main, uninterrupted phases of occupation followed by two phases of abandonment. The area has been interpreted as an open space (possible courtyard) opposite and south of the entrance of Spatial Unit 3,[9] the use of which was contemporary with the structure during at least some stages (**Figs. 5 and 8**).

The three phases of uninterrupted occupation can be broadly identified with the creation and use of the surfaces extending over most or all of the open area, which have been named stratigraphic units 25 (Phase I); 38 (Phase II); 13 (Phase III).[10] The numbering of the described phases is of course temporary, since the bottom of the stratigraphic sequence has not been reached, and it is expected that more phases will be recorded during the 2011 campaign; it is clear for example that at least one more phase is associated with the unexcavated foundation of Walls 3 and 4.

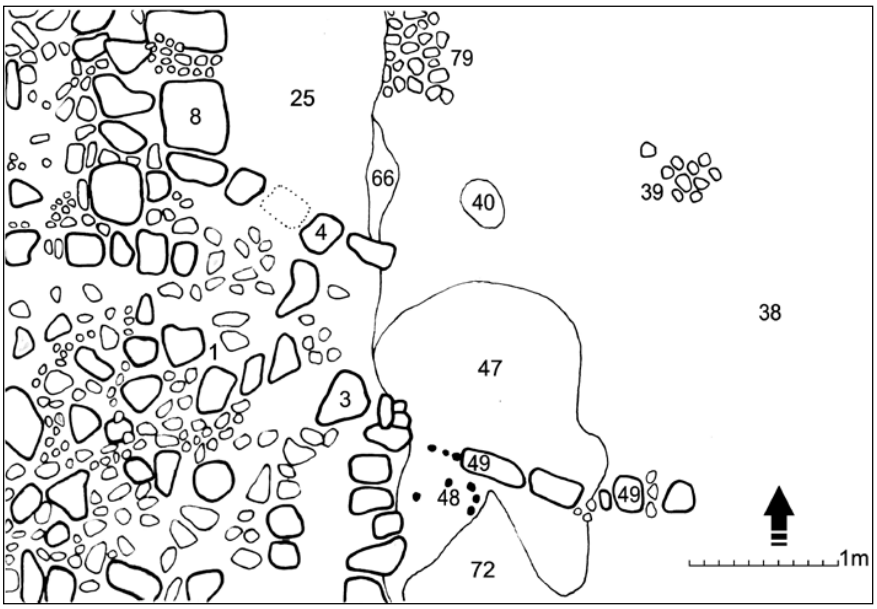
Phase I

This phase was characterized by the creation and use of surface 25, which was extremely hard-packed and well-leveled, probably as a consequence of a long period of occupation. Because it is still partially covered by the later surface 38, the full extent and characteristics of surface 25 will be better understood following



5. West section of trench A (drawing by M. Sinibaldi).

9. This structure was partially excavated originally and labeled Room 3 by the Beidha Documentation Project.
10. Stratigraphic Units cited in the text are indicated by underlining, i.e., 25. We also abbreviate this as StU elsewhere, in order to make a clear distinction with the PAWS use of "SU" for "Survey Unit".



6. Top plan of phases I and II (drawing by M. Sinibaldi, C.A. Tuttle and K. Harrington).

7. Overview of trench A showing phase II (photo by C.A. Tuttle).

its complete excavation; however, it is clear that it originally extended under the current location of wall 8, before this wall was constructed during phase III (**Fig. 5**). Therefore, in Phase I, the area south of and directly opposite the entrances to Spatial Units 3 and 4 was still undivided. Two large, shallow hearths (71 and 62) were placed in surface 25 in proximity to the earlier wall 4, possibly to take advantage of the shelter afforded by this wall; these hearths were partially covered by wall 8 when it was constructed in Phase III (**Fig. 5**). The hearths were therefore located in the space between the entrances of Spatial Units 3 and 4. Also in use with surface 25 was a structure composed of stones arranged in a nearly linear pattern (49), which still remains partially covered by surfaces 38 and 47 (**Fig. 6**).

Phase II

This phase is associated with the creation and use of surface 38, but also to the continued partial use of surface 25, which was not completely covered. Surface 38 also was found extending to the west beneath wall 8, indicating that it was in use before this wall was built during Phase III (**Figs. 5 and 6**).

8. The production activity remains (StU 43) under wall 8 (photo by M. Sinibaldi).

It is likely that the installation of surface 38 to cover most of the earlier surface 25 was an attempt to renovate the space by filling in irregularities created by use activities. Surface 38, not removed in 2010, extends throughout the trench and is characterized by traces of numerous activities which have been interpreted as follows:

In the NW corner of the trench, some sort of production activity occurred, which is not understood at the moment (43) (**Figs. 4, 6 and 7**) because its remains are largely covered by wall 8, which remains in situ. This deposit can be described as a thin accumulation of various materials including fragments of handmade pottery (some blackened by fire), abundant charcoals, small darkened stones, lumps of sandstone, limestone, and unfired clay. This activity took place exactly at the same spot along wall 4 where hearth 62 functioned during phase I.

A series of four renovations of small surfaces along wall 3 were found. The activities for which these were used probably relied on wall 3 as a kind of protection or support. In a first stage, surface 47 was laid in a very irregular shape measuring roughly one by two meters (**Fig. 6**); it was used as a base for several activities which left a large, irregular cut (72) and at least two series of post-holes that appear to be arranged along wall 3 in both linear patterns and a circular one. The post-holes (20 in total) were about 3 to 3.50 cm in diameter and between 1.50 and 3 cm deep. The circular pattern (48) was formed by curvilinear segments containing three post-holes each, the holes being spaced about 10 cm apart; this pattern appears to have resulted from a semicircular construction of about 50 cm diameter. All of the post-holes probably resulted from the wooden poles used to build these constructions. Their functions are not understood at the moment, but the relatively small dimensions and shallowness of the post-holes suggests that they were fairly lightweight; the stratigraphy also suggests that they had a relatively short period of use. At a later stage, several hearths were in use along wall 3, together with similar renovations of small surfaces on top of surface 47, probably with the purpose of leveling irregularities.

In summary, during phase II, when the space between Spatial Units 3 and 4 was still not blocked by wall 8, the users of the space renovated the area by laying surface 38. During the long use of this replacement surface a complex sequence of activities took place. These activities, which suggest both continuity and change in terms of function, took place always in the same areas: the space along wall 3 and the northwest corner of the trench (between walls 4 and 8).

Phase III

The last phase of occupation was connected to the use of surface 13. This surface, with a thickness from 5 to 30 cm, was found throughout most of the trench, and it was probably again laid out with the main purpose of renovating surface 38 in order to level over the traces of previous activities (**Fig. 9**). The activities associated with surface 13 in this new phase can be summarized:

In the northwest corner of the trench, two new hearths were created and used in the same area as the ones employed during phases I and II; these hearths were also used before the con-

struction of wall 8, which partially covered them. Several animal bones were recovered from between the hearths which suggest their use for food preparation.

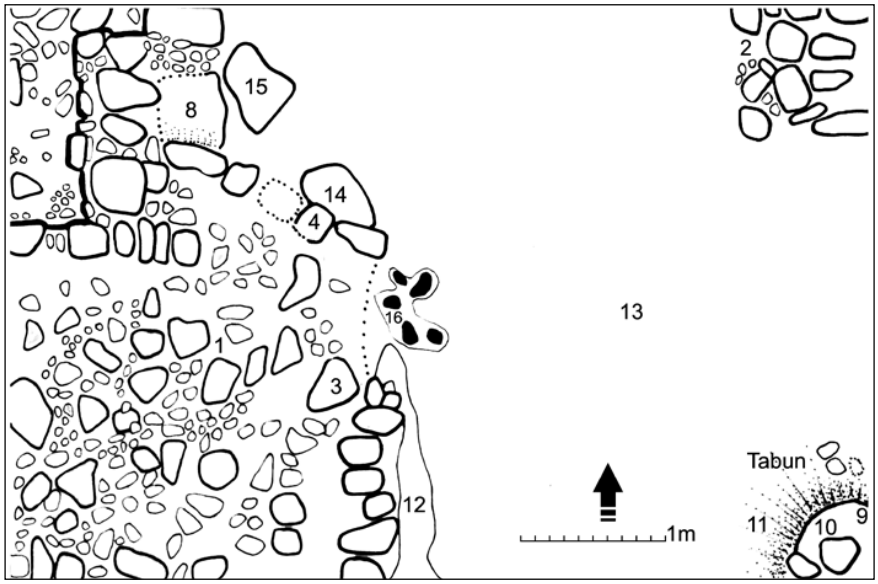
Several cuts and traces of constructions that left post-holes were created along wall 3; an example of these is 16, another semicircular construction indicated by five post-holes; this construction seems to have been larger and sturdier that that from Phase II since the post-holes are 8 to 25 cm in diameter.

In the southeast corner of the trench a bottomless *ṭābūn* (9), with a diameter of about 75 cm diameter, was constructed and used; it was found covered by abundant soil and ashes (11: see **Figs. 9 and 10**).

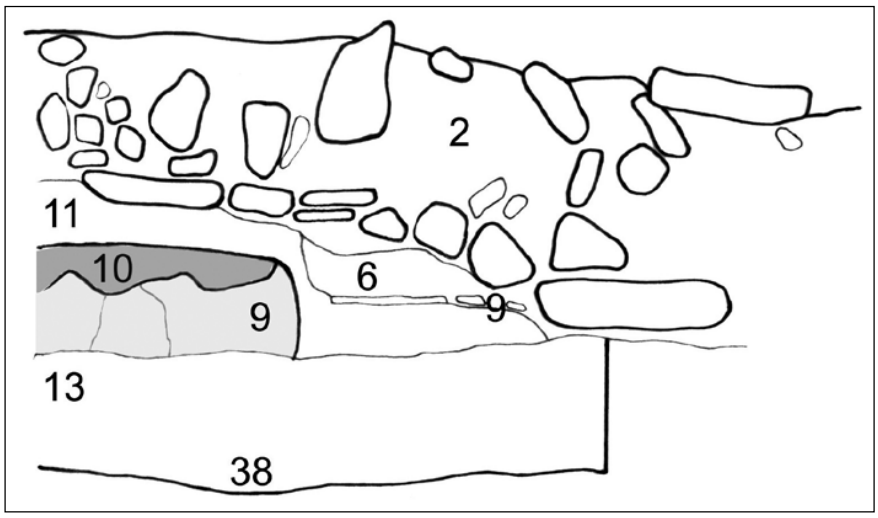
At a later stage, a thick wall (8), sitting on a foundation of mud mortar (44), was built in the northwest corner. This wall, abutting both wall 4 and the entrance wall of Spatial Unit 3 (70), created a division between the area south of the entrances to Spatial Units 3 and 4, showing some change made in the arrangements of the space by the users of the structures (**Figs. 4, 8 and 11**).

Phase IV

The whole area of Trench A was found covered by a thick level of soil and stones of various dimensions (2) which has been interpreted as resulting from a series of collapses. It is difficult to determine the sequence or phasing of these events in most areas of the trench due to



9. Top plan of phase III (drawing by C.A. Tuttle, M. Sinibaldi, K. Harrington).



10. South section through the ṭābūn (drawing by C.A. Tuttle).

11. The ṭābūn under the collapse (photo by K. Harrington).

the intense compacting and disturbance of the area by both the actions of natural agents and the passage of people and animals. Only the southeastern corner of the trench permitted reconstructing in detail the collapse that had sealed the *ṭābūn* (**Figs. 9 and 10**). A layer of soil rich in dark, decomposed organic materials (6, maybe remains of a roof made of vegetal material?) already covered the whole area before a series of collapses from the courtyard's walls (2) buried the *ṭābūn* (9) in several stages; during one of the collapses a flat stone hit the *ṭābūn* at an angle, causing the "explosion" of the upper part of the oven. Ceramic fragments from the *ṭābūn* were thus scattered all around and the ashes and pebbles (10, 11) from its interior were fanned out from its broken walls. Surface 13 was also compressed from the impact of the stones falling on the *ṭābūn*. The recording of such a sequence of events shows that the *ṭābūn* was still in good condition when it was abandoned.

Phase V

The second phase of abandonment is a recent one; it consists of the deposition in the modern era of loose stones from nearby areas (1), due to various activities including the looting of the village structures (**Figs. 5 and 8**).

The Ceramic Assemblage from Trench A: Stratigraphic Unit 13

This short report will introduce a representative sample of the pottery assemblage excavated in 2010, and suggest some elements of discussion on the subject.[11] The data provided here are very preliminary and will acquire more robustness with the excavation of the complete stratigraphic sequences of trench A and trench B, as well as with an increasingly available body of evidence on the ceramic chronology of the Petra area for the Islamic period. For the limited purposes of this report a very specific ceramic assemblage from a single stratigraphic unit (13),

11. The observations in this section also build on former ceramic analysis of the pottery from excavations of the Beidha Documentation Project, see Sinibaldi 2009.

12. Wall 8, looking west (photo by M. Sinibaldi).

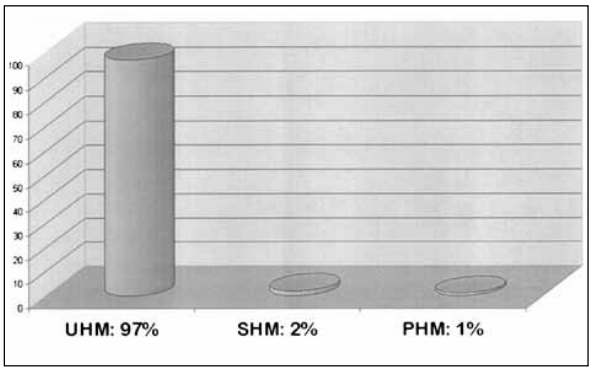
will be analysed here. This stratigraphic unit has been selected because it is the only occupational surface that was completely excavated in 2010 and, as discussed above, it is also representative of the last phase of occupation and use of the area. The material examined derives from the entire soil matrix of StU 13 and not just the hard-packed surface itself; since it was the result of a single and intentional levelling action the material from within the stratum has been interpreted as generally *pre-dating* the actual use of the surface. However, it is probable that some of the sherds recovered became embedded in the surface during its use life. The ceramic assemblage is therefore generally related to a period of time predating the creation and subsequent use of surface 13. In addition, some selected ceramic fragments from 2 (resulting from the collapse of the structures around the courtyard) will be presented; although some intrusions are very likely in this deposit, the generally high consistency with the material from 13, and the stratigraphy itself, indicate that most of these sherds probably belong to the phase associated with the use of surface 13.

The fragments presented here are representative of the entire assemblage from 13 and are those for which it is possible to indicate possible parallels in the Petra area. In terms of methodology, it should be stressed that, although some mention is made of parallels from other areas, priority should be given first of all to parallels from the Petra region because of great regional specificity — one of the clearest characteristics of the kind of pottery analysed here.[12]

A few general and quantitative data on the assemblage from 13 can be presented here. The assemblage consists of 839 fragments in total, consisting 100% of the so-called handmade group with the exclusion of one fragment from the Iron Age and a very few non-diagnostic Nabataean-Roman fragments, which are all wheel-thrown.[13] The production is extremely uniform: apart from one fragment with a dark grey core, all fragments have a black core, a clear indication for similar firing conditions of incomplete

12. The importance of "regionality" is suggested by a study in progress by Sinibaldi on ceramics of the Petra region in the Islamic periods. This study has generated the parameters used here to describe the fragments. The study is currently based on the stratified ceramic assemblages from Wādī Farasa (Humboldt University, Berlin), Khirbat an-Nawāfla (Department of Antiquities of Jordan) and Bayḍā (Beidha Documentation Project and Brown University Petra Archaeological Project). In addition, smaller stratified assemblages from Petra have been analysed, including those from Tomb 303 and the Djinn Blocks, both projects by the Institute Français du Proche Orient. The study also includes the materials from the surveys of the Finnish Jabal Harun Project (Helsinki University) and of the Brown University Petra Archaeological Project in the Petra region. Work is still ongoing for some of the described assemblages and the final publications for others are currently in progress.

13. Iron Age and Nabataean-Roman ceramics were also found in the area of Islamic Bayḍā by the PAWS survey team.



13. StU 13: Proportions of Surface Treatments in Handmade Pottery Groups. UHM: Unpainted/Unslipped Handmade; SHM: Slipped Handmade; PHM: Painted Handmade.

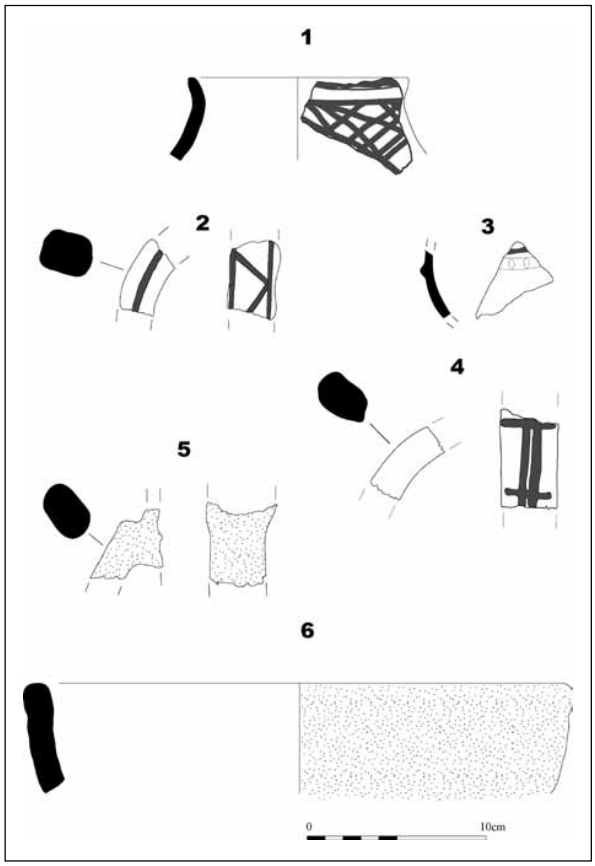
oxidation. Moreover, 100% of the fragments are made with the same general kind of fabric, characterised by a chaff, minerals, and calcite content. The manufacture quality, however, is variable.[14]

It is possible to discuss some aspects concerning surface treatment. Figure 13 shows that the proportion of fragments with decorated surface is about 3%. Of this, 2% is composed of slipped surfaces, while only 1% have painted surfaces. Therefore, despite the relatively small size of the assemblage analysed here, it can be observed both that the percentage of painted fragments is very low and that slipped pottery is about twice as prevalent as painted pottery. Moreover, 100% of the slipped pieces use a red slip, and none of these, despite the size of individual fragments, is also painted. These slipped fragments derive from three forms: juglets, basins, and cooking pots (**Figs. 14.5-6**). Finally, there appears to be no specific quality standard either in fabric selection or manufacturing technique associated with the slipped pieces. In summary, these data seem to suggest that this specific ceramic group (characterised by a red slip) seems to include different forms and different manufacturing quality standards.

As for painted, unslipped pottery (**Fig. 14.1-4**), all fragments appear to be painted with what can be broadly defined as a linear design, and the paint lies directly on the clay without the use of a slip; of these, the majority is red-painted, and only one fragment is painted in brown/black. Finally, the highest percentage of unpainted and unslipped pottery fragments derive from a variety of open and closed forms (**Fig. 15**).

The large majority of forms identified in 13 consist of cooking pots and jars, followed in quantity by bowls, basins, juglets and jugs. In addition, from the same assemblage, there are several examples of cooking pot lids and objects which have been interpreted as spindle whorls.

Some comments on these basic data can be made at present, bearing in mind, of course, the preliminary nature of these observations. Red-slipped surfaces in Islamic period ceramic assemblages have not been systematically recorded in the Petra area. Experience shows that it



14. StU 13 and StU 2: A selection of painted and slipped ceramic fragments (PHM and SHM) (illustrations by M. Sinibaldi).

14. Parameters such as manufacturing techniques, manufacturing quality level, firing, and fabric type are those being developed in the aforementioned Sinibaldi study, and are some of those used to describe ceramics of the "handmade" class. Manufacture quality in particular is an aspect which has been isolated as a diagnostic element to be recorded more closely since it may be a signifier for different types of production environments (Sinibaldi 2009: 461-462).

Fig. 14.1 (StU 2)

Fabric: chaff, minerals and calcite inclusions
Fabric hardness; medium
Chaff quantity: medium
Primary manufacturing technique: hand formed and possibly reworked on a turning tool
Manufacturing quality: medium
Surface treatment: smoothed on the external surface; dark red paint; no slip
Firing: black core; orange surface
Form: jug/jar (rim)
Rim diameter: 12 cm
Wall thickness: 5 to 7 cm

Fig. 14.2 (StU 13)

Fabric type: chaff, minerals and calcite inclusions
Fabric hardness; medium
Chaff quantity: medium
Manufacturing quality: medium
Surface treatment: smoothed surface; red paint; no slip
Firing: black core; orange surface
Form: jug/jar (handle)

Fig. 14.3 (StU 13)

Fabric: chaff, minerals and calcite inclusions
Fabric hardness; medium
Chaff quantity: medium
Primary manufacturing technique: handformed and probably reworked on a turning tool
Manufacturing quality: medium
Surface treatment: smoothed on the internal and external surfaces; red paint; no slip
Additional surface decoration: applied band with subcircular impressions
Firing: black core; orange surface
Form: jug/jar (wall)

Fig. 14.4 (StU 13)

Fabric type: chaff, minerals and calcite inclusions
Fabric hardness; medium
Chaff quantity: medium
Manufacturing quality: medium
Surface treatment: smoothed surface; red paint; no slip
Firing: black core; orange surface
Form: jug/jar (handle)

Fig. 14.5 (StU 2)

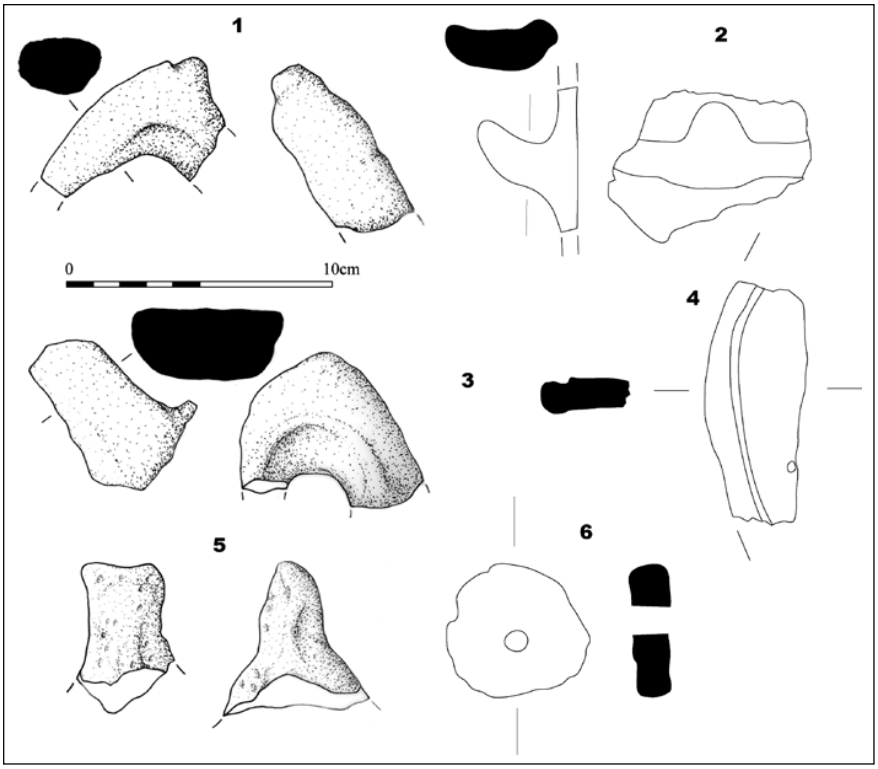
Fabric type: chaff, minerals and calcite inclusions (large chunks)
Fabric hardness; medium
Chaff quantity: low
Manufacturing quality: high
Surface treatment: smoothed surface; red slip
Firing: black core; orange surface
Form: jug/jar (handle)

Fig. 14.6 (StU 13)

Fabric: chaff, minerals and calcite inclusions
Fabric hardness; medium
Chaff quantity: medium
Primary manufacturing technique: coil made and possibly reworked on a turning tool
Manufacturing quality: low
Surface treatment: smoothed on the external and internal surfaces; red slip on external surface
Firing: black core; orange surface
Form: basin (rim)
Rim diameter: 30 cm or more
Wall thickness: about 1,50 cm

is often hard to define the presence of any slip for the so-called handmade pottery group in the region. This difficulty certainly extends to red slips, but there are instances where these can actually be identified.[15] However, since there is substantial variation in how scholars record "red slip," it is not always possible to identify these materials in publications. Nonetheless, it would appear from an analysis of reports from both excavations and surveys that red-slipped surfaces might exist in general through all Middle and Late Islamic periods in the Petra region and Southern Transjordan. It is suggested here that a systematic recording of this characteristic, including the proportions of its presence in an assemblage, might be useful for several purposes, including chronological interpretation.

As for the painted pieces presented from this assemblage in general, the simple zig-zag decoration on handles is a popular one, both in the Petra area and more generally in Jordan.[16] Some comments may also be presented about specific forms. Of particular relevance are the fragments related to cooking vessels (**Fig. 15.1-5**). The selected pieces are all very well represented in the Bayḍā assemblage. A first observation can be made on the contemporary presence of examples from different types of cooking pots in 13; this seems to suggest that several models of cooking pots were employed at the same time



15. StU 13 and StU 2: A selection of unpainted and unslipped ceramic fragments (UHM) (illustrations by M. Sinibaldi).

15. At the site of Wādī Farasa, near the Petra city center, red-slipped pottery consists of a small but easily identifiable group, which makes up about 50% of the all slipped fragments. Sinibaldi would like to thank Dr. Stephan Schmid, Director of the International Wādī Farasa Project, for permitting this material to be discussed prior to his final publication of that project (Sinibaldi, the pottery from the Islamic Period from excavations at Wādī Farasa. Working title, final project report chapter).
16. At al-Wu'ayra it is present in a Late Ottoman context (Tonghini and Vanni Desideri 2001: 717, fig. 18.b and d); at ash-Shawbak, again in a Late Ottoman phase (Brown 1988: 141, fig. 14.52). Outside the Petra area, this kind of decoration is present at Karak castle (Milwright 2008: 351, n. 7), at Tall Dayr 'Allā in the third period (Franken and Kalsbeek 1975: 194, fig. 70. 20, which was interpreted in Sauer 1976: 94 as Mamluk chronology) and at Tall Ḥisbān it is recorded from the beginning of the Ayyubid period (1200 AD) through the Late Islamic period (personal communication, Dr. Bethany Walker). Sinibaldi would like to thank Dr. Bethany Walker for allowing mention of this last information from an in-press draft of her work on the Ḥisbān pottery.

Fig. 15.1 (StU 13)

Fabric: chaff, minerals and calcite inclusions
Fabric hardness; medium
Chaff quantity: medium
Manufacturing quality: medium
Surface treatment: smoothed on the internal and external surfaces
Firing: black to grey core; surface color not uniform
Form: Cooking pot (handle)
Max diameter: about 25 cm
Wall thickness: 7 mm
Further details: blackened by fire

Fig 15.2 (StU 2)

Fabric: chaff, minerals and calcite inclusions
Fabric hardness; medium
Chaff quantity: medium
Manufacturing quality: medium
Surface treatment: smoothed on the external surface
Firing: black core; surface color not uniform; blackened
Form: cooking pot (handle)
Further details: blackened by fire

Fig. 15.3 (StU 13)

Fabric: chaff, minerals and calcite inclusions
Fabric hardness; medium
Chaff quantity: medium
Manufacturing quality: medium
Surface treatment: smoothed on the internal and external surfaces
Firing: black core; orange surface
Form: cooking pot (handle)

Fig. 15.4 (StU 13)

Fabric: chaff, minerals and calcite inclusions
Fabric hardness; medium
Chaff quantity: medium
Primary manufacturing technique: hand formed
Manufacturing quality: medium/low
Surface treatment: smoothed on the upper and lower surfaces
Additional surface decoration: incised line along the border
Firing: black core; orange surface
Form: cooking pot lid
Diameter: uncertain
Further details: one through hole; the lower surface is modeled to fit a vessel rim and is completely blackened

Fig. 15.5 (StU 13)

Fabric: chaff, minerals and calcite inclusions
Fabric hardness; medium
Chaff quantity: medium
Primary manufacturing technique: hand formed
Manufacturing quality: medium/low
Firing: black core; surface color not uniform (orange to grey)
Form: cooking pot lid (knob handle)
Further details: pierced with a fine-pointed tool; non-through holes are unevenly distributed on the surface

Fig. 15.6 (StU 13)

Fabric: chaff, minerals and calcite inclusions;
Fabric hardness; medium; Chaff quantity: medium
Primary manufacturing technique: reworked from a handmade closed form
Surface treatment: smoothed on internal and external surfaces
Firing: black core; orange surface
Form: spindle whorl
Diameter: 4 cm; hole diameter: 1 cm; thickness: 1. 4 cm

immediately preceding the general use of this particular courtyard surface; these forms include the cooking pot with an appliqué band and ledge handles and the one with basket handles (**Fig. 15.1-3**). It should be noted that the cooking pot with the appliqué band (**Fig. 15.2**) is also an excellent example of the continuity of forms throughout the Islamic periods in the Petra area. It is by far one of the most common forms at Islamic Bayḍā and, as observed before, it has been recorded extensively in Petra from at least the early Crusader through to the early Ottoman period, possibly as a non-specialised product well established in the local tradition.[17] It seems to start being used in the region at least in the 11th century (as it appears to be documented at Khirbat al-Mu'allaq: see Lindner *et al*. 1996) and continued until at least the Ottoman period (as documented at Khirbat an-Nawāfla: 'Amr *et al*. 2000). Such observations must therefore be considered as a warning against attempts to attach a specific chronology to this long-lasting form with minor variations. Both of these aspects — the long tradition of some specific forms and the contemporaneous use of different models of cooking pots — need to be considered when attempting to make connections between forms and chronology.

Similar observations on long-lasting forms can be made to some extent on the perforated lid fragments illustrated here (**Fig. 15.4-5**). They probably belong to the type that has a knob handle and a series of holes and was intended for use on a cooking pot. It is one of the various types of lids present at Bayḍā, and is present in the ceramic assemblages from both the Beidha Documentation Project and the BUPAP work at Islamic Bayḍā. This very long-lasting form in the Petra area is already recorded in assemblages that date from at least the 11th century (Khirbat al-Mu'allaq: Lindner *et al*. 1996; Khirbat an-Nawafla: 'Amr *et al*. 2000) and it is still present, although with possible variations, during the Middle/Late Islamic periods.[18] A similar lid has also been recovered from a mixed context with a prevalently Middle Islamic chronology from excavations at Tomb 303 in Petra.[19] It appears, finally, that the lids illustrated could have been associated with either of the two models of cooking pots presented here. Both the appliqué band cooking pot and the perforated lid have similarities with those found at the sites of an-Naqa', al-Mu'allaq and ar-Ruwayshid; however only the example from al-Mu'allaq was excavated and dated to the pre-12th century period (Lindner 1999: 494, fig. 25; 481, fig. 5; 486, fig. 14; 480). In summary, the two described types are very significant examples of remarkable continuity of forms during most of the Islamic period. The danger of attaching chronological values to both specific decoration patterns and forms which have a remarkable longevity in the Petra region, without taking into consideration simultaneously all other diagnostic elements together, has been discussed elsewhere (Sinibaldi 2009: 462) and the assemblage presented here appears to confirm this point.

Finally, several examples of spindle whorls came from the stratigraphic units related to the use of surface 13 (**Fig. 15.6**), and therefore are most likely to be associated with the activities performed in the courtyard. These objects represent secondary use of available materials, being made from reworked ceramic fragments from handmade vessels. Whorls made in this fashion and of this size (4-5 cm diameter) are known in Jordan from at least the Iron Age period onward. [20] The Islamic Bayḍā finds also include a "failed" spindle whorl, which was broken during the process of drilling the central hole.

Discussion and Preliminary Interpretation of Stratigraphy and Data from Trench A

Despite the preliminary state of our fieldwork, it is possible to make some observations on the results of season 2010, bearing in mind

17. See Sinibaldi 2009: 453, fig. 8 and 462 for discussion and a full profile.
18. Tonghini and Vanni Desideri 2001: 712, fig. 8.d; for Crusader or immediately earlier, see Vannini and Vanni Desideri 1995: 532, fig. 17.8-9, where the chronology is not indicated.
19. Sinibaldi would like to thank the directors of this project, Dr. Christian Augé and Dr. Isabelle Sachet, for the opportunity to study these ceramics and for permitting mention of the data prior to its final publication (Sinibaldi, A Middle Islamic Ceramic Assemblage from Excavations at Tomb 303, Petra. In I. Sachet (ed.), *Au Pied du Monument au Serpent de Pétra. Fuilles archéologiques du Tombeau 303 d' Ath-Thughrah*).
20. See for example Daviau and Dion 2002: 184-188; 258-9, figs. 2.144. 1-17.

that a clearer picture will probably be available after the next campaign in 2011. Stratigraphic excavations suggest that the explored area was an open or semi-open area most likely in use sometime during the life of the structure north of it (Spatial Unit 3). Moreover, the evidence suggests that before the last phase of renovation, a larger area was shared between the users of Spatial Units 3 and 4, which appear to be two separated habitation units. It is possible that this separation of spaces had to do with some property divisions or with some functional changes in the use of the area during its last phase of occupation.

It is also clear that the entire area included in trench A was external in relationship to a structure created by walls 3 and 4, which remains unexcavated. Some change in the use of this space is therefore very clear towards the end of phase III, not long before its abandonment. However, it is also clear that there was a generally intense continuity in the use of the courtyard throughout phases I, II and III, since the study of stratigraphy indicates that repetitive activities of similar natures took place in the same areas of the open space (courtyard?): this includes continuity in the creation of the constructions supported by post holes along wall 3, and in the creation and use of hearths in the northwest corner, along wall 4. This observation, together with the clear lack of evidence of abandonment of the area during the three phases, proves that there was no gap in the occupation of the area, and probably also not in the identity of its group of users. It appears as a matter of fact that the users decided to renovate the walking surface regularly, but still continued to perform the same activities in the same places.

This concept is reinforced by the clear consistency of ceramic materials throughout the sequence. Furthermore, the total lack of any indications of abandonment of the area between the different renovations of the working surfaces suggests that the area served a permanent occupation of the structures, rather than a seasonal one. It thus appears that the group of people using these spaces was part of a settled population, and that they were employing the external facing of the permanent structure formed by walls 3 and 4 to perform activities outdoors, including baking bread, cooking on hearths, and spinning. There is, moreover, no evidence of substantial fluctuation in the settlement occupation, of the kind, for example, observed at the rural site of Fāris on the basis of the change in the arrangements of ovens (McQuitty 1994: 72).

One of the most relevant questions in this context, therefore, is about the length of time that passed between each renovation of the use surfaces. It is not easy to calculate the life of the temporary constructions exposed, such as the ones indicated by the post-holes, especially because they are at this stage not fully understood. Nevertheless, we can reasonably assume that, given their fragility, they would probably need to be replaced quite often — perhaps even every few months; this would suggest a use of each surface for no longer than only a few years.

The *ṭābūn* found in phase III is perhaps a more useful point of reference in this respect. The *ṭābūn* in use during phase III (**Fig. 11**) seems to correspond well to the most common model of bread oven used until recently in the areas of Palestine and Southern Jordan, and it is especially typical of rural settlement. In form it is made of unfired clay, about 80 cm in diameter, and (being bottomless) it uses a base of rounded pebbles. When such an oven is installed, it is normally placed in a cut that is made into the ground; it is often covered over with readily available material after each use, such as soil, chaff or dung, to preserve the heat (McQuitty 1994: 55–56, 72, 1984: 261). The BUPAP Islamic Bayḍā work has therefore sampled ashes for phytoliths analysis from both inside and outside the *ṭābūn*, since these may well reflect different kinds of actions related to the same baking activity.

The *ṭābūn* is largely restorable and is currently under conservation. It had a ceramic lid and was filled with a large quantity of pebbles and ashes; all of this material was recovered during the excavation. It is similar in dimensions to others excavated in Jordan, such as the one found at Khirbat Fāris, dated to after the 12th century phase (Johns *et al.* 1989: 79). It appears that at least some sort of structure or even a simple wall would normally be expected as a protection for a *ṭābūn*; however, it has not been possible to assess this possibility for the *ṭābūn* of phase III since it was located in a corner of the trench, and the area around it remained unexcavated and not

completely visible.[21]

In her interesting ethnographic and archaeological study of *ṭābūn*s in Jordan, Alison McQuitty points out that the main characteristics of an 11th century *ṭābūn*, described in a historical document, appear to have little changed until today; for this reason, it is possible to use ethnographic evidence to better understand archaeological examples. McQuitty evaluates the use of modern *ṭābūn* ovens as having a life of three to fifteen years, and observes that when the *ṭābūn* goes out of use, it is often replaced on the same spot (McQuitty 1984: 265, 1994: 63, 70). Of course, other elements would need to be considered in order to assess the duration of the installation at Bayḍā, such as the frequency of the oven's use. This would in turn be connected to the possibility that more than one oven was in use at the same time by the same group of people — a factor which cannot be assessed at this moment, given that the trench did not completely expose the limits of the open area. However, this time span (three to fifteen years) appears to fit well with the rest of the evidence for the use of phase III. In any case, the opportunity to identify archaeologically a phase for a relatively short time period is valuable for both observing its characteristics and understanding the associated finds.

At the same time, this continuity in the main characteristics of the *ṭābūn* means that in terms of absolute chronology, the *ṭābūn* is much less helpful. This form of bread oven is the most widespread of any type during the Islamic period in southern Bilād ash-Shām. In fact it has been documented since the Bronze Age with very similar characteristics over time (McQuitty 1994: 69-70). Other *ṭābūn*s were found at Islamic Bayḍā during excavations of the Beidha Documentation Project, and a contemporary *ṭābūn*, which appears generally similar to the excavated one, is still visible in the area of as-Siq al-Bārid.

It is possible, finally, to generally describe the building techniques and architecture evident in structural remains of the village, although a detailed and systematic study is planned for subsequent seasons when further excavations will permit better visual inspections of the structures. In general, some differences in the quality of the building techniques are evident. An example is area III, where some of the walls already excavated by the Beidha Documentation Project show a higher quality of construction, characterized by more organized courses using building elements of a greater uniformity. The building techniques in areas I and II, however, are characterized by less regularity regarding orientation of the walls and dimensions of the building elements, which are less evenly cut and arranged in less organized courses. All walls analyzed so far utilize a mud-mortar bond and are characterized by the use of local materials, including occasional elements that are in secondary use (i.e., Nabataean stones that exhibit different dressing styles). All building elements can be roughly defined as between semi-hewn and roughly-squared to dressed stones; construction with these materials then proceeded with a boulder and chinking technique. Given the general paucity of studies about Islamic period sites in the Petra area — and especially those of a rural nature — such elements cannot at present be used to contribute to any specific chronological interpretation.[22] The Islamic Bayḍā project will be pursuing additional studies that relate this architecture with associated stratigraphy in order to help create a basis for comparisons in the Petra region and, hopefully, contribute towards developing a possible chronology of the standing structures.

The documentation of how architectural elements were employed during the Islamic periods also remains scarce for the region around Petra. What is known as a result of the work conducted by the Beidha Documentation Proj-

21. A systematic study of these structures in northern Jordan, a kind of work currently lacking for the south, shows that in that region it was common for a *ṭābūn* to be housed in a building by itself, in order to protect the baker from the natural elements; the ovens discovered at Ayla were arranged near to a wall, as perhaps part of a larger structure (McQuitty 1994: 60-62). Excavations at al-Mu'allaq in the Petra area uncovered a *ṭābūn* dated to the Islamic period that was positioned in the corner of a building (Lindner 1996: 119). It has also been observed that sometimes a small structure is found associated with *ṭābūn*s that could serve for storing fuel (McQuitty 1984: 264).

22. At Khirbat an-Nawāfla, in area V, all walls from the Nabataean to the Early Ottoman period are bonded with mud mortar ('Amr *et al*. 2000: 248).

ect, which included Spatial Unit 3, is that rooms in Islamic Bayḍā can be characterized by the use of roof-supporting arches and the presence of small semicircular structures, possibly with a storage function, along the internal facing of the walls.[23] In the Nawāfla excavations, structures with arched roofs were uncovered that date from the Ayyubid through to the Early Ottoman phases, where a *ṭābūn* oven was also recorded (ʻAmr *et al*. 2000: 247–248).

As a result of the ambiguity in the available data regarding Islamic period constructions in the region, an assessment of absolute chronology for the excavated deposits rests at this moment on the evidence provided from ceramic remains. Yet it must again be stressed that given the absence of available parallels that were studied by similar methods, and from sites of similar function in the Petra region, as well as the general preliminary stage of research on ceramics of the Islamic period in Transjordan, makes any interpretation a very tentative one. Nonetheless, work on several assemblages of the Petra area is currently in progress and the present evidence seems promising with respect to advancing the definition of better ceramic chronologies in the future. Based on the available evidence, it is possible to propose, for the moment, a tentative chronology only for the Late Islamic period.[24] This data would fit in the context of former observations on the high percentage of Late Islamic pottery in the Jibāl ash-Sharāh area, based on pottery readings from surveys, and more generally, with the recorded presence of Late Islamic Period settlements in the Petra area (ʻAmr *et al*. 2000; ʻAmr *et al*. 1998: 504-515; ʻAmr and Momani 2001; Tholbecq 2001: 405).

Other finds from the stratigraphic deposits include small glass fragments and worked hematite pieces. Hematite pieces are an important element found in the artifact assemblage from excavations at the nearby site of Ṭur Imḍayy (Simms and Russell 1997), occupation at which is dated from the 17th to the 19th centuries. However, the Ṭur Imḍayy excavations also yielded a significant number of other lithic artifacts, such as gunflints and fire starters, distinctive artifacts that have not yet been identified amongst the material culture recovered during the first season at Islamic Bayḍā. The limited publication of the pottery assemblage from Ṭur Imḍayy unfortunately does not afford us any useful comparative information (Simms and Russell 1997).

Another notable absence at Bayḍā, when considering a possible late Islamic period chronology, is tobacco/smoking pipes. During the Ottoman period, smoking pipes appear to have been produced since the 17th century (Simpson 1990) and to be present until the late 19th century in Palestine (Ziadeh 1995: 211). In Petra, tobacco pipes have been clearly recorded in the Ottoman phase at al-Wuʻayra, dated from the 18th century onwards (Tonghini and Vanni Desideri 2001: 717, fig. 19). Several examples dating mostly from the 18th century have been recovered from surveys of the Finnish Jabal Harun team,[25] and fragments of additional examples were also recovered during the 2010 season of the BUPAP PAWS survey, but the chronology of these latter examples still needs to be assessed. These finds confirm the presence and use of such objects in the Petra region since at least the early 18th century. The total lack of such finds in the excavations at Islamic Bayḍā is particularly noteworthy and, in association with the ceramic observations, might suggest a chronology within the range of the late 15th to the 17th centuries.

In conclusion, the evidence presented here reflects the challenges of trying to determine the chronology of rural sites from the Islamic period in the Petra area based on archaeological sources. The importance of both careful stratigraphic study and the analysis of the archaeological context cannot be stressed enough when aiming at understanding the chronology and character of the described site. For this reason, the method of analysis of the project included the regular

23. Bikai 2007: 370, and observations on the site by the current team.

24. For Late Islamic as a general definition in this paper we refer to the chronological system adopted by D. Whitcomb (Whitcomb 1992): Late Islamic: 1400-1800 AD. However, whenever possible, specific dates expressed by centuries will be adopted.

25. On the basis of similarities in fabric and shape with dated examples, most of the fragments found in the Finnish Jabal Harun Project survey do not appear to be earlier than 18th century. Sinibaldi wishes to thank Dr. Paula Kouki (Helsinki University) for sharing this information from a publication that is in progress.

use of a Harris Matrix for every stratigraphic situation, including standing structures, a close study of the building techniques, and the analysis of botanical remains with several methods of analysis. Finally, an important part of the ongoing methodology is the careful analysis of excavated ceramic assemblages in synergy with the ceramics from the BUPAP landscape surveys. All of this research will be conducted within the framework of studies already in progress that are aimed at developing a chrono-typology of Islamic period ceramics of the Petra region.

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JARASH HINTERLAND SURVEY 2010 – AN OVERVIEW OF THE RESULTS

Fiona Baker and David Kennedy

Abstract

Jarash, ancient Gerasa, is an archaeological site and landscape of international importance. However, very little archaeological survey or excavation work has taken place in the immediate vicinity of the city walls and the archaeological evidence there was poorly recorded and little understood until the Jarash Hinterland Survey (JHS) commenced in 2005. The JHS was initiated in response to rapidly growing urban expansion into this hinterland threatening the unrecorded archaeological landscape. This baseline survey shows that this rapid urban development may be destroying ca. 10% of the archaeological sites around the city every year.

Introduction

Jarash is one of the best preserved Roman provincial cities to be found. It spreads over some 85 ha with a planned layout encircled by city walls. Its famous colonnaded streets and piazza, theatres, temples, churches, baths and hippodrome are visited by many thousands of tourists every year.

No city, ancient or modern, is a self sufficient island and an urban centre requires a hinterland that provides for its basic needs of food and water, agricultural surplus and building materials as well as a place to bury the dead.

The population of Jarash has doubled within 15 years from 21,000 in 1994 to 42,000 by 2009 and is still growing. Although the core archaeological park is protected, well over 100 new houses are being built beyond its perimeter every year and the pace of development and expansion is relentless. Not only is this rapid urbanisation destroying archaeological sites, it is destroying the rich agricultural land along the Wādī Jarash. It is because of this that the Jarash Hinterland Survey (JHS) project was instigated in 2005. The objectives of the JHS are to identify record and make mitigation and management recommendations for the archaeological sites threatened with destruction. It will also provide a richer basis for understanding the hinterland of ancient Gerasa and the relationship between city and country.

Three seasons of survey have now taken place in 2005, 2008 and 2010. We have previously reported on the first two seasons (Kennedy and Baker 2009b; Baker and Kennedy 2010) and this article provides a summary overview of the 2010 survey results. More detailed analysis and future publications will follow.

The original objective of the JHS was to survey an area of 10 sq km centred on the ancient city. However, it was clear from the outset that attempting to survey 7.5 sq km in the final 4 week season was over ambitious and the survey strategy was revised. In the final season the focus was on joining up the already surveyed areas to the W, E and S boundaries of the survey area; covering small gaps and assessing the areas furthest away from the ancient city. In some areas this provided a survey transect that ran from the City wall to the edge of the survey area and it also provided information on site type and density furthest out from the focus of the City. In addition to the 10 sq km area an area earmarked for housing development located just to the NW of the survey area was also subjected to a rapid walk-over survey. Although not meeting the original objective of covering 10 sq km the survey has provided a representative sample, information on site type and density furthest out from the focus of Gerasa and an archaeological overview of the Jarash Hinterland.

The general JHS area is covered with lime-

stone outcrops and has the deep red rendzina soil or terra rossa that is common on the limestone outcrops in the northwest of Jordan. The fields in both the north and south Wādī Jarash have more mixed topsoil indicative of centuries of cultivation. The 2010 survey area largely comprised agricultural land of ploughed olive groves, fields and rough grazing land.

The field survey was carried out by archaeologists walking intensively over the landscape looking for archaeological sites of any period. When a site was located, its position was marked by handheld GPS, colour digital photographs were taken and the site was recorded by written description, measurements and sketches on a specifically designed field recording form. If artefacts were present, these were collected to provide dating evidence. The field recording form is based on the JADIS record form and includes a section to identify and assess the level of threat to the archaeological sites. Due to extensive ongoing development almost every site has a high risk of being destroyed.

At the commencement of the project it was necessary to produce a suitable scale map of the survey area. The team had intended to use the 1977 1:50,000 UTM Sector 36 map as the primary map for the project coupled with rectified aerial photographs (APs) to produce a base map for the survey area. However, when checking the co-ordinates of fixed points on the ground with the GPS to assist with the rectification of APs it became apparent that the GPS co-ordinates derived from satellites did not agree with the UTM co-ordinates derived from the map. Further research determined that the UTM map is inaccurate and that the co-ordinates taken from the map may be up to 200m away from the co-ordinates obtained from the GPS. This is a known problem encountered by other survey teams (for example, Mortensen 1993; Flanagan and McCreery 1995). It should be noted that the error on the UTM map is variable, both on this particular map sheet and across Jordan. Therefore, there is no formula that can be applied to the GPS-derived co-ordinates to calculate the corresponding UTM map co-ordinates. The JHS has used enlarged Google Earth satellite aerial photographs as field survey base maps.

The survey team used hand-held GPS (Garmin 60CSx, Garmin 60C and a Garmin CS76) to locate the sites in the field. The GPS plots were cross checked by the field surveyors against the annotated field maps to ensure that all sites are correctly located.

All co-ordinates given in our reports and the database are derived from GPS readings, using the WGS 84 co-ordinate system, and are the true UTM co-ordinates for the archaeological sites identified. The accuracy of the GPS reading is usually within +/-5m, but occasionally the accuracy was +/- 6m or 7m of the site. The level of accuracy is recorded in the GPS field log. It is important to note that the sites recorded by the survey should be located either from the supplied maps only or by GPS. If one tries to locate the sites by co-ordinates using the UTM Sector 36 S 1:50,000 map one will not find the sites as the UTM map is inaccurate by up to 200m.

The primary record for the JHS is a database, compatible with MEGA; copies for the 2010 season (as well as earlier seasons) along with the preliminary field reports may be consulted at the libraries of the DoA, CBRL and ACOR.

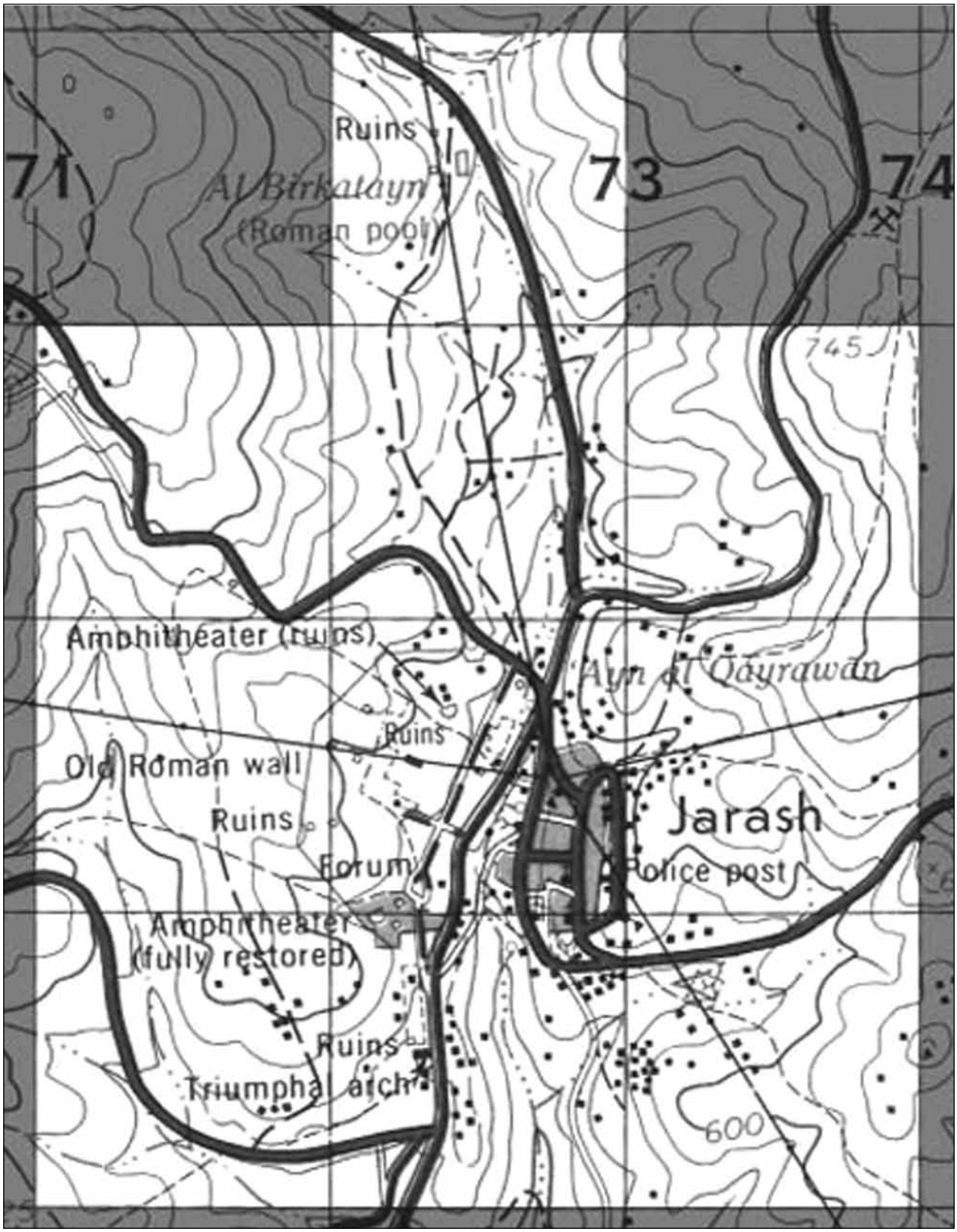
The 2010 Survey – Overview of the Results

A total area of 1.3 sq km was surveyed in 2010 and 519 new archaeological sites were recorded. The total area now covered by the survey amounts to 3.8 sq km and a total of 1141 sites have been recorded. It is estimated that at least 2 sq km of the remaining area is already built over (**Figs. 1, 2, Table 1**).

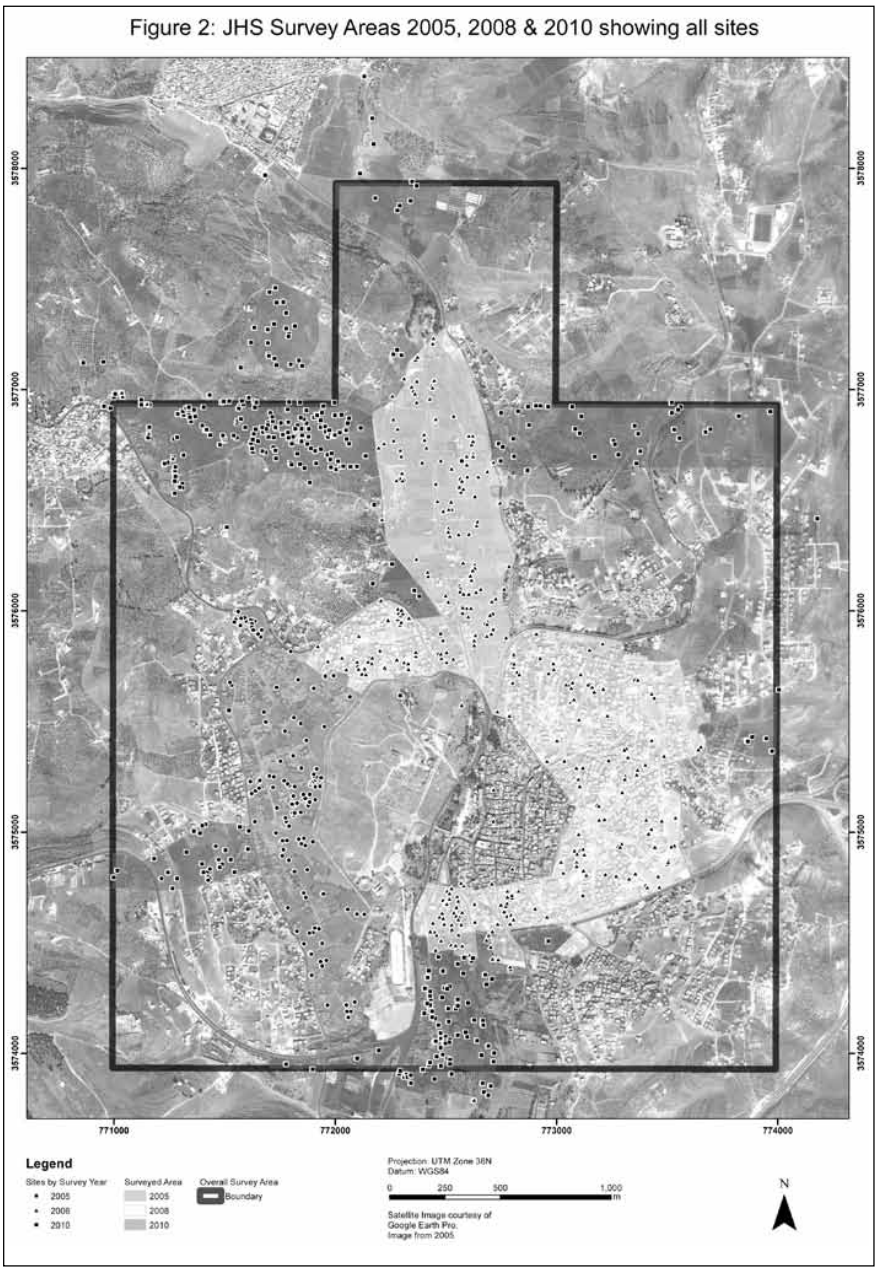
Examples of Site Types

Over 500 new sites were recorded in the 2010 season and over 1100 have been recorded over the three seasons. It is not our intention to describe or discuss all of the site types in detail here but to give a flavour of the types of sites recorded during the 2010 season. Our database can be interrogated by site type for full details and photographs of all of the recorded sites. Artefact analysis of the surface collections is still ongoing and will be completed during 2011 and the information added to the database in due course.

The JHS has provided a wealth of information on the occupation and exploitation of the immediate environs of Gerasa. During the 2010 season it was observed, as might be expected, that the survival rate for archaeological sites such as quarries, lithic scatters and olive and



1. Contour survey map showing whole area.



2. Overall survey map showing all sites and seasons.

wine presses was higher than in the more developed areas immediately adjacent to the city wall. While the results of the survey need to be analysed and assessed in detail it is apparent that spatial distribution of site types also reflects the topography and distance from the urban core. Several distinct areas of further research have emerged, for example water supply and management and tomb typologies. Analysis of the survey results is ongoing and we look forward to integrating the artefact data and producing more in depth publications in due course.

Quarries

A total of 145 quarry sites were recorded in the 2010 survey season, more than in previous seasons. Factors contributing to this higher count include the fact that the 2010 survey areas were less developed and built-up than in previous seasons, meaning that more sites are likely to have survived (**Fig. 3**).

Many of the quarry sites were simple cut edges strung out along the natural limestone terrace outcrops. However, such apparently dispersed evidence can often be regarded as part of

Table 1: showing types and numbers of sites.

Type of Site	**2005**	**2008**	**2010**	**Total**
Quarries	31+	45	145	221+
Rock Cut Tombs	67	64	72	203
Rock Cut Graves	17	7	3	27
Mausolea	5	2	2	9
Sarcophagi	26	15	6	47
Inscriptions /Petroglyphs	8 / 0	3 / 0	0 / 2	11 / 2
Artefact Scatters	10	79	75	164
Caves / Rock Shelters	2	11	50	63
Traditional Houses	2	7	6	15
Mills and Water management	9	29	54	92
Architectural Fragments	34	98	31	163
Milestones	0	4	0	4
Olive / Wine Presses	0 / 0	5 / 0	3 / 9	8 / 9
Platforms	0	4	0	4
Monumental Structures	0	2	0	2
Tracks / Roads	0	0	4	4
Cupholes / Basins	0	0	12 / 22	12 / 22
Other: including terraces, cairns, unspecified structures	16	20	23	59
Total Number Sites	**227+**	**395+**	**519+**	**1141+**

3. Aerial photograph of the large quarry S of the 'Ajlūn road.

a single area of exploitation, within which there are larger areas of extraction alongside small quarried areas and cut edges. This is both the result of evidence being hidden by later slope-wash, giving a more dispersed appearance to the visible remains, and by the selective extraction

of suitable stone. The recent exposure of quarried faces by tomb robbers indicates that up to 2m of soil has accumulated in some areas since the Classical period (**Fig. 4**).

Two incised marks were noted on the rock at limestone quarries. These are in the form of small weathered crosses. They may have been made by a quarry master or overseer to mark the best area of limestone, or where a team was to start work.

Although most quarrying was likely to have been for building material there are intriguing hints of a more specific quarry product in the 2010 survey area. In a group of four sarcophagi NE of al-Birkatayn there were two that were unfinished and at a quarry SW of al-Birkatayn sarcophagi sized blocks were marked out in the quarry face but had not been removed (**Fig. 5**).

Tombs

The majority of Classical rock cut tombs and burial features located in 2010 survey were on Abū aṣ-Ṣuwwān. These were of high status, located as they are close to one of the main entrances to Gerasa beside the Gerasa – Philadelphia road. Several tombs were also recorded on the E side of the Abū aṣ-Ṣuwwān plateau and many of these tombs had been remodelled as dwellings and some may in fact have originated as natural caves or had possibly been quarried out as flint mines.

Several rock cut tombs were recorded in the NW transect and it was noticeable that the quality and hence status of the tombs increased the closer one moved towards the main road along Wādī ad-Dayr and al-Birkatayn (the *Via Sacra*) (**Fig. 6**).

5. Abandoned and half-removed blocks site 716.1.

4. Quarry site 601 showing robber activity searching for tombs and depth of colluvium (2m vertical scale).

6. Tomb 745 with sarcophagus.

Two mausolea were recorded in the 2010 survey area. One at Abū aṣ-Ṣuwwān already in the care of the Department of Antiquities and one in the NW development area which comprises a rock cut tomb and a built structure with a mosaic floor.

The reduction in numbers of sarcophagi from 41 in earlier seasons to just 6 in 2010 probably reflects the survey areas being further away from the focus of settlement and high status burial.

Prehistoric cairns of probable Early Bronze Age date were recorded at the NW, NE and SE boundaries of the survey area and in the NW it was apparent that a megalithic landscape survives beyond the survey boundary. The best example of a prehistoric burial monument was a kerbed façade cairn of EB date found at the NW perimeter of the survey area.

Architectural Fragments

Only 31 architectural fragments were located by the 2010 survey, as opposed to 34 in 2005 and 98 in 2008, which reflects the focus of the survey on areas further away from the city. The frequency of architectural fragments increased the closer one came to Gerasa and most were observed as re-used masonry in field terrace walls. The distribution of architectural fragments is a clear indicator that the 2010 survey area encompassed a more rural landscape.

Artefact Scatters

Only a few dense pottery and artefact scatters were located by the 2010 survey, a total of 75 artefact scatters were recorded, and a third of these were lithic scatters, with a marked decrease in the number of sherds the further one moved out from the city. In the NW survey transect one artefact scatter perhaps represents a Roman – Byzantine farmstead but in general the sherd scatters in the NW were very low density. The NE and SW survey areas were notable for the lack of pottery. In the South Wādī Jarash the density and range of pottery increased as one moved N towards the city.

Flint Scatters

More flint was recovered during the 2010 survey season than in the previous two seasons and two areas proved to be particularly rich in lithics. The first was the South Wādī Jarash, in particular the mid and upper terraces on the east side and the lowest terraces on the west side. The second area is the well known and partially excavated 'mega-site' of Abū aṣ-Ṣuwwān, literally 'Father of Flint' first recorded by G. Lankester Harding in 1948. The latter site has been excavated in the 1980s and 1990s and is still under investigation by Dr Maysoon Al-Naher (Al-Naher 2010), who provided much helpful advice and comments on the JHS lithic assemblages. The Abū aṣ-Ṣuwwān lithic scatters recorded by the JHS form part of an extensive archaeological site, spread over an area of ca. 26 acres. The Abū aṣ-Ṣuwwān site is dated broadly to the Pre Pottery Neolithic and in particular PPNA and PPNB, much of the activity is of seventh millennium BC date and contemporary with 'Ayn Ghazāl and al-Bayḍa.

Previous descriptions (e.g. Harding 1948; Kirkbride 1958) of Abū aṣ-Ṣuwwān indicate a long period of occupation from the Palaeolithic and there are several obvious reasons for this. Primarily the spectacularly rich abundance of good quality flint nodules in the conglomerate limestone and the reliable water supply of the River Jarash (ancient Chrysorhoas = Golden River). Kirkbride (1958) mentions possible Palaeolithic occupation in some of the caves on the E side of the Abū aṣ-Ṣuwwān plateau overlooking the Wādī Jarash. Most of these caves have been converted for later use as Roman tombs, cisterns and later still in the modern period as houses and temporary houses. It is not always possible to determine which caves are natural in origin and which have been quarried out. It is also possible that some of these caves are in fact flint quarries rather than simply occupation or tomb caves.

Small assemblages of flint, including a ground stone axe fragment, were also located and collected in other areas of the survey – implying low-level knapping of prehistoric date throughout most of the survey area with some scatter densities suggesting occupation sites.

Surface flint collection and field observation on Abū aṣ-Ṣuwwān indicates a blade-dominated industry suggesting the bulk of both flint production and occupation activity is of Pre-Pottery Neolithic date (PPNA – B). Particularly diagnostic of this period are the long-blade or naviform cores, several of which were identified as well as long blades and backed or crested blades. Several complete or slightly damaged basalt hammer stones and pestles were also observed within the lithic scatter as well as broken basalt fragments. Also of Neolithic date were opposed multi-platform cores, borers, burins, perforators, flint knives, notched blades, and truncation on blades and scrapers. Some of the more significant tools collected included a double-retouched flint knife, two serrated sickle blades with high sickle gloss and a double waisted lunular tanged scraper and two rough-out examples of this tool (**Fig. 7**).

The site of Abū aṣ-Ṣuwwān is unfortunately being both ploughed intensively and built upon in some areas.

On the East side of the South Wādī Jarash the lithic scatters were not as abundant as on Abū aṣ-Ṣuwwān. However, the mid terrace level produced a number of diagnostic flint and chert lithics characteristic of the Upper Palaeolithic, Epipalaeolithic (possibly Natufian) and Pre-Pottery Neolithic industries.

On the W side of the South Wādī Jarash on the lowest terrace, only 5m from the present water course, two further small flint scatters were encountered. The assemblages include flakes, debitage, truncated flakes, small cores, scrapers, blades, bladelets and microliths suggests flint knapping in this zone. The presence of arched or lunulate microliths (sickle blades) and the diagnostically micro-lithic nature of the assemblage imply a pre-Neolithic date as this type of reduction sequence is more characteristic of Epipalaeolithic assemblages **(Fig. 8)**.

The presence of these sites so close to the river bed on the lowest wadi terrace is of interest. The lithic material appears to be *in situ* as one would expect such small flakes of debitage and the microliths to have been washed away and disturbed rather than being in a distinct assemblage indicating *in situ* knapping.

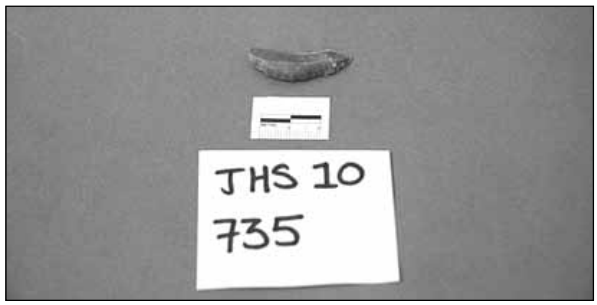
It is clear from the lithic scatters and the mills in the South Wādī Jarash, as well as the other water management features recorded by the survey, that the water supply of Gerasa was very different to what we see today.

Water Management: Springs, Channels, Cisterns and Mills

Water management features were far more frequent in the 2010 survey areas. The less disturbed nature of the landscape away from the focus of settlement preserved significant evidence of Classical period water management.

Five spring sites were observed in 2010, although only two of them were in the survey area. A major spring north of al-Birkatayn at ash-Shawāhid, a spring at Mukhayyam Sūf near Khirbat al-Maṣṭaba and ad-Dayr Spring in the northwest represent the main northern springs. Rock cut water channels were located which fed the water south to al-Birkatayn reservoir, Wādī

7. Selection of blades from Abū aṣ-Ṣuwwān.



8. Epipalaeolithic (Natufian) sickle blade from Site 735 on the lowest terrace of the west bank of the South Wādī Jarash.

ad-Dayr and Gerasa.

In 2008, the remains of a stone water channel constructed of individual U-shaped blocks were located in the Wādī ad-Dayr to the north of the City. This site was scattered over a large area along the middle of the wadi, with many of the blocks built into later agricultural terrace walls.

In 2010, another dump of stone water channel blocks was discovered at the W edge of Wādī ad-Dayr close to the city. These blocks are virtually the only remains of what was once a complete channel running along the W side of the wadi, which survived until about 35 years ago.

Along with these blocks, which represent two water channels in the middle and along the W side of the Wādī ad-Dayr, the survey identified more remains of at least one major rock cut channel with smaller subsidiaries running roughly N-S along the W edge of Wādī ad-Dayr. It is clear that there was a major channel at the W side of the wadi and it is possible that the ash-Shawāhid spring on the W side of the wadi N of al-Birkatayn fed the channel. Like the channel identified in the centre of Wādī ad-Dayr in 2008, perhaps fed by the al-Birkatayn reservoir, it is likely to have played an important role in the supply of water to Gerasa and for irrigating the fertile soils of the wadi.

South of the city a complex of rock-cut water channels was discovered, running N-S along both edges of the Abū aṣ-Ṣuwwān ridge. Only a short stretch of channel was noted on the developed W side but a series of least five roughly parallel channels 10-15m apart were noted on the E side of the ridge where more bedrock was exposed (**Fig. 9**).

The channels are much obscured by slope-wash, but can in general be followed for 100m or so N-S. They all roughly follow the contour, occasionally joining or diverging, which made the direction of flow impossible to gauge without detailed levels but our impression was that they flowed S away from Gerasa. The channels are also linked with caves or tombs that have been reused as cisterns or small reservoirs (as noted by Diana Kirkbride in 1958) (**Fig. 10**).

A third water channel feature is a rock-cut tunnel located in a limestone bluff only 10m above the river on the E side of the South Wādī Jarash. The tunnel aqueduct can be traced for at least 60m, but disappears to the S below slope-wash and the road constructed between 2005 and 2008 (**Fig. 11**).

Over thirty cisterns, wells and reservoirs or birkets were located in 2010. Different methods of water collection were observed. One system of collecting water was the utilisation of a quarried outcrop as a collection area with the water flowing down into a rock cut cistern. Water was also collected using small rock-cut channels to feed into a cistern. Some of these examples utilised old quarry beds as a silt trap before water ran off through more channels into the main cistern tank.

The majority of cisterns tended to be bell-

9. Aerial view of site 744 water channel complex and associated cave birkets 767, 786, 788. The channels can be seen as linear scars in the limestone.

10. Channel 744.2 along the top of cave cistern 786.

11. Rock-cut tunnel aqueduct, site 666.

shaped and are still in use. Several examples of caves and tombs re-used as cisterns were also recorded. This particular phenomenon seems to be concentrated on the S side of Jarash.

One new mill site of similar design to three of the examples already recorded by the JHS was discovered in 2010, bringing the total number of mills in the South Wādī Jarash to five (**Fig. 12**).

Mill sites are very difficult to date; research by Alison McQuitty and others (McQuitty 1995; Greene 1995) has shown that ones that have a

12. Mill site 663.

Roman appearance might actually be 19th century in date. There is evidence for such mills to have been built and used anywhere between the Classical and Ottoman periods and for the restoration of derelict mills in the Late Ottoman period (Rogan 1995). Excavation would be necessary in order to understand the JHS mills' development and date.

Cups and Basins

Cups and basins were recorded throughout the 2010 survey area in greater numbers than in previous seasons, again reflecting the survey areas being further away from the ancient city and less developed.

There were noticeable differences in the location of the cups and basins and there was considerable variation in size. The wine presses also had cups and basins associated with them and these examples can be associated with the use of the press.

Several tombs had small basins and cups associated with them, perhaps associated with libations or offerings for the dead. Cups and basins were also noted at quarry sites. Where the quarry faces have been reused for tombs it is unknown whether the cups and basins are associated with the quarry or the tomb. Small water reservoirs may be associated with the quarry sites as pot holders for jars and amphorae or for water to help with the quarrying, especially if heat and quenching or soaking of wooden wedges to assist with block removal was employed.

Elsewhere larger rock cut basins as well as natural solution holes appear to have acted as small localised cisterns or watering holes (**Fig. 13**).

Many of the cups and basins, particularly the

13. Cup and basin site 624.

cups, may have been used as mortars for grinding up cereals or acorns (Younker 1995). The sites where acorns have been found in stratified deposits are all prehistoric and they were perhaps a staple food when agriculture was just becoming established. There are also several ethnographic examples of pastoral nomads grinding and processing acorns in times of food shortages and acorns being processed for food is a well-established practice. It is important to note that water is also required for processing acorns, which may explain the groups of several cupholes together.

Wine Presses

Nine wine presses were recorded in 2010. The majority of these are simple treading floor and vat installations. Pamela Watson's paper on wine presses found in the Pella Hinterland is an excellent reference for the types of wine presses also found in the Jarash Hinterland (Watson 2004).

The most complex wine press installation found is located only 25m S of the 'Ajlūn Road at the S end of the survey area. This example features two treading floors, a settling basin with a hollow on the bottom for sediment or lees to settle in between one of the treading floors and the main large square vat. At the S end of the installation is another smaller rectangular basin, which may be a settling tank and another deep square vat. All of the wine presses are cut into limestone bedrock and there was no trace of any mosaic floors, usually considered a Byzantine feature (E Oweis, pers comm.), suggesting they are all Roman in date.

The simple wine presses consist of a treading

14. Wine press site 833 viewed to the north from the large 4.3m x 4.3m tank or vat. The scales are on the eastern of the two northern treading floors, rock cut channel leading from the W vat associated with the western of the two northern treading floors is entering the main central vat at the left of the picture. The basin with a depression in the bottom for settling lees is on the S side of the eastern of the two northern treading floors. Note that this basin is lower on the side of the large vat and higher on the side of the treading floor.

floor with a rock cut channel leading down into a deeper basin or vat. Some of the wine presses have rock cut post holes arranged around the vat and these presumably were used as post holes for a structure, pot or jar holders or for some kind of mechanism to help with pressing and processing the grapes or for water (**Fig. 14**).

Olive Presses

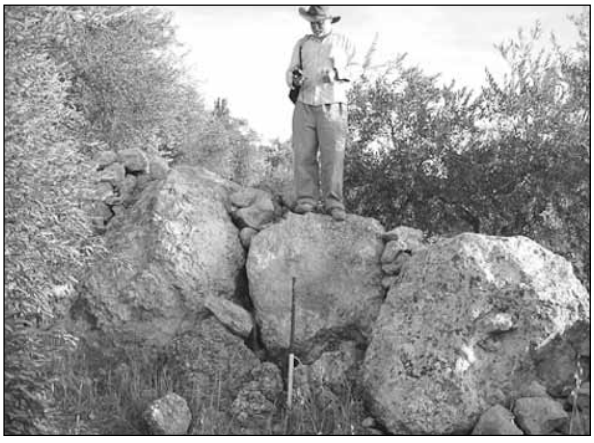
Three, possibly four, olive presses were recorded by the JHS10 survey, one of them, a complex installation, is at Khirbat al-Maṣṭaba. Khirbat al-Maṣṭaba is the first concentration of Classical settlement remains located to the N of the city walls. A lever and weight press and a lever and screw press were identified. All of the sites are cut into bedrock and no above ground structural elements were located. It is of note that the olive and wine presses were generally at the boundaries of the survey area giving an insight into the agricultural – urban interface in the Classical landscape **(Fig. 15)**.

Iron Age Walls

Two massive walls constructed of megalithic boulders were located in the NW survey transect. These two massive walls run parallel to each other and although they have the appearance of Iron Age fortified walls it was unclear what was being enclosed or defended. It is pos-

sible other parts of an enclosure have been destroyed by agriculture and further investigation is recommended. Another single example of a megalithic wall, presumably of Iron Age date was recorded in the NW development area (**Fig. 16**).

15. Site 563, robbed olive press viewed to E, showing large plaster lined vat, two external rock cut basins and cut in the bedrock at the left. In the interior of the vat, the niche in the wall to hold the pressing beam is at the fallen masonry.



16. Megalithic Iron Age wall site 2052.

Traditional Houses

The majority of the traditional houses recorded date to the Circassian settlement of Jarash in the late 19th century though it is of note that this traditional building style continued into the 20th century. Six traditional mud bonded stone buildings were recorded during 2010, half of them ruined. While reassessing the 2005 survey area to determine the rate of development it was noted that one traditional house had been largely demolished. The 19th and 20th century traditional houses at Jarash are disappearing rapidly and all must be considered endangered.

Caves and Rock Shelters

50 cave and rock shelters were recorded by the survey. While these are by definition natural some had been enhanced by the later addition of walls and doors for use as dwellings and animal pens. The rock shelters range from small natural solution caves to large caves that could have been inhabited by several people. The majority of these caves have been disturbed by later use for burials, occupation and storage. However, some caves appear to be undisturbed and could potentially contain Palaeolithic occupation deposits (**Fig. 17**).

Petroglyphs

Apart from the crosses interpreted as quarry master's marks two other interesting symbols cut into the bedrock were recorded. Both of these petroglyphs were recorded in the NW survey areas and were carved into bedrock outcrops with no clear association with any other apparent site. The illustrated example differs from the other example which is a ca. 0.5m diameter

17. Cave shelter 767, with additions from later occupation.

circle incorporating a cup into its circumference and it does not have a cross. Their date and function is obscure. However, at both examples liquid could channel around the groove and into the cup hole suggesting they are for libations, presumably of a religious nature (**Fig. 18**).

Summary Discussion

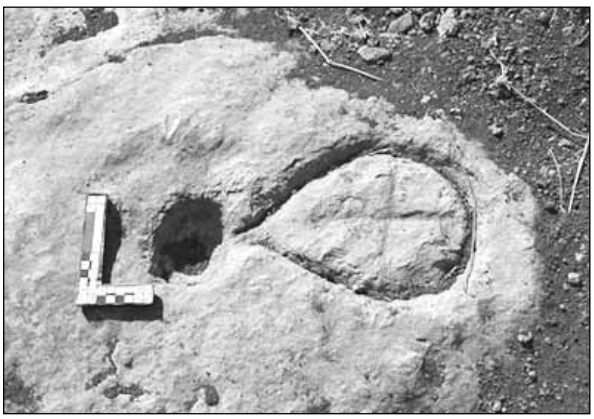
The survey has shown that intensive urban development in the immediate environs of Gerasa has destroyed many of the sites one would have expected, especially quarries, tombs and artefact scatters. Site density suggests that between 300 and 1000 archaeological sites have probably been destroyed by construction work.

At the outer limits of the survey area, the number of sites decreases, even artefact scatters, despite the fact that this is a less developed area. This may indicate that the intensity of activities of the inhabitants of Gerasa was falling off steeply within a relatively short distance.

It was also at the far limits of the survey area that earlier, prehistoric features such as Iron Age megalithic walls and Bronze Age kerb cairns survive. It seems probable that such sites that may have existed closer to Gerasa have been destroyed by Roman quarrying and later activity. Some prehistoric pottery sherds were recovered in small numbers from throughout the survey area.

Some sites of previously unrecorded type were located in 2010, notably a rectangular fortified watchtower overlooking the Wādī ad-Dayr and a substantial circular structure beside a small wadi.

There was a marked increase in the number of wine presses and – to a lesser extent, olive presses. No definite farms or villas could be identified by structural remains but an artefact scatter strongly suggests an area of Roman – Byzantine occupation in the NW survey area. An artefact scatter and rijm in the South Wādī Jarash may also represent a Byzantine – Islamic occupation site. Water management sites were also recorded in greater numbers in 2010. The absence of specific evidence of farms need not be due to destruction. It is possible farming within a kilometre or two of the city was undertaken from the town itself. However, the increase in wine and olive presses towards the outer limits of the survey indicates that enough agricultural land was in production to require these facilities.



18. Petroglyph site 2003.

We assessed the actual impact of development by re-visiting sites (excluding quarried outcrops) surveyed in previous seasons to try and quantify the actual rate of site destruction by new development.

Of the 223 sites surveyed in 2005, 188 of these sites were visited again in 2008. In 2008 we found the condition of 121 sites remained unchanged, 31 had been damaged and 35 had been destroyed by new development. This means that at least 35% of the sites recorded in 2005 had been damaged or completely destroyed by 2008.

In 2010 we revisited 50 sites in the 2005 survey area that survived in 2008 and 31 sites in the adjacent 2008 survey area at the NW of the city. The condition of 45 sites remained unchanged, 6 had been damaged and 21 had been destroyed by new development. This means that between 2005 and 2010 at least 42% of the sites recorded by the survey in this area had been damaged or completely destroyed. From these figures we can extrapolate that 10% of the archaeological sites within the immediate environs of Jarash are being destroyed every year. If this rate continues, 85% of all sites beyond the city walls could be destroyed within the next 5 years (**Figs. 19, 20**).

Acknowledgements

We are grateful to Dr Ziad Al- Saad, his predecessor Dr Fawwaz al Khraysheh and the Department of Antiquities of the HK of Jordan for their approval and support of the project. The JHS Team also thank Abu Abila, Chief Inspector of Jarash and his successor Ahmed al Shami for their assistance. In the field Eman Oweis (2005 and 2010) and Abd al-Majeed Mujalli, (2008)

19. 2010 view NE over the JHS 2005 survey area showing increasing development to the west of the ancient city.

20. 2010 view south over the S end of Wādī Dayr to the ancient city showing new development encroaching onto agricultural land and threatening archaeological sites recorded by the JHS08 survey along the so-called Via Sacra to al-Birkatayn.

provided invaluable assistance.

The project is co-directed by David Kennedy and Fiona Baker assisted by Paul Sharman, Catriona Gibson, Don Boyer, Andrew Card, Anne Poepjes, Ann Boyer, Stafford Smith, David Connolly, Maggie Struckmeier, Francesca Mazzilli, Helene Card and Naomi Poepjes.

The 2010 season was generously funded Mr Don Boyer. We are grateful to the CBRL for project affiliation and logistical support and to Gabriel Humbert for his ever generous hospitality.

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ARCHITECTURAL REMAINS AT BARSĪNYĀ RESULTS OF TWO SEASONS OF EXCAVATIONS (2006 AND 2007)

Lamia El-Khouri

Abstract

This paper aims at presenting the results of the architectural remains discovered during the first two seasons (2006 and 2007) of excavation at the archaeological site of Barsīnyā. The archaeological project clarified the importance of the site through different ages, particularly, in the Hellenistic, Roman, Byzantine and Umayyad periods. The uncovered architectural remains that were of domestic nature gave a clear idea of the agricultural occupation in the region of northwest Jordan and its development through the mentioned periods.

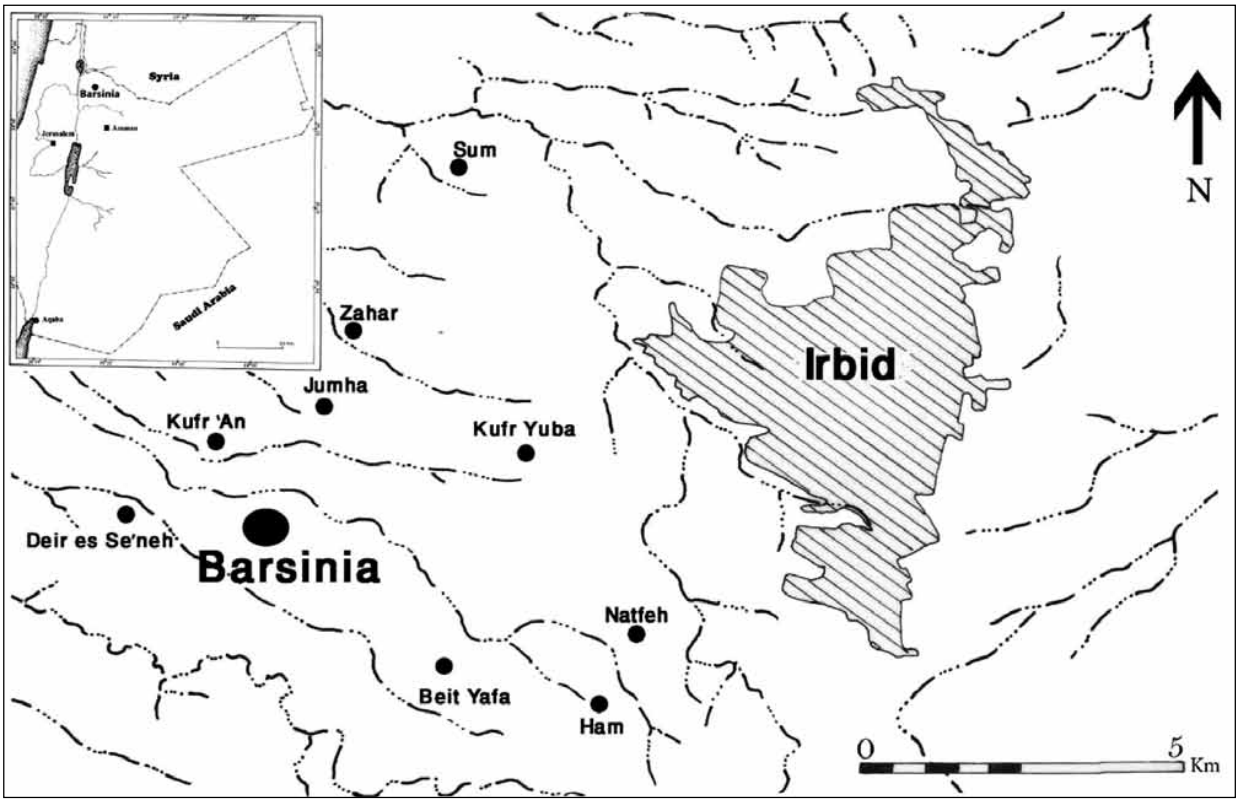
The architectural remains showed a number of houses (rooms and courtyards) some of which had paved floors of irregular cut stones. The excavated walls were of a medium quality built mostly with large hewn and un-hewn stones. Those walls have been rebuilt in different phases evidenced by many observable changes. The amended architectural remains at the site were good evidence of a long domestic architectural tradition that continued from the Hellenistic throughout the Late-Umayyad Periods. Using the same architectural spaces throughout a long period of time could be also an indication to similar social structure and daily activities.

Location and History of Archaeological Activities

Barsīnyā (Barsina JADIS 2221030) is located in the northwestern part of Jordan (**Fig. 1**), 15km west of the modern city of Irbid and 1.5 km east of the small village of Dayr as-Si'nah. The site is a good example of an agricultural settlement in the region that was flourished during the Hellenistic, Roman, Byzantine and Umayyad periods. The whole settlement that measures *ca.* 11200 sq meters contains domestic architecture and different types of tombs (Khouri el- 2009, 2010a, 2010b, 2011; Bader and Khouri el- 2009; Shorman al-, and Khouri el- 2011). With mean annual precipitations of ca. 400 mm the area belongs to the Mediterranean climate type and offers good conditions for seasonal agriculture.

The name of the site could be derived from the Greek name Barsine (βαρσινη). It was the name of the oldest daughter of Dareios Kodomannos, married to Alexander the Great (Pauli Realencyclopädie der Classischen Altertumswissenschaft, Fünfter Halbband (Barbarus bis Campanus), column 29 (Barsine) (Kaerst)). Basine is also the daughter of Artabazos, wife of Mantor of Rohdos, beloved of Alexander the Great, and mother of his son Herakles (Der Neue Pauly, Enzyklopädie der Antike, Band 2 (Ark-Ci), Column 456 (E. B.)). Or Byrsa, also is a site's name in Syria, between Apameia and Bata (Geogr. Rav. II 15 p. 87), maybe identifies Bersera that locates in (Tab. Peut.) between Apameia and Hierapolis (Pauli Realencyclopädie der Classischen Altertumswissenschaft, Fünfter Halbband (Barbarus bis Campanus), (Byrsa) column 1107 (Benzinger)). Byrsa in Latin and Greek (βυρσα) means "beef skin", the name of the Acropolis of Karthago. (Bi'rša) in Phoenician is "sheep fountain" (Der Neue Pauly, Enzyklopädie der Antike, Band 2 (Ark-Ci), Column 866 (H.G.N)). Also Bersima (βερσιμα) a site in Mesopotamia on Euphrates (Ptol. V 18, 5) (Pauli Realencyclopädie der Classischen Altertumswissenschaft, Fünfter Halbband (Barbarus bis Campanus), column 318, (Bersima) (Fraenkel.)).

The site is situated on a flat hilltop of calcareous rock, and is surrounded by modern agricultural areas used mostly for olive plantings and husbandry. The northern part of the hill



1. Map, location of Barsīnyā.

has been flattened for construction of a modern farmstead.

The site has been visited and surveyed by various scholars since the mid 19th century, such as Robinson and Smith (1842: 918), G. Schumacher (1890: 127-129), Abel (1938: 438-9), N. Glueck (1951: 176-7, site no.117), and Simons (1959: 335-6, no. 784). It has been identified by G. Schumacher (1890: 127-129) and Abel (1938: 438-9) with the biblical Rogelim (II Sam. XVII, 27; XIX, 32), both scholars connected the name Rogelim with Wadi Rugeili that passes by the site in its northeastern side.

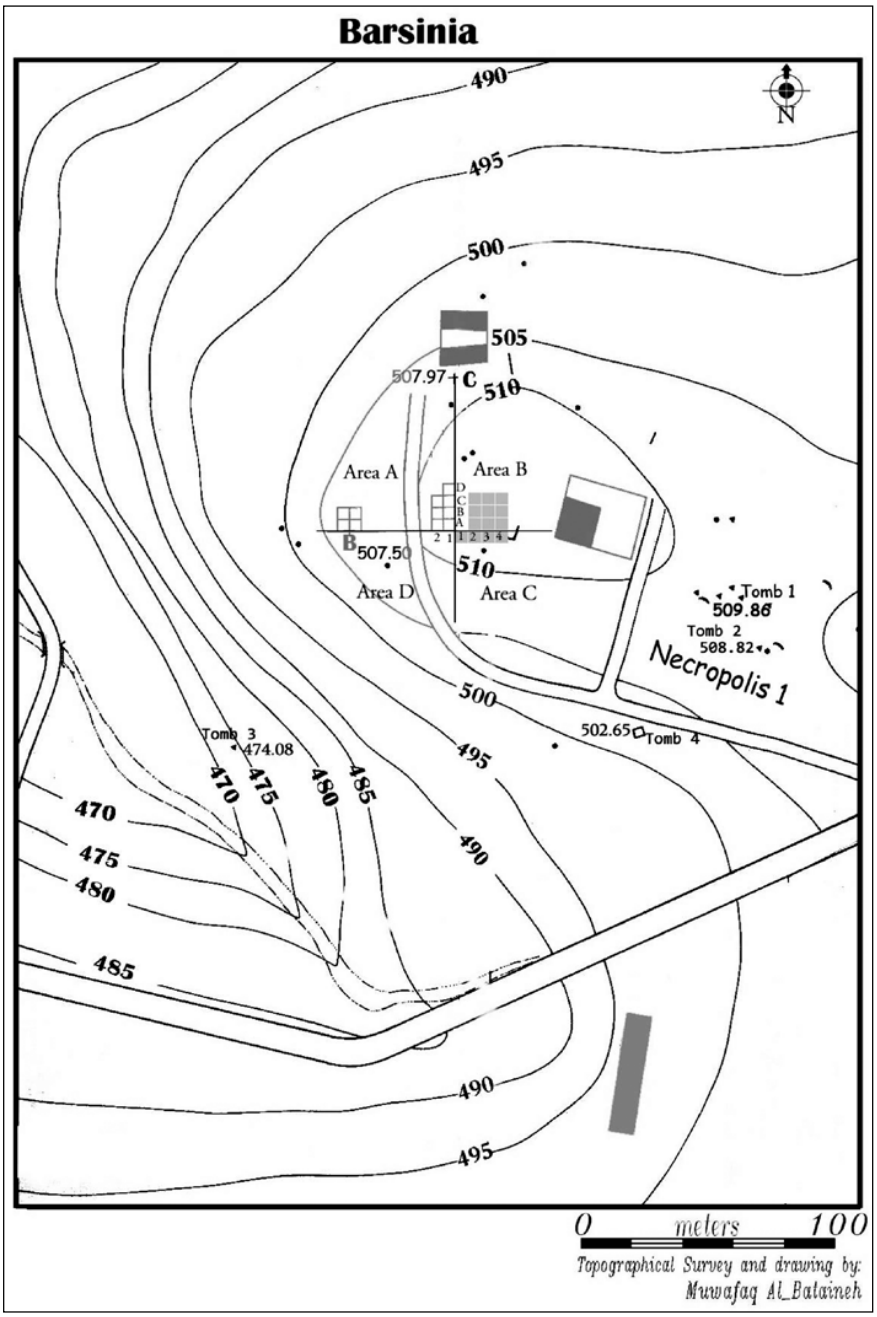
Barsīnyā has been recently visited during conducting the West-Irbid Archaeological Survey in September 2005 (Khouri el- *et al.* 2006, Site 18). The primary results of the survey indicated that Barsīnyā was one of the most prominent archaeological sites in the region of West-Irbid, it was remarkable for its building remains and other surface finds. Traces of building remains were visible only a little above the ground, it has a number of rock-cut and shaft tombs, cisterns, underground tunnels, as well as natural caves partly built up and partly hewn out of the rock.

With its residential area, tombs and agricultural installations Barsīnyā can be considered a well-preserved example of an ancient settlement complex in northwest Jordan. On occasion of the West-Irbid survey, however, traces of illegal digging activities were observed both in the settlement and in the burial ground of Barsīnyā. As these activities posed a serious threat to the antiquities it was decided to start a rescue excavation, which took place in 2006 and 2007. Research of the site is important, as there are few rural settlements in northwest Jordan that have been excavated thoroughly.

This archaeological project has been designed to serve as training course in the field archaeology at the Department of Archaeology, Yarmouk University, and was directed by the author.

Architectural Remains

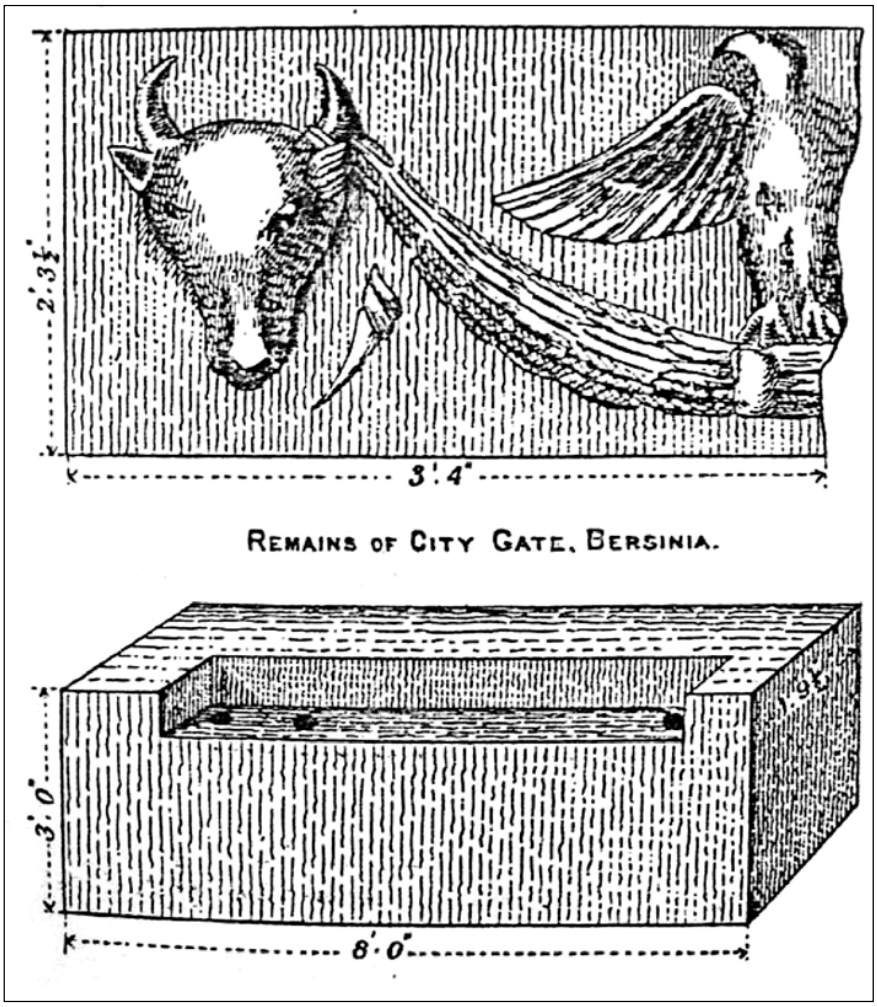
The archeological site, Barsīnyā, measures approximately 11200 sq meters in area; it consists of a residential district and burial quarters (**Fig. 2**). Two monuments were distinguished at



2. Topographical map of Barsīnyā showing the two seasons of excavations.

the site, the first seems to be a Byzantine church evidenced by the large number of *tesserae* around, a number of building stones decorated with cross shapes, and a fragment of a marble chancel screen. The second monument is a bath, evidenced by the water system around and the big number of roof tiles found in many places on the site (one of the land owners described cylindrical brick pieces and a luxury types of marble floor tiles, which were usually used in Roman and Byzantine baths). Remarkable remains of decorated stones were reported by G. Schumacher by the end of the 19th century (**Fig. 3**).

"*At the extreme east, where the ground, which has its highest point in the center, slopes down of the plateau, I found distinct remains of a city gate. Several limestone lintels were lying here, measuring each 8 feet in length, and 3 feet in height, with holes in them to receive the hinges of a stone gate. A square stone, broken across, had cut on it the head of an ox, much defaced a wreath and an eagle with outspread wings in*



3. Decorated building stones published by Schumacher (1890: 127-8).

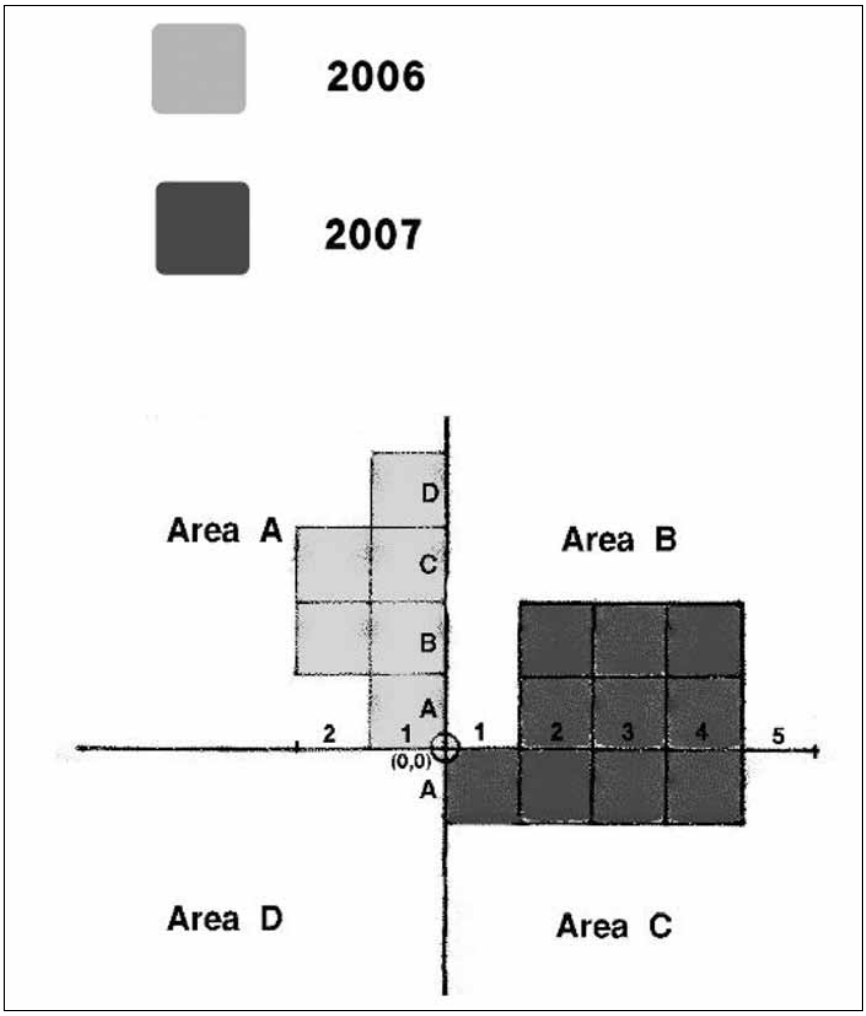
the center, next to which was a kind of torch". (Schumacher 1890: 127-8).

A modern house has been erected on the described area above, and all the previously defined lintels have been completely disappeared.

Architectural Remains of the First Season of Excavations, 2006

The first season of excavations has been undertaken in the period from July 9 and August 25, 2006. The work was carried out at various places of the site, in Area A that situated at the western side of the site and Necropolis (1) at the eastern and southern parts (**Fig. 2**). The main goal of this season of excavation was to expose as much of the architectural remains as possible and to collect as much data as possible, in order to achieve the maximal stratigraphic information about the settlement. A series of plots, each of 5 meter, was laid out in the western part of the site, numbered in continuous alphabet and numeric sequence; A-A1, A-B1, A-C1, A-D1, A-B2, A-C2 (**Fig. 4**). Another series of plots was laid out west of the previous mentioned plots, at the far western edge of the site; A-A9, A-B9, A-B10 (**Fig. 4**).

The main architectural remains encountered in the excavated squares (A-A1, A-B1, A-C1, A-D1, A-B2, A-C2) are of domestic nature (**Figs. 5, 6**), dating mainly to the Iron Age II until the Late-Umayyad/Early-Abbasid periods. The uncovered walls are of a medium quality built mostly with large hewn and un-hewn stones. These walls have been rebuilt in different phases evidenced by many observable changes; the blocked opening of some entrances, the upper most levels of the walls that were built of different kinds of reused stones, and the variant quality in building stones and techniques using well-cut stones sometimes and rubble stones in



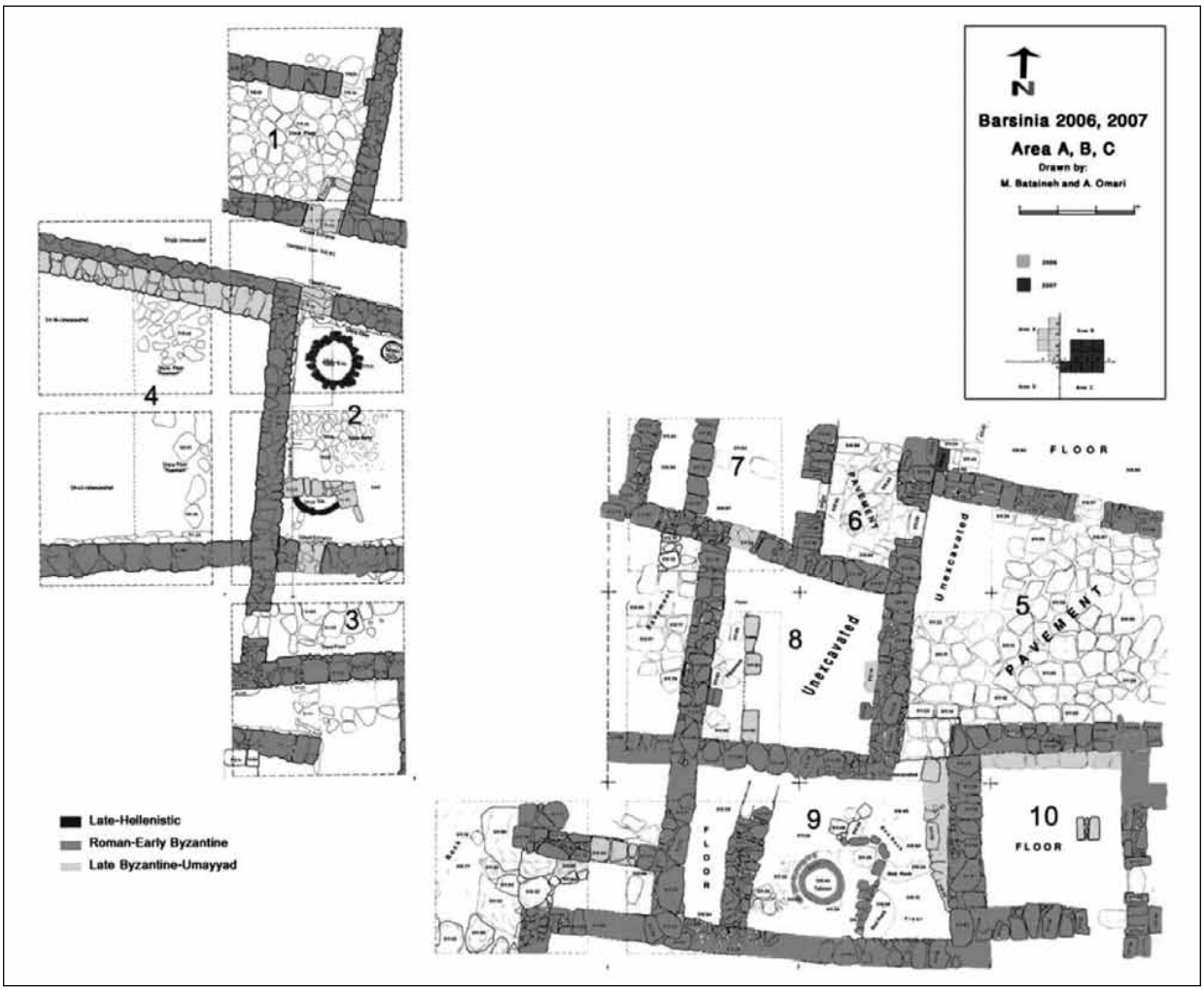
4. Sketch of the excavated squares (2006 and 2007 seasons).

other times.

The excavated pottery sherds at all plots indicating the predominance of the Late-Byzantine. Nevertheless a big number of Umayyad and Late-Roman, in addition to few Early-Roman sherds were also found. Among the collected potsherds individual Abbasid, Ayyubid/Mamluk, Fatimid, and Ottoman potsherds were also found. These few pieces were good evidence of the later phases of occupation in the site. As two test pits are dug in the lower levels in squares A-B1 and A-C1 the Hellenistic and Iron Age levels have been encountered (**Fig. 7**). In these squares that have been partly excavated down to the bedrock there was considerable evidence of disruption by earlier deposits by damaging the paved floors and reusing the stones in building the upper levels of some walls and blocking some entrances. A consequence of this disturbance is that the Late-Byzantine/Umayyad stratum contained few admixture of earlier potsherds, including a few Early-Roman and a somewhat larger number of Late-Roman and Early-Byzantine sherds. There were evidences of disturbance the lower levels, in particular, the Roman phase. Some paved floors which were constructed in the Late-Roman period have been destroyed in the Late Byzantine and Umayyad periods. Traces of the damaged floors are still seen protruding from the walls, only the paved floor in square D1 remained in a good condition and reused without interruption in the Early Islamic periods (**Fig. 8**) (**Table 1**).

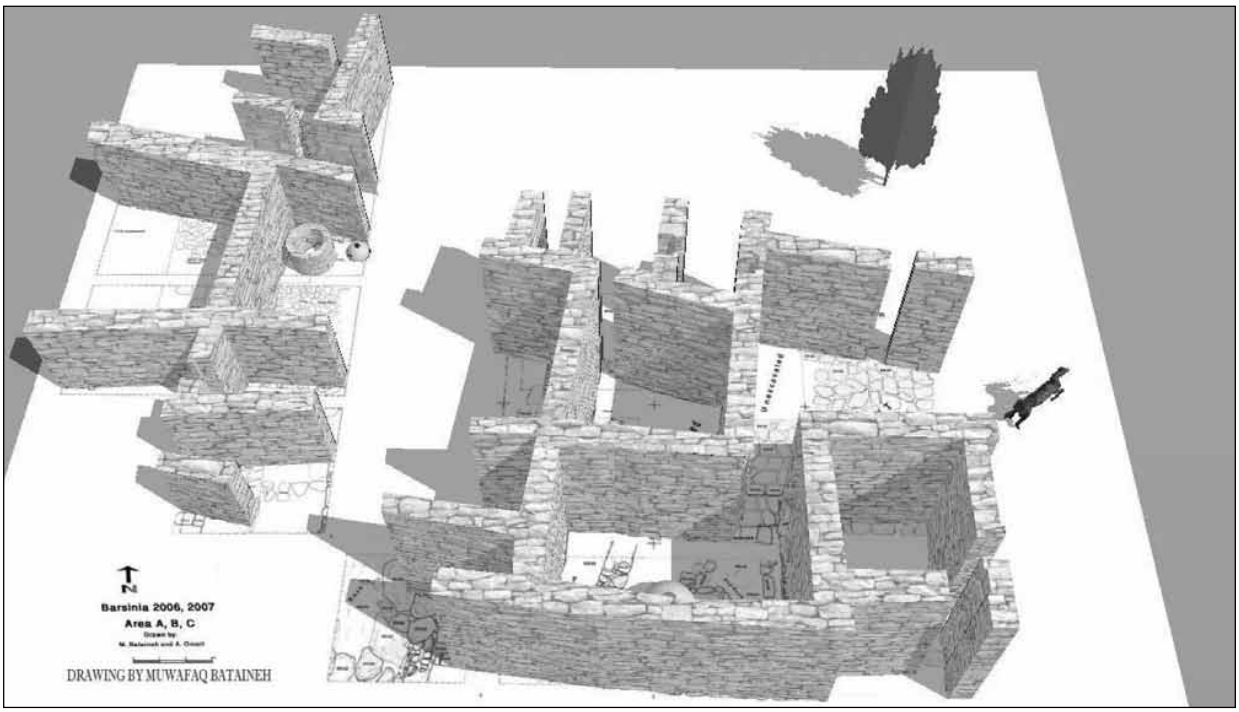
Room 1

This room covers partially square A-D1 (**Figs. 4, 5**), located in the northern part of the excavated area. It presents a room with a fasci-

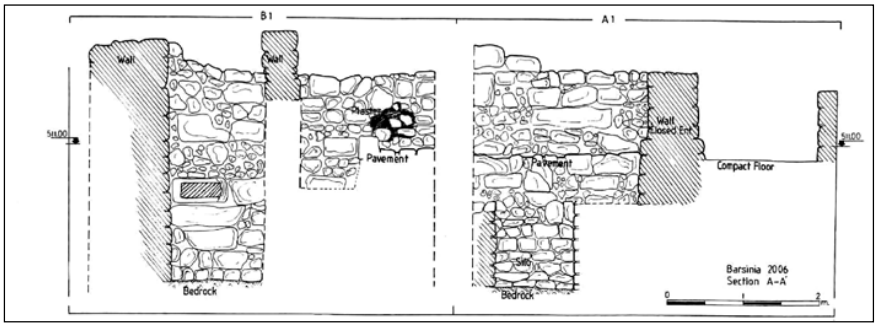


5. Top plan of architectural remains uncovered in 2006 and 2007.

nating intact paved floor (A-D1, 010 and A-D1, 012). The most western part of the room still unexcavated. The floor was made of irregular flagstone paving appeared in all parts of the room and in the northern area outside the room. This paving probably represents the original flooring of the room in the Byzantine period (**Fig. 8**). It is sunk about 70 cm below the level of the outer passageway and Room (2), shown in square A-C1. In its southern wall the room had an entrance and steps lead down from the passageway to the room, in a later phase this entrance had been blocked, the steps had been removed and upper courses were added to the wall. In the northern wall of this room there is an entrance and a wide window, its threshold is about 2 meters wide, and 1.2 m above the room pavement. On the paved floor domestic installations, containing a small basalt mortar or basin or limestone quern and a small marble column, were uncovered. The marble column seems to be reused from earlier building; it is similar in shape to chancel screen columns or altar parts found usually in Byzantine churches. It seems that this room was being devoted to daily activities while the southeastern corner of the room was provided by a small place bounded by two long stones. The Pottery and stone objects found on the paving floor are dating mostly to the Byzantine and Late-Umayyad periods. The fill over the paving floor outside the room also yielded some typical seventh century black cutware (**Fig. 9**). It seems that the pavement in this room had been constructed in the Early-Byzantine period and reused later until the Late-Umayyad period.



6. Reconstruction of architectural remains (2006 and 2007 seasons).



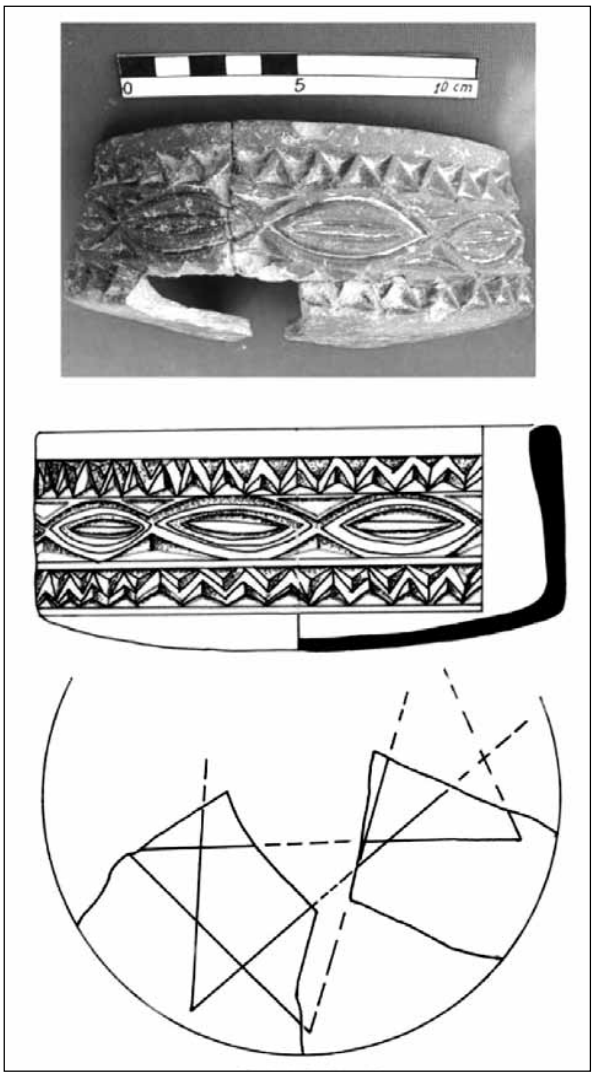
7. Section of architectural remains uncovered in 2006 season (squares A-B1 and A-C1), looking west.

8. Room (1) with impact paved floor, square A-D1.

Table 1: Diagram, showing the Loci in squares A1, B1, C1, D1, B2, C2, arranged according to their levels, and phases of occupation.

Level	square A1	square B1	square B2	square C1	square C2	Date	square D1
512.42						Late-Byz/ Early-Islamic Periods	
512.4		L.002 (w-e wall)					
512.3		L.001 (light grey loose soil)					
		L.007 (w-e wall)					
512.2	L.000 (top soil)	L.006 (light grey loose soil)					
512.1			L.000 (dry loose soil)				
512	L.001 (grey soil) (L-Byz-Umm Pottery 6th-8th c)	L.004 (n-s wall)		L.003 (n-s wall)			
	L.007 (large flint stones)			L.004 (w-e wall)			
511.9	L.004 (loose grey soil)			L.001 (loose dry soil)			
	L.005 (hard yellow-ish soil)						
511.8	L.002 (n-s wall) (L-Byz-Umm pottery 6th-8th c)	L. 005 (light brown loose soil) (L-Byz-Umm pot-tery 6th-8th c)	L.001 (w-e wall)	L.006 (w-e wall)			L.001 (loose soil)
	L.003 (loose brown soil)		B2.3= Byz-Umm pottery				
	L.006 (compact mud floor)					Byz. Period 4th-6th c AD	L.002 (stone layer)
511.7	L.009 (e-w wall)				L.001 (w-e wall)		
	L.010 (tabun and ash fragments)						
	L.011 (losse yel-lowish soil) (L-Byz-Umm Pottery, 5th c AD)			L.012 (loose soil mixed with large stones)			
511.6				L.002 (soil mixed with large stones)	L.002 Byz-Umm		L.003 (n-s wall)
511.5		L.008 (light brown loose soil) (L-Byz-Umm pottery, 5th c AD)		L.009 (compact floor mixed with pebbles) base of a mosaic floor!!			
		L.009 (lime mortar and paved floor) base of a mosaic floor!!		L.010 (dark brown soil)			
511.4	L.016 (large un-shaped stones) (Hell-ER Pottery 2nd c BC-1st c AD, as fill)	L.010 (entrance)		L.007 (dark brown loose soil mixed with small stones)	L.003 (L-Byz-E-Umm 5th-7th c		
511.3		L.012 (basalt mortar)		L.008 (light brown compact soil)			
511.2	L.008 (hard yellow-ish soil mixed with stones			L.005 (light brown loose soil)			
	L.013 (loose yellow-ish soil)						

Level	square A1	square B1	square B2	square C1	square C2	Date	square D1
	L.018 (paved floor) (Roman Pottery 3rd-4th c)					Roman/Early Byz (3rd-4th c AD)	
511.1	L.012 (broken jar)	L.011 (dark brown soil)					
	L.014 (paved floor) (Roman floor 3rd-4thc)				C2.5= Byz pottery, 4th-5th c		
	L.015 (loose grey soil)			L.013 (dark brown loose soil) (Byz pottery, 4th-5th c)			
511	L.017 (3 large limestones), Umm coin	L.016 (plaster floor) (Roman floor 3rd 4th c)		L.011 (compact lime floor) (Roman floor, 3rd-4th c)			L.004 (w-e wall)
510.9		L.013 (paved floor) (Roman floor 3rd-4th c)		L.014 (compact floor) (Roman floor 3rd-4th c)			
510.8							
510.7			L.004 (paved floor) (Roman floor 3rd-4th c)	L.018 (stone layer with loose soil)	L.006 (paved floor) (Roman floor 3rd-4thc)		
510.6		L.014 (semi circular pit)					
510.5				L.020 (tabun fragments)			
510.4				L.021 (soil inside tabun) (Roman pottery 2nd-3rd c)			
510.3							L.010 (paved floor) L-Byz-Umm Pottery
510.2				L.019 (silo) (Hell, Iron II-III)			
510.1							
510		L.017 (dark brown compact soil) (Hell-ER Pottery 2nd c BC-1st c AD, Iron II-III)	B2.8= Hell-ER pottery				L.012 (paved floor)
509.9		L.018 (tabun fragments, with ashy layer)					L.011 (compact layer)
		L.019 (compact brown floor)		L.016 (compact floor)			
509.8		L.020 (silo)		L.017 (compact layer)			
509.7							
509.6							
509.5							
509.4							
509.3		L.021 (compact vergin mud soil over bedrock)					
509.2							
509.1							
509							



9. Late Umayyad-Early Abbasid black cut ware cup, found in Room (1).

Room 2

This room covers square A-B1 and the southern part of square A-C1. The bedrock is reached in the southwestern corner of the room at a level of about 3 meters down from the top soil. In this corner different phases could be distinguished dated from the Iron-Age II to the Late Umayyad periods. Three main walls and a number of floors pointed to different phases from the Hellenistic to the Umayyad periods. The upper levels of the walls were built of reused stones. Parts of the walls were built with roughly dressed limestone blocks of poor quality.

The western wall of the room (A-C1, 003, and A-B1, 004) was ca. 6 m long and 2.50-2.80m deep. A well-cut framed stone of a typical Hellenistic masonry (70 x 36 cm) (**Fig. 10**) found at the lower levels of the wall (Bessac 1995: 393-401), it seems that it was removed from a monumental Hellenistic building at the site. The northern wall (A-C1, 004) has a blocked entrance in its western side. This entrance was accessing the room with a narrow corridor or a long path, which separate this room from Room (1). The southern wall of the room (A-B1, 002) has a blocked entrance in its upper levels too. This entrance was opposite to the entrance in the northern wall.

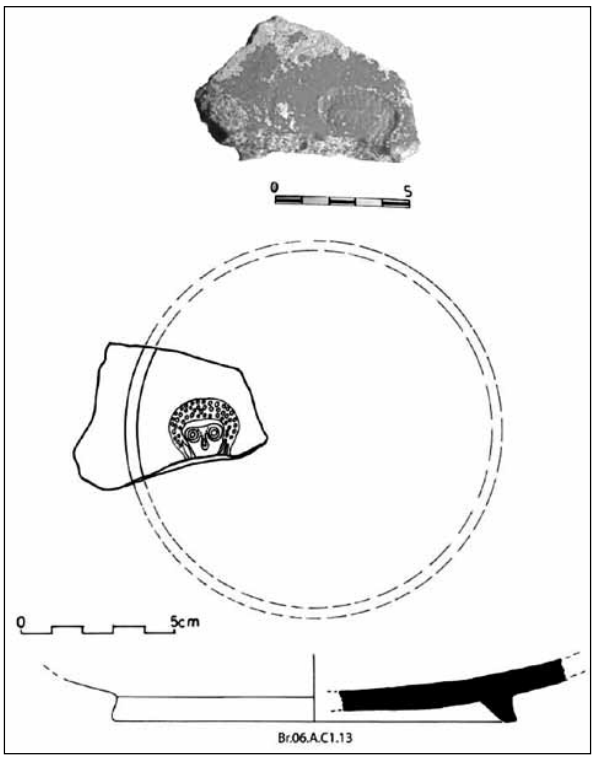
A paved floor was visible in the central part of the room. Traces of pavement are still seen protruding from the walls, this paving is related both to the north and east walls (A-C1, 003 and A-C1, 004) and most probably represents the original flooring of the room in the third century A.D. There are traces of restoring the floor in later periods by adding kinds of compact lime mortar. It seems that the paved floor in this room was contemporary to the pavement in Room (1), shown in square A-D1, but its elevation is about 60 cm higher.

In the southeastern corner of the room a small room was constructed, in a later phase, by adding a small wall running E-W (A-B1, 007). This wall was crude of moderate workmanship and built of reused stones, some of them not well suited to the purpose. The entrance of the room is in the east side. Inside this room a basalt mortar (33 x 25 x 15 cm) was laying (**Fig. 11**). This small structure was used according to pottery in the Byzantine and Umayyad periods. Adding this small room might be con-

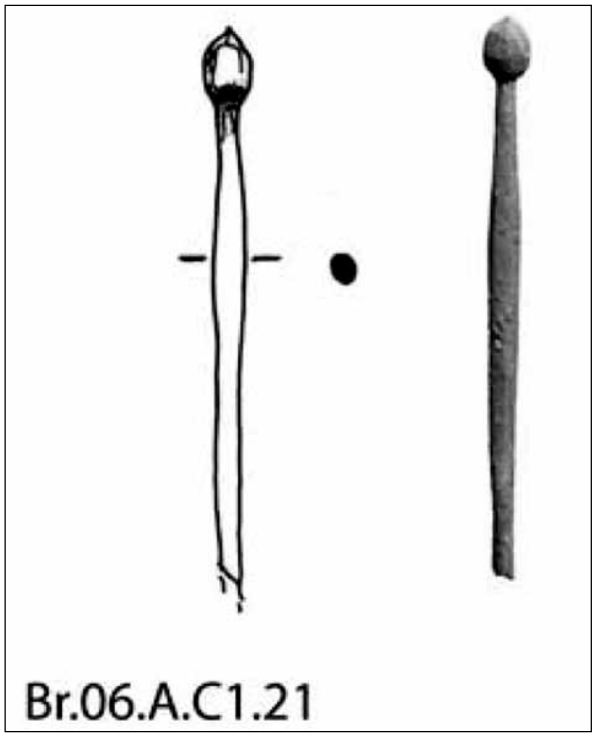
10. Well-cut building stone, western wall of Room (2), square A-B1.

11. Stone Mortar found in the small room inside Room (2), square A-B1.

temporary to blocking the entrance of the main structure, which appears in the east-west wall (A-B1, 002). Underneath the level of the removed pavement clarified the earlier phases of occupation. Roman levels were encountered since Early- and Late-Roman pottery sherds started to appear, but mixed with few Byzantine and Umayyad sherds. A fragment of African red-slip bowl stamped with a human figure was found (**Fig. 12**). An ashy layer and a *ṭābūn* in fragmentary form were lying over a compact brown soil floor; this floor could be dated originally to the Early Roman period. An ivory kohl stick was found mixed with soil inside the *ṭābūn* (**Fig. 13**) (cf. parallels in Clark 1986: 265, pl. XXVI:1). Further down Hellenistic pottery began to appear. One of the fascinating discoveries was a Rohdian amphora handle stamped with a Greek inscription dating to the first half of the second century B.C. (**Fig. 14**)



12. African Red-slip pottery sherd stamped with a human figure, found in Room (2), square A-C1.

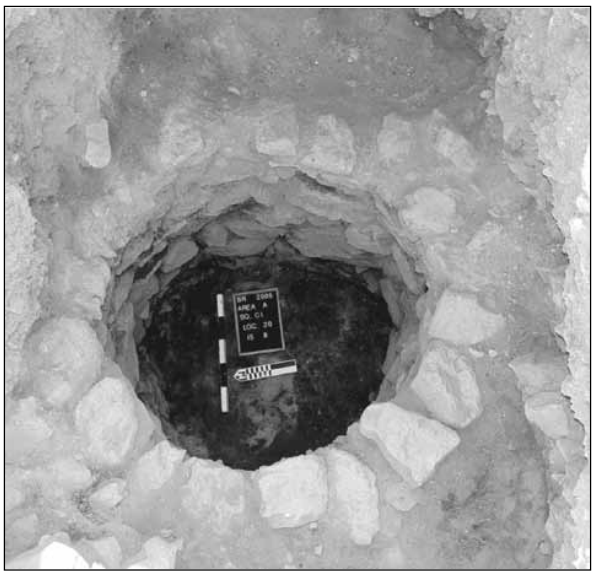


13. Ivory Spatula, found in the lower levels of Room (2), square A-C1, Locus 21.

14. Rhodian amphora handle stamped with a Greek inscription, found in the lower levels of Room (2), square A-B1, Locus 17.

(Bader and Khouri el- 2009).

In the lower levels of this room, underneath the pavement level, part of a *ṭābūn* rested on a thin 2 cm layer of lime mortar has been encountered (A-C1, 020), it is ca. 80 cm in diameter and 50 cm high, its walls are 3-4 cm thick. Approximately 50% of the *ṭābūn* remained *in situ*, the upper portion having been destroyed. The most fascinating discoveries in this room were two large silos, one of which is located in the northern part of the room measures 110 cm deep, 100 cm in diameter and 27 cm thick (**Fig. 15**), it was constructed of 8 courses of medium sized un-hewn stones with kind of mud mixed with straw used as mortar between its stones. The potsherds found in its deposit are dating to the Iron II, Iron III and Hellenistic periods. The second silo located 2 m south of the first one, only parts of it was preserved, the deposit inside this structure was mixed with Hellenistic potsherds. The structure might be similar in shape and size to the first complete silo. South of this spot the foundation of the wall was reached; it stands directly on the bedrock. It would appear that the walls of this room represent structures beginning with the Iron II, Iron III, Hellenistic, Roman, and certainly continuing into the Byzantine and Umayyad periods. Along with the numerous pottery sherds and stone objects, a number of iron knife, hook and nails were found in different phases in this room (**Figs. 24, 25, 26**).



15. Silo in square A-C1.

Room 3

A small room, *ca.* 2.00 m wide and *ca.* 3.00 m long, covers the northern part of square A-A1 and the southern part of square A-B1. The northern, western and southern parts of the room were excavated. It was paved with unshaped flat large stones, most parts of the pavement are still *in situ*. The room had two blocked entrances in its northern and southern walls, and one more recent entrance in its western wall. The threshold of this entrance is still visible and found in higher levels than the other blocked entrances. It may be, therefore, reused from an earlier building. In the lower levels of the square few Roman pottery potsherds were found. An Umayyad coin (**Fig. 16**) dated to 695 A.D. was found stuck to the western wall.

Room 4

It is located in the western part of the excavated area and covers two squares A-B2 and A-C2 and the western parts of squares A-B1, and A-C1. A large room measures *ca.* 6 m long and exceeds 6 meters wide. The western part of the room is not excavated. The room is wider in its western side. The northern wall (A-B2, 001 and A-B1, 002) was *ca.* 1.00 m thick, it seemed to be two walls parallel to each others and thicker than the other excavated walls. The eastern wall (A-C1, 003, and A-B1, 004) separates Room (2) from Room (4). A paved floor (A-B2, 004 and A-C2, 006) at a similar level of the destroyed pavement of Room (2) has been uncovered. Parts of the pavement floor have been destroyed. The levels over the floor present soft soil layers mixed with a large amount of pottery sherds. Part of these levels was heavily striated with irregular carbon deposits (mixed with carbonized olive seeds). The levels immediately below the layer of ash contained large amount of pottery in fragmentary state, dated mostly to the Late-Byzantine and Umayyad periods mixed

16. Umayyad coin found in Room (3), Square A-A1.

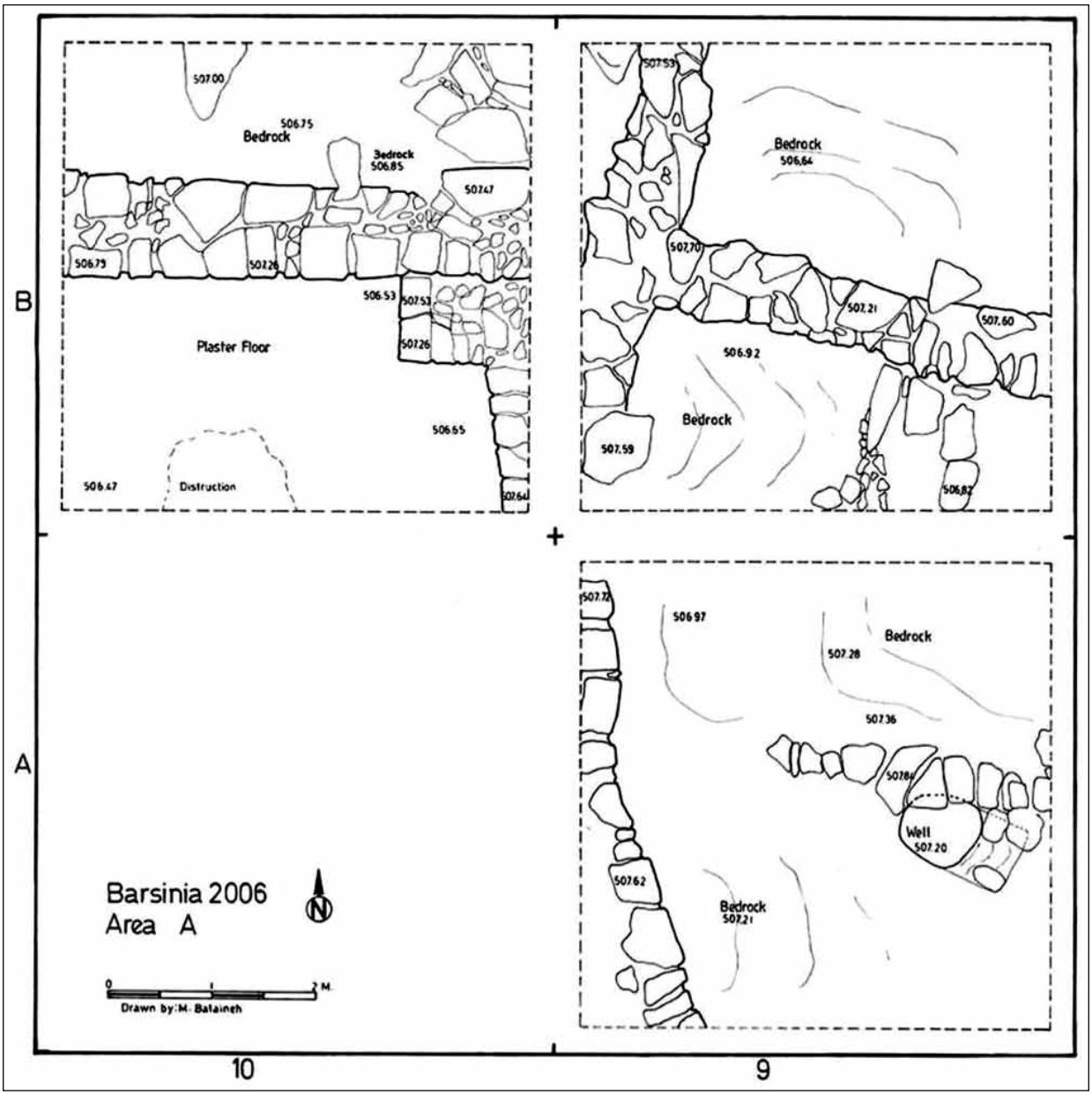
with few Hellenistic and Roman sherds. Most of the potsherds belong to vessels of local undecorated wares in general use such as cooking pots and storage gars.

Passage 1

This passage locates in the northern part of squares A-C1 and A-C2. It presents a long narrow path way, measures more than 10.00 m long and 1.30 m wide, and running in the east west direction. It separates most probably one residential unit from another. The upper levels of the path were only excavated, and a compact lime floor was encountered. Two entrances were recognized in this passage, one is opened in the north wall, which leads into Room (1). The other one is visible in the southern wall leading into Room (2). It seems that both entrances were blocked in later phases.

The Western Plots

The western plots (A-A9, A-B9, A-B10) (**Fig. 17**) which locate about 30 meters west of the previous squares (A-A1, A-B1, A-C1, A-D1,

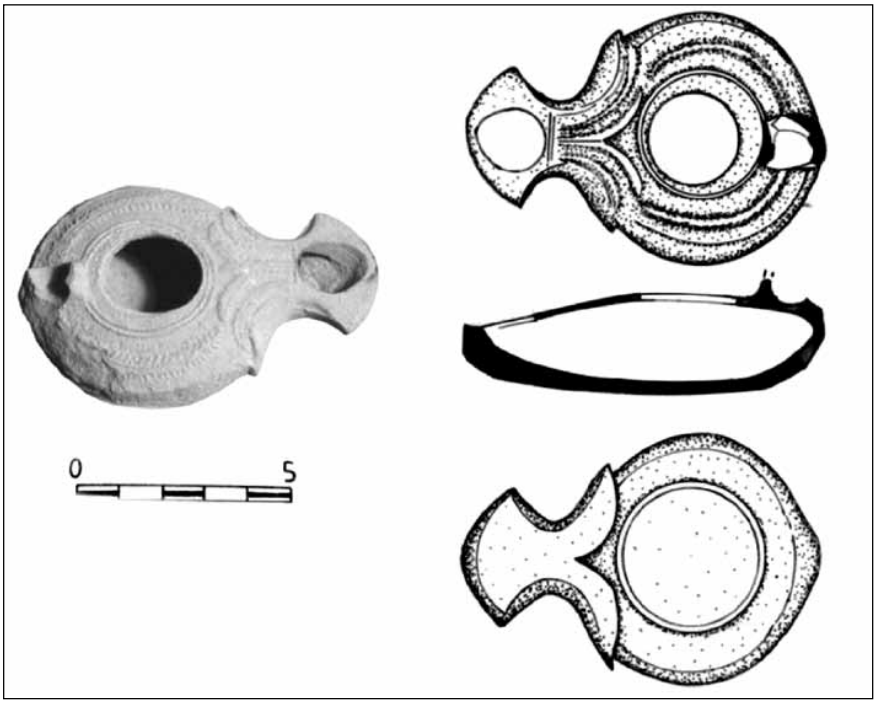


17. Top plan of the architectural remains in the western part of the site, squares A-A9, A-B9 and A-B10.

A-C2, A-D2) (**Fig. 2**) present a domestic area dated to the Roman through the Late-Byzantine/ Early-Umayyad periods. Only parts of at least three rooms were uncovered. The bedrock has been reached rapidly in this area. The walls were built directly on the bedrock, however only two or three courses were still preserved. Two impressive finds were encountered in these plots; an intact second century Roman pottery lamp (**Fig. 18**), and a small cistern cut into the bedrock. The lamp was found leaning to a wall, while the cistern walls were plastered by a lime plaster (A-A9, 007a), of 2.11 cm deep, and 1.7cm wide, carved in the bedrock (**Fig. 19**). The fill inside this cistern was a mixture of large and medium sized stones, a large number of pot-sherds, individual animal bones, and *ṭābūn* fragments. The cistern has a small plastered tunnel in the eastern side of its opening. All the pottery sherds found in the cistern was more mixed, predominantly Late Hellenistic (second-first centuries B.C.), and Early-Roman (first-second centuries A.D.) (Khouri, el- 2011). This quantity of pottery sherds are good evidence of earlier phases of occupation at the site, they also could be a good evidence of exposing some places in the site from earlier occupations and reusing the structures in later periods. It seems that the cistern had been blocked after it has been filled with earlier pottery vessels, *ṭābūn* fragments, and bone pieces.

19. Cistern carved in the bed-rock, in square A-A9.

The walls in plot (square A-B10) forms part of a vaulted chamber. The vault had completely collapsed refilled with soil and debris, only the first three or four courses of the vaulting base were intact (**Fig. 20**). It was 0.80 m high, 1.00 m long and 1.00 m wide, built of well-cut large and medium sized stones, with small size stones in between. Small part of the nearby wall (A-B10, 001) is covered by red 3 cm thick layer of plaster (A-B10, 005) (**Fig. 20**). The fallen stones of the vault were aligned on the upper levels of the western part of the plot.



18. Roman pottery lamp found in square A-A9.

20. A square vault base in square A-B10.

Architectural Remains of the Second Season of Excavations, 2007

The second season of excavation started on June 17 and continued up to August 2, 2007. The main objective of this season was to explore the rest of the 2006 discovered remains, to try to get a sense and extension of the larger complex that had been found in 2006 season. This objective required laying out excavation squares east of the structure uncovered in 2006, following the alignment of its stone walls.

This season of excavation took place in the central part of the site. Ten 5x5 meter squares were excavated in two areas B and C (B-B2, B-B3, B-B4, B-A2, B-A3, B-A4, C-A1, C-A2, C-A3, C-A4) (**Figs. 4, 5, 6**). Architectural remains consist of a number of rooms were uncovered. Some walls show that the whole complex continues further in all directions, therefore, the whole structure extends on a larger area.

The top courses of some walls were clearly visible, even before excavating the area. Some walls were robbed out almost down to the lowest one or two courses in some places. The walls constructed of reused earlier blocks with the spaces between filled with rubble and debris. These earlier blocks were originally belonging to a Roman-Byzantine significant structure, for instance, a temple or a church. Among these items to be noted are two decorated lime stones with carved cross in the middle, a small marble column, marble fragments of a slab, mostly belonging to the furniture of a church, a large number of (mostly white, pink and black) *tesserae*, the majority are lime-stones and some are white marble. Notably are the large number of terracotta roof tiles. Traces of plaster covering parts of wall (Locus 001) in square B-A2 indicate that the walls were originally encrusted with a thick coat of plaster.

At least three of the uncovered rooms were furnished with hearths (*ṭābūns*). The largest *ṭābūn* is located in square C-A3, ca. 1.00-1.20 m in diameter and 1.00 m deep (**Fig. 21**). Four other fire-installations in fragmentary form, two in square B-A3, one in square C-A4 and one in square B-A2 were also uncovered. They belonged to the later phases of occupation at the site, as they appeared on the upper layers of the squares, they left a charcoal ashy deposits and fragments of their outer hedges. The *ṭābūns* in square B-A3, however, were more intact than the other *ṭābūns* in squares C-A4 and B-A2. The presence of that number of hearths are evidence for large scale cooking process, especially by finding a fair amount of fragile animal bones and sherds of cooking pots dated mainly to the Late-Byzantine and Umayyad periods.

Most floors were paved with uneven stone slabs, pavements were preserved only partly in some rooms (**Fig. 22**). Worthy of attention is the existence of *tesserae* stones almost in every *locus*, this is an evidence of destroyed mosaic floors that were most probably used as floors in some rooms. Most of the walls were much deeper than the pavements. Big changes were made to the uppermost levels of the walls. The pavement floors are contemporary to the doorways. The paved floors in the western part of the excavated area were reached in a higher level than the eastern part. The pavement in squares B-A2 and C-A1 was running on top of some walls es-

21. A ṭābūn in Room (9), square C-A3.

22. Room (5) with impact paved floor.

pecially, it was more visible in square C-A1. In this square the bedrock was reached also at a high level (510.77 m), while this square locates mostly at the highest point of the site. In the eastern part of our excavated area the pavement floor was about 1 meter lower than the western part, it was reached at a level of *ca*. 511.00 in squares B-A4 and B-B4.

The latest pottery sherds found at the excavated squares belonged to the Abbasid period. The earliest however were dated to the Late Byzantine, except for some few sherds from the Early-Byzantine and individual pieces from the Roman periods, as well as two intact Roman (first-second centuries A.D.) and Hellenistic (second-first century B.C.) pottery lamps (**Fig. 23**) (cf. parallels at Pella (Edwards *et al*. 1990: Pl.III,3)).

Room 5

It covers squares B-B4, B-A4 and the eastern parts of squares B-B3, and B-A3. The eastern wall of the room is unexcavated. The room is ca. 6 m long (N-S) and more than 6 m wide (E-W). It was paved with irregular slab stones, all the paved floor was intact and well preserved. The room is most probably a courtyard and has two entrances, one in the northern wall and one in the northern part of the western wall. The northern wall (B-B4, 003 and B-B3, 007) has a doorway nearly at the middle of it (door sockets), this wall, however, is much deeper than the doorway level. The western wall (B-B3, 003 and B-A3, 003) separates the room from two nearby rooms, it has however an access only to one room through a doorway in its northern side.

23. Pottery lamps found in season 2007.

The room has an access also to another room in the south through an opening path by two steps leading down to it.

Room 6

It covers square B-B3. A small rectangular room ca. 1.70 m wide and more than 3.00 m long, with paved floor (B-B3, 005). It served most probably as an entrance hall to another larger Room (7) in the west side. Only the eastern (B-B3, 003), western (B-B3, 006) and southern (B-B3, 002) walls of the room have been exca-

24. Iron nails, Left – right – Br.06.A.C2.2, Br.06.A.B9.1, Br.06.A.C1.21, Br.06.A.C1.9, Br.06.A.C1.12, Br.06.A.B1.8, Br.06.A.B2.3.

25. Iron hooks, Left-right –Br.06.A.A1.8, Br.06.A.B1.9.

vated. Access to this room from Room (5) was afforded by a doorway opened in its eastern wall (B-B3, 003). There is a second doorway opened in its western wall leads to another larger Room (7).

Room 7

It covers square B-B2 and the western part of square B-B3. Only the southern part of the room has been excavated. The room has access from Room (6) through a doorway in its eastern wall (B-B3, 006). Three walls of the room were excavated, the eastern, southern (B-B2, 006) and western (B-B2, 005) walls. At the western part of the room a row of well-shaped stones (B-

26. Iron knives, Left-right – Br.06.A.B10.3, Br.06.A.C1.5.

B2, 013) was laid parallel to the western wall of the room, and ca. 1 m away from it. The room has another blocked doorway (B-B2, 017) in the southern wall (B-B2, 006), the only access to Room (8). No visible pavement was reached in this room.

Room 8

It covers the eastern half of square B-A2 and the western half of square B-A3. The room is almost square 4.50 X 4.50 m, its only access is through a blocked doorway (B-B2, 017) in its northern wall (B-B3, 002) that divides it from rooms 6 and 7. The room was paved, traces of the pavement (B-A2, 018) is still visible in the western part of it. A row of well-cut lime stones appeared in the western part of the room parallel to the western wall (B-A3, 001). Two small square pillars were found attached to the western (B-A3, 001) and the eastern (B-A3, 003) walls, they served perhaps as bases of an arch supporting the ceiling of the room. Two *ṭābūns* were dug above the pavement floor. The first one (B-A2, 008) was found in the south western corner of the room, the second one locates beside the southern wall (B-A3, 007) at the middle part of

it. The western wall of the room was covered with a *ca*. 3 cm thick layer of plaster.

Room 9

Rectangular room covers squares C-A2 and C-A3. The only access to it is through a narrow opening from Room (5). The most distinguished object in the room is a large *ṭābūn* (C-A3, 005) ca. 1.00 m deep, its diameter ranges from 1.00 m in the top and 1.20 m in the middle. The rim of the *ṭābūn* was surrounded with a row of stones. The *ṭābūn's* body was supported by a number of stones and compact soil layers surrounding it all around. The presence of this large *ṭābūn* indicates that it was used either as a large family cooking installation or as a commercial cooking installation, perhaps a bakery for the large domestic complex adjacent to the room. The nearby Room (10) was used as an ash depository for the *ṭābūn* cleanout. A second wall in the western part of the room was built parallel to it. The area between these two walls was deeper than the *ṭābūn* unit. It seems that this area was serving as a storage unit. The bedrock was reaches in parts of this room.

Room 10

Covers square C-A4 and the southern part of square B-A4. A nearly square room ca. 3.50 sq.m. It has access through doorways in its southern and eastern walls to other rooms. The eastern wall (C-A4, 005) is 0.90 m high; it has a doorway in its southern end. The southern wall is *ca*. 0.50 m high; it has an entrance in its eastern end. A close to each others, one doorway is blocked. The blocking doorway was cut by the southern wall. The room contained deposits of gray soil, charcoal fragments and carbonized olive seeds, along with *ṭābūn* fragments, and two metal spoons (**Fig. 27**) have been found. No visible floor has been uncovered.

Phases of Occupation

The results of the first season of excavations clarified the history of occupation in the site that started at least in the Iron Age II and continued to the Ottoman period with almost no visible interruption (**Table I**). Even the surface collection played an important role to confirm the flourishing history of the site Barsīnyā as well. As a result, the paved floors that have been excavated in 2006 season have been constructed and used in the Late Roman period (*ca*. third-fourth centuries). The earlier walls were used as foundations of the later structures. In the Late-Byzantine/Early-Umayyad period the Roman and Early-Byzantine structures have been reused with some changes in the arrangement of the rooms. Some paved floors were removed and the lower phases of occupation that locate immediately under the Late-Roman paved floors were disturbed. The pavement stones in squares (A-B1 and A-B2) were reused in blocking the earlier entrances and rebuilding the upper levels of the walls, the reason why the levels under the removed paving floors in the mentioned squares still contains Late-Byzantine and Umayyad potsherds. However, the Early Byzantine paved floor in square A-D1 remained in use until the Umayyad period, it seems that this floor remained in a good condition after the earthquake of 363 A.D.

27. Two metal spoons were found in Room (10), above: Br.07.C.A4.2, below: Br.07.C.A4.1.

It seems clear, due to archaeological collected materials especially pottery sherds, that the excavated structure was used over a long period of time. This made interpreting the phases of occupation difficult. The results of 2006 season of excavation, particularly in squares A-B1 and A-C1 were helpful in defining the phases of this structure, while that excavation gone through deeper levels and earlier phases were more obvious. Such "vertical exposures" are important for understanding the history of the site, the different layers, floors, and the periods during which

walls were built, abandoned, and destroyed. To summarize, the rebuilding of the stone walls in the whole structure gives evidence of later occupation phases. The structure would definitely be affected by several earthquakes, as the region was affected by at least the 10 earthquakes between the second and the mid-eighth century A.D., the most destructive and disastrous appear to have been in 363, 551 and 748 A.D. (Russell 1985: 38-59).

As indicated by the largest quantity of the pottery sherds over the paved floors, the upper phases over those floors were dated to the Late-Roman (third century A.D.), Byzantine and Umayyad periods. The lower phases beneath the paved floors are dated to the Iron II, Iron III, Hellenistic and Early-Roman periods. Our evidence from the 2006 season of excavation, in the layers underneath the paved floors showed that the excavated architectural remains were built over older structures. Verifying this assumption and illuminating the underneath phases is another high priority target for our next excavation season.

The following stratigraphy of the occupational phases at the site was based mostly on the collected pottery analysis, given especially by excavating squares A-B1 and A-C1, as follows (Matrix ?):-

- The earlier phases of occupation could be reached in the first season of excavation, in the lower levels of squares A-B1, A-C1, are dated to the Iron II, Iron III (Persian), and Hellenistic (mostly second century B.C.) periods. The pottery fragments inside the silo of square A-C1 are dated to the Iron II, Iron III and Hellenistic periods. These periods of occupation were not investigated sufficiently, but they could be attested through the pottery assemblage, they could be also attested during the second season of excavation by the reused intact Hellenistic lamp found in square C-A1.
- The phase above the silo level was obvious in square A-B1, especially Locus 17. Hellenistic and Early-Roman pottery was found, dated to the second century B.C. - first century A.D. The cistern in the western plots (A-A9.7a) is dated to this phase. Some Eastern Sigillata A wares were dated to this period and scattered in many places in the site as well.
- Exactly beneath the paved floors in square (A-B1 and A-C1) pottery sherds were dated to the late Roman period (second – third century).
- The layers over the paved floors are dated to the fourth and mostly fifth centuries A.D. The paved floor accordingly was constructed somewhere at the end of the third or early fourth century A.D. The site has been probably affected by the earthquake of the Early Byzantine period (A.D. 363), however, the paved floor continued to be used until the 5th century.
- A second phase of occupation throughout the Byzantine period was dated to the Late-Byzantine period. A mosaic floor, built of large cubes of mosaic could be traced. This floor might be used throughout the Late-Byzantine period (probably late fifth -early sixth century A.D.). This floor was destroyed and only the foundations and a large number of *tesserae* were found.
- The next period of occupation could be assigned to the Late-Byzantine and Early-Umayyad periods (sixth-eight century A.D.). Dates of the major earthquakes could be taken into consideration to limit this period of occupation (551 to 748 A.D.). Earlier walls and some intact Byzantine pavement floors (especially in square A-D1) were reused, some walls were added, and some door openings were blocked. The site during this phase was densely occupied, attested by the great number of potsherds. At the end of this phase the buildings were most probably affected by the earthquake of 748 A.D.
- The last phase of occupation is dated to the Late-Umayyad/Early-Abbasid period. It started most probably after 748 A.D. Destroyed floors were removed and the large *tābūn* was reused (at square C-A2). Walls were rebuilt using earlier blocks, new *tābūns* were constructed (at squares B-A2 and B-A3).

The architectural structures in Barsīnyā (rooms and courtyards) are topologically adjacent forming an irregular plan. Such spatial organization characterizes the rural building technique and arrangement, which was very common in northern Jordan (Khouri el- 2008: 80-82; Muheisen al- 2006: 91-95; Sari 1991, 2004; Najjar *et al*. 2001) and northern Palestine (Wiegand 1920: 1-35; Kuhnen 1989: 167, 234-251; Safrai 1994: 4; Hirschfeld 1995: 21-

103; Horsley 1996: 89; Meyer *et al*. 1978; Galor 2003). The main features of the rural plan include houses that were closely adjacent, courtyards and rooms of different sizes, rarely forming an isometric plan. The floors were either paved, mosaic, plastered or compacted. The walls were built of either hewn or un-hewn stones. The structures illustrate a long tradition of domestic architecture that had been probably developed from the Hellenistic to the Early-Islamic periods. For example, Duḥalah (Sari 1991), Ṣa'ad (Sari 2004), Ya'mūn (Najjar *et al*. 2001), and al- Badiyya (Muheisen al- 2006: 91-95) showed similarities in their building techniques and architectural features.

The people of Barsīnyā during the Roman period reused and re-planed previous structures to pertain a new function. Partition walls, for instance, were added in some rooms, some entrances were blocked, and cut stones and thresholds were placed on top of the earlier walls. Both well-cut and un-hewn stones were used in construction and covered by plaster as shown by some traces of plaster pieces in a number of rooms. Although the population number may have triggered architectural expansion throughout the consecutive occupation periods, building reuse at the site may still indicate a similar social structure and possibly subsistence economy.

The presence of considerable buildings during the classical periods coupled with precious pottery, glass, and metal objects may indicate a prosperous rural settlement. The subsistence economy (agriculture and animal husbandry) put the community in the level of self sufficiency or even wealth accumulation that might have been given off to the nearby cities. Consequently, Barsīnyā achieved the survival requirements throughout the very long period of occupation.

Acknowledgment

This project would not have been possible without the financial support of Yarmouk University, and the assistance of the excavation team of the Faculty of Archaeology and Anthropology: Maher Tarboush, Muhammad Jaradat, and (the late) Nabil al-Qadi archaeologists and area supervisors, Ali Omari and Muwaffaq Bataineh draftsmen, Hussein Dibajeh and Yousef Al-Zoubi photographers. I wish to express my gratitude to (the late) Dr. Muhammed Hatamleh who directed the second season of excavation at the site, only few months before he died.

I would also like to convey thanks to the Jordanian Department of Antiquities and the representatives of the department Wajieh Karasneh and Adnan Neqresh. Special thanks to Dr. Abdullah Al-Shorman (Department of Anthropology, Yarmouk University) for his comments.

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BROWN UNIVERSITY PETRA ARCHAEOLOGICAL PROJECT: THE 2010 PETRA AREA AND WĀDĪ SULAYSIL SURVEY

Alex R. Knodell and Susan E. Alcock

Introduction

The Petra Area and Wādī Sulaysil Survey (or PAWS) undertook its initial season of fieldwork in the summer of 2010 as a major component of the Brown University Petra Archaeological Project (BUPAP). The PAWS research area is located some three to ten kilometers north of the Petra city-center, between the modern village communities of Umm Ṣayḥūn and Bayḍā, within which three zones were intensively surveyed: Areas a, b, and c (**Fig. 1**).[1] Given its close proximity to Petra, it is no surprise that previous travelers, explorers, and archaeologists have investigated this region, with the earliest accounts going back to the 19th century (Robinson and Smith 1841). However, the diachronic, systematic, and intensive design of the PAWS survey represents a novel approach to the documentation of this landscape that has yielded substantial and provocative results after only a single season of fieldwork.

In approximately a month long period between 28 June and 31 July 2010, the PAWS team systematically surveyed 133 hectares, in which material culture from all periods (from Paleolithic to the present) was counted and collected for some 334 Survey Units, and over 240 features — ranging from tombs to water management structures to agricultural installations — were recorded. The intention of this article is briefly to review previous research concerning the survey area, to discuss our methodological and theoretical concerns, and to summarize the preliminary results of the 2010 season.

The PAWS Survey Area and Previous Research

Our 2010 survey focused on a zone including Wādī Baqā‘,Wādī Sulaysil, and the immediate vicinity of the Islamic Bayḍā structures (the site of architectural mapping and excavation by BUPAP in this same season).[2] Again, this territory has long been known, if somewhat cursorily, to travelers and archaeologists. This brief synopsis summarizes accounts of the earliest western visitors and archaeologists who have conducted field research here in recent decades, framing what was known about the area previously and revealing some of the gaps that PAWS and its particular methodologies can fill.

The PAWS survey area is located in some of the most viable agricultural land near Petra and also is transected by several potential paths into the city. In terms of long-distance routes, there is a pass from Wādī ‘Arabah to the north of Wādī Sulaysil that allows access to the city center via Wādī Sulaysil; if approaching Petra from the north one must pass through the Bayḍā area, the site of the famed as-Sīq al-Bārid, or Little Petra, and numerous other Nabataean rock-cut tombs and complexes (see below). As for travel within the region, several wadis link the territory surveyed in 2010 with the city center itself, and any traffic between Bayḍā/Little Petra and Petra proper would pass through here. Without a doubt, this was an important part of Petra's hinterland during its Nabataean zenith, although our work proves its interest and importance is not limited to that time period alone.

Our earliest information goes back nearly as far as the first modern, Western descriptions of Petra. Burckhardt and many who followed in his footsteps entered via Wādī Mūsā and the Sīq (Burckhardt 1822: 422), usually traveling from ash-Shawbak. It is therefore possible that

1. Unless otherwise indicated, all maps created by Alex R. Knodell.

2. See Sinibaldi and Tuttle in this volume.

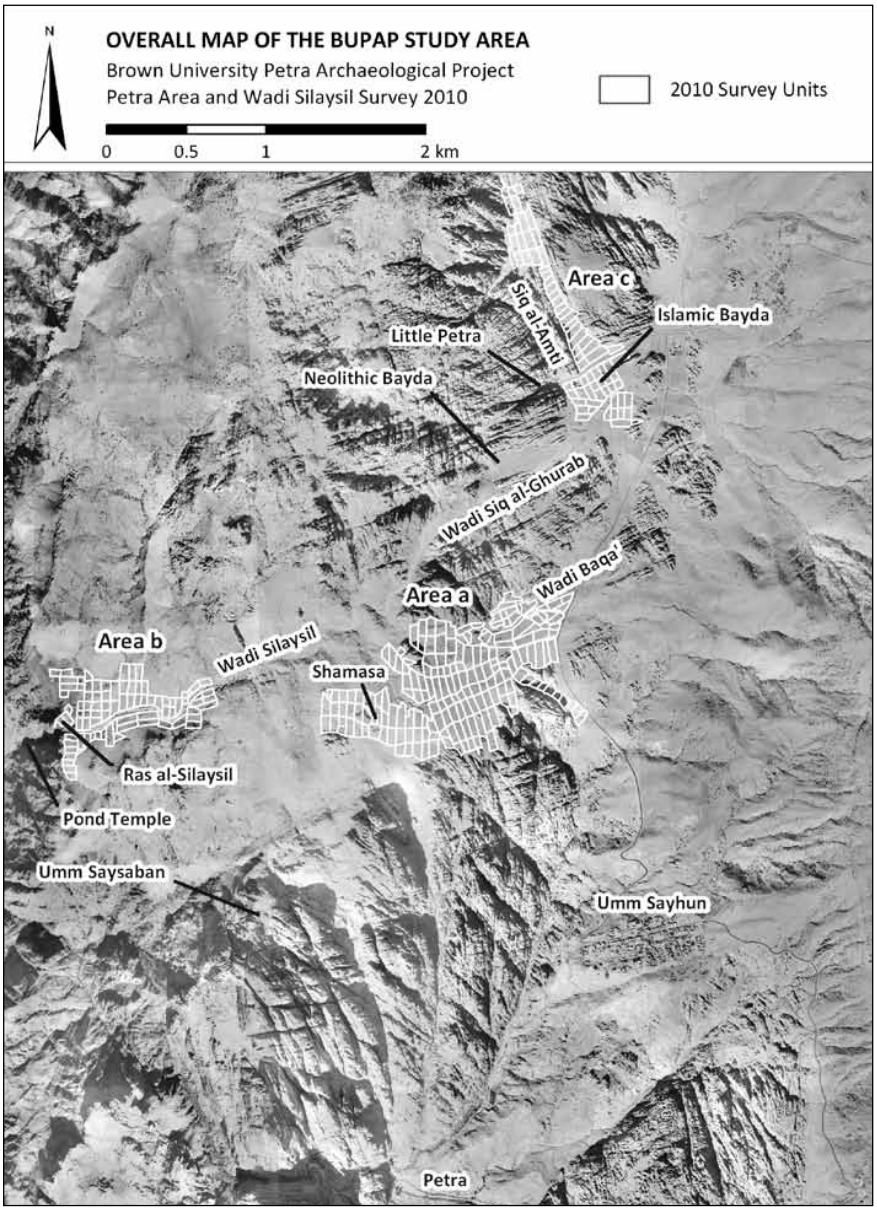
they traveled through the northern part of our survey area, passing near Bayḍā, but they do not discuss it. By contrast, the Biblical scholars Robinson and Smith (1841: 504-512) came up from the Wādī ʻArabah and appear to have ascended quite near the western extent of our work, north of Wādī Sulaysil. They gave only the name "Nemela" for the pass, where they described the porphyrite and sandstone (Precambrian and Cambrian) combination characteristic of the Wādī Sulaysil environs. They then descended into the wadi, still called Nemela according to their guides, and mentioned a narrow gorge that fits the description of the western end of Wādī Sulaysil, where it debouches dramatically and nearly vertically down to the area of the Pond Temple (Lindner 1995a). From here they followed the course of Wādī Sulaysil, mentioning the numerous terraces in the area, then continued into a "chasm" in a group of cliffs further east, called "as-Sīq", which is Wādī Sīq al-Ghurāb. They next came into an area called "*Suṭūḥ Bayḍā*ʻ", meaning "white plains", which seems to refer to most of the area around and south of Bayḍā. As Robinson and Smith moved south along the course of the modern road they described the now familiar topography and tombs in the distance, as well as the difficult nature of the farming undertaken by the Bedouin living in the area. Musil, in the early twentieth century, was the first writer to give the name "Sulaysil" to part of this region (1907: 333), and it has been referred to variously ever since (see Lindner 1995b for a summary).[3] The Baqāʻ area (roughly our Area a), lying between the previously mentioned areas and Petra proper, is not named in early accounts, nor located on modern maps. It is a toponym known colloquially and is used descriptively, meaning "open or empty place". A great deal of variability thus exists in how and for how long aspects of this landscape have been known or discussed by outside observers.

Certain parts of the survey area have been the subject of archaeological interest, again a fact not surprising given its very close proximity to Petra, and several significant sites have been excavated, surveyed or described in various manners (**Fig. 1**). However, the area as a whole had never been subjected to the kind of systematic, intensive survey espoused here, where the artifact (and from there densities of artifact types and their periodization across the landscape), rather than the site, is the minimal unit of analysis. By adopting such a non-site-based approach, we have already achieved results that complement previous investigations exceptionally well.

The vicinity of Bayḍā has received by far the most attention in the PAWS survey area, not least for the prehistoric periods. Two surveys in this region sought explicitly to document prehistoric sites (Gebel and Starck 1985; Kirkbride 1966), and a number of syntheses of the prehistory of the Petra area (and the Middle East more generally) include discussion of the well-known Natufian and PPNB site of Bayḍā (e.g., Gebel 1988). This site was put on the map through the excavations of Diana Kirkbride, which took place between 1957 and 1983, after she discovered it with local help in 1956 (Kirkbride 1960, 1961, 1962, 1966, 1967, 1968, 1984; Mortensen 1970). Since then several contemporary sites (e.g., Baʻja, Basṭā) have been noted or excavated in the wider region; these will not be discussed here as they lay outside of our immediate study area. More recently, Brian Byrd briefly renewed fieldwork at Bayḍā and has synthesized the results of Kirkbride's excavations for the Natufian and Neolithic periods (Byrd 1988, 1989, 2005).

Bayḍā has also recently undergone a program of research with respect to its Nabataean remains. This work has focused primarily around rock outcrops among and near the remains of the Islamic period village, east of the better-known monuments of Little Petra in the as-Sīq al-Bārid. Since 2003, the Bayḍā Documentation Project, led by Patricia Bikai, has engaged in study of numerous features, including agricultural installations, cisterns, and sev-

3. That transliteration from Arabic to English can result in multiple spellings of the same words or places needs no explanation. However, we should be explicit in stating our spelling conventions, as well as pointing out the alternative spellings of place names that appear in the text and bibliography of this article. In consultation with Nancy Khalek (Brown University), who conducted a preliminary study of toponyms in the PAWS survey area, we have decided to transliterate place names in keeping with the system used by the *International Journal of Middle East Studies (IJMES)*. Thus, for example, we use "Bayda" where others have used "Beida" or "Beidha" and "Silaysil" where "Suleisel" or "Slaysil" also appear.



1. Overall map of areas surveyed in 2010 with place names and known archaeological sites.

eral substantial structures, most notably an extremely impressive colonnaded hall (Bikai *et al.* 2005a, 2005b, 2006, 2007, 2008). Also in this area is an important Nabataean inscription that links winemaking and ritual aspects of the landscape (Zayadine 1986). It remains to be seen how the Bayḍā Documentation Project and our own work will affect previous interpretations of this apparently very rich and dynamic area (e.g., Zayadine 1992).

There is a general trend, in the archaeology of the Petra region, to privilege investigation of prehistoric periods and of the Nabataean/Roman era at the expense of later epochs: this motivated to a great extent BUPAP's work at the in the area of Islamic Bayḍā. Yet there has been work on the material culture of modern times. For example, in the early 1980s Banning and Khöler-Rollefson (1983, 1992) undertook an ethnoarchaeological survey in the Bayḍā area that aimed to study the tangible remains of recent pastoral practices in the area (see also Russell 1993, 1995). Because of the diachronic goals of BUPAP, their results are of great interest, especially in terms of understanding modern land-use and its material signatures. At present, this research possesses limited spatial and methodological overlap with our own work, but we plan to develop such eth-

nographic and ethnoarchaeological dimensions in future seasons.

Although our 2010 survey territory remains relatively undisturbed, not least because of its location within the boundaries of the Petra Archaeological Park, some recent encroachments have been observed. Beginning in 1996, the Wādī Mūsā Water Supply and Wastewater Project began as a rescue operation in response to, and cooperation with, the installation of a pipeline running some 60 kilometers from the vicinity of Bayḍā in the north to the area of Jiththa in the southwest. The project, focused on a narrow strip of land that passes through our survey area along the course of the road between Bayḍā and Umm Ṣayḥūn, included an archaeological survey component that was heavily oriented towards the discovery of sites, 39 of which were documented between 1996 and 2000. All of these sites received basic description and some more attention in the form of drawing or limited excavation (ʻAmr *et al*. 1998; ʻAmr and al-Momani 2001), though the project directors pointed out that these "sites" are more appropriately described as "outstanding archaeological features" (ʻAmr and al-Momani 2001: 256). Some of these features fell within our survey area and were additionally documented by our project, with cross-references provided to previous work.

Of all pre-existing research to be mentioned, however, first and foremost must be the explorations by the Naturhistorische Gesellschaft Nürnberg (NHG), begun in the 1970s under the direction of Manfred Lindner. This team undertook several campaigns of exploration in the broader Petra region, focusing on remains from various periods (e.g., Lindner 1978, 1986, 1999). Thanks to them, for example, we know of the Early Bronze Age site of Umm Saysabān, the only Bronze Age site documented in our survey area (Lindner *et al*. 2001). They undertook basic description, mapping, and drawing at the Nabataean high place sanctuary and village at the far western end of Rās Sulaysil — which would become a major focus for our attention in Area b in 2010 (Lindner and Gunsam 1995b) — as well as at the "Pond Temple" located some 300 meters below, accessed by a now ruined and treacherous serpentine path (Lindner and Gunsam 1995a; Zayadine 1992). Finally, in our Area a, the "fortified suburb" now called Shammāsa was also studied by Lindner's team; here numerous water features, building remains, and a rock-cut shrine, possibly dedicated to Dushara, were recorded (Lindner and Gunsam 2001). Apart from the baseline of information provided, we would underscore that the NHG's research captured some important data subsequently lost, for example with the destruction of the high place sanctuary complex at Rās Sulaysil shortly after their 1989 visit to the site (Lindner and Gunsam 1995b: 271-273). Such actual and latent threats to the study region motivate, in part, our work.

In sum, previous research in the PAWS survey area has been largely site-based and oriented toward particular time periods. Based on this piecemeal documentation, we know a fair amount about certain places and certain epochs, but there remain major gaps in our understanding of the archaeological landscape, particularly with respect to patterns of long-term continuity and change. Our methodology was designed to fill these gaps and to recognize what has so far tended to be overlooked.

Methodology

The methods employed by PAWS are drawn from the practices of "intensive survey" and "landscape archaeology" as it is typically defined in the Mediterranean: core elements include a commitment to the collection of multi-period data, a regional scope, and interdisciplinary collaboration (cf. Cherry 1983: 287). These precepts were originally drawn from a later 20th century movement in world archaeology toward systematization, sophistication, and transparency in survey methods (e.g., Plog *et al*. 1978; Schiffer *et al*. 1978). Innovative methods for bringing these concerns together in an artifact-rich environment were especially evolved by British and American archaeologists working in the Mediterranean from the late 1970s onward (e.g., Wright *et al*. 1990; Cherry *et al*. 1991; Davis *et al*. 1997). Similar developments were ongoing in Jordanian survey archaeology over the same time period (for overviews see Banning 2001; MacDonald 2007), but surprisingly little cross-referencing has taken place between practitioners of survey method and theory in Jordan and the Mediterranean. Furthermore, the concept of off-site or non-site survey has not been widely

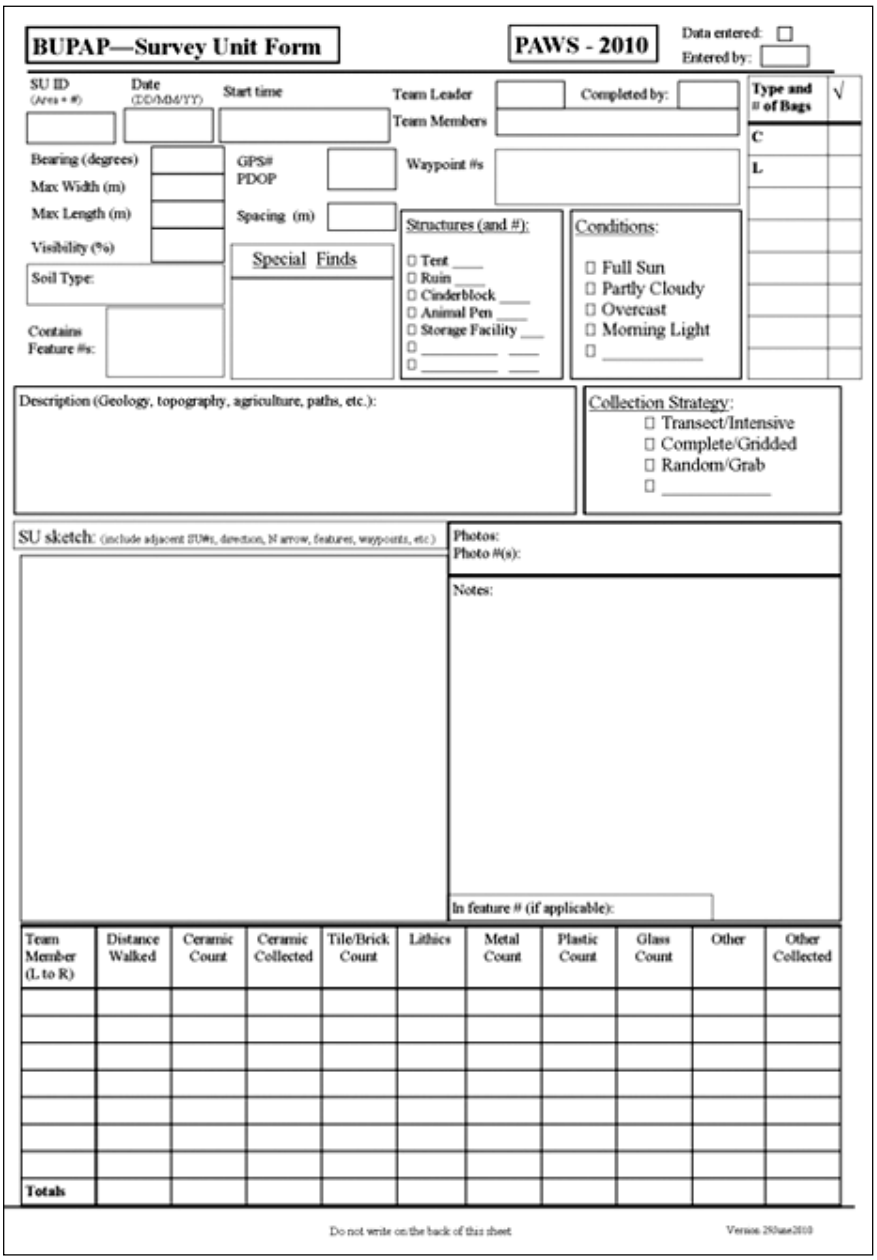
employed in Jordan (Banning 2001: 634), despite the fact that this is an approach particularly useful for documenting high densities of surface material continuously distributed in landscapes witnessing a variety of uses over time (Bintliff and Snodgrass 1988; Alcock *et al.* 1994). This seems to us very apposite to the archaeological landscape we have encountered north of Petra. Given that a principal concern of survey archaeology anywhere must be data comparability and utility for other researchers (Alcock and Cherry 2004), and given that methodological transparency is crucial to this, we describe our goals and methods in some detail here.

In 2010 the PAWS survey worked in three zones: the Wādī Baqā‘ (Area a), the Wādī Sulaysil (Area b), and in the vicinity of the Islamic Bayḍā structures (Area c). Each of these was divided into a number of survey units (or SUs), the boundaries of which were defined by GPS points taken at unit corners. Boundaries were determined based on team size and natural breaking points in the landscape (e.g., field borders or topographical features), as well as a desire to keep units small enough to maintain good spatial control of the data. Unit size thus varied from approximately 40 to 60 meters wide by 50 to 150 meters long. For each of the three Areas, it was decided that as much territory as possible would be explored intensively, excluding extreme topography that is better dealt with through more extensive methods (e.g., selective inspection or remote sensing). In each SU four to six field walkers spaced 10 meters apart carefully inspected the ground surface, documenting all artifacts within a two meter wide transect for each walker. For projecting distributions of artifacts across the landscape, we thus possess a 20 percent sample of ground inspected per SU, from which densities of sherds, lithics, and modern material per hectare can be generated[4]. The choice of a tight, 10 meter spacing also went a long way to ensure that all features in each SU could be noted, recorded, mapped, photographed, and drawn. Information was recorded on paper forms for each unit (**Fig. 2**), and later digitized and transferred to our electronic database.

As for our artifact collection strategy, each field walker, within their two meter wide transect, collected all chipped stone, counted all ceramic material and collected diagnostic sherds, and counted and briefly described all modern material. This strategy was obviously governed by practical concerns. For example, while collecting all ceramics might be ideal in some circumstances (it goes without saying that what is diagnostic for a field walker may differ from what is diagnostic for the ceramic specialist), the high densities in some areas would make total collection nearly impossible and certainly impractical. It was thus decided that, as in many Mediterranean surveys, a consistent method of counting all and collecting only diagnostic and potentially diagnostic sherds would be the best way forward. Such a protocol also works to avoid chronological biases, which is a governing principle of the Brown University Petra Archaeological Project as a whole. The nearby survey undertaken by the Finnish Jabal Harun Project employed a similar field walking and collection strategy (e.g. Frösen *et al.* 1999), which will eventually aid in data comparability across the immediate region.

While the three zones surveyed in 2010 contain previously known archaeological settlements (notably Shammāsa in Area a, Rās Sulaysil in Area b, and the Nabataean and Islamic communities in Area c), our goal was not to identify “sites”, *per se*. Site definition is a notoriously tricky issue, better handled after data processing, when chronological and spatial relationships among artifacts and archaeological features across the landscape can be better understood. Thus, what other projects may have called sites — for example, a cistern or a tomb — are termed by us “features” until their full landscape and chronological context is better

4. The calculation of artifact densities per survey unit is carried out as follows. For each survey unit, field walkers covered two meter wide transects. Thus, the total area of the ground surface for which artifacts are counted is the sum of the walkers’ transects multiplied by two (20 percent of the Survey Unit). Artifact counts for the Survey Unit are then divided by this product (the sum of walker transects times two) to render the average number of artifacts per square meter. This number is then multiplied by 10,000 to determine the number of artifacts per hectare (100x100 meters). Such a calculation provides an immediate and comparable sense of distributions across the landscape, though we acknowledge that, especially for lithic artifacts, it may appear to exaggerate the amounts of material observed. For actual lithic numbers, by Area, see **Table 1**.



BUPAP—Survey Unit Form | **PAWS - 2010** | Data entered: ☐ Entered by:

SU ID (Area + #) | Date (DD/MM/YY) | Start time | Team Leader | Completed by: | Team Members

Type and # of Bags | √ | C | L

Bearing (degrees) | Max Width (m) | Max Length (m) | Visibility (%) | GPS# PDOP | Spacing (m) | Waypoint #s

Soil Type: | Contains Feature #s:

Special Finds

Structures (and #): ☐ Tent ___ ☐ Ruin ___ ☐ Cinderblock ___ ☐ Animal Pen ___ ☐ Storage Facility ___ ☐ _____ ___ ☐ _____ ___

Conditions: ☐ Full Sun ☐ Partly Cloudy ☐ Overcast ☐ Morning Light ☐ _____

Description (Geology, topography, agriculture, paths, etc.):

Collection Strategy: ☐ Transect/Intensive ☐ Complete/Gridded ☐ Random/Grab ☐ _____

SU sketch: (include adjacent SUs, direction, N arrow, features, waypoints, etc.)

Photos: Photo #(s):

Notes:

In feature # (if applicable):

Team Member (L to R)	Distance Walked	Ceramic Count	Ceramic Collected	Tile/Brick Count	Lithics	Metal Count	Plastic Count	Glass Count	Other	Other Collected
Totals										

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2. PAWS Survey Unit field form.

understood.

All features were assigned individual numbers and at the very least described, mapped, sketched, measured, and photographed. Others were selected for more detailed treatment through architectural drawing or total station survey. Analysis of certain features in the survey area (such as quarries) is also being undertaken in tandem with study in the city center to better understand architectural and economic relationships between and within the center and its hinterland. The digitization of all these data and incorporation into the project Geographic Information System (GIS) allows us to make comprehensive plans of features within the survey area (as a whole and in parts) that can be compared with artifact densities across the same landscape (see below).

GIS and remote sensing play a major role in our survey design, execution, data processing, and interpretation. After selecting the general area for study, a QuickBird satellite image of 0.6-meter ground to pixel resolution was purchased from DigitalGlobe Incorporated. In tan-

dem with ArcGIS and known GPS coordinates, this imagery was used to identify areas of interest, as well as the previously known sites within the survey area. Features such as terrace walls were readily identifiable, and the high-resolution satellite imagery, in combination with ground truthing, has been a great aid in mapping them. A digital elevation model of 30-meter ground to pixel resolution was obtained from ASTER, which has been used to model various aspects of the landscape, such as viewsheds and potential routes of movement (Because of the extreme and often abrupt topography of the area, obtaining higher quality elevation data became a top priority for the 2011 season). Handheld personal digital assistants (PDAs) were used in the field with ArcPad mobile GIS software and Garmin GPS receivers, which typically registered accuracy of two to five meters; this allowed for on-the-spot generation of shapefiles to denote the boundaries of survey units and locations of features. GIS was also used to perform various data-processing tasks, including the display of artifact densities and period distributions for each survey unit and the generation of models based on elevation data; of course, it also serves as a generally useful interpretive tool for viewing multiple types of data simultaneously.

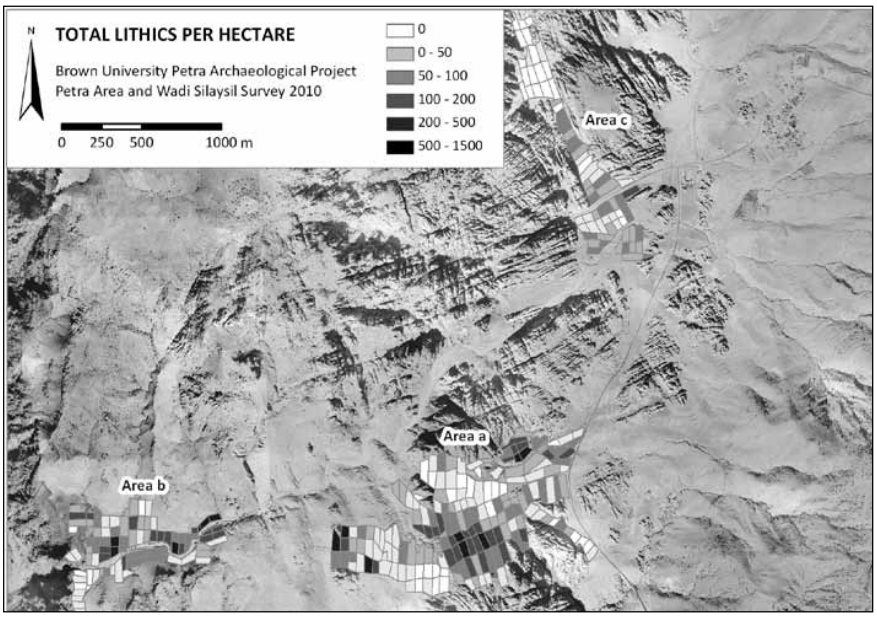
Not everything could be achieved in our initial season. In particular, we acknowledge the need for more structured and detailed input from geologists and hydrologists, to understand what is clearly a fragile and dynamic landscape. Moreover, we hope to develop an ethnographic component to our work, a dimension we feel to be necessary to any survey committed to understanding all aspects of the landscape and its use through time. Not only do the current inhabitants of the area understand and know the current state and recent past of this region better than visiting archaeologists, but they also have a great stake in how this area develops and is presented as an archaeological and human landscape.

Preliminary Results of the 2010 Season

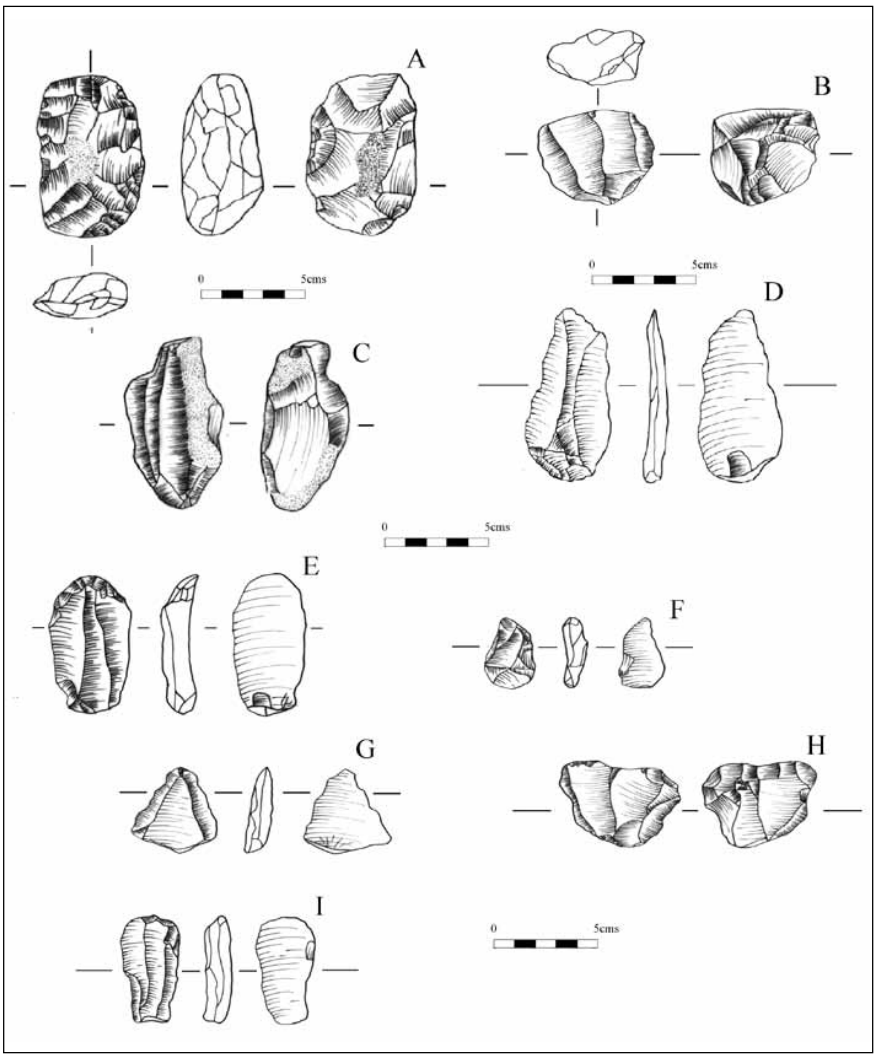
What follows is a summary of our preliminary results for the 2010 season. Following a brief general outline, we provide diachronic synopses of Areas a (Wādī Baqā‘), b (Wādī Sulaysil), and c (the vicinity of Islamic Bayḍā) before moving to general patterns, observations, and directions for further research.

Lithics were found in many parts of the survey area, albeit with some specific clusters identified. Gary Rollefson (Whitman College) did preliminary work on these finds during the 2010 field season, augmented by more detailed study (with Clive Vella of Brown University) in May 2011. The 2010 season recovered material dating as early as the Lower Paleolithic, as well as all subsequent major periods of prehistory (**Fig. 4, Table 1**). Overall, Paleolithic artifacts from the duration of the Pleistocene period account for more than 15% of the unit collections. Despite the proximity of Area c to the prehistoric site of Bayḍā, Epipaleolithic and Pre-Pottery Neolithic finds were relatively rarer than might have been anticipated, essentially equal to the Paleolithic periods. The samples as a whole were dominated (almost 60%) by Chalcolithic/Early Bronze lithics; while this might be taken to indicate a greater level of activity during these later periods, it must be recalled that these artifacts are simply the highest in the stratigraphic record, and that earlier artifacts remain covered (or removed) by thousands of years of erosion and redeposition. Moreover, there seems to have been a significant change in production in the Chalcolithic/Early Bronze Age, where stone tools were likely produced on an *ad hoc* basis, then cast aside, resulting in greater numbers and wider distributions than we have for other periods. Areas a and b reflect absolute counts and densities much higher than in Area c, which may reflect in part the especially heavy overburden of later periods around Bayḍā, in part the sandy deposits which presently cover a section of the Sīq al-Amṭī (**Figs. 3 and 4**).

Ceramic analysis was undertaken by Tali Erickson-Gini (Independent Scholar) and Micaela Sinibaldi (Cardiff University). With their combined specialties ranging from the Hellenistic to the Late Islamic periods, they were able to date the vast majority of diagnostic material collected (though they stress that some yet unidentifiable material may be recognizable to specialists in earlier periods). Ceramic finds, as Figure 5 illustrates, were widely dispersed throughout the survey area. Only a handful of tracts had no material, and some yielded densities (calculated in the manner explained earlier) as high as 140,000



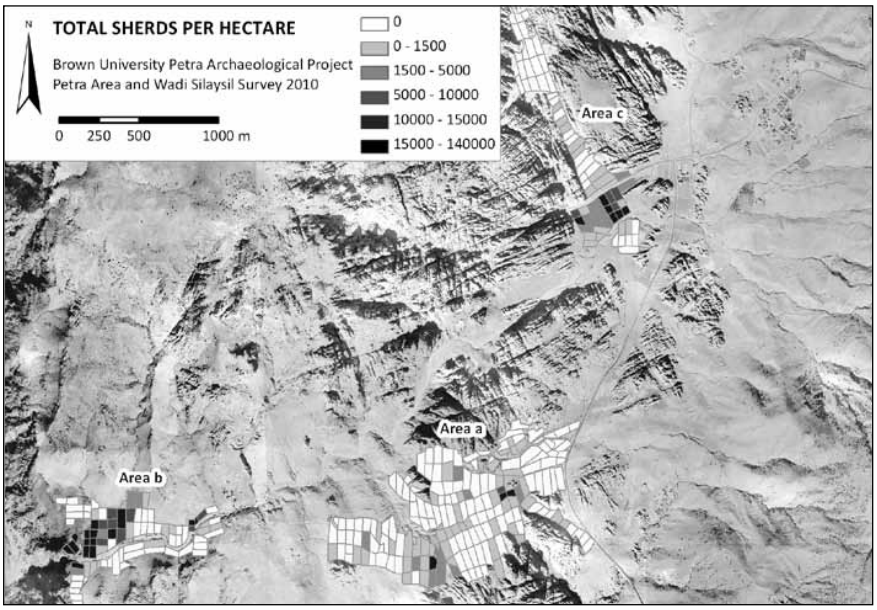
3. Total lithic density in Areas a, b, and c.



4. Select lithic illustrations: A – PPN axe/adze (Survey Unit c50); B – Ch/EB blade core (c25); C – Ch/EB blade core (a135); D – MP Levallois blade (b37); E – UP end-scraper (b19); F – LN canted dihedral burin (a102); G – MP Levallois point (b41); H – MP Levallois point core (b10); I – LN burin on concave truncation (b45) (Illustration by Clive Vella).

Table 1: Distribution of chipped stone artifacts by temporal periods in the different PAWS survey areas in 2010 (Table by Gary O. Rollefson and Clive Vella).

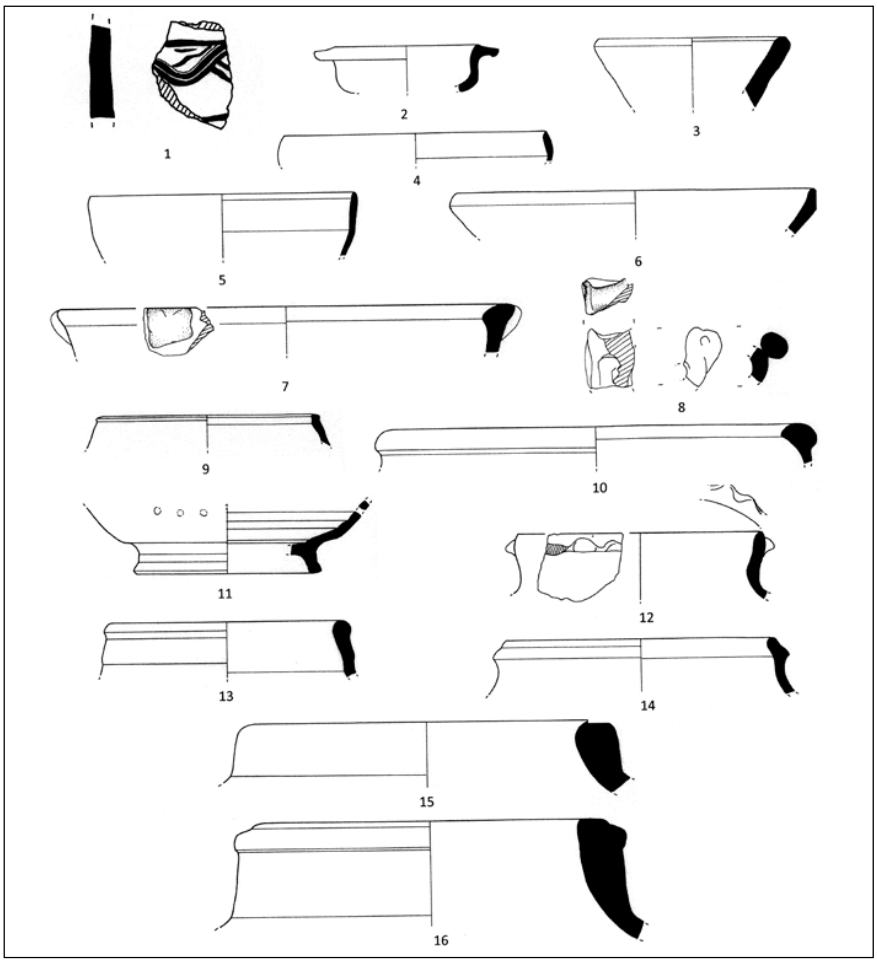
	Area A		Area B		Area C		All Areas	
	n	%	n	%	n	%	n	%
Lower Paleolithic	1	0.6	2	1.7	1	1.6	4	1.2
Lower/Middle	1	0.6	7	6.0	7	11.3	15	4.5
Middle Paleolithic	12	7.6	12	10.3	3	4.8	27	8.0
Middle/Upper	0	0.0	5	4.3	1	1.6	6	1.8
Upper Paleolithic	0	0.0	3	2.6	0	0.0	3	0.9
Upper/Epi	0	0.0	0	0.0	0	0.0	0	0.0
Epipaleolithic	10	6.4	4	3.4	0	0.0	14	4.2
Epi/Pre-Pottery Neo	10	6.4	8	6.8	1	1.6	19	5.7
PPNA	0	0.0	0	0.0	0	0.0	0	0.0
PPNB	4	2.5	2	1.7	0	0.0	6	1.8
PPN	8	5.1	8	6.8	1	1.6	17	5.1
Late Neolithic	5	3.2	3	2.6	1	1.6	9	2.7
LN/Chalcolithic	7	4.5	3	2.6	0	0.0	10	3.0
Chalco/Early Bronze	98	62.4	59	50.4	44	71.0	201	59.8
Late	1	0.6	1	0.9	3	4.8	5	1.5
Subtotal	157	100.0	117	100.0	62	100.0	336	100.0
Unidentified	6	(3.7)	17	(5.2)	4	(6.1)	27	(7.4)
Total	163		134		66		363	



5. Total ceramic density in Areas a, b, and c.

sherds per hectare. The majority of ceramic finds ranged in date from the Iron Age II (700 – 500 BC) to the Middle and Late Islamic periods (1000-1800AD). High densities of Roman (50 BC – 450 AD) and Islamic era ceramics were especially noted, with other periods (Hellenistic [300 – 50 BC] and Byzantine [450 – 650AD]) also present. We should note that the terms Hellenistic and Roman are used here not to assign cultural designations, but to frame our ceramic chronologies in a way that allows broader inter-regional comparison. The social and cultural activity we are witnessing for the last centuries BC and early centuries AD is, of course, Nabataean in character, even well after the Roman annexation in the early second century (cf. 'Amr 2004). At Tali Erickson-Gini's suggestion, we illustrate select examples of Iron II and Hellenistic survey material, periods less well represented in publications from this region than the better-known Roman era ceramics (**Figs. 6 and 7**).

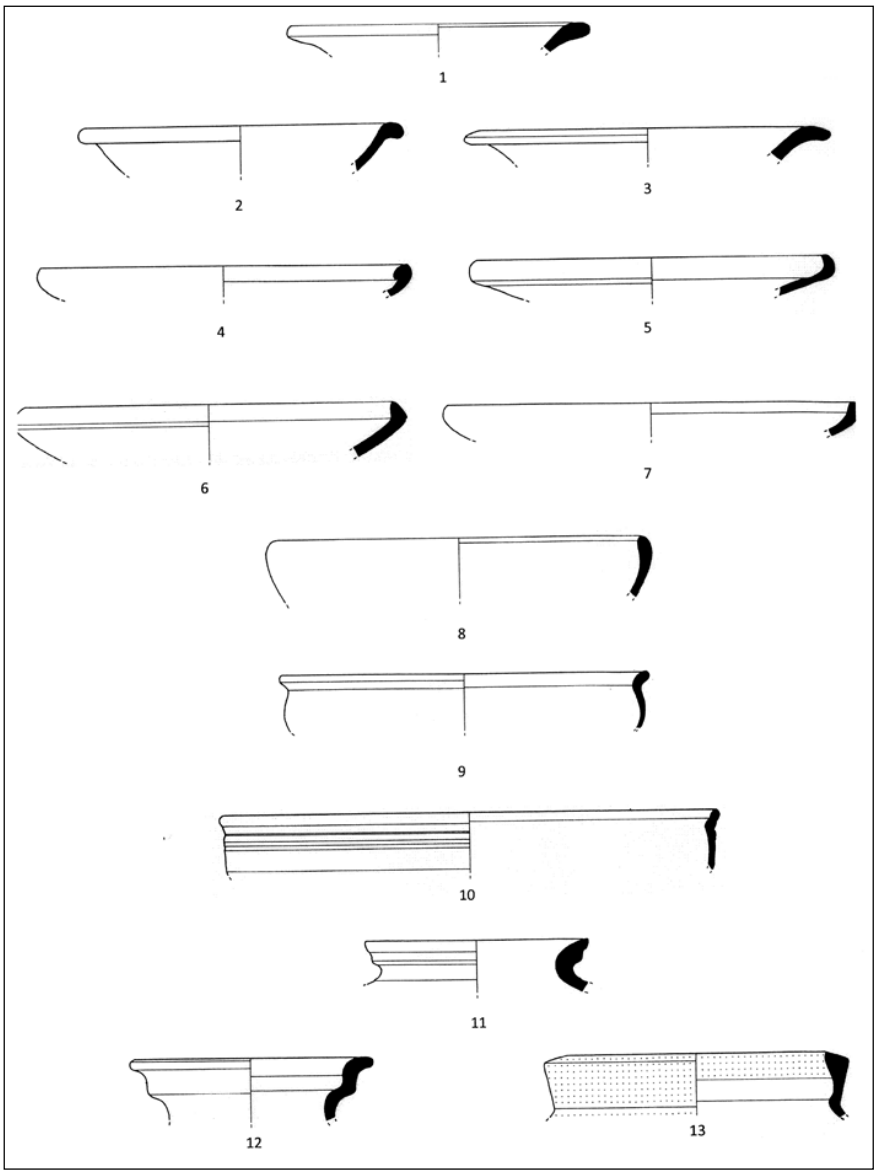
The third major category of finds to report



6. Iron Age II ceramics (selection by Tali Erickson-Gini; Illustration by Munjad Qasem).

(Appendix: Ceramic Finds from the PAWS 2010 Season (by Tali Erickson-Gini)
The Iron II Finds (**Fig. 6**)

1. *Sherd with raised line decoration – SU a 29.1. Yellowish red ware (5YR5/8). Coarse fabric with numerous light gray inclusions. Light brown slip on exterior (7.5YR6/4). Raised wavy-line decoration.*
2. *Bowl – SU a 106.1. Strong brown ware (7.5YR5/8). Light gray core and minute light gray inclusions.*
3. *Bowl – SU a 149.2. Yellowish red ware. Thick gray core and numerous medium to large light gray inclusions.*
4. *Painted ware bowl – SU a 178.1. Reddish yellow ware (5YR6/8). Minute light gray and white inclusions. Thin black and thicker red lines on interior.*
5. *Painted ware bowl – SU a 172.1. Reddish yellow ware (5YR6/6). Bands of dark reddish brown on exterior (5YR3/2).*
6. *Bowl – SU a 72.1. Yellowish red ware (5YR5/8). Light gray core and minute light gray inclusions.*
7. *Bowl with knob handle – SU a 65.1. Yellowish red ware (5YR5/8). Brownish-gray core and minute light gray inclusions.*
8. *Knob handle – SU a 86.1. Reddish yellow ware 5YR6/8. Light grayish brown core. Dark red paint (2.5YR4/8).*
9. *Krater – SU b 52.3. Red ware (2.5YR6/8). Weak red slip on interior (2.5YR6/4) with red painted decoration on interior rim and a dark red band on exterior (2.5YR4/4).*
10. *Krater – SU a 47.2. Reddish yellow ware (5YR7/6). Minute light gray inclusions.*
11. *Perforated vessel base – SU a 127.1. Yellowish red ware (5RY6/8). Gray core and gray inclusions. White accretions on both sides. Row of perforations on lower body and above the base.*
12. *Jug or cooking pot – SU a 43.1. Reddish yellow ware (7.5 YR7/6). Light gray core. Coarse finish and traces of brown slip on exterior (7.5YR4/3). Thumb impressed decoration along the rim.*
13. *Cooking pot – SU a. 46.3. Yellowish red ware (5YR 5/8). Numerous light and dark gray inclusions.*
14. *Cooking pot – SU a 25.1. Reddish yellow ware (5YR6/8). Light gray core and minute light gray inclusions. White accretions on both sides.*
15. *Storage jar – SU a 149.1. Yellowish red ware (5YR5/6). Thick gray core and numerous medium to large light gray inclusions and number of large red inclusions.*
16. *Large jar or jug – SU a 70.1. Yellowish red ware (5YR5/8). Thick light gray core and medium to large light gray inclusions. Band of red paint on rim.*



7. Hellenistic period ceramics (selection by Tali Erickson-Gini; Illustration by Munjad Qasem).

The Hellenistic Finds (**Fig. 7**)

1. Bowl – SU b 71.3. Reddish yellow ware (5YR7/6). Small white and light gray inclusions. Traces of red wash on the exterior (2.5YR5/8) and worn dark reddish gray wash on the interior (5YR4/2).
2. Bowl – SU a 45.1. Pink ware (5YR7/4). Minute dark gray inclusions. Traces of dark slip on exterior.
3. Bowl – SU b 51. 3. Reddish yellow ware (5YR7/8). Light gray inclusions. Light gray slip on exterior (10YR7/2).
4. Bowl – SU b 51.2. Reddish yellow ware (5YR6/6). Dark reddish brown band on exterior rim (5YR3/2).
5. Bowl – SU b 71.4. Dark reddish brown ware (5YR3/2). Medium to large white inclusions.
6. Bowl – SU b 51. 1. Reddish yellow ware (5YR6/8). Minute dark gray inclusions. Red slip on exterior (2.5YR5/8). Dark reddish brown slip on exterior rim.
7. Bowl – SU b 1.1. Reddish yellow ware (5YR7/8).
8. Bowl – SU b 13.2. Reddish yellow ware (5YR6/8). Minute dark gray inclusions. Faded reddish brown slip on exterior (5YR4/4).
9. Bowl – SU b 36.1. Light reddish brown ware (%YR6/4). Gray slip on exterior (5YR5/1).
10. Bowl – SU b 21.4. Reddish yellow ware (7.5YR6/6). Light gray core and minute gray inclusions. Brown slip on exterior (7.5YR4/3).
11. Jar – SU b 36.2. Yellowish red ware (5YR5/8). Large light gray inclusions. Red slip on exterior (2.5YR6/8).
12. Jar – SU b 49.1. Reddish yellow ware (5YR6/8). Medium dark gray and white inclusions. Brown slip (7.5YR4/2).
13. Cooking pot SU b 71.2. Yellowish red ware (5YR5/8). Light gray core. Yellowish red slip on interior (5YR5/6) and very dark gray slip on exterior (7.5YR3/1). Dark brown wash on interior rim (7.5YR3/4).

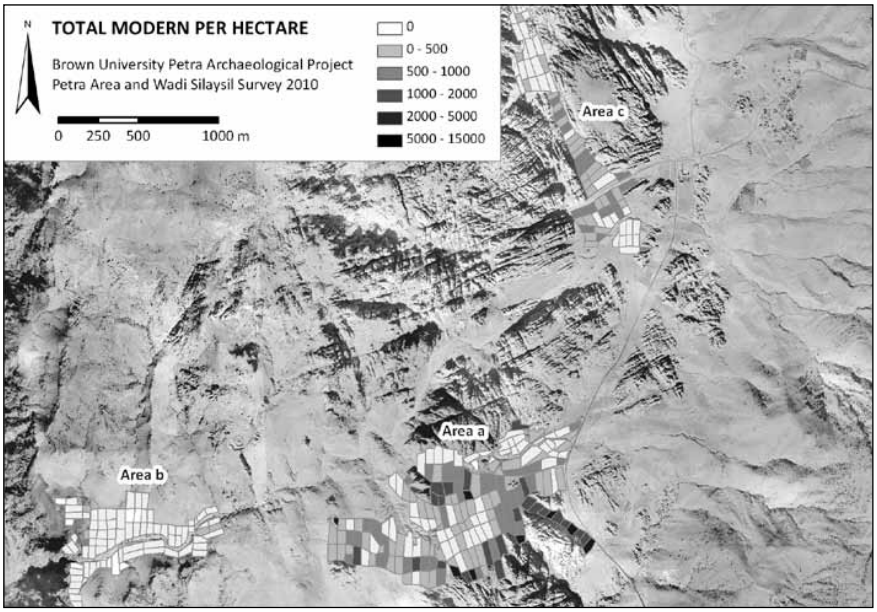
is modern detritus (**Fig. 8**). A great deal of this can be traced directly to local occupants, who graze their animals, live, and picnic in this area. But much is clearly related to growing, and not always regulated, tourism in the region. This phenomenon is only likely to develop and expand as significant Jordanian and NGO energy is devoted to encouraging people to spend more time in the Petra region, in hopes of generating additional local revenue streams. While this is an admirable goal, the potential negative impact on the area is no minor danger, and we plan to continue documenting changes in the region, as well as alerting local archaeological authorities to specific threats. The "garbage map" of the PAWS 2010 season, for example, has already been shared with groups working on archaeological conservation and management issues for the Petra Archaeological Park.

Area a

Located in and around an area called Baqā' or Wādī Baqā', Area a was divided into 180 survey units, 163 of which produced lithic material from the Lower Paleolithic to the present. The Middle Paleolithic is well represented, including several Levallois blades, points, and flakes. Epipaleolithic through Pre-Pottery Neolithic artifacts are also relatively abundant, although the fragmentary nature of many of these pieces made it impossible to distinguish between almost half of the Epipaleolithic to Pre-Pottery Neolithic B samples; tools were rare. Chalcolithic/Early Bronze Age lithics were frequent, possibly associated with the Area's close proximity to the Early Bronze Age site of Umm Saysabān (Lindner *et al*. 2001). What is surprising is the seemingly continuous scatter throughout the sector, there being only a handful of survey units with no identified lithic material (**Fig. 3**). In general, these results compare in date and description to material found in the nearby Finnish Jabal Harun Project's survey (Frösén *et al*. 1999, 2000).

The heaviest concentrations of chipped stone were just north of Wādī Baqā', which also happens to be the part of Area a closest to Bayḍā. All aspects of the *chaîne opératoire* for stone tool production are represented here, including cores, debitage and finished implements. Based on the character of cortex on artifacts, raw material was clearly collected from wadis, quite likely this one, next to which production seems to have taken place. This fits well with Kirkbride's interpretation that wadi pebbles formed the chief supply of flint in the area, with the other possible source being the tabular flint from limestone strata of Jibāl ash-Sharāh (1965: 37-39).

Given the ubiquity of late prehistoric lithics and the close proximity to Umm Saysabān, it is surprising that no pottery from the Early Bronze Age was found in Area a. However, it is possible that some of the small amount of uniden-

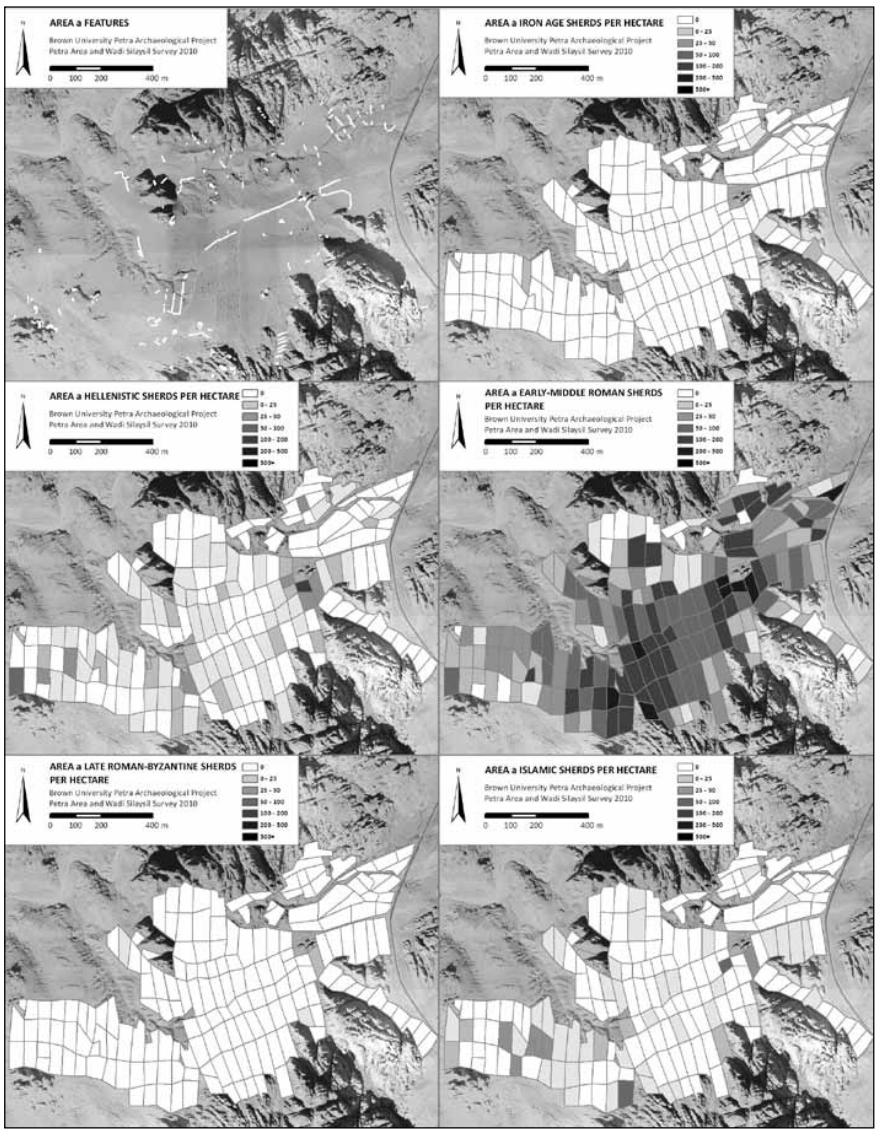


8. Total density of modern materials in Areas a, b, and c.

tified material may date to the Bronze Age or earlier periods. The earliest identified ceramic material belongs to the Iron II period (700 – 500 BC) (**Fig. 9**). This is a period that has received relatively little attention in the immediate vicinity of Petra, though there are significant sites in the region at Ba'ja, Khirbat al-Mu'allaq, Jabal aṣ-Ṣuffāḥa, and Umm al-Biyāra at Petra itself (Lindner and Farajat 1987; Lindner *et al*. 1996; Lindner *et al*. 1998; Bienkowski in press). In Area a, the largest concentrations of these sherds are found near the modern road between Umm Ṣayḥūn and Bayḍā, and near the fortified Rock of Shammāsa. No architectural remains can be securely dated to this period.

Following the Iron Age II, Edomite period, there is an apparent gap in identified material until the Hellenistic period, approximately the third century BC, though the very presence of material this early is noteworthy. The largest concentrations of Hellenistic ceramics are found near major features, such as those at and around Shammāsa. It is noteworthy that these appear to always co-occur with large amounts of later (Roman period) ceramics, implying a continuity of use of space over time.

Sherds identified as Roman (50 BC – 450AD, though especially Early and Middle Roman [50 BC – 250AD]) were by far the most common throughout Area a. As is true for Areas b and c, Area a is nearly completely devoid of Byzantine ceramics. Islamic period ceramics are



9. Area a features and ceramic densities, by period.

scattered throughout, but in no great concentrations – except at Shammāsa, an observation that fits Lindner and Gunsam's interpretation that Shammāsa served as a fortified outpost in this period (2002).

Based on associated finds, building methods, and historical circumstances, it is our preliminary conjecture that most of the 120 features recorded in Area a date to the Roman period. A large number of features seem to be directly related to water management and agricultural practices in this difficult environment. Thirty-two dams or other water control elements were documented in Area a alone, including the elaborate system in Wādī Baqā' itself (This system formed the subject of a more detailed study by Emanuela Bocancea and Timothy Sandiford of Brown University). Six cisterns, some but not all previously known, were also mapped and drawn. Numerous terrace walls and field boundaries were also recorded. While such features are notoriously difficult to date, we currently posit that many of these were part of a program of land management beginning in the early first century AD. This is the interpretation of the terrace systems on Jabal Harūn (Frösén *et al.* 1999), a date which would also work with the majority of our ceramic evidence. In addition to agricultural and water management features, five tombs, eight quarries, four structures, and 17 rock-cut features of various types, including water channels, niches, and shrines, were thoroughly documented; detailed treatment of these will follow in other publications.

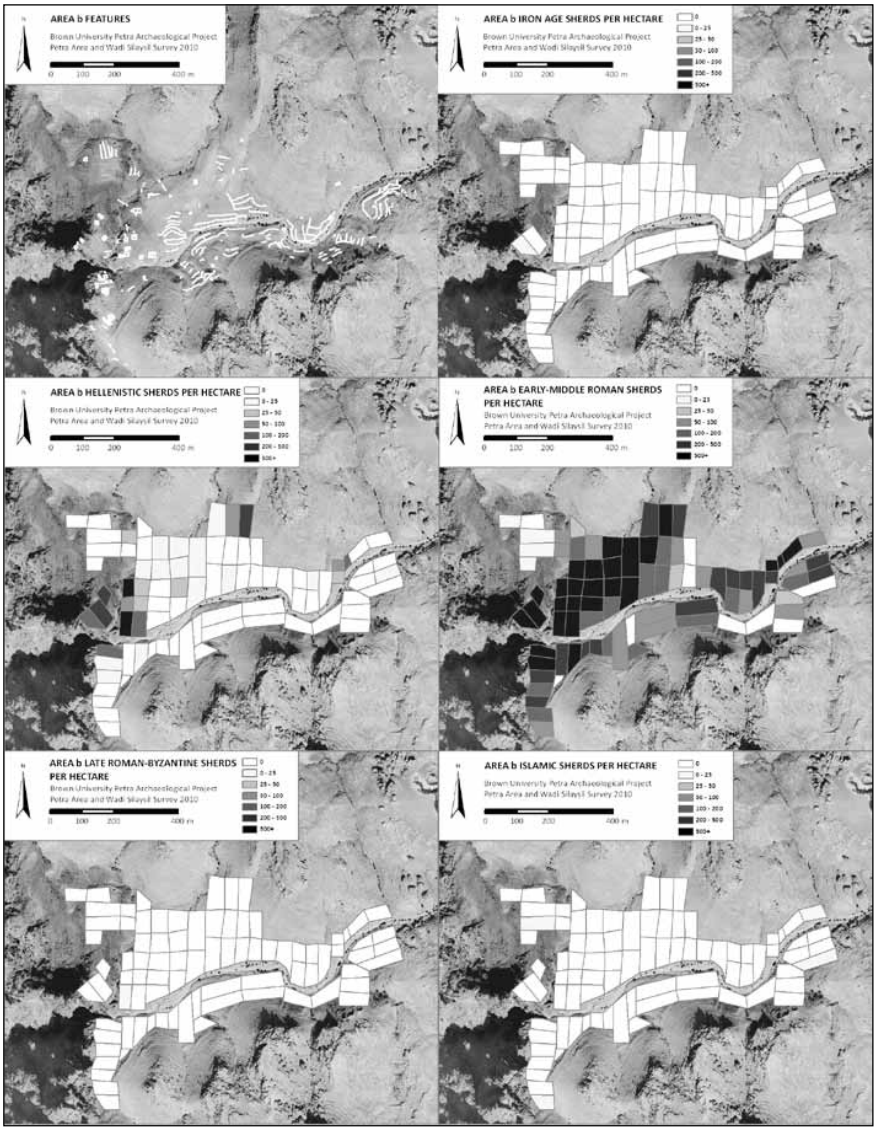
Area b

The remains of the Nabataean village of Rās Sulaysil and its immediate surroundings were the primary focus of our investigations in Area b, located at the western end of Wādī Sulaysil. In the 1980s Gebel (1988: 76) surveyed a site called "Wadi Sleisil", which he dated to the Natufian period. He gives a description of surface finds — a scatter of stone tools on the north side of the wadi — which we relocated during the course of our work. Aside from this location, lithic material was found throughout Area b, with high density areas on the north side especially (**Fig. 3**).

Although Area b covers only about a half of the surface extent of Area a, the lithics in the surface collections (found in 134 survey units in Area b compared to 163 in Area a) indicate that this survey sector was more heavily "populated" by chipped stone artifacts. Lower and Middle Paleolithic presence was three times as intensive; for the Middle Paleolithic, the samples reflect a heavy reliance on the use of Levallois techniques for the production of blades, flakes, and especially Levallois points that were used as hunting and butchering tools. Middle/Upper and Upper Paleolithic artifacts reach almost 7%, which is the highest level for the entire survey region in 2010. Epipaleolithic to Pre-Pottery Neolithic blades, flakes, and cores were found in 20% of the survey units, a possible indication that the Wādī Sulaysil incises a varied terrain in Area b, which would allow for a broader array of exploitable resources. Finally, the Late Prehistoric period (Late Neolithic through Early Bronze) retains its numerical superiority, but we stress again that this may well be as much a reflection of natural processes as of any cultural florescence.

For ceramic finds (**Fig. 10**), very little Iron Age material was found in Area b, but most was located at the strategic high point at the end of the wadi on the north side. The site of a Nabataean high place sanctuary (and perhaps lookout), this area overlooks the extent of Wādī Sulaysil to the east, as well as the Wādī 'Arabah and an important route to Petra to the west.

The Nabataean remains in the area have long been known — discussed first by Kirkbride (1961), described as a caravanserai by Zayadine (1992) and investigated by Lindner's team (Lindner and Gunsam 1995b). Documentation of the high place sanctuary and associated finds, as well as a basic description of the environs, thus exists — fortunately because, as mentioned, the sanctuary suffered a massive, intentional destruction sometime between the NHG team's visits in 1989 and 1990 (Lindner and Gunsam 1995b: 271). For our part, we are able to provide more topographical and chronological data for this landscape and all of its numerous archaeological features. While Lindner and Gunsam (1995b: 273) dated the pottery associated with the sanctuary at earliest to the first century AD, our survey collection recovered a significant amount of earlier, Hellenistic pottery, especially associated with the structures at the sanctuary (**Fig. 10**). Based on these new finds, it seems that

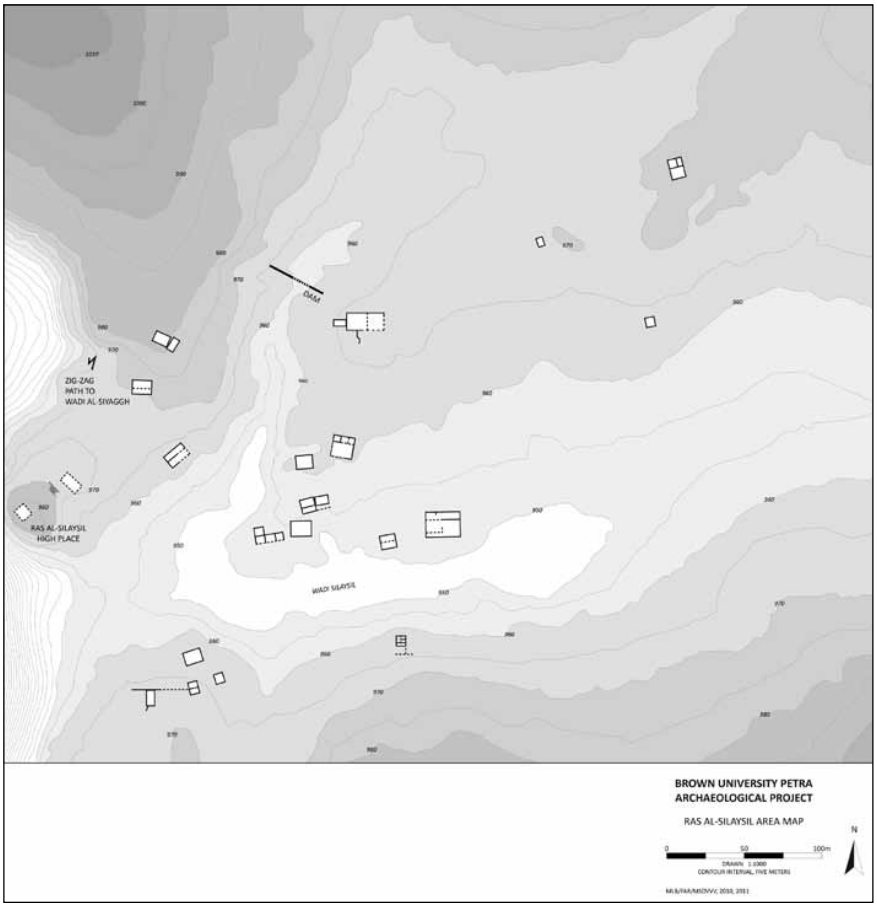


10. Area b features and ceramic densities, by period.

Nabataean activity in the area should be pushed back to at least the third-second centuries BC. The ritual interpretation of the site – tied up intriguingly with its spatial and visual relationship with Jabal Hārūn, the Pond Temple below, as well as other landmarks – requires more detailed attention (Lindner and Gunsam 1995a).

Turning to the built environment, Michelle Berenfeld (Pitzer College) and Felipe Rojas (Brown University) undertook a detailed architectural drawing and topographic survey, producing drawings of all 21 structures in the area, as well as an overall plan (**Fig. 11**). From this, four distinct clusters of buildings can be noted. Those outliers observed are located in strategic places, such as above the confluences of wadis; they thus possessed lines of clear visual communication with the building clusters to the west, as well as with places that those clusters could not observe.

Water management and cultivation were as important here as in Area a. An additional 12 dams were recorded and the investment in agriculture is made obvious by the numerous terraces found throughout the area. Again, while these are difficult to date, similar terraces located slightly farther up Wādī Sulaysil have recently yielded radiocarbon dates of around 100 AD, which matches the bulk of our ceramic evidence (Beckers in press). All in all, the area of Rās Sulaysil emerges as a most intriguing zone: part of an inter-visible system of fortifiable and otherwise significant locations (including



11. Map of Rās Sulaysil structures and topography (map by Michelle L. Berenfeld, Felipe A. Rojas and Michal S. Dziedziniewicz).

Shammāsa, Jabal Hārūn, and Petra itself), apparently intensely cultivated and charged with ritual significance.

The floruit of the Sulaysil community appears relatively short-lived, with the bulk of ceramic finds dating to the Early to Middle Roman period (50 BC – 250 AD). Material that could definitively be identified as Byzantine was nearly completely absent, consisting of only a few sherds in a single survey unit, and only slightly more Islamic pottery was collected. Finally, Area b had by far the least modern garbage of any of the areas we surveyed. This must certainly be a direct result of its difficult access from the main road and the fact that modern land-use is thus far limited to goat herding and some apparent small-scale farming activity.

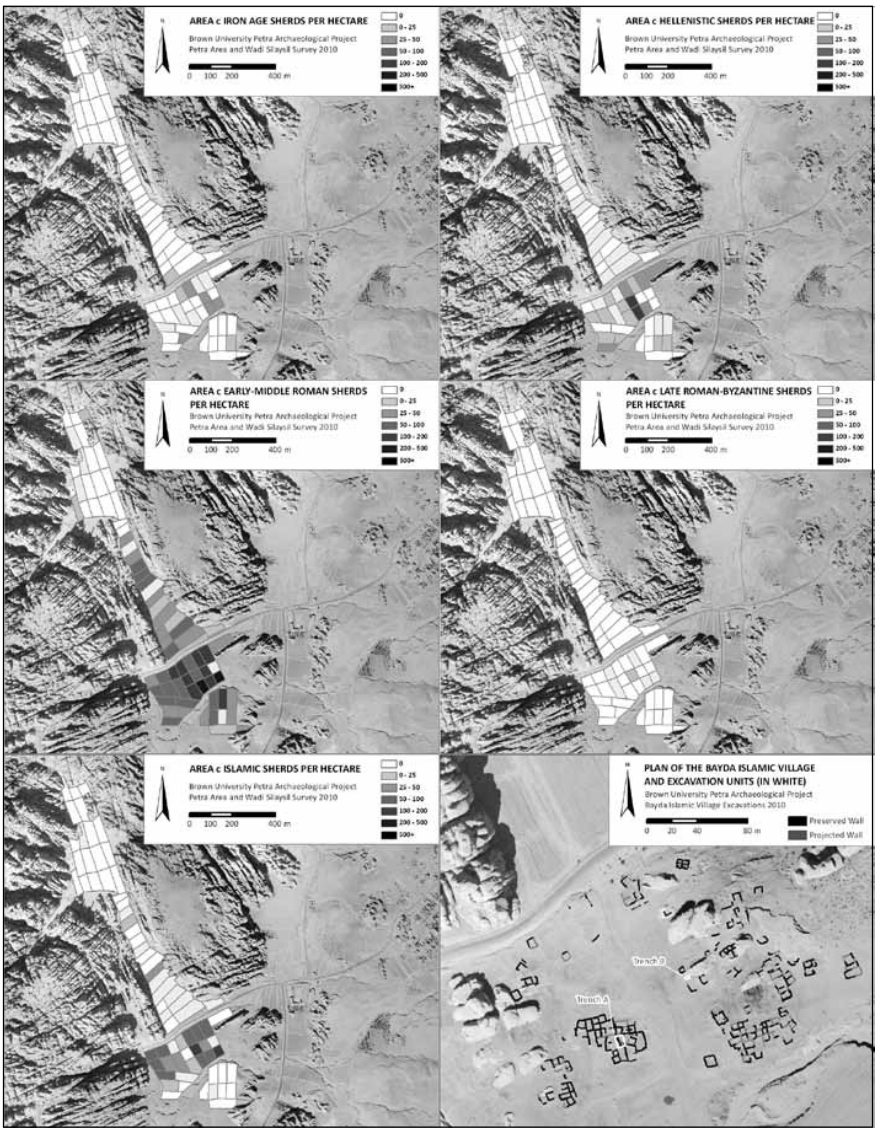
Area c

Centered around the Islamic Bayḍā structures, Area c is divided into 70 survey units covering the extent of the village and the Sīq al-Amṭī, as well as areas to the west and south. While ceramic, lithic, and modern finds were located throughout, it should be noted that the very low densities encountered in the northern part of Sīq al-Amṭī may be the result of a deep sand cover, not present elsewhere in the areas surveyed by PAWS in 2010. Several features, including quarries and petroglyphs, were located in this area but very few surface finds.

The numbers and distribution of chipped stone artifacts from Area c clearly reflect, at least in part, the geomorphological character of the Sīq al-Amṭī. Survey units that produced lithics numbered 65 (**Fig. 3**). Fully three-fourths of the recovered artifacts from Area c were from the later prehistoric periods (Chalco/EB and "Late"), although Lower, Middle, and Upper Paleolithic finds still accounted for around 20% of the Area c samples (**Table 1**). What is significant is the near absence of Epipaleolithic to Pre-Pottery Neolithic periods — a result which could be a consequence of better water resources, vegetational cover, and cultivable territory immediately around Prehistoric Bayḍā, a short

distance to the southwest.

Moving onto ceramics from historical periods (**Fig. 12**), there is a surprising diversity of periods represented in the area of Islamic Bayḍā, beginning with Iron II pottery, found in more abundance here than anywhere else thus far surveyed. Hellenistic sherds are also notably present, suggesting activity contemporary with the surrounding Nabataean complexes and features under study by the Bayḍā Documentation Project (Bikai *et al*. 2007). The Roman and Islamic periods were, however, best represented; this is not surprising, given the multi-period remains already documented by the Bikai team as well as the results of the current BUPAP mapping and excavation efforts at Islamic Bayḍā. The abundance of Roman period sherds, which are in some cases more numerous than those from the Islamic period, may allude to more complex architectural phasing in the village itself than previously thought. Whether these are strictly surface remains or not will hopefully be revealed by BUPAP's concurrent excavations amongst the Islamic period structures. Byzantine remains are again quite scant, and exist only in the vicinity of a structure identified as a former church. Since features in this area had previously been recorded by the Bayḍā Documentation Project, the BUPAP teams (for both PAWS and the excavation at Islamic Bayḍā) sought only to fill certain gaps (Bikai *et al*. 2007, 2008). Timothy Sandiford and Ian Straughn (Brown University) with Mi-



12. Area c ceramic densities, by period, and a preliminary Total Station survey plan of Islamic Bayḍā.

caela Sinibaldi (Cardiff University) undertook, for example, a preliminary mapping of the extant architectural remains at Islamic Bayḍā (**Fig. 12**; this work will be further discussed in reports on BUPAP's results from the excavations).

North of the village, in the Sīq al-Amṭī, ceramic distributions are predominantly of Roman and Medieval date. However, the overall densities are lower than one would expect for a caravanserai, as Zayadine (1992) and many others would like to see here. Architectural elements suggestive of ritual activity, as well as wine-presses suggesting the presence of vineyards, have been identified here by Bikai (Bikai *et al.* 2007: 369), an interpretation that seems to fit the area's Nabataean usage more readily. Further analysis of ceramic data based on the distribution of forms may clarify this issue.

Conclusions and Future Directions

In sum, the PAWS survey, after one season of fieldwork, has produced both novel and promising results. In many ways, our landscape approach complements research previously conducted in the area, providing necessary background to known sites. However, the intensive methodology advocated here has also revealed significant amounts of material from formerly little-known periods in the region (e.g. late prehistoric), and exposed more complicated, diachronic histories at sites generally described as belonging to a single period (e.g., Islamic Bayḍā or the Nabataean village at Rās Sulaysil). Despite these already significant results, we stress that the interpretations presented above remain preliminary in nature. Much work remains to be done with respect to primary fieldwork (for example, filling gaps between areas surveyed in 2010), as well as feature, artifact, and data analysis, which we look forward to reporting in the coming years.

In 2011, fieldwork will continue with a slightly larger team, allowing for greater expediency in the recording of survey units and features. Intensive field walking will have two primary goals: (1) to cover the areas separating Areas a, b, and c as comprehensively as possible and (2) to expand east of the road that runs between Umm Sayhūn and Bayḍā. Additionally, we hope to expand the ethnographic and geological components of the project, for which groundwork was laid in 2010. Architectural and spatial analysis of features will continue, as will topographic studies of routes of movement within the survey area, and between it and the city center of Petra.

A preliminary report cannot do justice to the efforts of all who contributed to the 2010 season of PAWS. Indeed, this article has had the daunting task of distilling multiple detailed field reports prepared by various project members, sometimes reducing several thoughtful pages into only a sentence or two. We hope, however, to have presented a coherent account of our first season of work that gives due credit to previous researchers in our project area, explains the background and motivations of the Petra Area and Wādī Sūlaysil Survey, and provides some initial interpretations in presenting the data thus far collected.

Acknowledgements

We would like to acknowledge our deep gratitude to the institutions and individuals who made this research possible, namely the Department of Antiquities of Jordan and the Petra Archaeological Park (especially Dr. Emad Hijazeen, Tahani al-Salhi, and Hyeam Twassi); Brown University and the Joukowsky Institute for Archaeology and the Ancient World; and our hosts, the Dakhillala Qublan al-Fakhir family and all of the residents of the Petra region. We also thank all BUPAP project members who participated in the 2010 season: Filip Ani, Michelle Berenfeld, Emanuela Bocancea, Tali Erickson-Gini, Katherine Harrington, Bronwen Konecky, Megan Perry, Felipe Rojas, Gary Rollefson, Timothy Sandiford, Ian Straughn, Bradley Sekedat, Micaela Sinibaldi, Harrison Stark, Christopher Tuttle, and Thomas Urban. Additional thanks are due to Tali Erickson-Gini and Micaela Sinibaldi for their assessment and discussion of the ceramic material, and to Gary Rollefson and Clive Vella for their reports on lithic assemblages. We especially thank Tali Erickson-Gini, Gary Rollefson, Micaela Sinibaldi, Christopher Tuttle, and Clive Vella for detailed comments on earlier drafts of this article.

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NORTHERN JORDAN PROJECT 2010: THE AṬ-ṬURRA SURVEY

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Introduction[1]

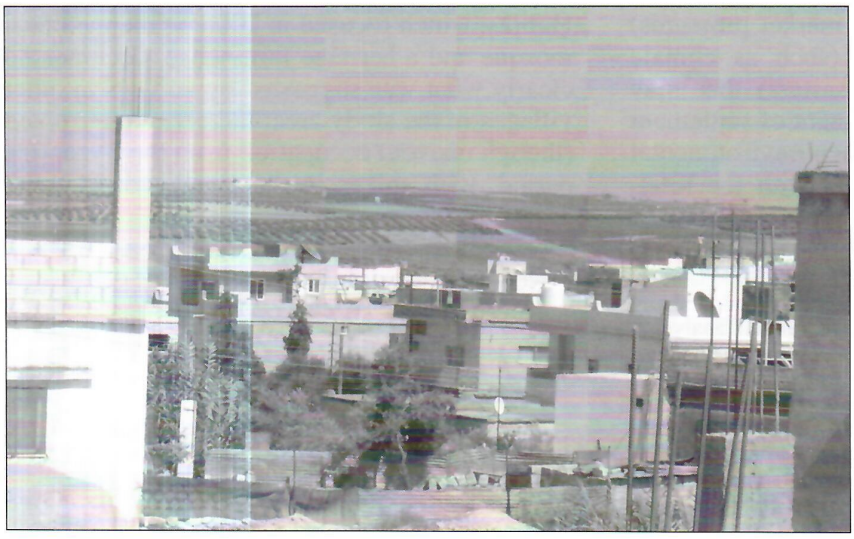
The Northern Jordan Project (hereafter NJP) was launched in 2003 in order to investigate potential fluctuations of settlement during the later historical periods in the region between Irbid and the Yarmouk River and to compare these patterns to central and southern Jordan, where surveys have suggested pronounced settlement decline from the late Mamluk period. Each season a different village and its hinterland are the focus of archaeological fieldwork, which is combined with archival, ethnographic, architectural, and environmental analysis. Villages are selected for study, in part, on the basis of textual sources and include both inhabited and abandoned settlements. The parallel studies are designed to help differentiate human factors (such as land use and political and market pressures) from environmental factors (such as climate change or environmental disasters) that may have contributed to the abatement of settlement in the Islamic era. This archaeo-environmental project is, in short, concerned with the totality of human behavior that has transformed the environment, with a particular emphasis on the Middle and Late Islamic periods.

Since its inception the Project has conducted surveys in Malkā (2003 - Walker 2005), Ḥubrāṣ (2003 - Walker 2005), Saḥam (2006 - Walker *et al.* 2007; Walker 2007c), and most recently aṭ-Ṭurra (2010), as well as excavation in Ḥubrāṣ (2006 - Walker *et al.* 2007; Walker 2007c; Walker and Kenney 2006)[2]. These together represent three different topographical/ecological zones: the deeply dissected hills below the lower Galilee and Golan in the west, a highland plateau in the central zone, and the plateau of the lower Hawran leading to steppe lands in the east. Each season has contributed to Project objectives in different ways. The excavations at Ḥubrāṣ, which focused in 2006 on the medieval mosque and a heritage farmhouse, documented clearly what was suggested by surveys in other villages in the study area: largely uninterrupted (though uneven) occupation from the Byzantine period, with spikes in the Umayyad, Mamluk

1. The Northern Jordan Project (hereafter NJP) is directed by Prof. Bethany J. Walker of Missouri State University. The staff for the 2010 season included Bethany Walker (archaeology, ceramic and textual analysis); co-director for ethnography, Prof. Mohammed Shunnaq (Yarmouk University); archaeologist Prof. David Byers (Missouri State University); architect and surveyor Mr. Muwafaq al-Bataineh (Yarmouk University); phytolith specialist Ms Sophia Laparidou (University College London); geomorphologist Prof. Bernhard Lucke (Erlangen University); and Prof. Atef Shiyyab, who helped co-ordinate Yarmouk University staff this season. We also wish to acknowledge the contributions of Mr Hussein Debajeh (photographer for the architectural study, Yarmouk University); archaeologists Mr Ali al-Rahabaneh and Mr. Hussein Sababha of Yarmouk University; and thirteen students from Missouri State University and Yarmouk University. Post-season laboratory work on soils was done at the phytolith labs of University College London. The pottery profile drawings for this report were produced by Ms Stephenie Walker of Missouri State University and floor plans and computerized architectural drawings by Mr Muwafaq al-Bataineh of Yarmouk University. We want to thank, as well, the continuing support of Dr Ziad al-Saad and his staff at the Department of Antiquities of Jordan; the former Director of the DoA, the late Dr Fawwaz al-Khraysheh; our representative from the DoA, Mr Khaled Janaydeh; the Municipality of aṭ-Ṭurra; the Department of Lands and Surveys in Amman; and the American Center of Oriental Research. We gratefully acknowledge the financial support of Missouri State University, Yarmouk University and University College London for fieldwork and laboratory analysis this season.
2. For historical studies generated by the Project, see Walker 2007a, 2007b, 2007c, and 2009b.

and Late Ottoman periods. In each season, the ceramic and architectural records attested to the wide-ranging contacts of northern Jordanian villages with the market centers and ports of wider Bilād ash-Shām and the Mediterranean over the course of the Middle Islamic (Ayyubid - Mamluk) and Late Islamic (Ottoman) eras, when villages grew and more land was 'under the plow'. The concurrent environmental studies conducted during those field seasons indicated a complex interplay of factors behind this settlement history. Preliminary pollen analysis during the 2003 season suggested that cycles of settlement abatement (such as during the late Mamluk to early Ottoman periods) may have coincided with years of limited rainfall, when some fields were abandoned and cultivation shifted from cash crops to a more diversified, subsistence (or limited, local market) system (Cordova in Walker 2005: 29-34). The results of continuing soil genesis analysis, on the other hand, have indicated that field systems have not significantly changed here during the historic periods, and land use has had limited impact on landscape development (see also Lucke *et al.* 2008). Rather, analysis of soil profiles at Ḥubrāṣ and architectural damage in that village and in Saḥam point to the role of violent rainfall events in both landscape change and contraction of settlement (Lucke in Walker *et al.* 2007: 464-467; see also Schumacher 1913a). The 2010 season further developed these avenues of inquiry into land use and settlement and environmental history through investigation of a village in the eastern sector of the study area and expansion of data collection techniques.

The village of aṭ-Ṭurra is located on an undulating plateau of the southern Hawran, eight kilometers north of ar-Ramthā, to the east of ash-Shajarah and Wādī ash-Shumar, and northwest of Wādī ash-Shallāla (which flows into the Yarmouk River); the village's northern and north-eastern fields approach the Syrian border (**Fig. 1**)[3]. Situated between optimal agricultural land to the west and the steppe to the east, aṭ-Ṭurra experiences mid-range environmental conditions. Its fertile soils (largely a reddish brown loam[4]) are rocky and broken by natural, limestone outcrops and caves. The high water table here has recently raised concern about the vulnerability of its groundwater to contamination (Margane *et al.* 1999: 183). Annual rainfall (350 mm / yr) is sufficient for dry farming, but irregular: according to the atlas of 1964, for example, rainfall in nearby ar-Ramthā ranged between 152.5 and 359.4 mm / yr in one decade



1. View of village to the north, towards Syrian border.

3. Administratively, aṭ-Ṭurra belongs to the Liwā' of ar-Ramthā, in Irbid Governorate. Its map coordinates are 35° 25′ - 36° 10′ (long.) and 32° 25′ - 32° 45′ (lat.). Its altitude varies from 478 meters above sea level at its highest point (the highest hill located in the center of the village, now occupied by a cemetery) to 449 meters at its lowest (in fields to the north and east of the village).
4. This red Mediterranean soil is uniquely suited to the cultivation of cereals (Bender 1974: 189). The local soil is thick in organics and retains water. A more yellow, desert soil has also been noted at aṭ-Ṭurra.

(al-Shalash 1964: 20). Today, as in antiquity, the village is well connected by transport routes. The modern road, based on the former *ḥajj* route from ar-Ramthā to Muzayrīb, divides the village into two halves; we used this spatial division to organize our survey (as described below). This village was selected for survey for a variety of reasons: (1) it is located in a topographical and environmental zone of our study area we have not yet investigated, (2) historically it experienced a different history from villages studied in previous years of the project, as it was located on the Mamluk and Ottoman frontiers and served an important security role as a result and (3) we expected a different agricultural regime, as this region of the southern Hawran served global wheat markets in the 19th century.

Aṭ-Ṭurra was first archaeologically investigated by Mittmann in his regional survey of northern Jordan the late 1960s (Mittmann 1970: 6). In 1990 it was the subject of an MA archaeological and ethnographic thesis, published very recently by the author, al-Muheisen (al-Muheisen 2008: 119-188). The Department of Antiquities did preliminary fieldwork in the village in 1999, 2000 and 2002, with surveys that focused on the northern fields and the village center, as well as small-scale excavation of the Shaykh Khalīl shrine in the village proper in 1999. The results of these efforts appear in unpublished reports in the DoA archives in Amman (al-Bataineh and al-Naqrash, n.d.; Hawadineh and al-Naqrash, n.d.; al-Naqrash, n.d.). What was not covered by this fieldwork was a systematic survey of the southern fields or multi-disciplinary research, ethnographic interviews in the village excepted. The 2010 season drew from this work and expanded it, as was appropriate for the design of the larger Northern Jordan Project.

The goals of the brief, two-week season, conducted between 15 and 28 June, were quite specific: to document the settlement history of the village, begin to map the ways in which the physical village has changed over time, describe land use historically, identify ancient field and water and transport systems, and investigate locations in the village that could possibly be the Mamluk tower and Ottoman-era garrisons noted in written sources and by local residents. The team this season consisted of 20 faculty, students and staff from Missouri State and Yarmouk Universities, as well a phytolith specialist (Ms Sophia Laparidou, of University College London) and a geomorphologist (Dr Bernhard Lucke, of Erlangen University in Germany). The strong soil sciences component of our team this year allowed us to more fully explore our environmental history objectives and to experiment with data collection strategies. We innovated, as well, in our methods of data recording, opting for a largely paperless survey (recording directly into data forms on Blackberries) – a novelty for Jordanian archaeology. Fieldwork proceeded according to the model adopted in previous seasons. Four simultaneous surveys were thus run in tandem with one another: an archival project, an ethnographic survey, the more or less traditional archaeological survey with surface collection of ceramics and lithics, and a multi-faceted environmental survey. The following report summarizes the preliminary results of each of these.

2010 Case Study: The Village of aṭ-Ṭurra

The Village in Historical Perspective (Bethany Walker)

Traditionally part of an important grain-producing region of the southern Hawran, aṭ-Ṭurra gained economic and military importance in the Mamluk period, its lands supporting religious institutions in Damascus (specifically the mosque - *madrasah* complex of Sultan Baybars in Damascus and his *khān* in Jerusalem in the 13th century) and a tower for fire signals built there in 1418 as part of a system of communications on the Mamluks' eastern frontier (al-Yunini 1961: 248; Ghawanmeh 1982b: 61, 1982a: 72; al-Muheisen 2008: 151). Unlike many of the villages of central and southern Jordan, aṭ-Ṭurra continued to be settled after the Ottoman conquest in 1516. Over the course of the 16th century, its lands collectively became a family endowment (*waqf*) and then a land grant for an Ottoman officer (*timar*), the revenues consisting of taxes on primarily wheat but also barley, some summer crops, and goats and beehives. By century's end, it had a population of some 98 families and 40 single men, all Muslim (Hütteroth and Abdulfattah 1977: 123; al-Bakhit 2008: 171, 186).

There is a lacuna of textual sources for the

17th and 18th centuries, so the status of the village cannot be gauged for the Middle Ottoman period by the written record alone. Sitting astride the Ottoman *ḥajj* route likely brought aṭ-Ṭurra great benefits, and it is likely that settlement continued here unabated. In the early 19th century, when many historically known villages throughout Jordan (even in the north) had disappeared from the map, aṭ-Ṭurra was a steady presence. Both Burckhardt (in 1812) and Buckingham (in 1816) passed through, acknowledging this village on the Damascus – Mecca pilgrimage route. Burckhardt, travelling with a pilgrimage caravan, noted that the village was situated on a "low chain of hills" and that it was surrounded by grassland (apparently not cultivated - Burckhardt 1822: 246). Buckingham counted 300 households there – a not insignificant number for a Transjordanian village of the time (Buckingham 1825: 161). In 1854, as a result of the 'grain boom' that pushed local products to international markets, the village had become a 'colony' of the district capital at Dar'a, and there were active efforts to move families there to further develop it. Local *bedouin* told the Prussian consul of the time in Damascus, Wetzstein, that it was "the most important place of al-Nuqra" (a low-lying region of the southern Hawran - Wetzstein 1860: 84-5; Lewis 2000: 39). Some of our most detailed descriptions of the century are provided by Schumacher, who was contracted to do a survey of the region to lay railroad tracks as part of the German - Ottoman investment in regional infrastructure. His accounts, based on trips to the region in 1884, 1891 and 1897, describe the following: (1) it was a "good-sized village on the *ḥajj* road", which was generally well maintained (Schumacher 1886: 1999), (2) a telegraph passed through in 1891, but there was no station in aṭ-Ṭurra (the nearest one was at Shaykh Sa'd - Schumacher 1893: 73 and Map 1; Schumacher 1897: 112), (3) the village was serviced by several roads (in addition to the *ḥajj* route), including the main road connecting 'Ajlūn with the Hawran (this was an old Roman road still in use then), a 'new' road for trade leading to al-Mafraq, and the main trade artery for the region - another Roman road connecting aṭ-Ṭurra with ar-Ramthā and Irbid and leading caravan traffic westward to the Mediterranean ports of Acre and Haifa (Schumacher 1913b: 128) and (4) the markets at nearby Dar'a and ar-Ramthā provided ready access to a variety of goods (Schumacher 1897: 103-4). The village at the end of the century was home to 120 households (approximately 500 people), and was serviced by numerous large cisterns for water storage (Schumacher 1897: 131)[5]. Schumacher describes this region of the Hawran as treeless and generally empty of population, with the exception of a handful of villages connected by well travelled roads; aṭ-Ṭurra was among these.

What foreign travelers did not note in their accounts, and about which they were probably unaware, was the mobility of residents in the 19th century and the fluidity of village borders. Farmers regularly moved back and forth between villages in which they had traditional claims (and eventually officially registered ownership) of land, and this pattern continued well into the British Mandate era. To cite only one example, in 1922 AD an immigrant from the Salihiyya quarter of Damascus settled in aṭ-Ṭurra to marry there (Abu Sha'r 1995: 98). Physical mobility created competing land claims. As early as the mid-19th century, administrative documents attest to land disputes in the village by families resident outside the village proper. One such document, for example, describes an extended dispute between the Hashish clan of Tall Shihab in the Hawran and the Darabiseh clan in ar-Ramthā, both of whom laid claim to the same land in aṭ-Ṭurra from 1857 to 1865 (al-Jaludi 1990: 351, cited in Fischbach 2000: 44).

With the registration of local farmland in the late Ottoman era, land changed hands frequently. This process gained momentum with the passing of an Ottoman law in 1912 that authorized the sale and mortgage of farmland throughout its empire in payment of debt (Abu Sha'r 1995: 402). By the mid-1920s, loans of this kind resulted in a land crisis in the village: the newspaper "al-Sharq al-'Arab" regularly advertised local land for sale at public auction during the years 1926 and 1927 (Abu Sha'r 1995: 422-3). These exchanges created larger estates run by

5. The population had apparently dropped from the *ca.* 300 households estimated by Buckingham in 1816 (Buckingham 1825: 161).

landowners in ar-Ramthā and Irbid or further afield from Damascus. At the same time, several local proprietors in aṭ-Ṭurra came to acquire numerous lands and shares in lands in villages throughout the Irbid District and beyond. Documentation to this effect was identified in the archives of the Department of Lands and Surveys in Amman during research on the registration, transfer and use of village land during the British Mandate (1920s - 1940s) period. The *daftar ad-dabt* and *daftar ar-rahn wa fakk ar-rahn* files of Qaḍā' 'Ajlūn record land sales and mortgages. They include information on land borders, prices and the names of proprietors and leasees, and as such serve as an invaluable window on changes in Jordanian village life and the rural landscape during the emergence of the modern state. In previous seasons the NJP has made use of the *Asasi Yoqlema* (formal registration of land for tax purposes) to map, in a general way, old field divisions and compare them to modern ones[6]. These registers are hand-written in Arabic and Ottoman Turkish and document how the land was used, how much it was worth and where the new landowners came from. Collectively these late Ottoman and British Mandate-era registers obliquely describe movements of people that can shed light on the settlement fluctuations suggested by the archaeological record. What impact the land transfers of the 19th and early 20th centuries had on land use is part of an on-going study by the Project.

Unlike the registers studied previously for Malkā and Ḥubrāṣ, the files for aṭ-Ṭurra are later, beginning only in 1925. These are essentially documentation of the mortgage of land, which resulted in the development of some extensive landed estates in northern Jordan by regional elites. A preliminary reading of the documents suggests growth in the physical village and its lands from the 1920s to 1940s, as well as describing the familial and economic relationships between this village and others in the Irbid region.

In the 1920s, shares of local land were leased at a set price (generally ranging from 30 - 60 *lira*), for a set number of months (usually 10 - 20) to individuals and family groups living in Irbid. The farmland appears to have been located in the immediate vicinity of the village and bordered by the roads to ar-Ramthā and ash-Shajarah, as well as by other private land (DLS.ATR.Dabt - entries 34 and 38; Abu Sha'r 1995: 413, 416, 417). Over the course of the 1930s and 1940s the leasees included people from villages as close as ash-Shajarah and as far away as the city of Beirut. Local land was increasingly rented to neighbors in at-Ṭurra. An important trend in this period was the building of landed property in villages throughout northern Jordan. In one case (DLS.ATR.Rahn - entry 331) the property owner (leaser) also held land in ar-Ramthā, Ḥarthā, Ḥubrāṣ, Samā, al-Qum and Kharjā; in another, the land owner in aṭ-Ṭurra held title to land in nine different villages and towns in the region (DLS.ATR.Rahn - entry 579). The most striking example of this trend was a group of landowners from the family in aṭ-Ṭurra who collectively claimed farmland in ar-Ramthā, Ḥubrāṣ, Kafr Sūm, Kharjā, Marw, 'Anbā, Ḥawāra, Kafr Yūbā, Bayt Rās, Saḥam, Bayt Yāfā, Samā, Kafr Jāyiz, aṣ-Ṣarīḥ, Kafr Raḥta and numerous plots in aṭ-Ṭurra (DLS.ATR.Rahn - entries 598, 599, 603, 604, 639, 650, 651, 652, 667, 668, 694). In terms of archaeological relevance, these registers bear witness to a real physical and economic mobility in the NJP study region in the late 19th and early to mid-20th centuries, the village of aṭ-Ṭurra fully participating in the land purchases, sales and leases recorded therein. The economic and social ties the village had with other settlements in northern Jordan, southern Syria and Lebanon illustrated here provide a backdrop for understanding trends in the archaeological record related to settlement history, distributional patterns of material culture and agricultural developments.

The Village Today (Based on a Report by Mohammed Shunnaq)

In spite of land transfers earlier last century, demographically the village has changed little from the late Ottoman and British Mandate periods. Interviews with the village Mayor and staff of the Municipality office provided information regarding the origins of several of the families

6. The extant *Asasi Yoqlema* series for Jordan begins in 1876; aṭ-Ṭurra is not mentioned in this early series, suggesting that land registration began later in this village than in others previously investigated by the NJP.

of the modern village, many of them having moved there from what is today Syria, Lebanon, the West Bank and Egypt. The population of aṭ-Ṭurra today is largely defined by eight major clans, which include the Darabiseh (comprised of the lineages of Hijjiah, Judeh, Samarat, Barakat and Arshaydat), Ramadan, al-Hayek, al-Janaydeh, Hijazi, Hannawi, Girba' and Sukhni. Other clans include al-Goor and Khateeb (from Syria), Hamarneh and Gabha (from Palestine), Fardous (from Lebanon), al-Masri (Egypt), Shiyyab (from aṣ-Ṣarīḥ, in Irbid governorate), the Smeiraan and al-Kaldi (*bedu*), and the Sme'aat and Khabuur. In 1899 the Darabiseh, Ramadan and al-Janaydeh clans together either built or repaired the former 'Omari mosque in the village, according to an architectural inscription (al-Naqrash n.d.: 5).

The interviewees described a modern land use that is very similar to that of the past: a predominantly rain-fed regime with a limited number of fields irrigated by privately owned subterranean wells. Continuing work by Project staff is comparing cropping practices and field boundaries described by informants to that alluded to in the land registers, documented in aerial maps and suggested by environmental analysis (see below).

The Archaeological Survey (Based on a Report by David Byers)

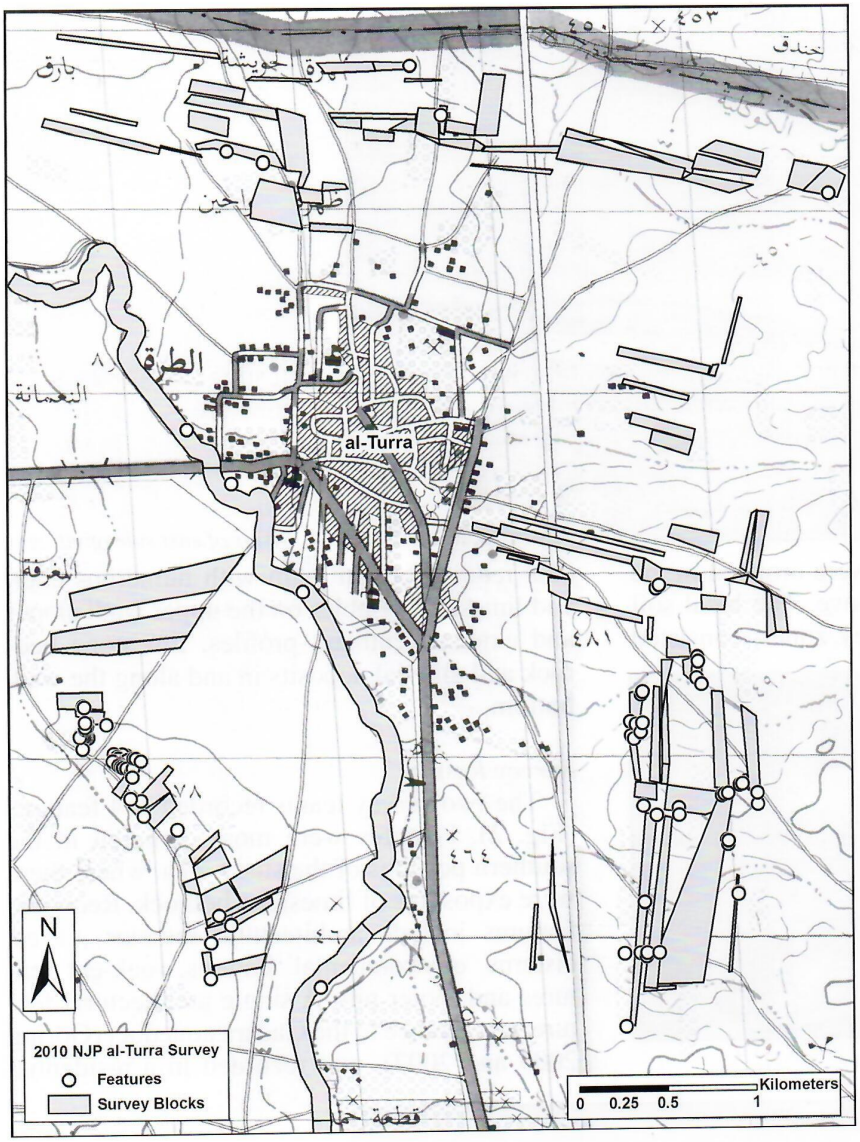
The core of the Project this season consisted of a traditional archaeological survey. A total of 106 separate survey parcels totaling approximately 291 hectares was inspected through pedestrian survey (**Fig. 2**). These include agricultural fields and olive groves to the north-west and north-east of the village of aṭ-Ṭurra and directly south of the Syrian border, as well as survey blocks to the south-west and south-east of the village. The 2010 survey also included a 100 m wide corridor centered on the portion of a large wadi that flows within the village boundaries. The goals of these investigations comprised the identification and mapping of cultural features and surface collection of temporally diagnostic ceramics.

Two survey teams surveyed the selected parcels within the village boundary. Survey parcels were identified on the basis on ground cover and were mapped on the 1999 1:25,000 aerial photo of the village by the Royal Jordanian Geographic Center. To survey each parcel, crew members were spaced at *ca.* 15 m transects, and parcels were walked from one end to the other. Parcel corners and feature locations were recorded with Magellan Sport Track Map handheld GPS units, and this data was entered into an Excel database at the end of each day. Descriptive information about features and sites were entered into database forms packaged in smart phones for download to laptops back at camp[7]. The survey teams collected 100 % of all ceramics in each parcel. In addition to the ceramics, a grab sample of lithics was recovered from the 13 parcels in the north-west portion of the study area. Owing to the ubiquity and generally non-diagnostic nature of the stone artifacts, surface collection of these items was subsequently terminated for the remainder of the project.

The northern portions of the survey area focused on agricultural fields and olive groves (**Figs. 3 and 4**). The local terrain included a gently rolling landscape covered with summer season crops – including olive groves, wheat, cucumber plots and potatoes – and fallow fields. These were often arranged in an alternating fashion, and although olive groves were found throughout, they were almost always encountered on the hill tops. Survey was conducted only in olive groves and fallow fields, and within these areas ground visibility ranged from 75 to 100 %. Wheat fields and vegetable gardens were avoided so as to not harm crops.

The southern survey area focused on agricultural fields located along several low ridgelines, consisting of a series of low north - south trending hills (**Figs. 5 and 6**). The local terrain to the west included a series of low hills and an otherwise gently rolling landscape planted in the same fashion as the north sector. To the east, the terrain was rockier than the area to the north and west. Throughout the southern project area, survey targeted the plowed earth in the olive groves and fallow fields where ground visibility ranged from 75 to 100 %. Extensive bedrock outcrops

7. These forms are electronic forms in Word format, adapted to mobile phone use and based on the survey forms used by the Madaba Plains Project (Herr *et al.* 1998).



2. *Map of survey parcels and feature locations.*

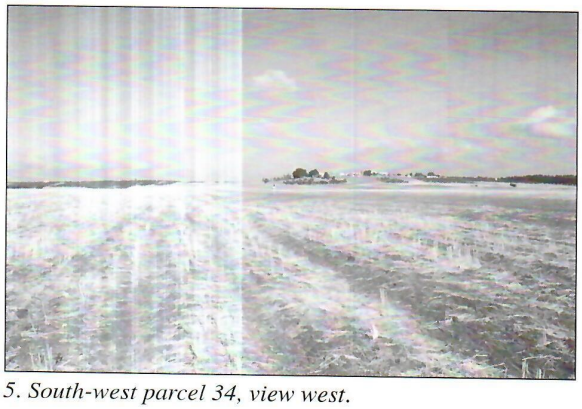
3. *North-west parcel W11, view west.*

also distinguished the lands to the south, where numerous caves and other rock-cut features were recorded. In addition to surface collection, survey in the south-eastern portion of the study area also sought to locate two sets of features visible in aerial photos: one potentially a road, and the other boundaries for ancient fields. Pedestrian survey failed to find evidence of either.

The final survey zone centered on the large wadi that flows north - south along the western margin of the built-up area of the village (**Fig. 7**). This survey area included a corridor *ca.* 100 meters wide and covered *ca.* 6.2 km of the wadi from the southern to the eastern boundaries of the village lands. The terrain included the steep slopes of the incised wadi, as well as the wadi bottom. Agricultural fields were encountered to

4. Fields of east side of village.

either side of the wadi and were cropped in the same manner as the hills above. The local soil matrix, as in the other survey zones, consisted of a reddish brown loam with numerous chert and limestone cobbles on the upper wadi slopes and exposed cutbank profiles, limestone bedrock and alluvial deposits in and along the wadi bottom.



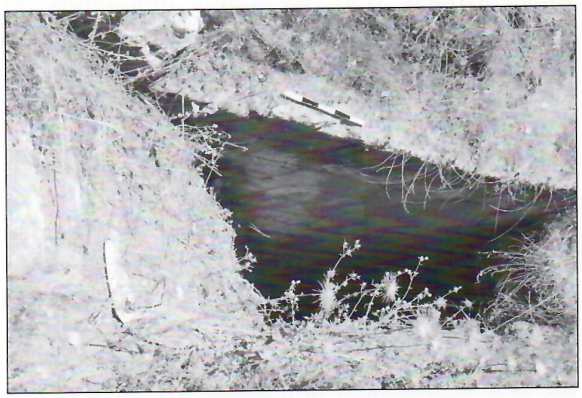
5. South-west parcel 34, view west.

Survey Results

The two survey teams recorded 114 features (**Fig. 2**). Features were more common in the southern portions of the study area, where there were exposures of limestone bedrock. Recorded features include architectural remains, caves, cisterns, environmental features, rock-cut features and looter pits. A single architectural feature, an entrance to the Gadara aqueduct (Göring 2005 and 2007), was recorded in a residential

6. South-east survey area.

7. Wadi overview, view north.



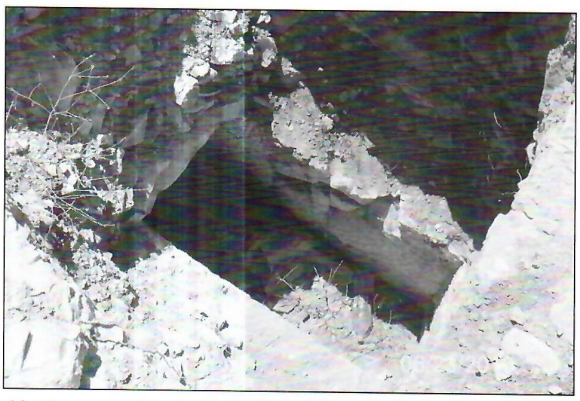
8. Entrance to Gadara aqueduct.

9. Feature 92, cave entrance (water collection drain).

10. Feature 44, cave entrance.

area along the south-western margin of aṭ-Ṭurra (**Fig. 8**). In addition to these were a number of caves, most within the southern half of the study area that include seven modified and 11 unmodified openings situated in the local limestone bedrock (**Figs. 9 and 10**). Most of these features were filled in with sediment, lacked any evidence of use beyond the presence of modern trash and will require test excavations to determine their cultural relevance. The survey teams also documented a number of cisterns and these included five ancient and 28 recent / modern water storage features. The cisterns likely dating to pre-modern periods ranged from rough circular shafts dug into the limestone substrate to deep (> 3 m) bell-shaped water storage features with plaster treatments to their interior surfaces (**Fig. 11**). Recorded environmental features include two dry stream beds that may have served to transport water to agricultural fields in the past. Rock-cut features represent another commonly encountered feature class. These include four cup holes excised into limestone outcrops, 26 quarry sites documenting the extraction of limestone building stones, one rock-cut step, one possible tomb, eight oil / wine presses and five

11. Feature 61, ancient cistern.



12. Feature 42, tomb previously investigated by the DoA.

13. Feature 62, wine or olive press.

unclassified rock-cut features (**Figs. 12, 13 and 14**). Many of these features occurred as clusters.

The survey teams observed both lithics and ceramics throughout the study areas. The small grab sample of lithics derive from what is best called a 'lithic landscape' that appears to characterize the region. Stone artifacts were commonly observed and these include unifacial flake tools, tested cobbles, irregular / expedient cores, blades, abundant debitage and numerous basalt groundstone fragments. This lithic phenomenon

14. Feature 100, quarry.

appears to document a widespread unifacial / flake tool industry that may represent Neolithic and Chalcolithic occupations in the area. In fact, lithic artifacts were seemingly ubiquitous on the ground within many of the survey parcels in the northern half of the study area. The recovered lithic assemblage totals 161 artifacts and these include 15 cores, nine blades, 61 modified flakes, two bifaces, 66 pieces of debitage and eight groundstone fragments.

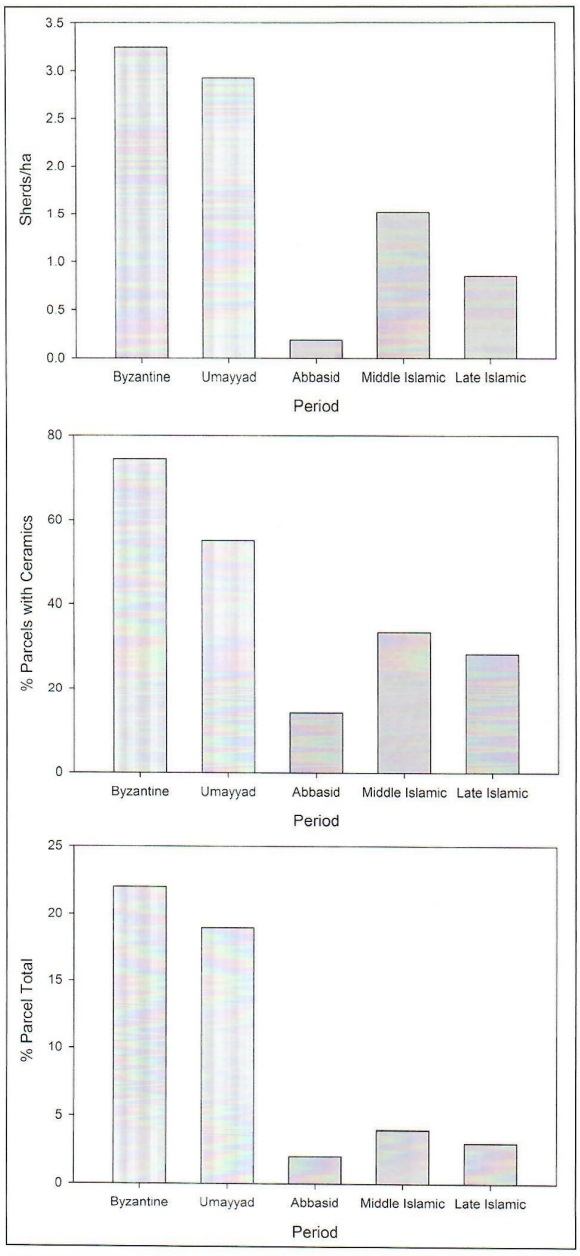
The NJP 2010 aṭ-Ṭurra survey recovered a substantial ceramic assemblage totaling 1423 sherds, recovered from 78 different survey parcels (**Fig. 15**). Within parcels producing ceramics, Early Islamic (7th – 12th century) ceramics are best represented in absolute frequency (n = 431), numbers of parcels (n = 65), mean sherds / ha (n = 5.19) and mean percent of individual parcel total (38 %). Within the Early Islamic assemblage, Umayyad ceramics (n = 255, 2.93 sherds / ha) are represented at far greater frequencies than those from the Abbasid period (n = 23, 0.19 sherds / ha). The Early Islamic ceramics are followed in decreasing frequency by ceramics from the Byzantine (n = 258, 3.25 sherds / ha), Middle Islamic (12th – 16th century: n = 129, 1.52 sherds / ha), Late Islamic (16th - early 20th century: n = 59, 0.85 sherds / ha) and Iron Age periods (n = 4, 0.02 sherds / ha).

Re-use of Space in the aṭ-Ṭurra Project Area

Several trends in the sherd data suggest a spatio-temporal pattern to the use of the agricultural lands within the study area. In fact, the data collected during the 2010 aṭ-Ṭurra project appears to document at least one temporal trend in the regional intensity of use within the proj-

15. Distribution of ceramics by period.

ect area. Assuming that sherd densities provide a reasonable proxy for occupational intensity, then the sherd / ha densities for each period outlined above suggest occupational continuity during two periods (**Fig. 16** top). The first includes a history of occupation from the Byzantine into the Early Islamic periods, with occupational intensity appearing to peak during the Late Byzantine and Umayyad transition. Sherd densities decline sharply during the Abbasid period, only to rebound again and then hold steady through the Middle and Late Islamic periods, although at lower numbers than during the preceding times. Likewise, the frequencies of parcels containing sherds from any given period mirror this pattern (**Fig. 16** middle). The numbers of parcels containing sherds are greatest for the Byzantine and Umayyad, lowest during the Abbasid and then rebound once again during the Middle and Late Islamic periods. While the temporal distribution of parcel use suggests a bimodal distribution in the numbers of parcels used across the past 1800 years, the average by-period, within-parcel sherd percentages are highest for the Byzantine and Umayyad periods (**Fig. 16** bottom). In other words, sherds from these two periods on average account for most of the ceramic assemblage from any given parcel. Conversely, the subsequent Abbasid, Middle Islamic and Late Islamic periods are, on average, represented at relatively minor levels within any given parcel. When viewed in sum, these three trends suggest that while there was a rebound in the numbers of parcels used after the apparent Abbasid period lull in the local occupational sequence, they were used much less intensively than during earlier times.



16. Sherd density and spatio-temperal pattenrs.

The data collected during the 2010 aṭ-Ṭurra project also allow for the recognition of patterns in the continuity of the intensity of use of individual parcels. The sherd / ha densities for all parcels during each period were ranked and then the rank orders were compared statistically to evaluate the hypothesis that parcels heavily utilized in one period, also experienced heavy use in preceding or following periods.

Our analysis of the spatio-temporal distribution of ceramics with the study area suggests a three-part occupational sequence initially focused on the north. Sherd densities, numbers of parcels used during various periods and the relative abundances of temporal diagnostics together suggest that the heaviest occupation for the area during pre-modern times appears to have occurred during the Byzantine and Umayyad periods. Moreover, fields in the northern portion of the survey area were used more intensively during the Byzantine era, while during following periods sherd densities were more spatially homogeneous across the entire project area. The intensity of field use falls during the Abbasid period, only to rebound once again, although not to the same levels as seen at the beginning of

the sequence. A comparison of individual parcel uses mirrors this trend. Our data indicates that the greatest levels of continuity in parcel use occur across the Byzantine / Umayyad and Middle / Late Islamic period boundaries. The ceramic evidence, in short, suggests no significant abatement in occupation or land use from the 16th century onwards, in contrast to other parts of the country. In contrast, the Abbasid period displays less continuity with either the preceding or the following periods and this time may represent a period of spatial, social and political reorganization in the aṭ-Ṭurra region.

Remnants of the Historical Village

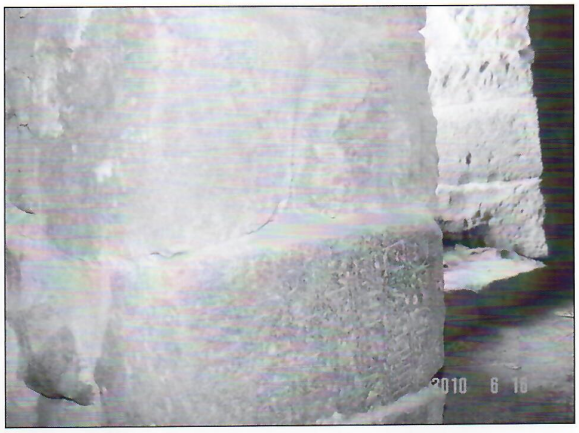
As in many villages of northern Jordan, heritage buildings in aṭ-Ṭurra are quickly disappearing. No trace could be found of the Mamluk tower mentioned by medieval Arabic chroniclers; the most likely location for it would be on the highest hill in the village, now occupied by the former village cemetery. The hewn basalt blocks used in the cemetery appear to have re-used building blocks from an earlier structure. Likewise, an Ottoman guard house, bulldozed to build a home, and the 'Omari mosque, which was either built or repaired in 1899 and was documented by the DoA survey of 2002 (al-Naqrash n.d.: 5), no longer remain. Systematically recording heritage structures remains a priority of the NJP.

The Architectural Survey (Based on a Report by Muwafaq al-Bataineh)

Concurrent with the archaeological survey, a component of our team from Yarmouk University conducted an ethnographic survey in the village, documenting the oldest standing architecture (19th century in date) and interviewing village officials and elders with the longest collective memory of the village. Such surveys have been done in each NJP season and have as their goal describing the physical and functional transformation of the village and its agricultural and pasture lands from the late Ottoman period until today. They also support the Project's commitment to systematically recording historical buildings and, where most needed, making plans to facilitate their conservation and restoration. Modern development and looting are rapidly erasing the last vestiges of the historical village. In the decade that has passed since the DoA surveys and excavations until now, two historical buildings have disappeared and robbers' pits have effaced ancient fields and cave systems.

The village-wide architectural survey of the oldest standing architectural structures built on the documentation and fieldwork done by the DoA a decade ago[8]. The Maqām Shaykh Khalīl, a masonry shrine built in the late 19th century, was photographed, drawn and studied in detail (**Fig. 17**). A basalt stone re-used at the base of a wall pillar inside the doorway of the shrine bears an inscription in Egyptian hieroglyphics and dates to the reign of Pharaoh Ramses II (**Fig. 18**). The construction from which this was originally taken has not been identified in aṭ-Ṭurra but may have been transported there from

17. View of Maqām Shaykh Khalīl, facing south.

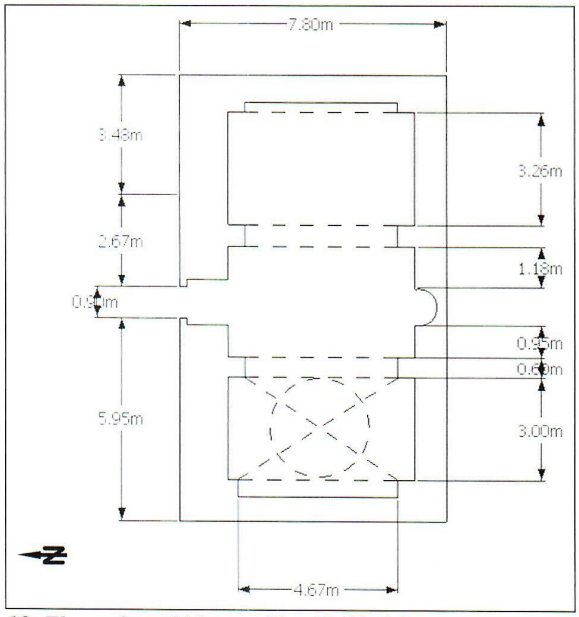


18. Hieroglyphic stone re-used in Maqām Shaykh Khalīl, facing north-east.

8. Exploratory probes were excavated inside and outside this structure by the DoA in 2000 (Hadawineh and al-Naqrash n.d.).

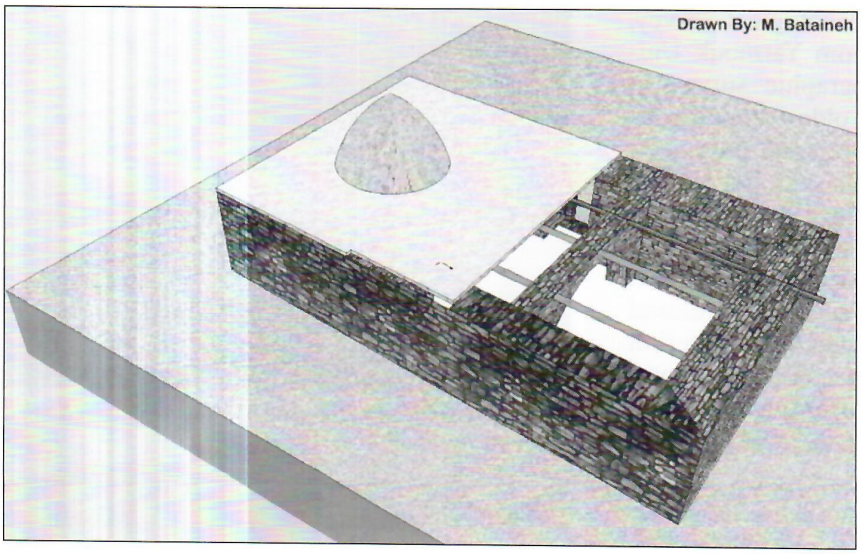
ash-Shihab, 5 km away (Wimmer n.d.). While the results of the excavations in 1999 were inconclusive in determining the date of original construction, the floor plan (**Fig. 19**), design of superstructure and building techniques (**Fig. 20**) all point to the Ottoman era (late 19th - early 20th century AD). The construction of long, rectangular buildings covered by a tri-partite superstructure – the latter produced by a combination and barrel and cross-vaults (supported by engaged piers), and domes (of various forms) – is a familiar one in northern Jordan during this period (**Fig. 21**) (McQuitty 2004: 259). The pebble floor and portable *minbar* are other characteristics that bind the Shaykh Khalīl shrine to this tradition. The Saḥam mosque studied by the NJP during the 2006 season exemplifies, as well, many of these traits (Kenney in Walker *et al.* 2007: 433-435).

Our architect examined two other historical buildings in the village - Maḍafat Ayed Samarra (**Fig. 22**) and Qirbā' House (**Fig. 23**) – in conjunction with ethnographic interviews with village elders. The first, a *maḍafah* (or public rest house), traditionally provided a place to stay for travelers and visitors and was financially supported by either the entire community or a wealthy local patron. This particular rest house was built, according to the interviews, in 1938 by Basheer Ershaidat, a local master mason. The Qirbā' House, dated by its building inscription to 1350 H (or 1930 AD), was constructed of finely

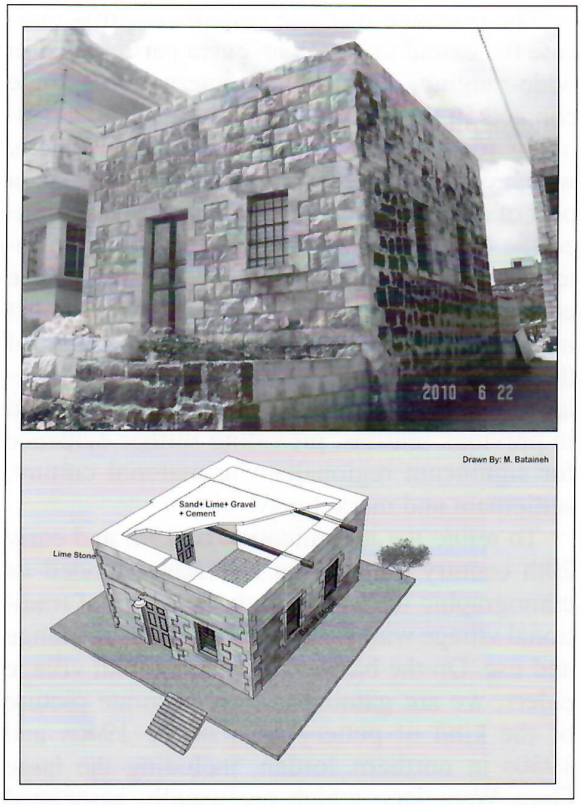


19. Floor plan of Maqām Shaykh Khalīl.

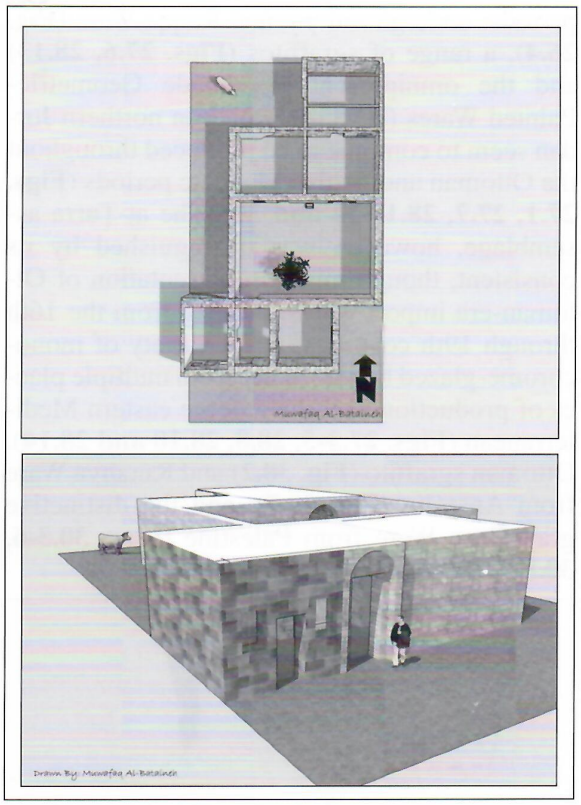
21. Interior of Maqām Shaykh Khalīl - note barrel vaults supported on engaged piers, miḥrāb to right.



20. Computer drawing of Maqām Shaykh Khalīl - note mixed construction of limestone and basalt.



22. Photo and computer drawing of Maḍafat 'Ayed - note mixed limestone - basalt construction and iron rebar-reinforced cement roof.



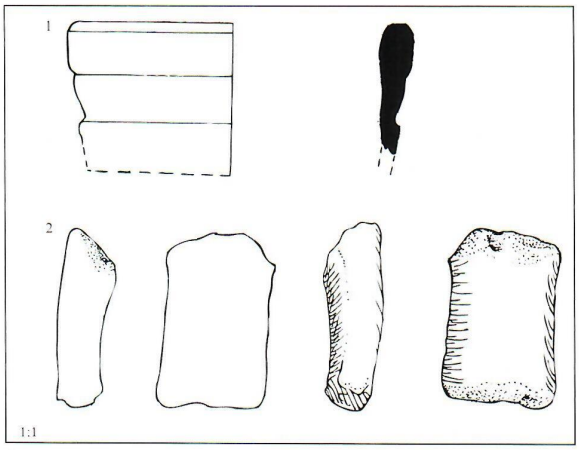
23. Computer drawings of Qirbā' House, aerial and frontal views.

worked basalt stone imported from Syria and carried to aṭ-Ṭurra by camels, at the cost of 5 piasters per stone. 3D computer-generated images of these buildings, adopted for this first time in the NJP this season, documented information regarding construction techniques and building materials, information that we are using to develop a database of traditional building styles in northern Jordan for dating purposes. Together, these preliminary studies suggest a level of wealth and economic integration with the rest of Syria during the British Mandate period and provide a foundation on which to build future studies of traditional architecture. A database and architectural survey forms are being developed for the next field season to further the documentation and study of heritage architecture.

Ceramics Analysis (Figs. 24 - 33) (Bethany Walker)

It became clear in previous NJP seasons that the material culture of northern Jordan differed significantly from that of the rest of the country, so extensive ceramic analysis has been a priority of the project from the start. In 2010, all sherds – as in every survey season – were surface-collected from each plot and read daily. While the ceramic analysis is still underway, we can make a few general statements about the corpus. The majority of the sherds ranged in date from the Late Byzantine to Mandate eras, with particular concentrations in the Late Byzantine and Umayyad periods. Vessel forms were dominated by jars (table wares and storage jars) and bowls. The most characteristic wares of each period were identified on survey, attesting to settlement, transport and economic exchange throughout the Late Antique and Islamic eras. African red slip, painted wares, combed jars and ridged amphorae constituted the bulk of the Byzantine-era assemblage (**Fig. 25**). Among the most typical wares of the Early Islamic era were Umayyad and Abbasid painted pottery (**Fig. 26.3**), Abbasid mold-impressed bowls (**Fig. 26.2**) and Iraqi Abbasid splashed glazed ware (**Fig. 26.1**). The Middle Islamic pottery was reminiscent of a Syrian assemblage of the Ayyubid and Mamluk

periods: underglazed-painted Raqqa Ware (**Fig. 26.4**), a range of sgraffitos (**Figs. 27.6, 28.13**) and the omnipresent Handmade Geometric-Painted Wares (HMGP), which in northern Jordan seem to continue to be produced throughout the Ottoman and British Mandate periods (**Figs. 27.1, 27.7, 28.11-12 and 30**). The aṭ-Ṭurra assemblage, however, was distinguished by its consistent, though minor, representation of Ottoman-era import wares, ranging from the 16th through 19th centuries, *viz.* a variety of monochrome-glazed bowls, likely from multiple places of production in Syria and the eastern Mediterranean (**Figs. 27.3-5, 28.8, 28.10 and 28.14**), Ottoman sgraffito (**Fig. 30.2**) and Kütahya Ware from Anatolia (**Fig. 30.7**), and the distinctive gray Gaza Ware from Palestine (**Figs. 30.3-6, 30.8-9, 31.10, 31.12-14 and 32**).



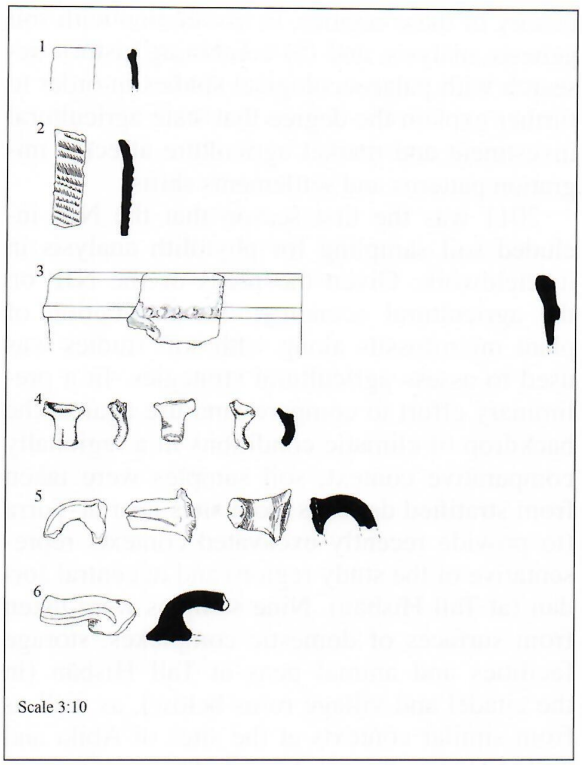
24. Pre-Medieval pottery from aṭ-Ṭurra survey.

The presence of these ceramic imports indicate the extent to which aṭ-Ṭurra participated in wide-ranging regional and international trade contacts in the later Islamic periods. The developing road networks of the late Ottoman era, which connected aṭ-Ṭurra to the Mediterranean port of Acre and markets of Damascus, facilitated the distribution of ceramic imports from international markets to the Hawrani interior. The ceramic assemblage as a whole is quite distinct in terms of fabric and chronology from that of the Madaba Plains, for example, and very similar to other sites in the NJP study area analyzed in previous seasons, providing further evidence for significant regionalism in material culture, settlement and market networks.

To refine the identification of 19th and early 20th century pottery, the NJP has extended its ethnographic work to include the study of traditional village wares – their production, exchange and use. On the basis of interviews with village elders, we are gaining a more accurate picture of the kind of pottery used in the 1940s and 1950s in northern Jordan, including the large Gaza Ware jars, which are usually associated with 19th century Palestinian production, and monochrome-glazed jars used to store honey and butter (**Fig. 34**)[9]. Fragments of such vessels are regularly encountered on archaeological surveys in the region, and more complete vessels can also be found in the ruins of Mandate-era farmhouses that are quickly disappearing from the villages of the study area.

No.	Registration	Ware	Form	Fabric	Published parallels
1	NJP10.EP069.88	plain, wheel-made	store jar	(surfaces) 7.5 YR 6/3 (light brown); (fabric) semi-coarse with small-medium white & black inclus; 7.5 YR 6/6 (reddish yellow), with light gray core	Iron II fabric; (form) Tall al-Sa'īdiyyah – *Pritchard 1985: Fig. 14.6 (Iron II)
2	NJP10. WP036.102	coarseware	jar	(fabric) semi-coarse with small-medium white & limestone incls; 7.5 YR 6/6 (reddish yellow)	Iron II fabric
*I am grateful to Larry Herr for this reference.					

9. The informant in this case was the owner of the Qirbā' House, aged ninety-five, who received these vessels as part of her dowry in the 1940s.



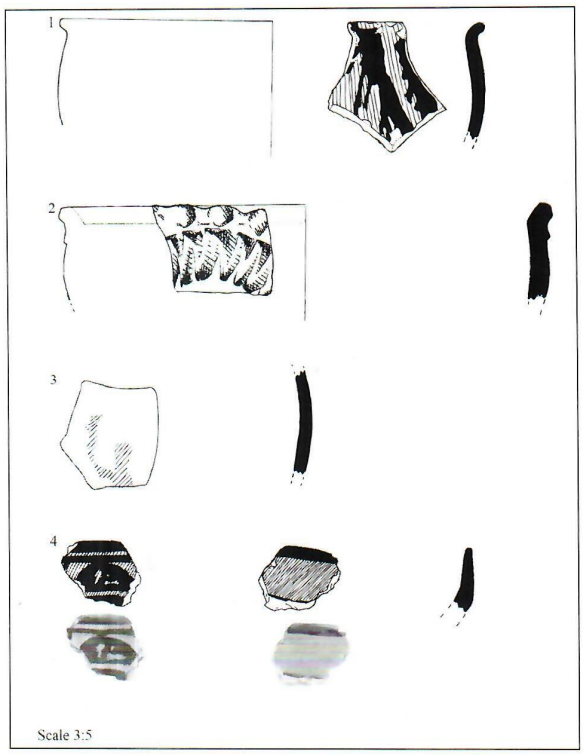
25. Byzantine and Early Islamic pottery from aṭ-Ṭurra survey.

The Environmental Survey (Based on Reports by Sophia Laparidou and Bernhard Lucke)

Phytolith Analysis

Environmental and palaeoecological studies have been incorporated in most of the field seasons of the NJP study area. This season a more comprehensive and multi-faceted study of land use, based on archaeological survey, the study of historical documents, and microfossil and soil chemistry analyses, has been combined with study of the phytolith record in an effort to address multiple research questions related to cropping, diet and climate (the latter when combined with pollen and geomorphological analyses). Among these are: (1) an understanding of imperial agricultural policies through identification of cropping practices applied in the sites under study, (2) identification and measurement of the fluctuation of yield of villages throughout the periods of study, (3) cross-referencing historic documentation with palaeoecological research regarding developments in agricultural strategies and cropping patterns of these sites from Mamluk to the British Mandate periods, (4) identification of the human factor affecting the environmental

No.	Registration	Ware	Form	Fabric	Published parallels
1	NJP10.WP016.89N	plain, wheel-made	jar	2.5 YR 8/2 (pinkish white), fine with small black and white incls.; fitted with a rim ledge for a lid	
2	NJP10.WP016.89G	plain, wheel-made	amphora	2.5 YR 7/6 (light red), fine with small red, white, and black incls; Venetian blinds-style external ribbing	Late Byzantine
3	NJP10.EP005.47	handmade	basin	(surfaces) 5 YR 5/1 (gray); (fabric) 5 YR 5/6 (yellowish red); ext. with thumb-impressed ridge below rim	Early Abbasid - Khirbat Yājūz – Khalīl and Kareem 2002: 125, Fig. 11.7
4	NJP10.WP017.19	wheelmade fineware	amphora	(surfaces) 2.5 YR 5/8 (red); gray core; (fabric) fine with possible mica incls.	Early Byzantine – Saraçhane – Vroom 2005: 60, Fig. 16.1
5	NJP10.WP016.89K	plain-wheel-made	amphora	2.5 YR 7/6 (light red), fine with small red, black, and white incls.	Early Islamic fabric
6	NJP10.WP032.90	coarseware	jar	(surfaces) 10 YR 5/2 (grayish brown); (fabric) 5 YR 6/6 (reddish yellow), coarse with small calcite and black incls.	



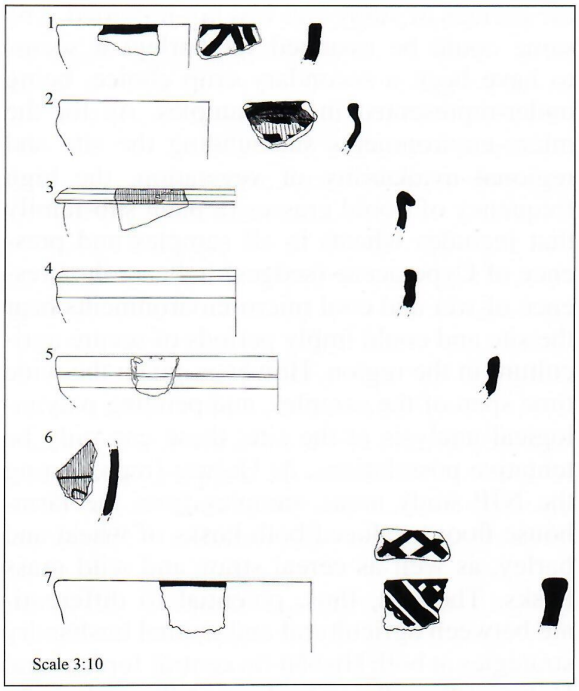
26. Early Islamic pottery from aṭ-Ṭurra survey.

history of these regions, in association with soil genesis analysis, and (5) combining historic research with palaeoecological studies in order to further explain the degree that state agricultural investment and market agriculture affected migration patterns and settlements shifts.

2011 was the first season that the NJP included soil sampling for phytolith analysis in its fieldwork. Given the focus of the NJP on the agricultural economy, the distribution of plant microfossils along with soil studies was used to assess agricultural strategies. In a preliminary effort to compare land use against the backdrop of climatic conditions in a regionally comparative context, soil samples were taken from stratified deposits from sites near aṭ-Ṭurra (to provide recently excavated contexts representative of the study region) and in central Jordan (at Tall Ḥisbān). Nine samples were taken from surfaces of domestic complexes, storage facilities and animal pens at Tall Ḥisbān (in the citadel and village ruins below), as well as from similar contexts at the sites of Abila and Tall al-Ḥuṣun, near aṭ-Ṭurra[10]. These were com-

No.	Registration	Ware	Form	Fabric	Published parallels
1	NJP10.WP017.35	Iraqi splashed glaze	bowl	(ext) white slip; (int) glossy pale yellow glaze splashed with bright green glaze over same slip; (fabric) 7.5 YR 7/4 (pink), semi-fine with small white incls.	Abbasid – On ware, form, and distribution see Mason and Keall 1991.
2	NJP10.WP011.7	plain, wheel-made	basin	(surfaces) 5 YR 5/1 (gray), pie-crust rim form and mold-impressed design on ext; (fabric) 5 YR 5/3 (reddish brown), fine with few small black incls.	Early Abbasid – Yoqne'am – Avissar 1996: 128, Fig. XIII.82.2 (Abbasid); al-Muwaqqar – Najjar 1982: 313, Fig. 5.13 (mid 8th-mid 9th c.); Jarash – Schaefer 1986: Fig. 8.13 and 14 (Umayyad); Khirbat Yājūz – Khalil and Kareem 2002: Fig. 11.11 (Abbasid)
3	NJP10.WP011.11	painted, wheel-made	jar	(ext) faint trace of reddish purple painted floral pattern; (fabric) 7.5 YR 7/4 (pink), fine with small white and black incls.	Late Umayyad/Early Abbasid – Tall Jāwā – Daviau and Beckmann 2001: Fig.4.19 (early Abbasid)
4	NJP10.EP023.63	Raqqa Ware	plate	(surfaces) black-painted design under thick turquoise glaze; (fabric) fritware	Ayyubid (*Note: drawing scanned wrong – rim form is flanged) – Jerusalem, Armenian Garden – Tushingham 1985: Fig. 41.35 (Mamluk)

10. Ms. Laparidou wishes to thank the directors and staff of the Tall Ḥisbān (Profs Øystein LaBianca and Bethany Walker), Abila (Prof. Robert Smith, Mid-Atlantic University), and Tall Ḥuṣun (Prof. Zeidoun al-Muheisen, Yarmouk University) excavations, as well as the Department of Antiquities of Jordan, for permission to take surface samples from these recently excavated contexts.

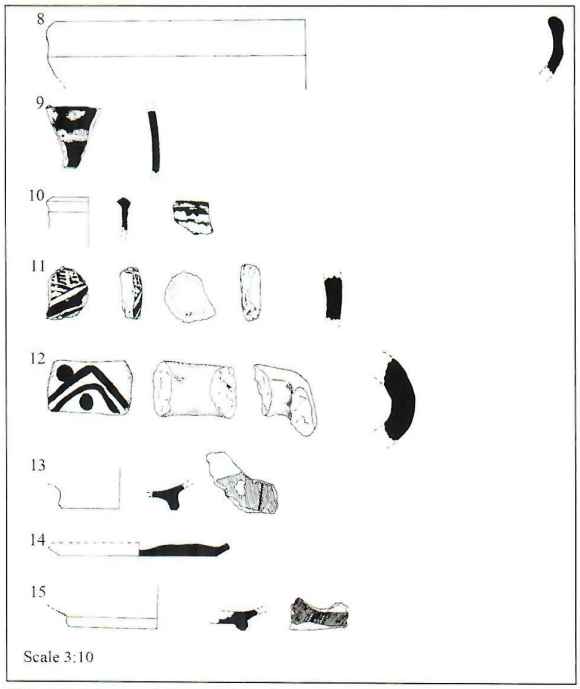


27. Middle and Late Islamic pottery from aṭ-Ṭurra survey.

pared to two representative soil samples from the 2006 NJP excavation at Ḥubrāṣ – extracted from surface and below surface loci in the Field B farmhouse – sent from the United States to the phytolith labs in London (**Fig. 35**). Collectively these contexts spanned the Byzantine to British Mandate eras, and the soils sampled were rich in phytolith remains. While analysis is still underway, a few preliminary statements can be made about this component of the laboratory work.

The phytolith samples examined this year have demonstrated great potential to provide information about agricultural activities and continuity of occupation and crop production (specifically wheat and barley) from the site of Ḥisbān between the Byzantine and Ottoman periods. In terms of cropping and diet, analysis of samples from all contexts and periods at Tall Ḥisbān attest that wheat remained the most common and important crop in the periods studied, and also that wheat production was local: the crop was cultivated on-site through

No.	Registration	Ware	Form	Fabric	Published parallels
1	NJP10.WP011.17	HMGP	bowl	(surfaces) yellowish-red (5 YR 4/6) painted design over pink (5 YR 7/4) slip; (fabric) 5 YR 7/4 (pink), coarse and sandy	Mamluk – For common forms and designs, see Franken and Kalsbeek 1975 (Jordan Valley)
2	NJP10.WP017.34	slip-painted	bowl	(surfaces) bright yellow glaze over white slip-painted design in interior (glaze extends over rim exterior); (fabric) 5 YR 5/8 (yellowish red), fine with few incls.	Mamluk – Horbat 'Uza – Getzov *et al.* 2009: 149, Fig. 3.26.5
3	NJP10.WP032.95	monochrome-glazed	bowl	(int) gritty olive glaze, continues over rim ext.; (ext) plain; (fabric) 5 YR 5/8 (yellowish red), fine with small white and black incls.	Ottoman – Tall Ḥisbān – Walker 2009: 147, Fig. 5.18.6 (poss. 19th c.)
4	NJP10.EP034.75	monochrome-glazed	bowl	(int) uneven, streaked pea-green glaze over thin white slip (continues down rim ext); (ext) otherwise plain, 10 YR 8/4 (very pale brown); (fabric) 5 YR 6/6 (reddish yellow), fine with small white, black, and red incls.	Ottoman
5	NJP10.WP009.3	monochrome-glazed	bowl	(surfaces) glossy, dark green glaze over white slip; (fabric) 7.5 YR 6/6 (reddish yellow), fine with few incls.	Ottoman
6	NJP10.WP017.31	sgraffito	bowl	(int) glossy, olive green glaze over white slip, incised design; (fabric) 5 YR 7/6 (reddish yellow), fine	Mamluk
7	NJP10.WP011.15	HMGP	bowl	(ext) thick white slip with chaff pocking; (int) reddish brown (5 YR 4/2) painted design over same slip; (fabric) 5 YR 6/4 (light reddish brown), coarse	Mamluk – as in #1



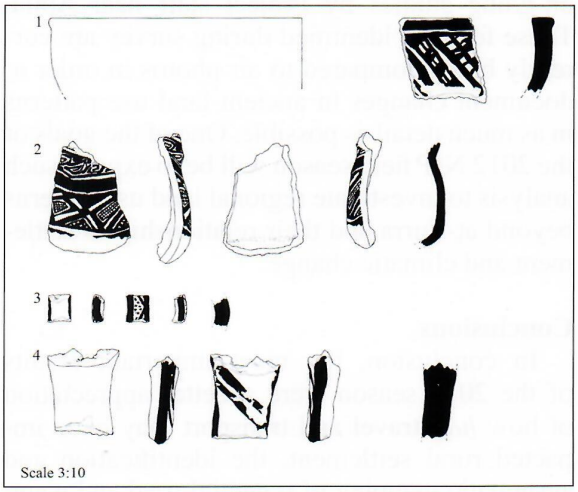
28. Middle and Late Islamic pottery from aṭ-Ṭurra survey.

the periods of study and was not imported. The same could be assumed for barley; it seems to have been a secondary crop choice, being under-represented in the samples. As for the micro-environments surrounding the site and regional availability of vegetation, the high frequency of Pooid grasses (a plant sub-family that includes wheat) in all samples and presence of Cyperaceae (sedges) indicate the presence of wet and cool micro-environments near the site and could imply periods of secure agriculture in the region. However, given the wide time span of the samples, and pending palynological analysis at the site, these can only be tentative postulations. At Ḥubrāṣ (representing the NJP study area), samples from the farmhouse floor produced both husks of wheat and barley, as well as cereal straw and wild grass husks. There is, thus, potential to differentiate between agricultural and animal husbandry strategies at both Ḥisbān (in central Jordan) and Ḥubrāṣ (in northern Jordan). Once analysis of

No.	Registration	Ware	Form	Fabric	Published parallels
8	NJP10.EP034.76	monochrome-glazed	bowl	(surfaces) dark green, glossy glaze over thick white slip; (fabric) 7.5 YR 6/6 (reddish yellow), fine with few small white and red inclusions	Ottoman
9	NJP10.WP006.1	glazedcoarse-ware	bowl/jar	(int) uneven, clear yellow glaze; (ext)10 YR 4/1 (dark gray), covered by splotches of white slip; (fabric) 7.5 YR 5/6 (strong brown), fine cooking fabric	
10	NJP10. WP032.96	monochrome-glazed	ibriq	(surfaces) olive green glaze over thin pink (5 YR 7/3) slip; (fabric) 5 YR 6/4 (light reddish brown), fine with few incls.	Ottoman – Saraçhane – Hayes 1992: 340, Fig. 106 (16th-17th c.)
11	NJP10.EP001.44	HMGP	jar	(int) plain; (ext) dark brown (7.5 YR 3/3) painted design over thin white slip; (fabric) 5 YR 7/6 (reddish yellow), coarse with small white and medium-sized black (river pebbles?) incls.	Mamluk – as in #1
12	NJP10.EP034.72	HMGP	jar	(surfaces) dark brown (7.5 YR 3/3) painted design over thick white slip on handle ext.; (fabric) 7.5 YR 6/6 (reddish yellow), coarse and poorly levigated	Mamluk – as in #1
13	NJP10. WP017.30	sgraffito	bowl	(int) pale yellow glaze over thin white slip, incised design, spot of green glaze; (fabric) 2.5 YR 4/8 (red), fine with few inclusions	Mamluk – (form) Malkā – Walker 2005: 14, Fig. 8
14	NJP10.EP064.84	monochrome-glazed	jar	(int) iron-speckled olive green glaze; (fabric) 5 YR 6/6 (reddish yellow), semi-fine with small white and black inclusions	Ottoman – (ware) Saraçhane – Hayes 1992: 272-4 (Ware B – 15th-mid 17th cs.)
15	NJP10. WP017.32	slip-painted	basin/ bowl	(int) green glaze over white slip-painted linear design; (fabric) 5 YR 6/6 (reddish yellow), fine with few incls.	Mamluk – Malkā – Walker 2005: 22, Fig. 13.5; Yoqne'am – Avissar and Stern 2005: 21, Fig. 7.8

the Abila and Tall Ḥuṣun samples is complete, we will be able to generalize trends of irrigation (or absence of irrigated regimes) during specific periods and thus imply drier periods or intensification of production.

In later stages of analysis, phytolith size measurements of multi-cell forms of wheat and barley will be considered as data for irrigation signals. Also, identification of more food crops (such as vegetables), possibly through starch analysis, will be helpful in exploring diversification of production and could give more information on local diet. This is an ongoing investigation that could imply risk- buffering strategies adopted against short drought events and can contribute to a better understanding of the agricultural strategies used by villagers and the government that facilitated continued settlement during periods of environmental stress. Further excavation in the NJP study area will provide more data to shed light on the different environments, ecologies and agricultural practices of northern Jordan.

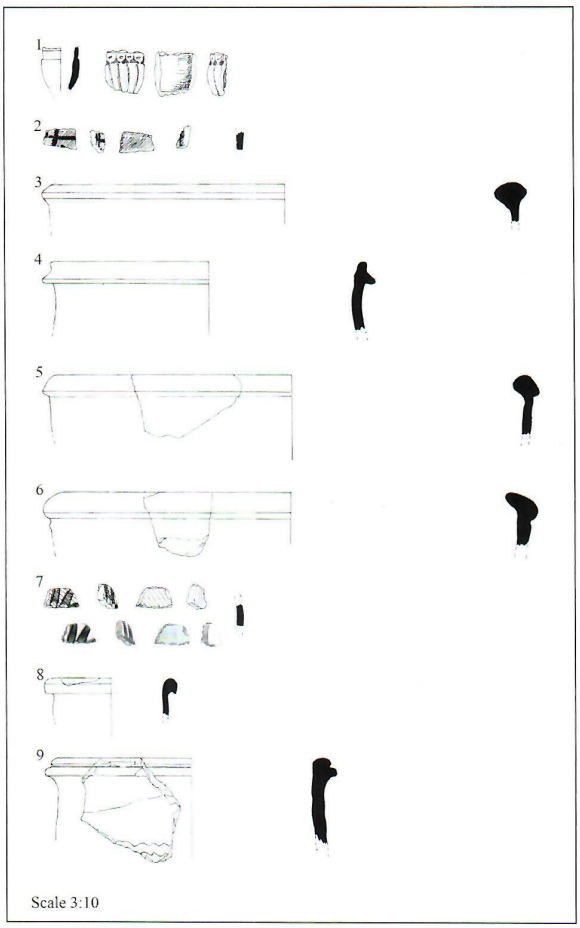


29. Handmade Geometric Painted Ware from aṭ-Ṭurra survey.

Soil Genesis Analysis

To complement to the phytolith study, soil development (soil genesis) analysis was conducted to document soil formation, erosion and landscape change against the backdrop of changes in land use and environmental conditions. To this end, soils from the same excavated contexts as the phytolith study (namely Abila and Tall Ḥisbān), as well as naturally visible soil profiles in the study area, were compared. In addition to the more traditional method of studying soil profiles to assess landscape developments over time, sediment samples suitable for magnetic and optically stimulated luminescence (OSL) dating were collected, with the hopes that such techniques might help refine archaeological chronology in future seasons.

No.	Registration	Ware	Form	Fabric	Published parallels
1	NJP10.WP017.26	HMGP	bowl	(ext) heavy pinkish-white (7.5 YR 8/2) slip; (int) strong brown (7.5 YR 5/6) painted design over same slip; (fabric) 7.5 YR 6/4 (pink), sandy, coarse, and poorly fired with white and black inclusions	Mamluk – For these common patterns and forms in the Jordan Valley – Franken and Kalsbeek 1975
2	NJP10.WP017.20	HMGP	jug	(int) hand-impressed and plain; (ext) dark gray (7.5 YR 4/1) paint over pinkish-white (7.5 YR 8/2) slip; (fabric) 7.5 YR 7/3 (pink), coarse with small white and black incls.	Mamluk – as above and (form) Tall Ḥisbān – Walker and LaBianca 2003: 451, Fig. 11; Saḥam – Walker *et al.* 2007: 449, Fig. 21.4; Bet She'an - Avissar and Stern 2005: 114, Fig. 36.1-2
3	NJP10.WP017.24	HMGP	jug	(ext) brown (7.5 YR 4/2) painted design over pinkish-white (7.5 YR 8/2) slip; (fabric) 7.5 YR 7/3 (pink), semi-coarse with small to medium-sized dark incls.	Mamluk – as in #1
4	NJP10.WP017.21	HMGP	jar	(surfaces) brown-painted (7/5 YR 5/3) lines over reddish-yellow (7.5 YR 7/6) slip; (fabric) 7.5 YR 6/6 (reddish yellow), coarse and sandy with small to medium-sized white and black incls.	Mamluk – as in #1



30. Late Islamic pottery from aṭ-Ṭurra survey.

In order to start obtaining the calibration curve, three archaeologically dated floors from different periods at Tall Ḥisbān were sampled. Laboratory analysis is still underway. If the results are promising, the technique will be applied to previously excavated contents in Ḥubrāṣ, which is part of the NJP study area, next season.

The survey in the fields of aṭ-Ṭurra pointed to ancient land use patterns, such as potential earthen roads and field systems, preserved by variations of soil color as already indicated by on-going studies by Project staff near Abila. These features identified during survey are currently being compared to air photos in order to document changes in ancient land use patterns in as much detail as possible. One of the goals of the 2012 NJP field season will be to expand such analysis to investigate regional land use patterns beyond aṭ-Ṭurra and their relationship to settlement and climatic change.

Conclusions

In conclusion, the most important results of the 2010 season were a better appreciation of how *ḥajj* travel and transport may have impacted rural settlement, the identification and systematic mapping of potential road and water systems that connected the village with a much larger region between the Roman and Late Ot-

No.	Registration	Ware	Form	Fabric	Published parallels
1	NJP10.EP013.1	mold-made *chibouk*	pipe (bowl)	(ext) impressed pattern, slightly polished; (fabric) 5 YR 5/6 (yellowish red), fine with small black and white inclusions	Middle Ottoman - Belmont Castle – Simpson 2000: 148, Fig. 13.3.17-21 (late 18th-early 19th c.); Athenian Agora – Robinson 1985: 182 and Pl. 53 (15th-17th c.)
2	NJP10.EP001.43	monochrome-glazed	bowl	(ext) light olive green glaze over thick white slip; (int) same slip and glaze, with deeply incised linear design; (fabric) 5 YR 6/6 (reddish yellow), fine with few incls.	Ottoman – Saraçhane – Hayes 1992: 271-80 (15th-17th cs.)
3	NJP10.EP034.73	Gaza Ware	jar / bowl	(ext) 7.5 YR 5/6 (strong brown); (fabric) 7.5 YR 6/6 (reddish yellow), fine with small black inclus. and crushed river pebbles (?)	Late Ottoman (19th c.) – Malkā – Walker 2009: 135, Fig. 5.7.8
4	NJP10.WP032.92	Gaza Ware derivative	jar	(surfaces) 10 YR 3/1 (very dark gray); (fabric) 7.5 YR 6/8 (reddish yellow), fine with small red and black incls.	Late Ottoman (19th c.) - see #9
5	NJP10.WP009.5	Gaza Ware	basin	7.5 YR 5/6 (strong brown), very fine with few small black and white incls.	Late Ottoman (19th c.)

6	NJP10.EP003.46	Gaza Ware	basin	(surfaces) 5 YR 6/6 (reddish yellow); (fabric) 5 YR 7/4 (pink), fine with few small black inclus.	Late Ottoman (19th c.) – Malkā – Walker 2009: 135, Fig. 5.7.6
7	NJP10.EP003.45	Kütahya Ware	coffee cup	(int) thick clear glaze; (ext) blue and black painted floral decoration under same glaze; (fabric) coarse fritware	Ottoman (18th c.) – Saraçhane – Hayes 1992: 266-8; Pl. 43
8	NJP10.WP018.37	Gaza Ware derivative	jar	(surfaces) GLEY 1 4/N (dark gray), with trails of clear glaze over rim; (fabric) 7.5 YR 5/6 (strong brown), fine with small black and white incls.	Late Ottoman – (rim form like Rashayya al-Fukhkhar Ware) Saḥam and Ḥubrāṣ – Walker 2009: 128, Fig. 5.2.3, 4, 5; Mt. Hermon – Zevelon 1978: 195, #5 and 6
9	NJP10.EP064.83	Gaza Ware derivative	jar	(ext) color ranges from 10 YR 4/3 (brown) to 10 YR 6/3 (pale brown), surface sponge-wiped with incised wave design; (fabric) 7.5 YR 6/6 (reddish yellow), fine with small black incls.	Late Ottoman (19th c.)– Ḥubrāṣ – Walker *et al.* 2007: 456, Fig. 28.4 and 457, Fig. 29.5; Giv'at Dani – Lazar 1999: 134, Fig. 8.4, 6; Tell Jemmeh – Schaefer 1989: Fig. 8.7

toman periods, and documentation of settlement here in the 18th and early 19th centuries (a period when many other villages in the country were either abandoned or in decline). The NJP is in a publication phase this coming year, as further laboratory results become available and the results of this season can be placed into the larger changes of settlement and land we have documented in the three distinctive ecological zones of the northern highlands since 2003.

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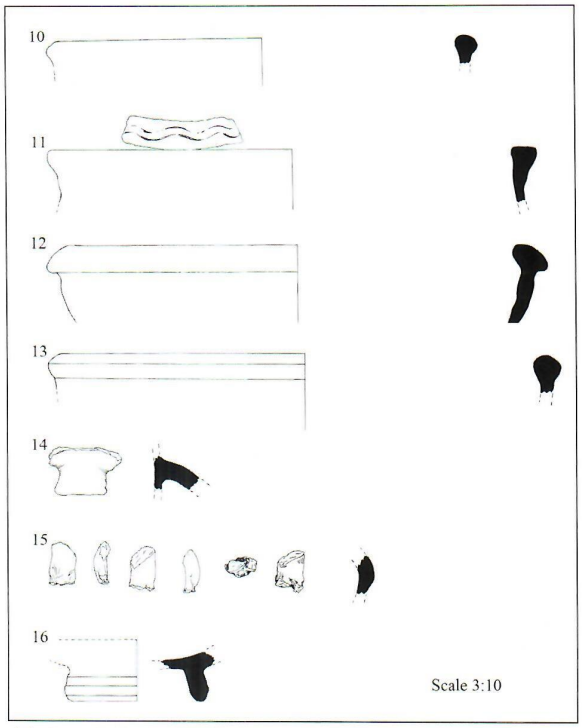

31. Late Islamic and misc. pottery from aṭ-Ṭurra survey.

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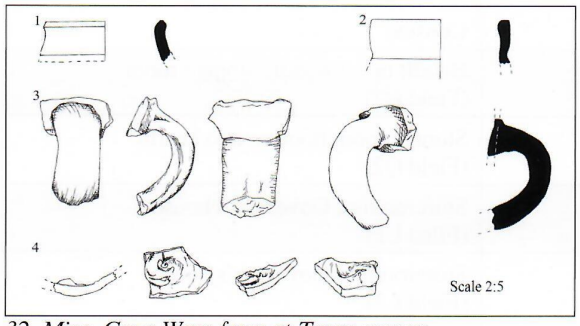
No.	Registration	Ware	Form	Fabric	Published parallels
10	NJP10.EP024.67	Gaza Ware	jar	(surfaces) 10 YR 5/1 (gray); (fabric) 7.5 YR 5/8 (strong brown), slightly coarse with small white and black incls.	Late Ottoman (19th c.) – Malkā – Walker 2009: 135, Fig. 5.7.3
11	NJP10.EP037.80	plain, wheel-made	basin	rim surface incised in wave pattern; (fabric) 10 YR 6/3 (pale brown), fine with mineral pockets and possible mica	Early Abbasid – (form) Jarash – Schaefer 1986: 428, Fig. 9.5 and 430, Fig. 10.1
12	NJP10.EP034.74	Gaza Ware	jar	(ext) 7.5 YR 4/3 (brown); (int) 7.5 YR 4/2 (brown); (fabric) 7.5 YR 5/4 (brown), fine with small white incls.	Late Ottoman (19th c.)
13	NJP10.EP037.81	Gaza Ware	jar	7.5 YR 5/6 (strong brown), semi-fine with small white incls.	Late Ottoman (19th c.) – Malkā – Walker 2009: 135, Fig. 5.7.5; Giv'at Dani – Lazar 1999: Fig. 8.5
14	NJP10.EP024.66	Gaza Ware	jar	(surfaces) 5 YR 5/8 (yellowish red) with traces of trailing green glaze; (core) light gray; (fabric) incompletely fired, fine with small black incls.	Late Ottoman
15	NJP10.EP023.64	monochrome-glazed	jug	(surfaces) glossy dark green glaze over white slip; (fabric) 7.5 YR 7/6 (reddish yellow), semi-fine with small black and white incls.	Ottoman
16	NJP10.EP024.65	monochrome-glazed	bowl	(int) olive green glaze over uneven, thin white slip; (ext)10 YR 5/4 (yellowish brown); (fabric) 7.5 YR 6/6 (reddish yellow), semi-coarse with small to medium-sized black incls.	Early Ottoman – Saraçhane – Hayes 1992: 352, Fig. 110.73.44 (Ware B – 15th - mid 17th c.)



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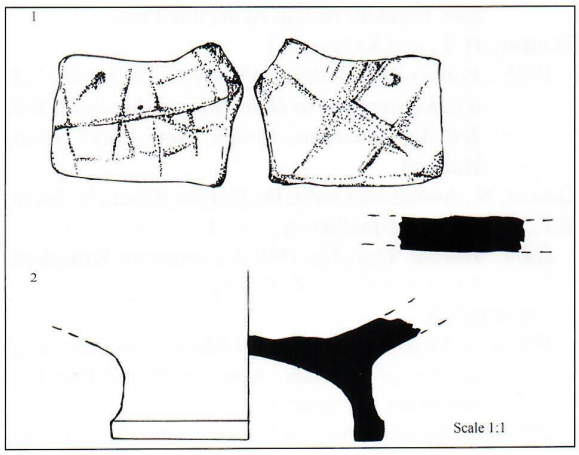
No.	Registration	Ware	Form	Fabric	Published parallels
1	NJP10.WP011.12	Gaza Ware	jug	(surfaces) 5 YR 6/1 (gray); (fabric) 5 YR 6/4 (light reddish brown), fine with small black incls.	Late Ottoman
2	NJP10.WP018.38	Gaza Ware	store jar	(surfaces) 10 YR 5/3 (brown); (fabric) 10 YR 5/8 (yellowish brown), semi-coarse with small white and black incls.	Late Ottoman – (form) Habonim-Kafr – Avissar 2009: 104, Fig. 2.8.9
3	NJP10.WP108.36	Gaza Ware	jar (handle)	(surfaces) 10 YR 5/1 (gray); (fabric) 5 YR 6/4 (light reddish brown), fine with few incls.	Late Ottoman
4	NJP10.WP011.10	Gaza Ware	jug (base)	(surfaces) 10 YR 5/1 (gray); (fabric) 5 YR 6/4 (light reddish brown), fine with few incls.	Late Ottoman



33. Pottery of uncertain date from aṭ-Ṭurra survey.

34. Early 20th century glazed storage jar from at-Ṭurra.

No.	Registration	Ware	Form	Fabric	Published parallels
1	NJP10.WP023.41	coarseware, gaming piece or token?	unknown	(surfaces) plain except for roughly incised lines, executed before firing; (fabric) 5 YR 6/6 (reddish yellow), coarse with medium- sized red, black, and white incls.	possible Iron II fabric
2	NJP10.WP009.4	wheelmade, poss, glazed	bowl	(int) trace of a white slip, so vessel may have been originally glazed; (fabric) 5 YR 6/6 (reddish yellow), fine with no visible incls.	Ottoman

Sample number	Date	Context
H-00-1	14th-16th centuries	Hearth in a domestic storage room (Field Q2)
H-00-3	14th-16th centuries	Storage room floor next to hearth (Field Q2)
H-00-4	14th century	Storeroom of Governor's house (Filed L1)
H-00-6	14th century	Storeroom of Governor's house (Field L2)
H-00-7	16th century, phase III of L1	Governor's courtyard (Field Q5)
H-00-9	Late Ottoman-Early Mandate	Animal pen/ courtyard (Field O)
H-00-10	Byzantine-Early Islamic	Domestic house (Field N)
H-00-12	Byzantine	Cistern (Field G)
H-00-13	Byzantine	Cistern (Field G)
H-00-16	Late Ottoman-Mandate	Farmhouse floor (Hubras/NJP)

35. Chart of phytolith sample numbers and contexts.

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LIFE AT THE EDGE: SEPULCHRAL, HYDRAULIC AND PASTORAL LAND USE IN WADIS AS-SAHAB AL-ABYAḌ AND AL-ASMAR, SOUTH-EASTERN JORDAN: PRELIMINARY REPORT ON THE FOURTH SEASON OF THE EASTERN JAFR JOINT ARCHAEOLOGICAL PROJECT, 2010

Hans Georg K. Gebel, Hamzeh M. Mahasneh, Patrick Keilholz and Jürgen Baumgarten

The Project

The fourth season of the Eastern Jafr Joint Archaeological Project (Eastern Jafr JAP) was carried out over 11 field days in June 2011 in Wādī as-Sahab al-Abyaḍ and Wādī as-Sahab al-Asmar, under the joint directorship of Dr Hans Georg K. Gebel and Prof. Dr Hamzeh Mahasneh, with the close co-operation with the Department of Antiquities of Jordan. The project runs under the auspices of Ex Oriente at the Free University of Berlin and Mu'tah University, and receives additional support from Research Cluster 2 of the German Archaeological Institute at Berlin. Previous seasons were carried out in 2001, 2006 and 2008 (Mahasneh and Gebel 2001, 2009; Gebel and Mahasneh 2006, 2008, 2009, 2010, in press; Gebel 2010; Pokrandt, in prep.; see also Kirkbride and Harding 1944).

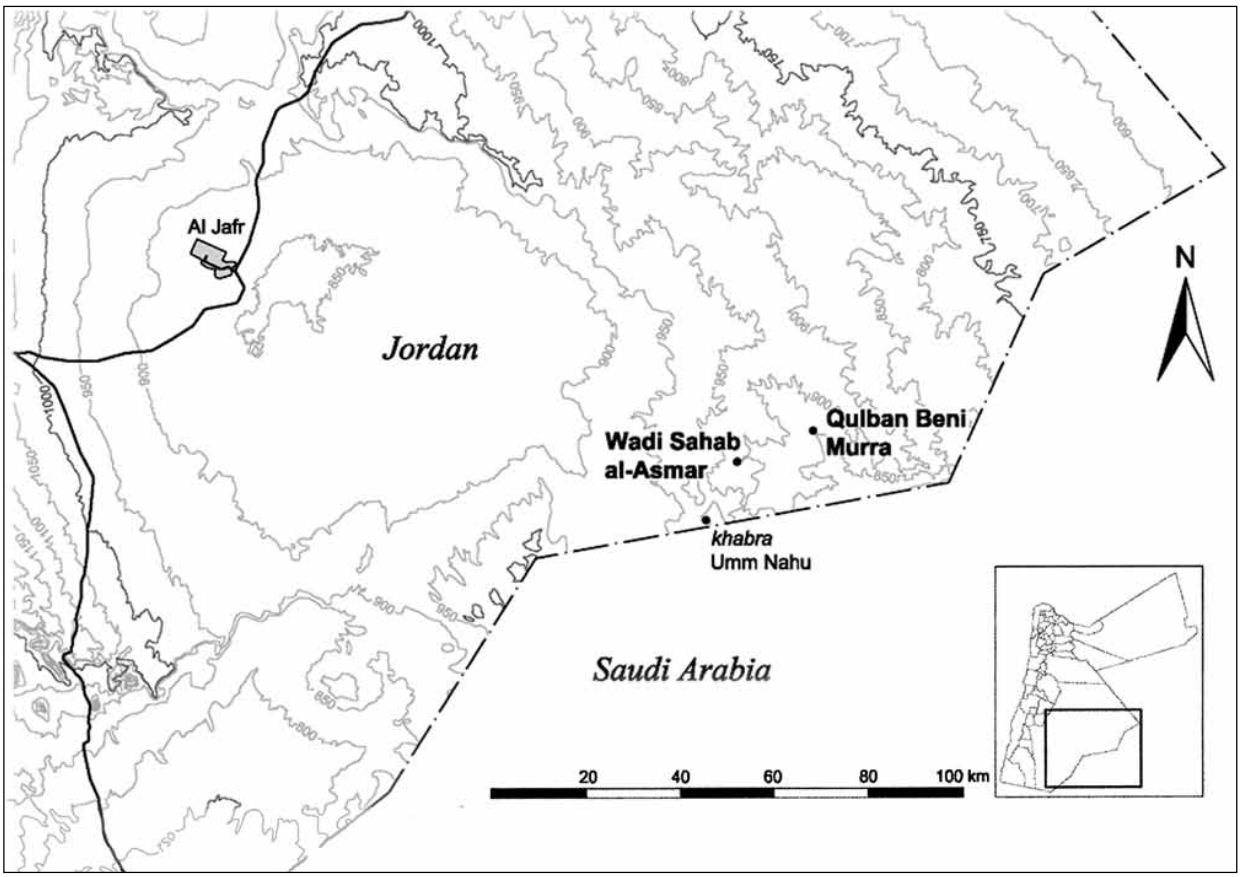
The project's principal survey areas are the drainage systems of Wadis as-Sahab al-Abyaḍ (SA) and al-Asmar (AR) (**Fig. 1**), located in Jordanian territory north of Jabal aṭ-Ṭubayq (Rhothert 1938), 30 - 35 km from the Saudi border and 120 - 130 km east-south-east of al-Jafr (for the project's general survey area see Mahasneh and Gebel 2009: Fig. 1). Both wadi systems constitute sepulchral and hydraulic landscapes of the aceramic Late Chalcolithic / Early Bronze Age periods, with Wādī as-Sahab al-Asmar hosting a large number of campsites and settlements at *inselberg* locations (**Table 1, Fig. 2**). Excavations have focused on the main site of the area, Qulbān Banī Murra.

This remote area is challenging in terms of working conditions and requires careful logistical planning. During summer, work can be only carried out in the mornings and late afternoons. It is even more challenging to find preserved, datable climatic data, such as mid-Holocene sedimentary sequences and organic material.

The field work of 2010 ended Phase I of the Eastern Jafr JAP, which concentrated on general survey, preliminary excavations at Qulbān Banī Murra and hydrological studies. It prepared the ground for Phase II, which will focus on excavation of collective burials, camp sites, hydraulic features and structures, geophysical and (palaeo-) hydrological studies related to water management, physical anthropology and isotope analysis, palaeoethnobotany and zooarchaeology, and environmental / climatic sedimentology.

In 2010, water and a large herd of camels were brought in from al-Jafr to exploit the extensive areas of *Stipagrostis plumosa* grazing (Reinder Neef, pers. comm.) (see **Fig. 20**) that emerged after a wet spring (see J. Baumgarten below). During the 2006 and 2008 seasons no *bedouin* camped in the immediate vicinity, while in 2001 we shared the area with just one *bedouin* tent.

The archaeological landscape of Wadis as-Sahab al-Abyaḍ and al-Asmar is suffering from increased looting of its burial mounds by local *bedouin*. In light of recent illicit digging, our previous reluctance to touch preserved burials before gaining an understanding of their nature and date now seems inappropriate. News of our discovery in 2010 of a statue in one of the graves (Luck 2010) immediately caused a rush to the research area, leaving more cairns looted. It should however be mentioned that the burial mounds have been subjected to looting throughout the millennia since 4000 BC, but more recently the rate of damage has accelerated as a result of increasing *bedouin* motorization in the area. Our project has therefore begun to explore ways and means of increasing heritage aware-



1. Locations of Qulbān Banī Murra in Wādī as-Sahab al-Abyaḍ and Wādī as-Sahab al-Asmar in the south-eastern deserts of Jordan (drawing Keilholz).

ness amongst local *bedouin*, in an attempt to reduce the ongoing destruction of Jordan's remote sepulchral landscapes.

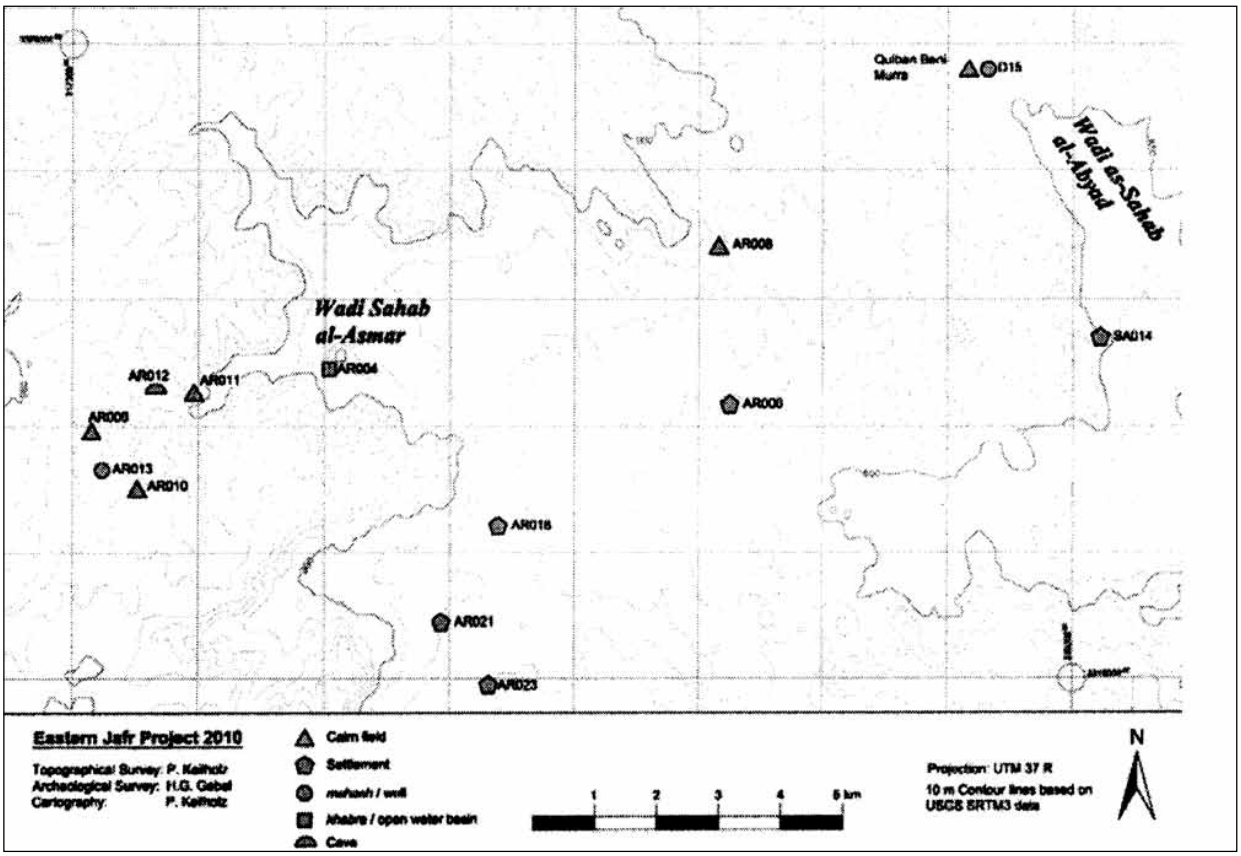
Objectives of the 2010 Season

The fourth season, with its extraordinary discoveries, concentrated on (1) a sounding in the previously excavated well complex (Space 12 of Structure D15, excavated in 2008) at the Late Chalcolithic / Early Bronze Age site of *Qulbān* Banī Murra (Gebel and Mahasneh 2008), (2) surveying the neighbouring Wādī as-Sahab al-Asmar and upper Wādī as-Sahab al-Abyaḍ (**Table 1, Fig. 2**) and (3) on mapping the camp and burial site of Wādī as-Sahab al-Asmar 14 (SA014). Major objectives were to obtain datable samples from the well complex and to assess Late Chalcolithic / EB water management and sites in the area, in addition to the general objective of the survey, namely the location of sites from all periods in archaeologically unknown areas of Jordan. The Late Chalcolithic / EB objectives aim to provide a framework of research hypotheses to assess whether or not the area witnessed a local transition from pastoral 'well cultures' to sedentary oasis cultures based on well irrigation. Such a process may have occurred as a consequence of drier conditions after mid-Holocene climatic optima, and would demonstrate the association of the Jordanian arid zones with one of the most important socio-economic and cultural achievements of the Arabian peninsula, *viz*. the oasis economies by which means sedentism was eventually established throughout Arabia after 4000 BC.

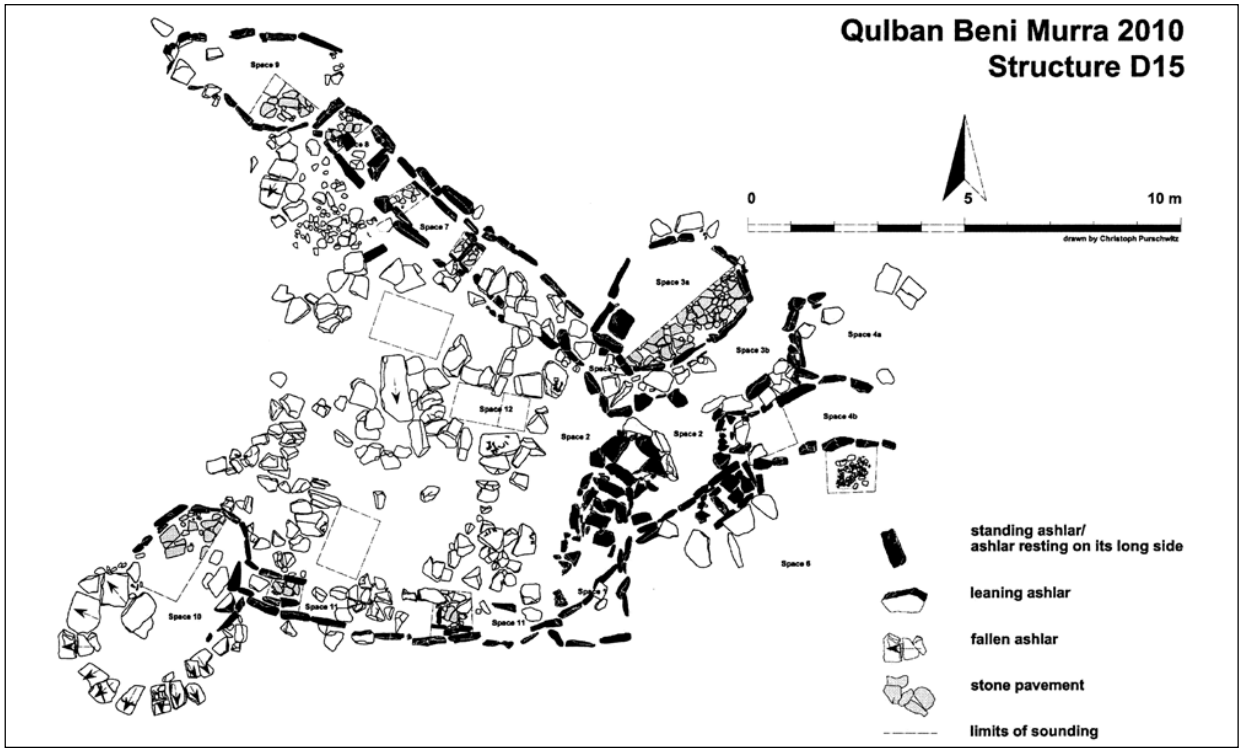
The main aim of our project is embedded in a broader research framework focused on the palaeoenvironments and occupational history of arid southern Jordan, and neighboring north-western and northern regions of Saudi Arabia, during the mid-Holocene / Late Chalcolithic and EB periods. The Eastern Jafr JAP benefits from established scientific collaborations; after the 2010 season one of the authors (HGKG) visited Ra-

Table 1: Major sites located during the 2010 season (SA = Wādī as-Sahab al-Abyaḍ; AR = Wādī as-Sahab al-Asmar).

AR005 (Khibrat Umm Naḥū)	29 55.906' 37° 03.551' 942 m	Khibrat Umm Naḥū: located near the Saudi border and visited by camel herds from the Ṭubayq area before the border was closed.
AR006	37 R 0327462 3323230 886 m	*Inselberg* campsite / settlement (Late Chalcolithic / EB): main occupation on south-west side with terraced animal pens partly dug into the slope; small habitation structures, hearths, silos, some fan scrapers etc. between the pens. At the base of slopes and on the north-east side of the *inselberg*, circular structures of boulders, ashlar structures, horseshoe-type structure, groups of boulders, cairns, *bedouin* graves, two long u-shaped structures (*ca* 6 m); high diversity of structures.
AR008	30° 03.005' N 37° 12.520' E 889 m	*Ca* 20 ashlar cairns / ashlar line cairns and other structures (Late Chalcolitic / EB); ashlar-line cairn 11 = "statue cairn".
AR009 - 11	approx. 30° 01.243' N 37° 06.115' E 944 m	Three cairn fields with more than 100 cairns of different types (late Chalcolithic - Iron Age), unknown structures, *bedouin* cemeteries and desert mosques.
AR012 (Lower Ṭur Sahab al-Asmar)	30° 01.786' N 37° 06.956' E 911 m	Rockshelter / cave in upper sandstone cliff; Thamudic incription at cave entrance.
AR013 (*Mshāsh* Sahab al-Asmar)	30° 01.080N 37° 06.458 E 921 m	5-6 wells and sub-recent pottery (?) kilns; source of red ochre, Late Chalcolithic / EB chipped stone, early oasis location (?).
AR014 (Upper Ṭur Sahab al-Asmar)	30° 01.150' N 37° 06.205' E 921 m	Rockshelter ("very deep cave"); no visible finds.
AR016 (Ibex Rock II)	30° 00.661' N 37° 10.368' E 883 m	*Inselberg* campsite / settlement (Late Chalcolithic / EB): petroglyphs including two ibexes and another horned animal, square with a cross inside, plan of stone structure / stone alignments, and an ibex and cheetah (?); also many flint and quartzite flakes, including fan scrapers, 15 round structures, partly constructed of ashlars (3-5m diameter; cf. QBM Area A); isolated hearths; 2 long, dam-like walls protecting terrace with round structures from wadi floods; wells anticipated on fringes of settlement; 'breakwater boulder fields' on sides of outcrop; 3 superimposed terraces on south-west side with large round ashlar structures (10 m diameter); more circular ashlar structures north of the *inselberg* on a raised wadi terrace (*ca*. 60 x 40 m).
AR021	29°59' 40.5" N 37°07'47.9" E 886 m	*Inselberg* campsite / settlement (Late Chalcolithic / EB): round / oval / curvilinear animal pens (pen wall on raised terrace to south also protects from wadi floods), circular habitation structures, silos, ashlar structures, double parallel row of ashlars with east-north-east - south-south-west orientation, pavements, flint and quartzite flake industry, bedrock bowl / mortar.
AR023	29°59'18" N 37°10'18" E 874 m	*Inselberg* camp site / settlement (Late Chalcolithic / EB).
SA052 (*Mshāsh* Ṣaliḥ)	30° 09.286'-307' N 37° 10.583-987' E 886 m	4-5 *Mshāsh* were still providing water in the 1970s in seasons of good rainfall; today the wells are buried by gravels.
SA053	30° 09.092' N 37° 09.666 E 890 m	Small dam located 10-60 m below several *Mshāsh* pools.
SA054-55 (al-Khabari al-Qubra' or Khabrat Qubūr al-Maṭālqah)	30° 10.641' N 37° 07.042' E 935 m	5 cement-renovated graves; one the grave of Diab al-'Audat who died in 1890.



2. Wadis as-Sahab al-Asmar and al-Abyaḍ: sites discovered in 2010.



3. Qulbān Banī Murra, watering complex / Well D15, Space 12 as investigated in 2010; dates to second half of the 5th millennium BC (field records Pokrandt, Keilholz and Suleiman; drawings Purschwitz).

jajil, a site similar to Qulbān Banī Murra located near al-Jawf in Saudi Arabia (see Zarins 1979).

This report includes sections on recent land use (by J. Baumgarten) and sub-recent water supplies and storage (by P. Keilholz) in order to document aspects of the rapidly vanishing traditional *bedouin* cultures with which our field projects are logistically associated, or even embedded. It represents an awareness of our responsibility as cultural researchers. While we have to concentrate on our archaeological research, we must not miss the chance to record the disappearing traditional cultures around us (Gebel and Baumgarten, in press). Therefore, our future archaeological preliminary reports will also contain summarized observations and insights into (sub-) recent socio-economic and cultural topics and related traditional local culture.

The Development of Project Objectives and Research Hypotheses

The results of the 2010 season allowed us to refine the project hypotheses by which we are tackling the question of a climate-induced transition from unknown mobile shepherd cultures of the second half of the fifth millennium BC to sedentary oasis life after 4000 BC. Parts of Jordan's south-eastern *Ḥamād* — including our research area — may have been one of the 'incubator' regions for this new way of life. Or, if our region was environmentally unsuitable for a successful transition, it may have witnessed such an attempt whilst in the event remaining pasture land to such extent as the climate permitted.

The Eastern Jafr JAP follows explicit project hypotheses which are steadily modified according to each season's results. This way, the development of testable interpretative frameworks remains transparent and checkable. The 2010 hypotheses are presented below.

Although 'announced' by the site of Wādī as-Sahab al-Abyaḍ 14, which was discovered in 2001, and other evidence, it was only during the 2010 season that we fully appreciated that the Late Chalcolithic / EB pastoral population must have lived in the area on a semi-sedentary basis (**Figs. 4, 5 and 6**). They not only left the vast, partly megalithic burial grounds — making the area a sepulchral landscape hundreds of square kilometres in extent — but also stayed at specific locations in animal pen campsites / settlements. The latter were found in association with *inselbergs* in Wādī as-Sahab al-Asmar, a wadi system not thoroughly explored in previous seasons. It is possible that these sites date to a period when the climate deteriorated, forcing shepherds to settle seasonally in areas with water.

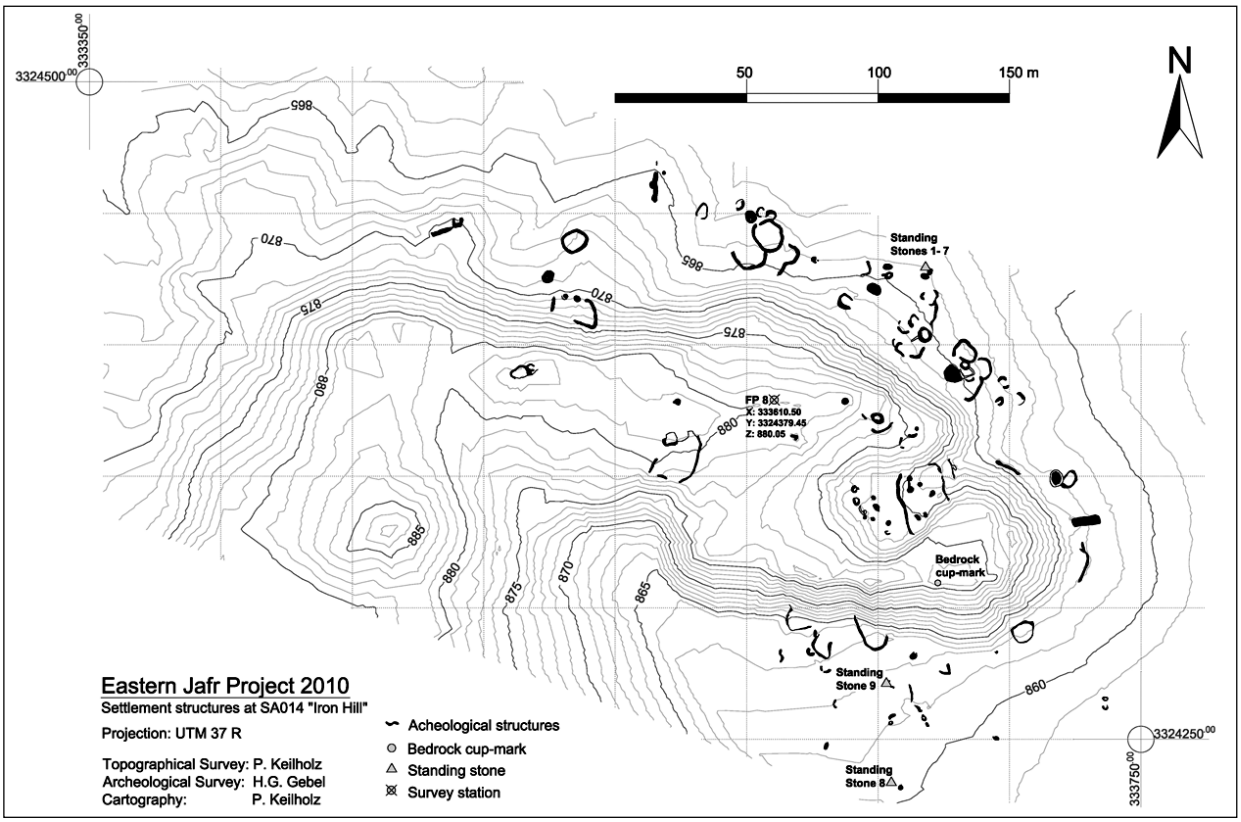
Our previous hypothesis that hitherto unknown pastoral well cultures preceded and became the progenitors of early oasis development after the climate of the Arabian peninsula became drier and colder had to be elaborated and refined for our research area. The presence of settlement-like camps indicates that some sort of seasonal pastoral settlement was possible in the area. Since the locations of these camps appear to be in sheltered and hydraulically favourable settings, the *inselbergs* (and perhaps also wild date palm stands) may have been where sedentary oasis life subsequently developed when the surrounding steppe gradually degraded and aquifers were depleted. However, it does not necessarily follow that the climate of the region allowed for a successful local transition.

The refined project hypotheses for 2010 were[1]:

Hypothesis 1

The extensive burial fields in the Wādī as-Sahab al-Abyaḍ and al-Asmar regions testify to the presence of Late Chalcolithic / EB pastoral societies before and after 4000 BC, whose subsistence and progressive population dynamics were favoured by the so-called mid-Holocene climatic optimum (possibly optima) of the Arabian peninsula, when the peninsula was characterized by extensive steppes, aquifers with high water tables and lakes. These conditions not only sustained progressively more productive domestic flocks, they also provided the pastoralists with substantial wild ungulate populations for hunting and possibly stands of wild dates, which would have been easy to store and transport over long distances.

1. These hypotheses are based on calibrated dates and other radiocarbon data (Pokrandt, in prep. and pers. comm.) from the well complex of Structure D15 at Qulbān Banī Murra (second half of the 5th millennium BC) and one of the ashlar-line cairns (4th millennium BC), as well as on the presence of fan scrapers, a general chronological marker for the Late Chalcolithic / EB at these sites.



4. Wādī as-Sahab al-Abyaḍ 14 (inselberg setting): layout of Late Chalcolithic / EB campsite (records Gebel, Keilholz and Suleiman; drawings Keilholz).

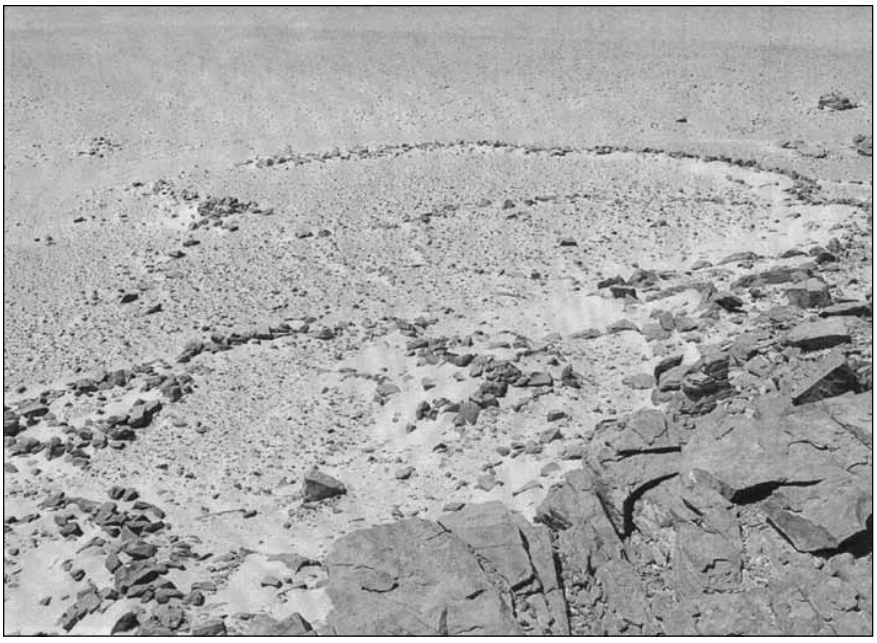
5. Wādī as-Sahab al-Abyaḍ 14 (inselberg setting): terraced, inner part of the outcrop with Late Chalcolithic / EB cairns from north-east (photo Gebel).

Hypothesis 2

In this period, tribal modes of organisation were established as prevalent and sustainable social systems, along with the specific *bedouin* territoriality and environmental adaptations to (semi-) arid conditions known to this day. During the optimal conditions of the second half of the fifth millennium BC, networks of these pastoral cultures extended from Sinai to the regions east of Riyad and also Yemen, belonging to a

6. Wādī as-Sahab al-Abyaḍ 14, southern side (inselberg setting): Late Chalcolithic / EB campsite with circular / curvilinear structures (pens and huts, 4-20 m diameter), platforms, burials with ashlars etc. (photos Gebel; editing Pokrandt).

7. Wādī as-Sahab al-Asmar 20 (inselberg setting): Late Chalcolithic / EB campsite with circular / curvilinear structures (pens and huts, 4-20 m diameter), terrace walls, flood-protection walls, platforms, burials with ashlars etc. (photo Gebel).



8. Wādī as-Sahab al-Asmar 21 (inselberg setting): Late Chalcolithic / EB campsite with circular / curvilinear structures (pens and huts, up to 30 m diameter), terrace walls, flood-protection walls, platforms, burials with ashlars etc. (photo Gebel).

'green desert belt" stretching from the Sahara to Oman and Yemen. The pastoralists' long-distance contacts created similar cultural and ideological milieus throughout this area.

Hypothesis 3

During these moist periods, in favoured locations — especially along major corridors with access to ungulate migration routes, ibex habitats and water — locally restricted, horizontal transhumant patterns would already have emerged which showed tendencies for (seasonal) philopatry supported by locally available nutritional resources. Most probably such conditions existed in Wadis as-Sahab al-Abyaḍ and al-Asmar. However, this does not rule out

that 'islands' of permanent settlement continued to exist from the PPNB onwards in the Arabian peninsula, remaining in post-Neolithic socio-economies.

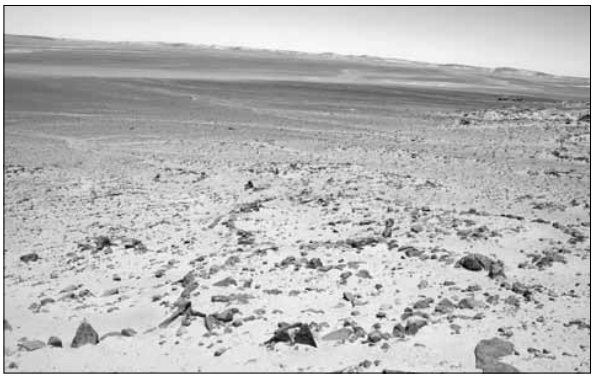
Hypothesis 4

When conditions got drier and colder in the first half of the 4th millennium BC (Rapid Climate Change 6000-5000 BP, see Weninger *et al*. 2009) and steppe habitats disappeared in most regions, groups of hitherto mobile herders would have gathered at remaining well-watered locations. Regressive population dynamics were associated with this development. Mobile pastoralists became sedentary oasis horticulturalists, while maintaining their tribal organisation and identity. They used their experience in well-building and channel-type watering systems / troughs for the new oasis irrigation systems, while domesticating the wild date palms growing at these well-watered locations. Gardens were created, with the palm trees providing protection from the sun and creating 'green house' micro-climates. A new, innovative and sustainable economy developed out of this climatic change, which the majority of steppe populations in the peninsula must have experienced in the context of the destruction of their mobile way of life. Mshāsh Sahab al-Asmar (see below) may have been one such location for this transition.

Hypothesis 5

Animal pen campsites / settlements like Wādī as-Sahab al-Abyaḍ 14 and Wādī as-Sahab al-Asmar 6, 15, 20 and 21 might represent regional starting points — as per Hypothesis 3 above — for oasis economies. Depending on what water supplies remained in the locale during aridisation in the first half of the forth millennium, Wadis as-Sahab al-Abyaḍ and al-Asmar may have become (1) an 'incubator' area for new oasis economies, (2) an area supporting pastoralism of greatly reduced mobility, existing alongside early oases developing at more remote and / or more favoured locations, or (3) a region from which both mobile pastoral life and seasonal settled life disappeared altogether.

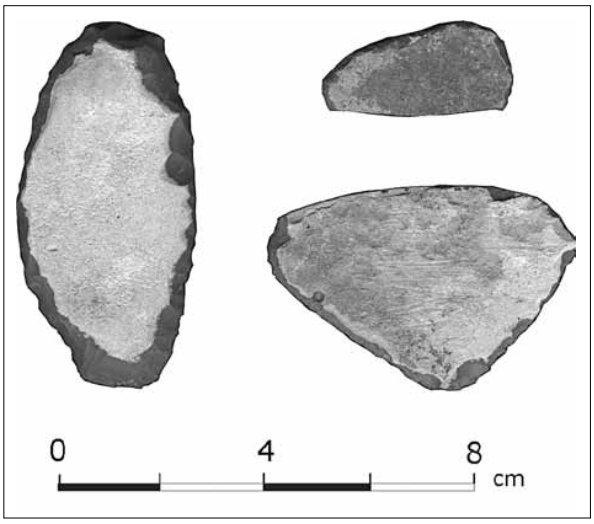
The 2010 results led to the development of a fieldwork programme for 2011 which included (1) archaeological — anthropological excavation of the so-called statue burial at Wādī as-Sahab al-Asmar 8 (**Fig. 2**) and / or other contemporary ashlar cairn burials in the Wādī as-Sahab al-Abyaḍ and / or al-Asmar burial grounds, (2) excavation and mapping of deflated buildings, hydraulic installations and other features of the Late Chalcolithic / EB camp sites of Wādī as-Sahab al-Asmar 6 and 15 (**Table 1, Figs. 9, 10 and 11**), (3) geophysical surveys at the Late Chalcolithic / EB camp sites of Wādī as-Sahab al-Asmar 6 and 15, (4) continuation of general surveys within the Wādī as-Sahab al-Abyaḍ and al Asmar drainage systems, the area east of Qulbān Banī Murra and of Jabal al-Adhriyyāt, (5) continued documentation of recent *bedouin* land



10. Wādī as-Sahab al-Asmar 6 (inselberg setting): Late Chalcolithic / EB campsite with circular / curvilinear structures (pens and huts, 4-20 m diameter), terrace walls, platforms, hearth, ashlar graves, isolated ashlars etc. (photo Mahasneh and Gebel).

9. Wādī as-Sahab al-Asmar 15 (inselberg setting): Late Chalcolithic / EB campsite with circular / curvilinear structures (pens and huts, 4-20 m diameter), platforms, hearths, burials with ashlars etc. (photos Gebel; editing Pokrandt).

11. Wādī as-Sahab al-Asmar 6: Late Chalcolithic / EB circular structure (hut / silo (?); ca 2.5 m internal diameter) with well-constructed double-faced wall (photo Mahasneh).



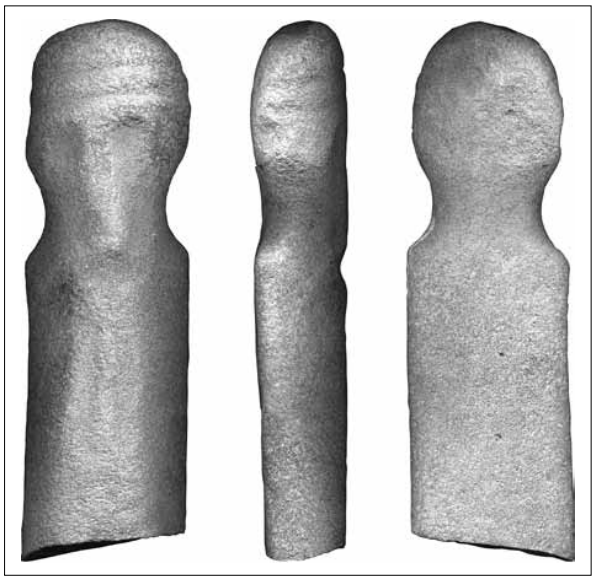
12. Wādī as-Sahab al-Asmar 9: Late Chalcolithic / EB fan scrapers associated with pastoralists in this area; used for shearing, butchering, processing animal skins etc. (photo Gebel).

use and (6) informal negotiations about opportunities for *bedouin* heritage education / awareness-building in an attempt to reduce illicit digging in the area.

Significant Results of 2010

*New Burial Grounds and the Statue Fragments (***Table 1, Figs. 13 and 14***)*

Four major aceramic Late Chalcolithic / EB cairn fields were discovered during the 2010 season, namely AR008, AR009, AR010 and AR011. AR008 is located on one of the ridges between Wadis as-Sahab al-Abyaḍ and al-Asmar. AR009 / 011 and AR010 are respectively located on the ridges and hillocks of the upper right and left banks of Wādī as-Sahab al-



13. Wādī as-Sahab al-Asmar 8: statue known as "Dalish" from the stone capping of Late Chalcolithic / EB burial Mound 11; note features of Arab male clothing (columnar basalt; height = 35 cm) (photo Gebel).

14. Wādī as-Sahab al-Asmar 8: head of statue from the stone capping of Late Chalcolithic / EB burial Mound 11 (female (?) face; calcareous sandstone; height: 15.5 cm) (photo Gebel).

Asmar in the Mshāsh al-Asmar area. While AR008 is represented by 20 limestone cairns and other structures, the burial fields of AR009 and AR010 each comprise some 40 cairns and some recent and sub-recent *bedouin* cemeteries, as well as desert mosques (cf. **Fig. 22**). The two latter fields are much more complex in terms of their grave structures, which include flattish Late Chalcolithic / EB ashlar-line cairns (some of which are quite prominent) and higher circular boulder cairns, which might be of aceramic Iron Age origin. Small boulders with Thamudic incriptions are associated with Late Chalcolithic

/ EB ashlar-line cairns, indicating that these may have been re-used after a gap of thousands of years. AR011 consists of 18 huge, circular (Iron Age?) cairns, on average 2 m high and 10 m in diameter, overlooking the wadis from a narrow spur.

Burial Cairn 11 of the less prominent (probably because nearby bedrock was unsuitable for large ashlars) burial field AR008 was the location of an extraordinary chance find. A team member (Amer al-Suleiman, Hashemite University) found a columnar basalt statue fragment[2] (**Fig. 13**; the statue became known as "Dalish") and a statue head of calcareous sandstone (**Fig. 14**) embedded in the stone capping of this multi-chamber Late Chalcolithic / EB ashlar-line cairn, which is orientated to the east and overlooks Wādī as-Sahab al-Abyaḍ. Fully preserved from the head to the abdomen, the basalt statue's length is 35 cm. It probably represents a male with thick lips or a beard, a long nose, ear depressions and expressive eye depressions. The most intriguing features are two grooves around the front and sides of the head, and the neckline-like feature of a shirt or robe on the chest which may date the '*aqāl* / *dishdāsha* mode of dress as far back as *ca* 4000-3500 BC. In a way, the find literally gave a face to the hitherto unknown shepherd culture.

The statue[3] was made of a piece of columnar basalt, with a natural sub-triangular section which facilitated production of the statue's final shape. Nevertheless, considerable pecking would have been required to create the sculpture's rounded triangular / plano-convex basic form and, especially, to shape the grooves of the chest, the 'beard', the relief of the mouth, nose and eyes, the grooves of the " '*aqāl* " and the round shapes of the front and upper part of the head. The flat and more irregular reverse was less carefully shaped, has no sculpted details and might even partially consist of the natural surface of the basalt. The piece must have rested in its position for a long time, as exposed parts were smoother from wind and sand abrasion than those parts which were covered by soil, *viz*. the head and right shoulder.

A reduction of the cross-section below what was to become the head created the distinctly elaborated shoulders, from which no arms lead off. Owing to the nature of the raw material, the body / chest is parallel-sided and of the same width as the head. The head is designed in rather an abstract way, with large eye depressions between which a long and parallel-sided nose starts to run vertically downwards, limited by a larger groove not connected with the neck's incision. Below this groove, a bulge-like area was sculpted which either represents a beard or lips. It is striking that the 'beard' — especially its left part — has a highly smoothed area (perhaps the result of handling); a similar smoothed surface can also be observed right of the right-hand chest groove. Other details of the face (e.g. cheeks, eyebrows) were not elaborated. The front of the head is high and the proportions of the eyes and nose remarkable. Similar proportions are known from the famous green amulet head of LPPNB Basta, which has been interpreted as having phallic symbolism. It should be noted that certain iconographic features may have survived from earlier periods, or were indeed shared between cultures; it is also possible that our statue was 'culturally recycled' and is of Neolithic origin. The front of the head has two parallel, slightly oblique, flat grooves (3-5 mm in depth) which end at the head's sides and continue, though less pronounced, on its flat re-

2. The discovery was made on the morning of 25 June 2010; despite an intensive search in 2010 and 2011, the lower part of the fragment was not found. It probably was removed a long time ago for its raw material. The statue fragment was taken to the Department of Antiquities, Amman by departmental representative Sate al-Masadeh. Circumstances in the field did not permit closer inspection for traces of paint or other applications to the artifact; it did not receive any treatment other than gentle removal of adhering sand with a soft brush. The statue fragment is being considered for display in the new National Museum at Amman.
3. Measurements of the artifact are: preserved maximum length 350 mm, maximum width near break (abdomen / belly area) 110 mm, circumference near break (abdomen / belly area) 290 mm, circumference in area of neck across nose 237 mm, circumference of head near eyes / ears 296 mm, circumference in area of " '*aqāl* " area 284 mm; dimensions of the nose: length *ca* 86 mm, width of upper, flat part of nose *ca* 12 mm; dimensions of the ears: *ca* 18 mm height x *ca* 15 mm width, depths of depressions *ca* 3 mm; dimensions of eyes: *ca* 26 mm height x *ca* 22 mm width, depths of depressions *ca* 6 - 7 mm; dimensions of chest grooves (interpreted as neckline of *dishdāsha*): length *ca* 90 mm, width *ca* 7 - 10 mm, depth *ca* 2 mm; cross-sections: rounded-triangular near break, high plano-convex at head.

verse. The ears are particularly striking; like the eyes, they were worked as depressions, both sets of which could have held additional decorative elements (also suggested by the features of the other fragment; **Fig. 14**, see below). The head's end is nicely rounded. The chest has two parallel grooves running vertically down towards the abdomen (interpreted as the neck-line of a *dishdāsha*[4]).

The second sculpture (**Fig. 14**) to be found, a head fragment of soft calcareous sandstone[5], was also found in the stone capping of Cairn 11. It undoubtedly represents a head similar to that of the basalt statue, insofar as the left ear is indicated by a depression similar to that of the basalt statue (the right ear was not executed; perhaps the statue remained incomplete or, alternatively, significance may have been attached to the missing ear). Other similarities include the long nose and a 'bulge', which in this instance might represent lips. A striking and unusual feature is the way in which the eyes are represented. On both sides of the upper nose, two pairs of pointed drillings were made as if representing four eyes. These 'eyes' do not give the impression of even abstract anatomy, as do those of the basalt statue, so it may be that this feature had a specific purpose (perhaps to retain decorative elements which marked the eyes). Although the facial area is again quite smooth, it would appear that the back of the head back did not receive much in the way of shaping and smoothing. The fracture above the neck, directly in the groove below the 'lips', probably represents the weakest part of the piece.

The style of the two sculpture fragments does not match that of the Rizqeh statues, once thought to be Chalcolithic (Kirkbride 1969; but see also Underbjerg 2003); these are now thought to be more reminiscent of the south Arabian Late Iron Age (Gebel 2010).

In addition to the two sculpture fragments, the stone capping of Cairn 11 yielded two sandstone plate fragments, a fragment of another sandstone plate, a plate fragment weight (?) with a biconical perforation, and a fan scraper.

Charcoal Samples and Radiometric Dates from Well Complex D15 at Qulbān Banī Murra

This season's sounding in Space 12 of well-watering complex D15 provided sufficient charcoal to date the structure's reddish deposits, interpreted as the eroded lining of the troughs. It is the first time that tiny charcoal remains have been recovered by the project from prehistoric deposits in the area.

Figure 3 shows the watering complex with well-room Space 2, the north-western and southern trough lines / channels (along Spaces 9 - 8 - 7 and 10 - 11 - 1), and the central part of the complex (not yet understood) around Space 12. Both trough lines are sub-divided by compartments, each having slightly lower floors dropping down towards their circular 'end troughs'. All floors of the structure's troughs have stone pavements.

The watering complex mounds of Qulbān Banī Murra consist of the structural remains and their eroded, reddish lining material. They must once have rested on the surface of the Late Chalcolithic / EB wadi, probably some 30-50 cm deeper than the present-day wadi bed.

This season's sounding in Space 12 was located close to the room containing the mouth of the well (Space 2). Its stratigraphy demonstrates that the reddish deposits have a depth of more than 80 cm in the centre of the structure and contain flint artifacts with 'fresh' edges, as well as bone fragments. Boulder and ashlar fragments from the sounding have no desert varnish.

Date KIA43373, obtained from Space 12, came in at cal BC 4459 - 4346 (two sigma range). The humic acid fractions of this sample and KIA43374 are considered too early at cal BC 5217-5018 and 5056-4894 (two sigma ranges), but hint that Sample KIA43374 might also be from the second half of the fifth millennium BC (Dr A. Dreves, Leibniz Labor für Alters-

4. Zeidan Kafafi has interpreted this as another anatomical detail of a phallus (pers. comm.).

5. Measurements of the piece are: preserved maximum length 155 mm, maximum width near break (below 'lips') 109 mm, maximum width near 'eyes' 130 mm, circumference of head near eyes / ears 354 mm, distance nose - back of head 78 mm; dimensions of nose: length *ca.* 78 mm, width of upper, flat part of nose 10 - 14 mm; dimensions of ear: *ca.* 28 mm height x *ca.* 33 mm width, depth of depression 3 - 6 mm; dimensions of 'eyes': 5 - 7 mm width, depths 6 - 7 mm; cross-section: roundish / irregular high plano-convex at head. Preservation of the piece may be affected by algae; intervention is required to halt the growth of existing damage.

bestimmung und Isotopenforschung, Kiel University and J. Pokrandt, Kiel University pers. comm.) (**Table 1**).

*Animal Pen Campsites (***Table 1, Figs. 4-11***)*

For the first time, *inselberg* / rocky outcrop locations were surveyed along the wide flood plains of Wādī as-Sahab al-Asmar. It seems that the *inselberg*-foothill zones were the specific settings for aceramic Late Chalcolithic / EB campsites (SA014, AR006, AR014, AR015, AR020 and AR021). These are characterized by large (20-30 m) and small (3-5 m) circular and sub-circular enclosures / structures (sometimes in terraced succession, and interpreted as pens, silos or habitation structures), terrace walls, various features of unknown function (possibly some had ritual functions), hearths, platforms, cairns with and without ashlars / ashlar-lines, other grave types, isolated and grouped ashlars, occasional ibex and other rock art etc. Dam-like terrace walls sometimes occur along the side of the campsite facing the wadi (AR021; **Fig. 8**). At one site (AR016; **Table 1**), a field of large boulders appears to be a 'breakwater' structure. Where bedrock allows, structures can be megalithic. Indeed, the structural diversity and horizontal stratigraphy of these sites is a challenge to understand. The size of the camps is 200-300 m in length and 50 - 100 m in width. The *inselbergs* must have functioned both as windbreaks and as barriers / diversions for aquifers and surface run-off.

The campsites apparently did not use pottery, but are instead characterized by chert and quartzite flake industries with fan and other scrapers; very few grinding tools are present. Wells, watering complexes and possibly gardens are thought to have been buried by post-occupational wadi gravels, as it is also the case with some of the campsite structures. Future geophysical surveys may help to locate these. Some of the deflated campsites display horizontal stratigraphy (including Wādī as-Sahab al-Abyaḍ 14; **Figs. 4-6**), representing at least two occupations with domestic / animal pen and funerary functions. It might also be the case that campsites were also present in locations other than *inselberg* / outcrop areas, but that for geomorphologcial reasons only those associated with these latter areas have been discovered.

Although we call these sites 'camps', their functional diversity, extent and seasonality may justify the term 'settlement'.

Sub-Recent Water Supplies and Water Storage (P.K.)

General

Water supplies in arid areas are can be based on precipitation, aquifers and surface run-off; other important sources of moisture, such as dew supporting an area's water balance, are ignored here. Built structures assist man in arid environments with securing access (wells, *Mshāsh*, springs), storage (cisterns, open water basins or *Khabrat*) or direction of water (channels, diversion dams etc.) in order to guarantee perennial or seasonal water availability. According to Gebel (2010), all water management supported by structures can be understood as productive water management, whereas water harvesting without structures can be understood more in terms of water 'foraging'. The different types of water provision each have advantages and disadvantages (**Table 2**). Here, the features of two types of productive water management found in our survey area in 2010, namely *Mshāsh* and *Khabrat*[6], are described. By analyzing current and sub-recent water harvesting structures, the potential for (pre-) historic water management can be evaluated and conclusions drawn on the lifestyles of vanished cultures insofar as they relate to water. In the region east of al-Jafr, three main methods of water harvesting and management were encountered, which are to some extent still practiced by *bedouin* utilizing the area today.

Mshāsh Sahab al-Asmar (AR013)

Mshāsh Sahab al-Asmar is an example of one type of seasonal water harvesting system used in the region, namely *Mshāsh*. These are known from several water-rich environments in the area, e.g. in our drainage system at Mshāsh Saliḥ (SA052) and at SA053. 70 km further north, large *Mshāsh* systems were used until recently at

6. A combination of both types might be represented at site SA053, where water was contained by dams to feed *Mshāsh* located in a *khabra*-like setting.

Table 2: Sub-recent and recent methods of water acquisition in the Wādī as-Sahab al-Abyaḍ and al Asmar regions.

	Wells (*biyār, Qulbān*)	**Seasonal pools (*Mshāsh*)**	**Open water basins (*Khabrat*)**	**Springs (not found in research area)**	**Closed basins / cisterns (not found in research area)**
Construction effort	High	Medium	Natural / low	Low / medium	High
Evaporation losses	Low	Medium	High	Low	Low
Water availability	Annual, but no storage capacity	Seasonal	Seasonal, temporary storage capacity	Annual / seasonal	Seasonal / annual
Water quality	High	High - medium	Low	High	High
Utilization	Drinking water, watering animals	Drinking water, watering animals	Agriculture, watering animals	Drinking water, agriculture, watering animals	Drinking water, agriculture, watering animals

Mshāsh Ḥudruj and *Mshāsh* Umm Zaqwh.

Mshāsh are shallow (1-3 m), artificial water pools or holes, with diameters ranging from 3-10 m, which are often found in the upper courses of wadis. They collect seasonally available water and their edges or sides are generally not strengthened with stones. As opposed to genuine wells, *Mshāsh* (or Mshāsh pools) are fed not by perennial aquifers, but by seasonal surface or sub-surface water, e.g. seasonal slope springs, as can be assumed in the case of Mshāsh Sahab al-Asmar.

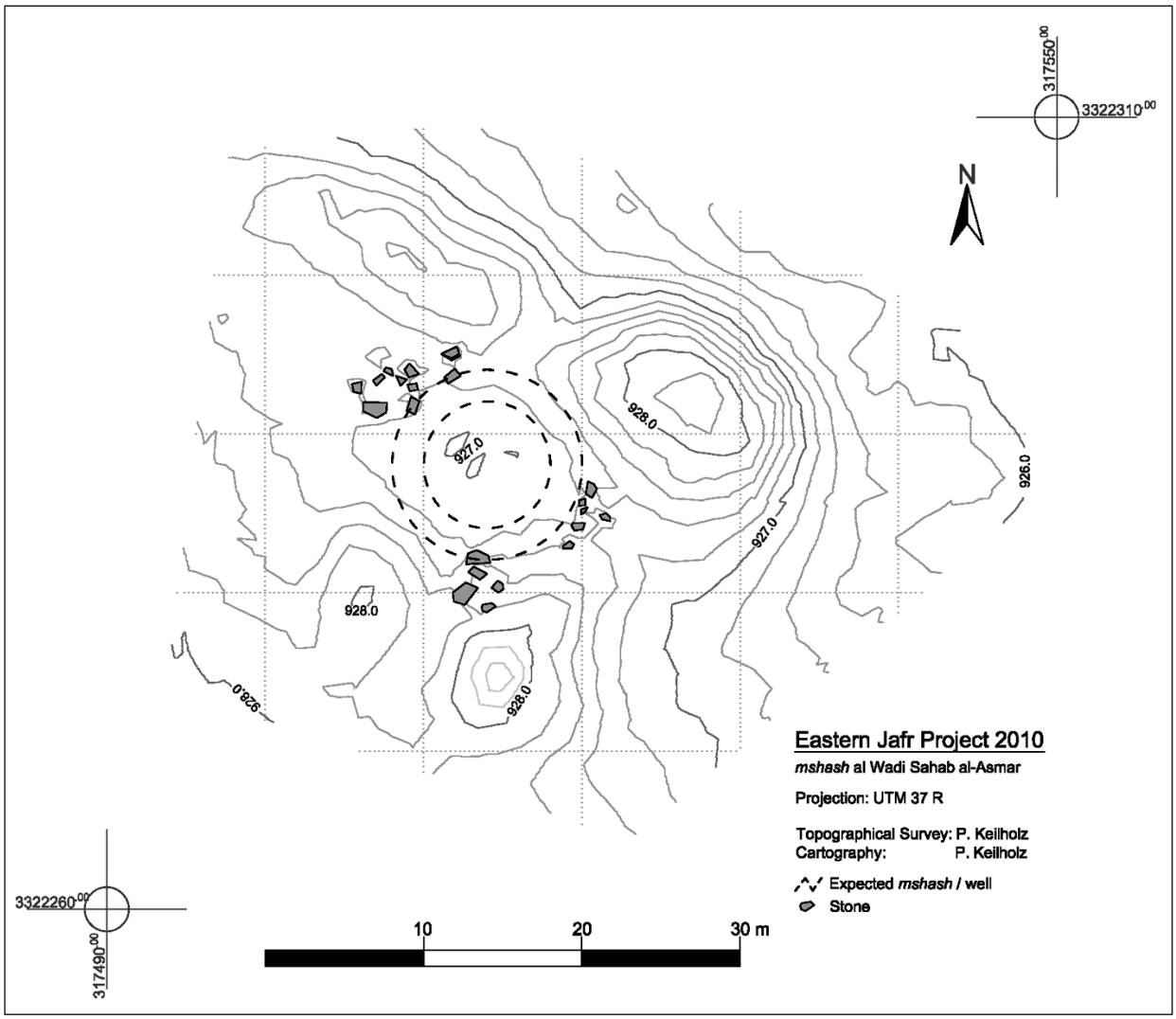
Huge piles of very recent backdirt can be seen at Mshāsh Sahab al-Asmar, presumably the result of excavating the large pool which once existed here. Today, only a sand-filled depression is recognizable; reinforcement or similar of its edges could not be detected. The volume of backdirt attests to the one-time presence of larger structure. Its volume was calculated by means of a high-resolution topographic survey (**Fig. 15**).

These data give a total volume of *ca*. 215 m^3. The location of the pool can be reconstructed through terrain modeling. Its depth is probably *ca*. 4.3-2.7 m, with an interior diameter of 8-10 m. This is extremely large for a traditional *Mshāsh* pool and, furthermore, the backdirt appears to have been deposited in modern times. Nevertheless, traditional structures of this size are known from al-Jafr, Tayma and other areas.

Khabrat are natural depressions or basins in locations which allow run-off water to collect. In addition, their water storage capacity is sometimes enhanced with the addition of minor constructions. *Khabrat* are only used between late winter and late spring / early summer, directly after the rains. *Bedouin* use alaun (*shebba*) to purify water from these *Khabrat* (Gebel and Baumgarten, in press).

Khabrat Miḥfār Sahab al-Asmar (AR004)

Visible from far away, the isolated mountain (AR038) at the edge of the south-eastern floodplain of Wādī as-Sahab al-Asmar 'hosts' Khabrat Miḥfār Sahab al-Asmar. Near the foot of the mountain on its southern side is a small natural depression with a shallow dam, used to this day by *bedouin* to collect water. The depression is situated in a closed basin; its catchment consists of two small wadis flowing in from the south-east, the mountain flanks to the north-east (with round structures AR039) and south-west (**Fig. 16**), and a small ridge immediately north-west of the *khabra*. To the south-east, another wadi passes by but is not connected with Khabrat Miḥfār. The small ridge to the north-west serves as a natural rampart, now open in two places giving the impression of a broken dam. In its upper part, stones had been piled up to raise the capacity of the reservoir the bedrock of the ridge. This all indicates that an already naturally favorable location (water-fed depression surrounded by elevated terrain) was enhanced by simple structures to increase its seasonal water harvest.



15. Mshāsh as-Sahab al-Asmar: potential location of the Mshāsh (drawing Keilholz).

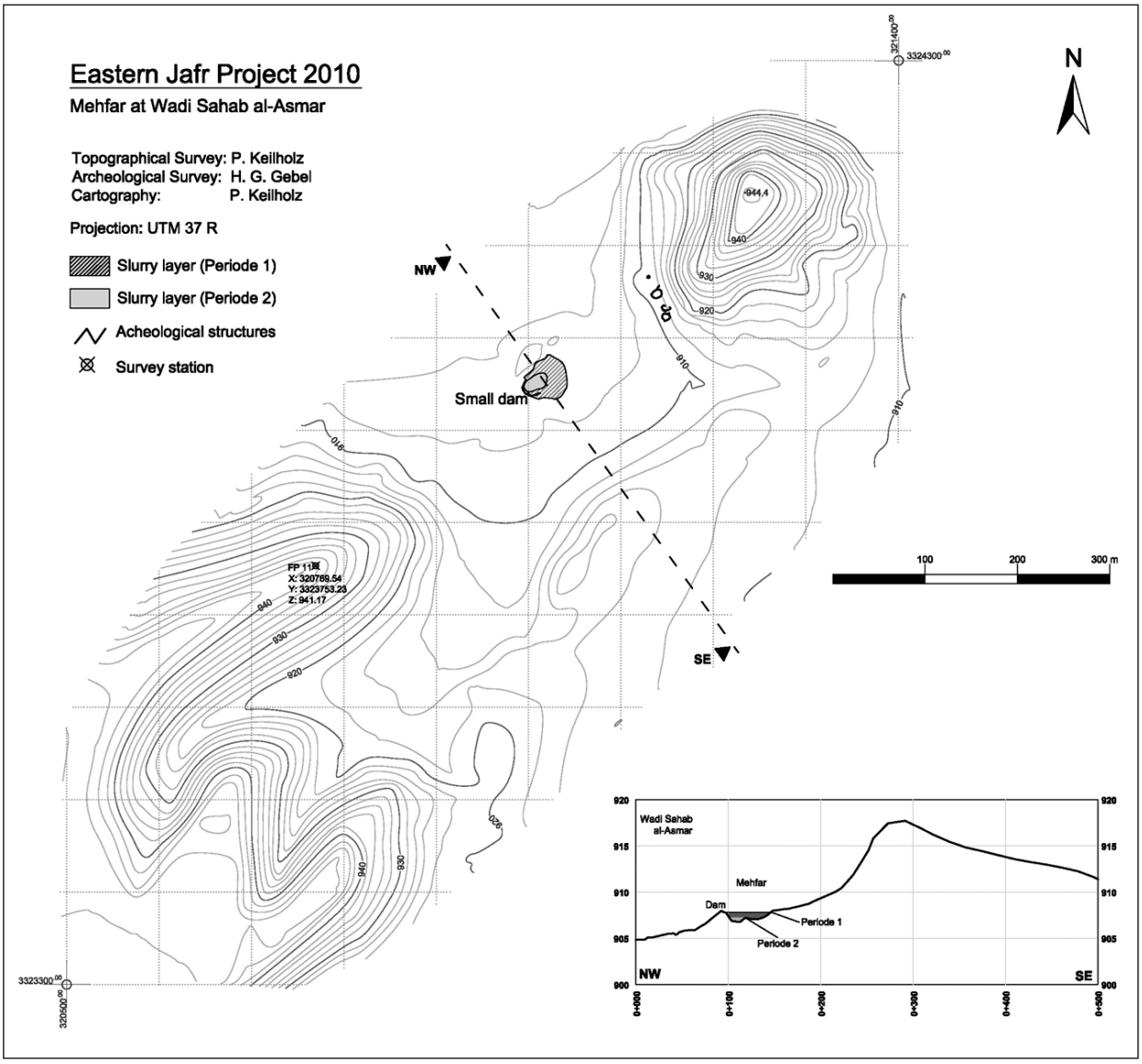
The complex appears to have two phases of use. In sub-recent Phase 1, the reservoir was much larger and may have retained water up to the level of the (partly) artificially raised natural ridge immediately to the north-west. The capacity of the reservoir later shrunk, creating its present-day Phase 2 shape and capacity, most likely as a result of one or more flash floods in the wadi which destroyed the raised dam on the reservoir's eastern and western sides, leaving only the central part intact. The Phase 1 water supply came from three sources: (1) water flowing in from the two southern wadis (0.18 km^2), (2) run-off from the western mountain flanks and south-eastern slope (0.05 km^2) and (3) water flowing in from the eastern wadi.

Phase 1 Water Supply

The present-day surface catchments are quite small for the task of filling a depression / reservoir of Phase 1 size. The extensive water-laid sediments in the depression (> 1640 m^2) testify to a reservoir in use for a long period, suggesting that hydrological conditions were much more favorable at that time. A detailed analysis of run-off processes should allow for a calculation of the precipitation required for optimal management of the reservoir. This should give some indication of hydrological conditions during Phase 1.

Phase 2 Water Supply

Following the destruction of the raised dam,



16. Khabrat Miḥfār Sahab al-Asmar: topography with drainage system, prominent hillocks with cairns on their summits (AR38) and round structures (possibly pens) at the base of their south-western slopes (AR39) (drawing Keilholz).

water from the two southern wadis and mountain slopes drained unhindered into Wādī as-Sahab al-Asmar. As the dam seems not to have been repaired, it would appear that at least some of the surface run-off water potentially available in the area was subsequently allowed to go to waste. Today, the small *khabra* is fed only by the small catchment of the south-east slope and possibly the south-eastern wadi. *Bedouin* collect surface water in shallow, stone-lined runnels leading from the foot of the slopes to the reservoir. These well-preserved lines of stone are easily traced and often cross older erosion rills. Today, Khabrat Miḥfār has a significantly smaller dam and an area of only *ca.* 350 m². The thick, water-laid deposits within it are stone-free (**Fig. 17**).

Khabrat Umm Naḥū (SA005)

Like Khabrat Sahab (SA056), Khabrat Umm Naḥū is located close to the Saudi border (**Fig. 1**). It lies in an area of geological faulting caused by the intersection at an acute angle of the Karak al-Fayḥa and ʻArfa fault systems / lines (Moumani 2008). This has caused the geology of the mountain to fold, resulting in the natural, up-

17. Khabrat Miḥfār Sahab al-Asmar: Phase 2 with its small dam (right) and the ridge immediately to north-west (from south) (photo Keilholz).

right sandstone 'walls' characteristic of Umm Naḥū which block the flow of surface and subsurface water (**Fig. 18**). Horizontal water flow is guided by these faults and may result in locally restricted availability of ground water.

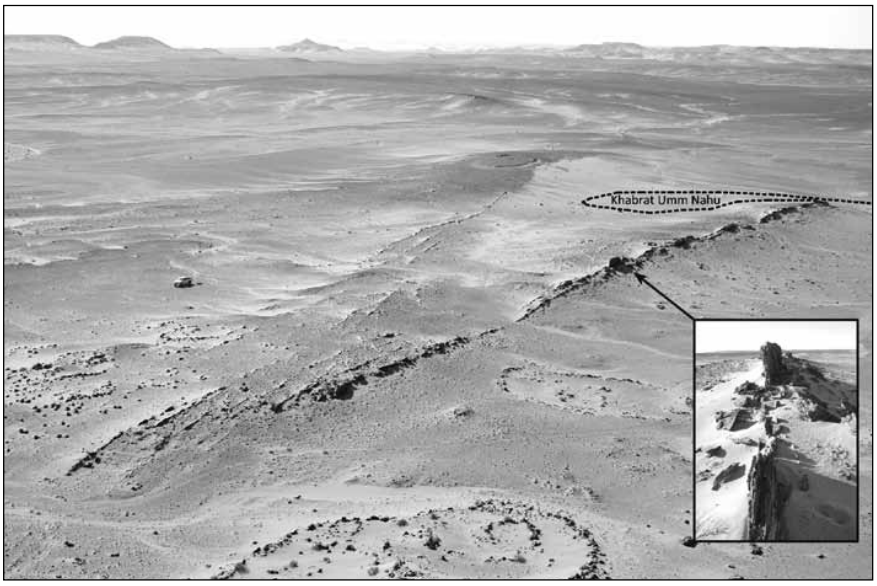
Another potentially important factor in the supply of water to Khabrat Umm Naḥū might be the possibility that the vertical layers of the sandstone bed allow the groundwater to rise. If the aquifer carries confined groundwater, water can rise up to the surface or even beyond. Confined groundwater is the result of mountains being connected to the aquifer and related elevation differences. The water of these confined aquifers escapes at permeable spots / layers caused by geological anomalies. Higher mountains are present in the western part of Khabrat Umm Naḥū, making the existence of confined groundwater likely for this area.

If the Khabrat Umm Naḥū water supply is indeed fed by confined groundwater, this complex could be one of the rare perennial *Khabrat* in the region. This supposition is supported by information from local *bedouin* (Dalish Salim Dmaniyyah al-Huwaitat of al-Jafr), who recall that *bedouin* and camels used to travel long distances to drink water from the *khabra*. The water supply of the present-day depression derives from the western wadi, whose floods are partly channeled into the *khabra*. The water enters the depression through a disruption in the fault line; a small dam prevents it from draining to the south-east in times of higher retention.

Khabrat al-Qara'a (SA055)[7]

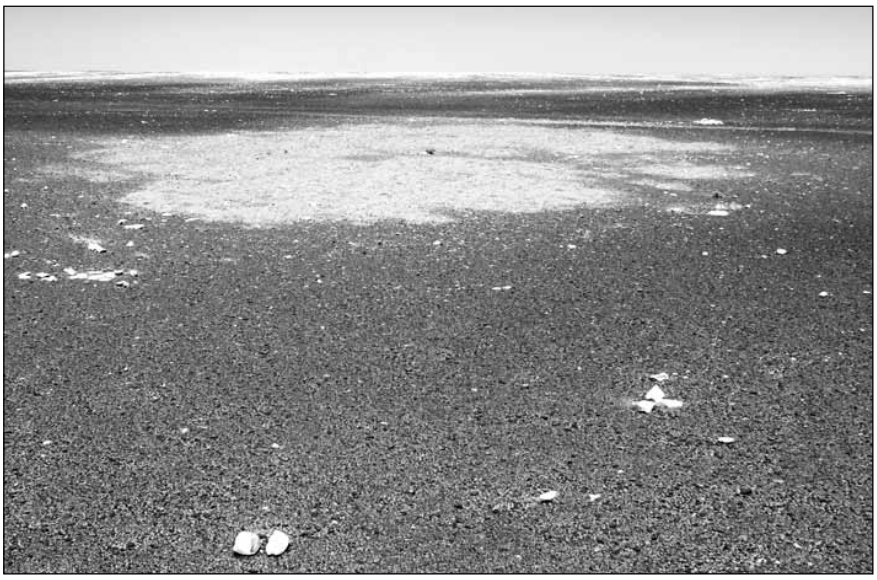
The plateau of the upper catchment of *Qulbān* Banī Murra is characterized by flat topography with depressions (*Khabrat*) in which the seasonal water accumulates. The depressions are stone-free and have mud layers (**Fig. 19**) which help to prevent the water from simply draining into the ground.

On parts of the plateau the bedrock is exposed, which helps a large proportion of rainfall to accumulate in the depressions by surface drainage. The resulting small, seasonal lakes can become quite extensive but are shallow. Under



18. Khabrat Umm Naḥū: geological fault lines with Late Chalcolithic / EB circular structures in the foreground (from north-west) (photo Keilholz).

7. Also known as Khabāri al-Qura' or Khabrat Qubūr al-Maṭālqah.



19. Khubrat Qura', situated on a plateau in the upper catchment area of Qulbān Banī Murra (from south) (photo Keilholz).

present-day climatic conditions, water would evaporate from a 50 cm deep depression within six weeks of the last rainfall at the beginning of May. Therefore, these depressions can only be used for a limited period of time after rainfall, assuming of course that rains come at all that year. Six depressions have been documented at Khabrat al-Qara'a, but more can be expected to collect water on the plateau in wet years; under such conditions, abundant water sources may available here, albeit for relatively short periods of time.

Conclusions

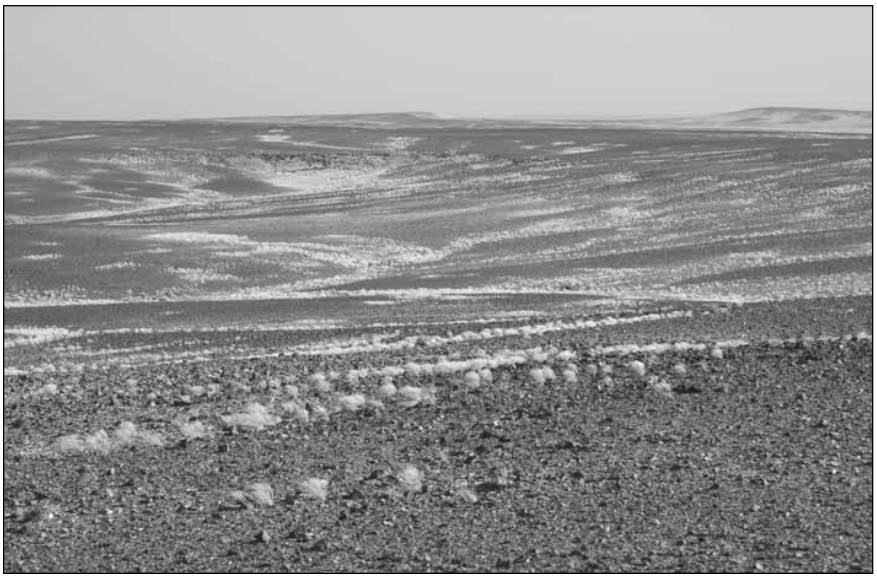
To judge from sub-recent and recent evidence for water management in the area, it seems likely that similar artificial and natural water supply systems were utilized during more arid phases of the Late Chalcolithic / EB (or in drier parts of the study area), *viz.* seasonal *Khabrat* with water retained by various natural and artificial dams, *Mshāsh* or combinations of the two. In addition, wells with watering complexes (cf. **Fig. 3**) were utilized in more humid periods (*ca.* 4400 BC). Although these would have yielded a relatively small amount of permanently available water, the labour required to fill the troughs would have been considerable. *Khabrat* may have been supplementary, seasonal watering places for animals and could possibly even have made agriculture possible in certain locations. Permanent humid-period lakes have not yet been encountered in the study area. While the shepherds of Qulbān Banī Murra may represent a pastoral well culture with horizontal transhumance, it is possible that a *Khabrat* / *Mshāsh* based semi-sedentary way of life was associated with the seemingly later settlements / campsites at *inselberg* locations (**Figs. 2, 4-11**; cf. above).

Recent Land Use (J.B.)

The area east of al-Jafr, extending as far as the mountain range of Jabal aṭ-Ṭubayq, is today used or even sometimes inhabited by sections of the Huwaitat tribe. It has been occupied by man since prehistoric times through various land-use practices, depending on prevailing climatic and hydrological conditions.

Traditionally, land-use in the *bādiya* consists of seasonal pastoralism in years of winter rainfall sufficient to allow pasture to grow. In June 2010, the *ca.* 40km long Wadis as-Sahab al-Abyaḍ and al-Asmar and their tributaries were still extensively covered with a grass known in Arabic as *naṣī* (**Fig. 20**). In the gullies a variety of shrubs and other plants were still green, with some in full bloom. The Latin name of *naṣī* is *Stipagrostis plumosa* (Reinder Neef, German Archaeological Institute, pers. comm.); according to our al-DmaniyyahHuwaitat guide, *naṣī* grass had not grown in the area for many years.

In 2010, the vegetation cover of Wadis as-Sahab al-Abyaḍ and Asmar fed a herd of more than fifty camels belonging to a family of the Nawasreh Huwaitat, a branch of the Ibn Jāzī (cf. Oppenheim 1943: 300). The Nawasreh, along



20. Wādī as-Sahab al-Abyaḍ: naṣī grass (Stipagrostis plumosa) covering extensive parts of the wadi in June 2010 (photo Keilholz).

with other sections of the Huwaitat, were settled by means of government projects starting in the 1970s, with the construction of the new village of al-Jafr where the Nawasreh, Dmaniyyah and other major sub-tribes received houses from the government (Bocco 1996: 226-41). In 2010, the camels were herded by two adolescents who had not set up a tent, but instead sheltered under the water truck by which they had arrived from al-Jafr. The rich pasture that year could have fed many more animals. The fact that only one camel-breeding family saw fit to utilize the vast areas of grazing that resulted from a winter of above-average rainfall indicates the extent of the social changes that the previously nomadic Huwaitat have undergone.

The sedentarisation process, primary and higher education, a multi-resource economy (including income from smuggling, looting antiquities and falcon trapping), plus the fact that camels are no longer used as a means of transportation, have all diminished the importance of and restricted the time available for mobile herding. Heads of families and young adults have jobs in the public sector, army and police, work as truck-drivers, shop-owners and guards, or are employed at the port of ʻAqaba, phosphate mines and other industrial zones. Local people recall that in the 1970s, well-watered locations in the *bādiya* were "crowded" with men and herds — not only camels, but also goats and even sheep. Numerous recent stone structures, such as the remains of the campsites, prayer areas (**Fig. 22**) and graves that are densely scattered over the landscape, lend credence to this narrative. The *bedouin* pastured in the vicinity of natural water-collecting basins (*Khabrat*), some improved with small dams, and around the wells (*biʼr*, *qalīb*, pl. *Qulbān*, *Mshāsh*) dug by tribesmen over long periods of time, which were used and re-used by the successive generations.

This way of life is now coming to an end. Owing to their integration within the modern national economy, year-round dwelling in settlements (offering electricity, running water, shops and medical facilities) and as a reaction to drier climatic conditions and lower water tables, the Huwaitat, like other *bedouin* tribes of southern Jordan, use the *bādiya* less frequently and with fewer people than before. It seems that herding is continued only by those members of a family who have "time" and are not engaged in business, either because they do not attend school, do not have a job[8] in the monetarised economy or are too old for a job. The extent to which the values of an urban industrial market society, i.e. of waged labour and money, have entered *bedouin* mindsets is illustrated by the answer we often received when asking about the current occupation of a person: "Now he has no job, he

8. This does not ignore the fact that to this day some families live more or less permanently with their flocks (camels, goats and even sheep), e.g. in the area north of Wādī Ḥudruj (Wādī al-Ḥasā).

21. Restored bedouin grave of Muhammad Diab al-'Audat (1890), near Khabrat al-Qara'a ("the bald pools") in upper Wādī as-Sahab al-Abyaḍ (photo Gebel).

22. Qulbān Banī Murra, Area G: a desert mosque typical of the bādiya east of al-Jafr (photo Gebel).

is with the goats." For the minority of *bedouin* families who still move their herds with 'dispensible' family members, herding is but an additional source of household income.

The decline in the number of people using the *bādiya* for herding is one reason for the many unused wells now filled with sand. The only well that has recently been dug to a depth of more than four meters (at Mshāsh Sahab al-Asmar) was not completed as groundwater was not reached (cf. Keilholz above). The main reason for the abandonment of wells, however, is that their maintenance is no longer a prerequisite for the survival of men and animals in the *bādiya*, since water is brought in by water trucks. This was true in the case of the Nawasreh family mentioned above; whenever they needed to refill the water-tank of their truck, the boys went back to al-Jafr, a ride of about three hours, whereas in the past it had taken days — we were told — to move the herd from al-Jafr to Wādī as-Sahab al-Abyaḍ, a distance of more than 120 kilometers.

This kind of motorized nomadism can exploit pasture without being dependent on natural water resources, whether surface runoff stand-

ing for weeks in *Khabrat* and other depressions after rainfall, or ground water close to the surface and easily accessible by *Mshāsh* or wells (cf. Obeidat 2009: 100-103; Lancaster and Lancaster 1999: 131-41). The well-known problem associated with motorized nomadism, *viz*. overgrazing caused by longer stays by large flocks transported into a fragile environment, does not seem to apply to the area east of al-Jafr which we found almost empty of men and herds.

Political borders have contributed to the decline of pastoral nomadism. In pre-state times, sections of the Huwaitat tribe used to camp at Jabal aṭ-Ṭubayq during the winter season (e.g. Glubb 1948), visiting natural accumulations of water in depressions like Khabrat Umm Naḥū (cf. Keilholz above) to water their herds. The closure of the Jordanian-Sa'udi border in the 1980s brought free migration in the region to an end. Traditional patterns of movement were halted, with tribes on both sides restricted to territories on their own side of the border. There are no official border-crossing points along the enormous distance between al-Umari and Mudawwara, and the impermeable ditch and berm system patrolled by Sa'udi border police has suffocated the traditional life-style and migration of the *bedouin* of the region.

Nevertheless, the *bedouin* way of life is still appreciated by elderly tribe members, and the landscape they furnished and shaped with wells, pens, dams, graves and prayer areas is still a point of reference and part of local identity, not only for the older generation. *Bedouin* graveyards, as well as groups of graves, dot the area. We found some of the graves to be in poor condition, whereas others seemed well-maintained, even to the extent of having been restored with cement. Near one of the six or seven depressions called Khabrat al-Qara'a ("the bald pools"), the restored grave of a Matalqa Huwaitat (Wādī as-Sahab al-Abyaḍ 54) has a recent Arabic inscription reading "Muhammad Diab al-'Audat 1890", using the Christian calendar to give the date of death of the buried person (**Fig. 21**). The al-'Audat were a sub-section of the al-Matalqa (Oppenheim 1943: 300).

Ancient cairns may display *wusūm* or recent inscriptions pecked into one or two of their larger stones. For example, the cairn of Wādī as-Sahab al-Asmar 9:38 bears the inscription "Muhammad Suleiman al-Hajaya 20/2/1997", thus referring to a second *bedouin* tribe of the south, the Hajaya, who traditionally utilized the *bādiya* east of al-Jafr (Oppenheim 1943: 283-4; Ghazi bin Muhammad 1999: 10-11). Today, the Hajaya have settled around al-Qaṭrāna and al-Ḥasā. Likewise, the entrance to the Wādī as-Sahab al-Asmar 14 rock-shelter (upper Ṭūr Sahab al-Asmar) has a *wasm* of the ad-Dmaniyyah Huwaitat. A *wasm* is a tribal motif used for branding animals and marking locations (e.g. wells, graves, larger stones in prominent positions etc.). The practice of leaving a *wasm* may simply mean that a person wished to record his presence and thus express his self-esteem. However, the marking can also be an expression of tribal claims to territory and / or grazing grounds, denoting that it has been their territory for generations. A *wasm* underscores the right to access and use of a *dīra* or well by a certain tribe, or section of a tribe, and communicates 'ownership' of the area to members of other tribes.

Knowledge of the resources of the *bādiya*, especially usable plants and animals, still exists among the older generation of *bedouin* who have spent their lives, or parts of it, as pastoralists. Here we give some examples of the various ways of using plants: *azr* is the 'mint of the desert', collected for making tea; *hatāt*, if boiled in water and drunk cold, helps against snake and scorpion bites; the leaves of *ribla* can be chewed; *qsīs* plants indicate the presence of *kema*, the truffle of the *bādiya* known by some as the 'potato of the desert'. There are two types, white and brown. White *kema* is cooked and eaten with yoghurt; brown, juicy *kema* is squeezed and provides a liquid used for soothing and healing eyes. *Silla, noqod* and *djreiba* are camel fodder plants; *naṣī* grass has been mentioned above.

Of the few animal species that survive in the *bādiya* (birds, reptiles, mammals), *ḍabb* is especially prized by local people. The large spiny-tailed *ḍabb* lizard (either Egyptian mastigure *Uromastyx aegyptia* or possibly *Uromastyx spinipes*) is found in Wadis as-Sahab al-Asmar and Abyaḍ and in Jabal aṭ-Ṭubayq. It is hunted by *bedouin* for its delicious meat, considered to be both healthy and a cure for many sicknesses, as well as a means of "strengthening a man's sexual power". A large adult *ḍabb* can provide "as much

meat as a small goat"[9]. Other animals trapped in the Afra region east of al-Jafr are *shāhīn* and *ṣaqr* falcons (Gebel and Baumgarten, in press). Apart from the prestige associated with owning falcons, the present-day trapping and sale of falcons to Saudi customers is an occasional but very lucrative activity: a *shāhīn* can be sold for 100-300 JD, while a *ṣaqr* (not caught since 1999) may be sold for up to 56,000 JD. Falcon trapping is associated with the arrival of migratory birds passing through the 'Afra region in October.

It is doubtful whether this knowledge will be passed on to future generations. Rather, the stories we have heard about camel herding in the *bādiya*, with flooded *qī'ān* and *khabrāt* surrounded by tents and large herds, and tribespeople wading into pools filled knee-deep with water, seem to be stories of the past, of an era that is disappearing. Mobile, nomadic *bedouin* have become a tiny minority. In the Governorate of Ma'ān less than 3 % of household incomes are based on agriculture or raising livestock (cf. Tarawneh *et al*. 2003: 8). Sinking water tables resulting from deep well pumping to provide water for urban-industrial centers have made life in the *bādiya* even more difficult and less rewarding. Development plans for the national economy are mostly brought into effect at the expense of arid area environments and to the detriment of pastoralism. Unfortunately, Donald Cole seems right with his statement: "Land degradation and desertification of the steppe is usually blamed on the Bedouin. However, the new uses, or abuses, are the work of non-Bedouin. Indeed, many Bedouin are themselves victims of the misuses of others" (Cole 2003: 262).

Conclusion

The clear, new evidence for the presence of aceramic Late Chalcolithic / Early Bronze Age *inselberg* campsites / settlements in Wādī as-Sahab al-Asmar (dated on the strength of the presence of fan scrapers, e.g. **Fig. 12**) requires consideration of slightly different occupational scenarios for the region (cf. also Hypothesis 5): either the pastoral cultures of the vast burial grounds (e.g. Qulbān Banī Murra) in the area were less mobile than previously thought and were already associated with semi-sedentary land-use, becoming incubators for later oasis economies, or the deflated *inselberg* settlements already represent 'proto-oases'. The complexity of funerary structures in the region might also be an indication that the area was occupied by both types of socio-economy over a longer time span, say from 4500 to 3500 BC, i.e. an earlier pastoral 'well culture' and a later early oasis culture, perhaps with a parallel, later pastoral culture unable to share — owing to environmental conditions — in the oasis economy. Future investigations will assess whether the *inselberg* location of the settlements was the result of aquifers being redirected and raised at such locations by sub-surface bedrock topography and / or the shelter that such locations afforded, as well as the extent to which the settlements were seasonal or permanent. The results of the 2010 season of the Eastern Jafr Project has allowed us refine the hypotheses (see above) by which we approach the question of how early oasis economies and their hydrographic contexts (Pokrandt, in prep.) might have developed in Jordan's south-eastern *ḥamad* during the first half of the 4th millennium BC.

Acknowledgements

Thanks are due to the Department of Antiquities at Amman, especially Dr Fawwaz al-Khraysheh and acting director Dr Rafe' Harahsheh, for granting the 2010 permit and for logistical support; sincere thanks go to Khalil Hamdan for administrative efforts. Further sincere thanks go to Mu'tah University and its president, Prof. Dr Suleiman Arabiat, Dean of the Faculty of Social Sciences, Ibrahim Irud and to Prof. Dr Ricardo Eichmann, Oriental Section of the German Archaeological Institute. Sate al-Masadeh was the Department of Antiquities' representative during the 2010 sea-

9. The *ḍabb* is hunted by hand "because it does not move fast". It is necessary to block the entrance of its burrow before trying to catch the animal, usually with two or three people. The *ḍabb* is killed with a knife, "saying *bismillah* when cutting its throat". The usual way of cooking a *ḍabb* in this area is to prepare the white meat in the manner of *mansaf*: the pieces of meat are fried with onions, boiled in *jamīd* (reconstituted dried sheep's yoghurt) and then served on a mound of rice with a hot *jamīd* 'soup' poured over it. The meat of the *ḍabb* can also be roasted or grilled on a spit (information provided by Dalish Salim ad-Dmaniyyah of al-Jafr).

son. Funding was again provided by Ex Oriente at the Free University of Berlin, the German Archaeological Institute and Mu'tah University; the project is a co-operative venture of the German Archaeological Institute's Research Cluster 2. Technical survey equipment, including a differential GPS, was provided by Prof. Dr Matthias Grottker from the University of Applied Sciences, Lübeck. Valuable information and advice came from Dr Khaleed Moumani of the Natural Resources Authority, Amman. The success of the 2010 field season, however, would not have been possible without the commitment of the participants: Patrick Keilholz (hydrological and archaeological survey), Dr Jürgen Baumgarten Berlin (survey assistant, modern land-use), Amer Salah al-Suleiman (student participant, Hashemite University), Ahmad Sa'ad Abbadi (student participant, University of Jordan), Stephan Wächter (student participant, University of Cologne), Dalish Salim Dmaniyyah al-Huwaitat from al-Jafr (local guide and guard) and Attallah (driver and camp manager, Mu'tah University). Unfortunately, teaching commitments preventing Dr Mahasneh from supporting the project in the field for longer than 20-25 June 2010. The fourth season of field work lasted from 20 to 30 June 2010 and was again characterized by harsh working and living conditions, this time including sand storms, incursions by venomous snakes and the 'ordinary' logistic difficulties of water, food and fuel. However, morale remained high and, in this respect, the season was one of the best we have had in the wilderness of Wadis as-Sahab al-Abyaḍ and al-Asmar.

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KHIRBAT ʻATARŪZ: AN INTERIM OVERVIEW OF THE 10 YEARS OF ARCHAEOLOGICAL ARCHITECTURAL FINDINGS

Chang-Ho C. Ji

The archaeological site of Khirbat ʻAtarūz is situated on the ridge of Jabal Ḥamīdah between the Wādī Zarqāʾ Māʻīn on the north and the Sayl al-Hīdān on the south. The ruin is near the modern town of Jabal Ḥamīdah, approximately 10 km west of Libb and 3 km east of the Hellenistic and Roman ruin at Machaerus.

The vicinity of Khirbat ʻAtarūz was surveyed by Schottroff (1966) some decades ago. This survey showed that it was one of the few permanently settled sites from the Iron Age in the Jabal Ḥamīdah region. Niemann (1985; see also Glueck 1939: 135) also examined the site and found Iron Age pottery as well as a portion of a terracotta figurine. This earlier effort notwithstanding, much of the ʻAtarūz region has not yet been properly researched for archaeological remains, since no excavations had previously occurred specifically at Khirbat ʻAtarūz.

Prior to further discussion, the excavation team expresses its sincere gratitude in particular to the Versacare Foundation for its multi-year financial support for the ʻAtarūz excavation and the survey of the Dhībān Plateau and ʻAtarūz region. My appreciation also goes to the Korean Research Foundation, Dr. Lawrence T. Geraty, the former president of La Sierra University, and Dr. Jong Keun Lee, professor of religion at Sahm Yook University, Korea, for their technical assistance and financial contributions to the project.

In addition, I wish to thank Dr. Fawwaz al-Khraysheh and Dr. Ziad al-Saad, Directors-General of the Department of Antiquities of Jordan for facilitating and supporting the excavations of Khirbat ʻAtarūz during the past ten years. Last but not the least, the project is also deeply indebted to the Department of Antiquities representatives, Adeeb Abu Shmais, Khalid al-Hawari, Issa Seryani, Ashraf al-Khraysheh, Basem al-Mahamid, and Husam Hjazeen. Their professional and collegial support and assistance are much valued and appreciated.

History of Excavations

The La Sierra University team has long been interested in Khirbat ʻAtarūz and its vicinity for archaeological research since 1996 when the Dhībān Plateau Survey Project (Ji and ʻAttiyat 1997; Ji and Lee 1998; 2000, 2003, 2007) was launched, given that the ʻAtarūz area is just north of the survey area across the Sayl al-Hīdān. Both the Dhībān and ʻAtarūz areas are closely connected in terms of geography and archaeological history (*cf.* Ji 2009). Accordingly, it was deemed essential to study the two regions together in order to understand the occupational history of central Jordan as a whole.

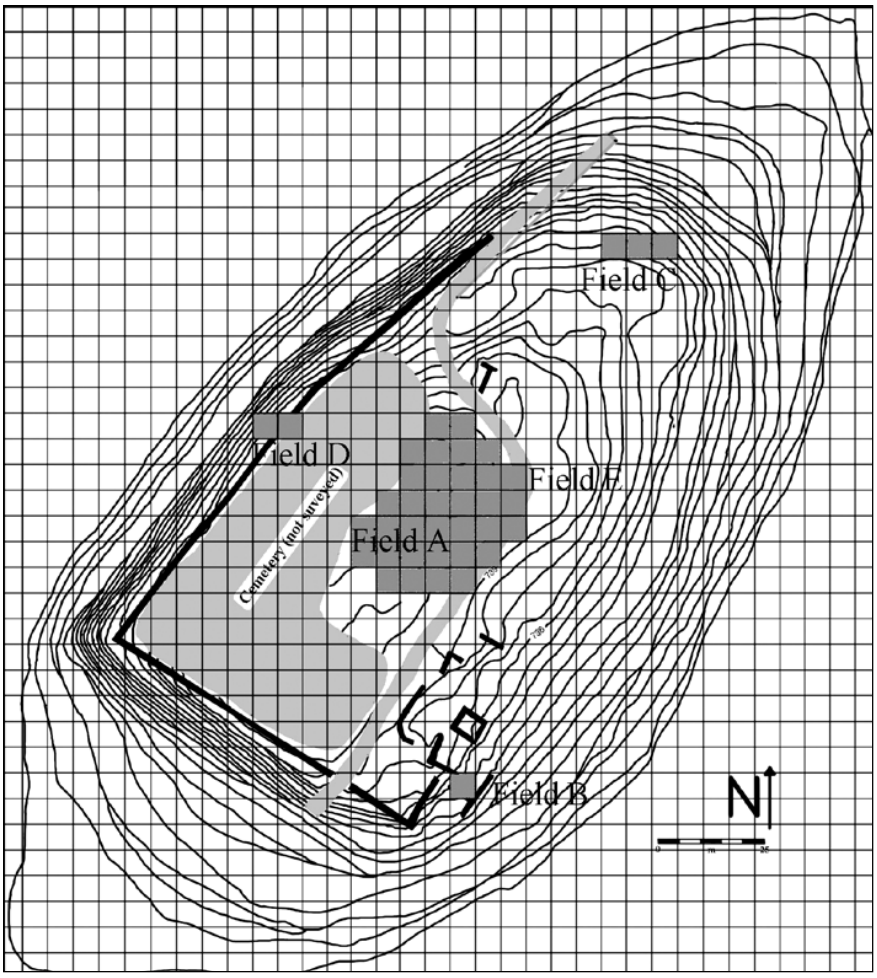
Accordingly, in 1998, as an extension to the Dhībān Plateau Survey Project, Dr. Lawrence T. Geraty and I arrived at Khirbat ʻAtarūz for a brief reconnaissance surface survey of the site, which produced a collection of diverse pottery dated to the Iron Age as well as some belonging to the Hellenistic, Roman, and Islamic periods. In particular, at the acropolis of the site were several ancient wall lines clearly visible and traceable above the ground. It was apparent from this visitation that Khirbat ʻAtarūz was rich in archaeological materials and evidence for the study of the Iron Age, classical era, and Islamic period. The ceramic evidence of Khirbat ʻAtarūz was also assessed to be compatible in shape and style with those from the Iron Age, Hellenistic, Roman, and Islamic sites in the Dhībān Plateau.

In 2000, upon completing the Dhībān Plateau Project, it was determined that I would be-

gin with two 6 m x 6 m squares at the acropolis area in hopes of engendering a preliminary stratigraphy for future full-blown excavations. Thereafter, six seasons of excavation took place between 2000 and 2011 under the auspices of the Versacare Foundation and the ʻAtarūz Regional Research Project, centering on four areas: the acropolis (Fields A and E), the southwestern slope (Field B), the northeastern slope (Field C), and the western defense wall (Field D) (see **Fig. 1**).

To be more specific, the initial field activity (2000) at the acropolis consisted of a reconnaissance type excavation that opened two 6 x 6 m squares in Field A, an operation designed to explore whether the ancient residents made use of the area. The fieldwork led to the discovery of part of an Iron Age building with many cultic vessels. In 2001, the excavation team continued in the squares opened in the previous season and concurrently opened three new squares (3 m x 6 m for one and 6 x 6 m for the other two). The third to sixth seasons of excavation took place in the summers of 2004 to 2011, expanding activities with 25 new 6 x 6 m squares in Field A and nine additional 6 x 6 m squares in Fields B to E. At the same time, work in the squares partially excavated in the previous seasons was resumed to completely expose wall remains in the squares and to understand their connections to the remains in other squares. The excavation of the central buildings at the acropolis was virtually completed during 2010, uncovering a building complex that most likely represents a temple dated to the period of Iron IIA (*ca*. 920 - 800 BC) - Iron IIB (*ca*. 800-700 BC).

This paper intends to present an overall summary of archaeological stratigraphy and major architectural findings from the 2000-2011 seasons of fieldwork, and is soon to be followed by a series of detailed reports centering on the architectural characteristics of the Iron Age



1. Khirbat ʻAtarūz Contour Map and Excavated Areas (Fields A-E).

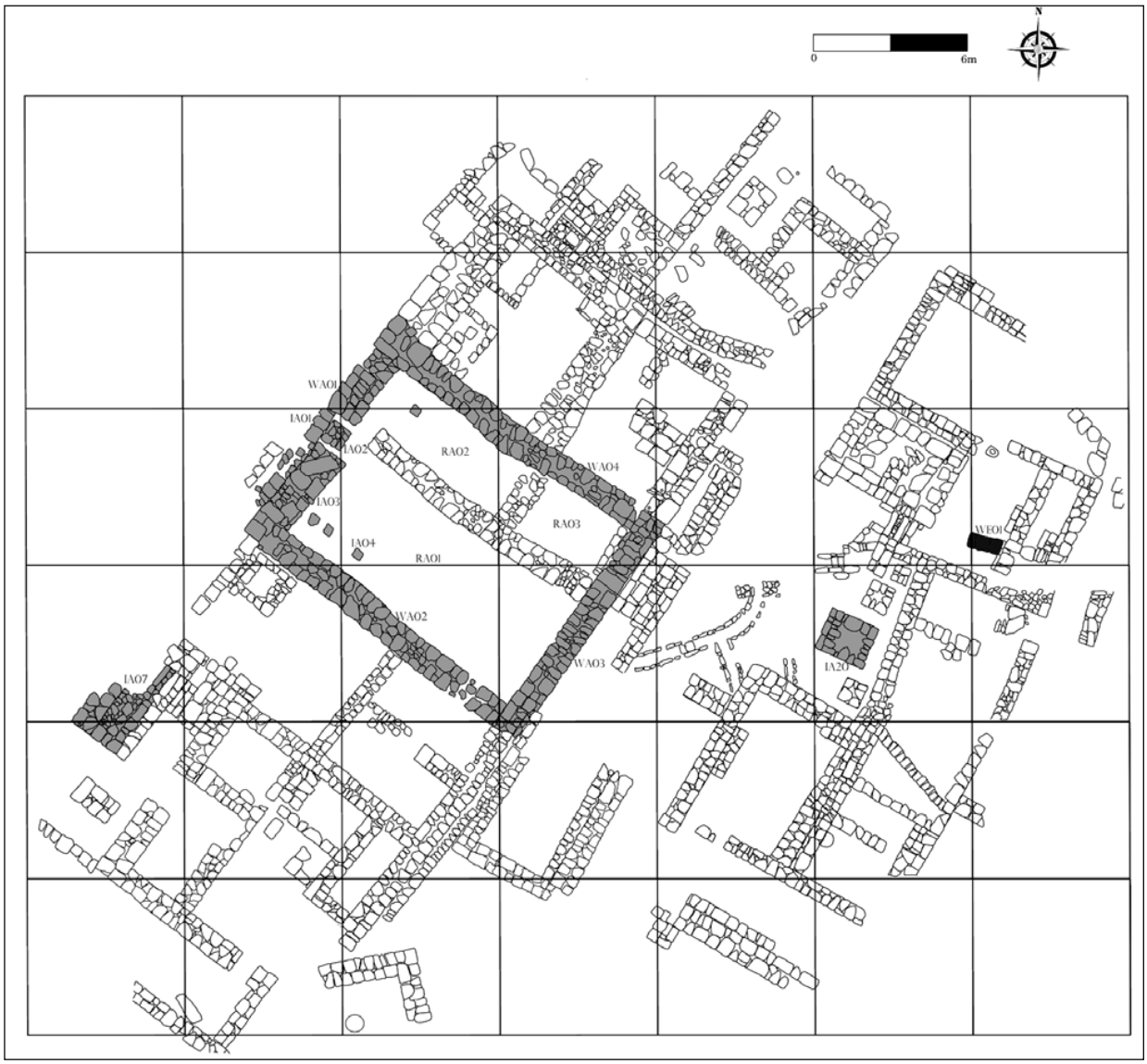
temple and ceramic evidence for the purpose of dating the temple. Those articles will also depict selected objects found inside the temple building, evidence considered to offer support for my identification of the building as a temple or cultic complex (refer to Ji 2012 for selected objects from the temple area).

Iron I (Stratum 12)

The earliest evidence that has so far been uncovered from Khirbat ʻAtarūz is Iron I that was attested to in Fields B and E. In Field B, the Iron I era is represented by several diagnostic sherds that appear in fills beneath the Iron II defense wall, a wall remaining on the southwest part of the site along the direction of northeast-southwest. As in Field B, Iron I sherds were recovered in earth and rock fills in Field E, fills made to build the earliest earth-beaten floor or surface for the Iron II temple courtyard. Here, a wall line (Wall E01) was found running along the east-west axis, which was about 1m long and 70 cm wide (see **Fig. 2**). It was erected with medium to large unhewn limestone blocks.

Early Iron IIA (Temple Phase I; Strata 11-10)

Above the Iron I fills in Field E is a large floor (Stratum 10) built on top of earth fills (Stratum



2. Late Iron I-Early Iron IIA Building Remains in Fields A and E (Strata 12 and 10) (Black Color: Stratum 12, Gray Color: Stratum 10; R: Room, W: Wall, I: Installation).

11) mixed with cobbles and small rocks. Also, Stratum 10 is very clearly represented in Field A where a large Iron Age IIA temple complex (see below) was discovered. What I know at this point for certain is that Stratum 11 lacks any building remains and is ubiquitous over the entire acropolis area of Khirbat ʻAtarūz, a fact positing that Stratum 11 is an earth fill put by the early Iron IIA residents to flatten bedrock preparatory to building the temple in Stratum 10.

The first major building activity at Khirbat ʻAtarūz is assigned to Stratum 10. According to the excavations, most of the temple walls in Stratum 10 were erected directly on top of bedrock. As to the floors, bedrock was also skillfully used in the construction of the temple floor; part of the floor was composed of the earlier earth-fill surface (Stratum 11), while the builders added beaten earth where the bedrock dipped or fell away. The temple proper, as shown in Figure 2, seems to have initially been built according to a simple, rectangular long-room plan that was composed of three internal elements: an offering platform, a sanctuary room, and a cella with a pedestal-like installation. In addition to these remains were a possible "high place" and an altar in the western and central courtyards, respectively (see the Temple Phase II section for the altar).

Specifically, the northwest corner of the sanctuary room was equipped with an artificially raised three-step platform upon which religious and votive objects were placed. The platform, labeled as Installation A03, was constructed along the rear wall (Wall A01) of the temple room and consisted of small to medium unworked stones with several flat-topped boulders. To the right of the offering platform was the recess-like inner cella that contained a pedestal (Installation A02), again made up of unhewn boulders set atop a beaten-earth floor against the rear wall. This pedestal currently stands about 1.3 m high and has a base measuring approximately 1 x 1 m. A standing stone (Installation A01), measuring 0.5 x 0.5 x 1.5 m in size, stood upright on top of this pedestal. The cella measures approximately 1.5 x 1.5 m. During this period, the sanctuary room (Room A01-A03) seems to have been accessed from two directions. The main entrance was probably in the middle of the southeastern wall (Wall A03) with a secondary access likely from the northeastern corner of the room.

Four stone bases (Installation A04) belonging to Stratum 10 were located inside Rooms A01 and A02 along the northeastern and southwestern walls (Walls A02 and A04), which seem to have been used to support the roof. Yet, such installations were absent in the middle and southeastern sections of the main sanctuary room. This perhaps suggests that only part of the northwestern section of the room was roofed, while the other remained uncovered. This being the case, the main sanctuary chamber appears to have been a partially open-air building consisting of a roofed and canopied section on the northwest side and a courtyard-like open space on the southeast side.

Approximately 10 m west of the sanctuary room (Rooms A01-A03) was a rectangular tower-like structure (Installation A07) with at least two construction phases, evidenced by one early structure (Stratum 10) and the addition of one row of walls or faces (Stratum 8) against the original one. This tower-like structure was possibly a "high place", one here named the Western High Place, where priests offered up prayers and worship during the first and second temple periods (see **Fig. 3**). This high place was only partially excavated due to the presence of a modern cemetery immediately west and north of the structure. Thus it is difficult to estimate the exact size of the structure. To be sure, however, the Western High Place was at least 2.5 x 4.0 m in size and higher than the adjacent courtyard by at least 1 m. It was reached by four steps, each about 25 cm high, leading to the top of the structure. This description stands for both phases of the high place.

Roughly 60 cm west of the staircase was a small fireplace (Installation A08 in **Fig. 4**; 50 cm in diameter) circled by a line of natural stones. I found fine ashes inside the fireplace, and fragments of an iron II jug were uncovered *in situ* right outside of the stone circle. This fireplace was only linked with Stratum 8, however.

Early-Mid Iron IIA (Temple Phase II; Strata 9-8)

The plan and walls of the original sanctuary room were preserved when the temple was ex-

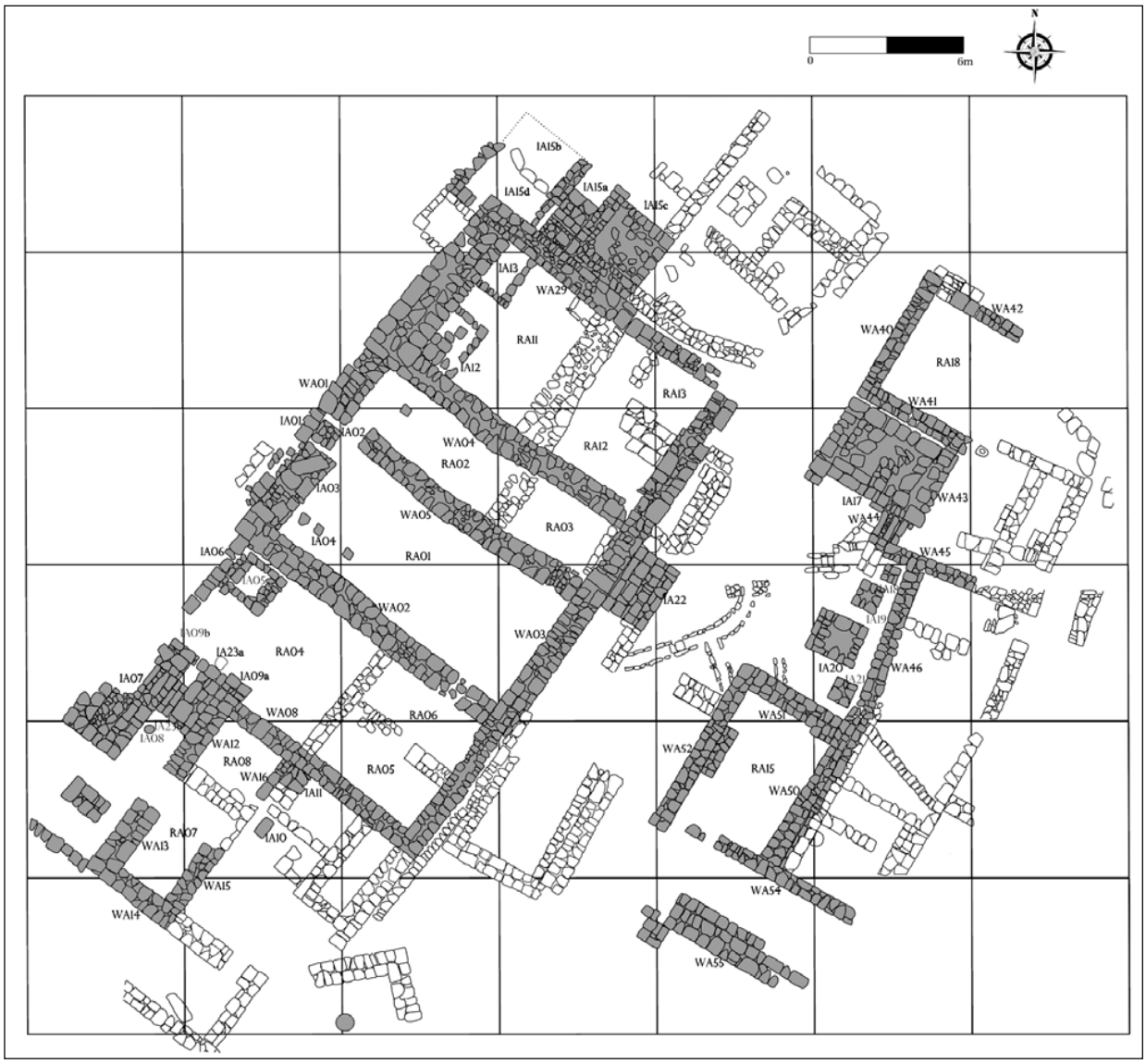
3. The Western High Place and Entrance to the Hearth Room (View from Southwest) (Photo by J. H. Park).

panded during the second temple phase. As presented in Figure 4, expansion was carried out purposefully on three fronts. First, Stratum 8 builders reorganized the original sanctuary room into two smaller rooms (Rooms A01 and A02-A03) by subdividing it with a long compartment wall (Wall A05) in the northwest-southeast direction between the two outer walls (Walls A02 and A04). This inner wall, like the outer walls, was erected on top of either bedrock or a shallow terra rosa layer above bedrock after sections of the Stratum 10 floors were eliminated. The builders then put a layer of soil (Stratum 9) on top of the earlier floor (Stratum 10) in Rooms A01-A03 to construct a new floor (Stratum 8) inside the sanctuary and auxiliary rooms. Second, additional rooms or courtyards were created west and east of the sanctuary room, appreciably enlarging and elaborating the cultic precinct. Third, concurrently added to the precinct was a large stone terrace most likely identified as a second high place and equipped with five stairs for access situated at the northeast face of the structure. The second phase buildings were destroyed by fire. But most of the walls survived this destruction and part of them were used to construct residences during the late Hellenistic, early Roman, and mid Islamic periods.

The Main Sanctuary Room (Room A01)

The architectural expansion and modification in Stratum 8 notwithstanding, the centerpiece of the second-phase temple should be perceived as Room A01 (hereafter the Main Sanctuary Room), which roughly corresponds to the western two-thirds of the first-phase sanctuary room (see **Fig. 5**). The length of this second-phase Main Sanctuary Room is 12 m or more and the width about 5 m. The primary entrance into the Main Sanctuary Room continued to be in the southeastern wall, yet its location seems to have been moved to the southwest by about 1 m as compared to the earlier entrance. The northeastern entrance remained in use during the second phase but this time as an outer door leading to the inner entrance via Room A02. Also, four doors were added to the Main Sanctuary Room. One opening was attested to near the southeastern end of the southwestern wall; the other openings were in the compartment wall and connected the main room with an auxiliary sanctuary to the east (Room A02-A03).

The aforementioned cultic installations and furnishings in the Main Sanctuary Room also appear to have remained unchanged, suggesting continuation of the principal rituals practiced at the temple despite the expansion and modification of the temple building. The artifacts found in association with the pedestal (Installation A02), both whole and fragmentary, include a four-horned terracotta altar, incense cups, and various ceramic and iron oil lamps (Ji 2012). Such findings perhaps indicate that the pedestal stand was erected not only to hold the standing stone but also to support a terracotta altar and the lamps and cups used for burning incense and oil. Like the pedestal, the two lower stairs of the platform (Installation A03) continued to be in use as offering tables or benches; a large number of votive objects were also found *in situ* on its two lower stairs. Additional objects associated with the platform were a bronze belt-like plate decorated with serpents, iron fragments, terracotta lamps, chalices, bowls, and stone vessels;



4. Early-Mid Iron IIA Building Remains in Fields A and E (Stratum 8) (R: Room, W: Wall, I: Installation).

5. The Main Sanctuary and Auxiliary Sanctuary Rooms (View from Southeast).

fragments of a clay cultic stand or shrine model (see **Fig. 6**) was discovered on the platform as well as on the floor around the standing stone cella (*cf*. Ji 2012).

East of the Main Sanctuary Room was the Auxiliary Sanctuary Room (Rooms A02-A03), a long rectangular room mainly made up of Walls A04 and A05, the two walls running parallel at a distance of approximately 2 m. When the northernmost section of Room A02 was cleaned up in 2004 and 2011, the team found pot sherds and fragments of cultic objects, all similar to those from the Main Sanctuary Room (see **Fig. 7**). As noted above, there were three doors in the Aux-

6. The Two Male Cultic Stand from the Main Sanctuary Room (Photo by J. S. Burnett).

7. Cultic Objects in situ in the Auxiliary Sanctuary Room (Photo by B. J. Kim).

iliary Sanctuary Room leading to and from the Main Sanctuary Room.

In my view, an auxiliary room adjacent to a main sanctuary room is reminiscent of a small room located inside the "fosse temple" of Lachish dated to the fifteenth or the beginning of the fourteenth century BC (Mazar 1990: 492). Like the side chambers found near the altars at Tel Dan, the Auxiliary Sanctuary Room appears to have been used for cultic as well as storage purposes (*cf*. Nakhai 2001: 184).

The Hearth (Rooms A04-A06) and Double Altar (Rooms A11-A13) Rooms

Southwest of the Main Sanctuary Room was Rooms A04-A06, named the Hearth Room, with a couple of important cultic architectural features. Most importantly, in this room stones were elaborately stacked to make Installation A06 against the rear wall, although the exact template of the installation evades our imagination since its middle section was badly plundered when the temple was destroyed. One sure thing, however, was the presence of a rectangular niche (*ca*. 30 x 50 x 20 cm) incorporated roughly in the center of the installation. The niche should have served as an essential component of and been used in conjunction with the cultic activities in this room since it is situated right behind a cult hearth (Installation A05) and can be seen over the hearth from the middle of the room. Priests or worshipers possibly placed a statute or image of the temple's deity in it. This suggestion seems plausible given that plunder centered on this niche and its surrounding section when the installation was vandalized; the excavation team did not find any clear evidence of destructive activities in other portions of the room, only in the area of the niche installation.

In front of the niche installation was the aforementioned square hearth (Installation A05; approximately 2 x 2 m; see **Fig. 8**), the inside of which was filled with very fine ash when excavated. Animal bones were completely absent from the hearth, positing that the hearth was probably used to keep a flame alight rather than to burn offerings or sacrificial animals. The flame may have signified a sort of "eternal" flame in honor of a deity who was worshiped at the ʻAtarūz temple, perhaps associated with the image or statue inside the niche.

The Hearth Room floor was covered with beaten earth as was the Main Sanctuary Room. The eastern entrance to this room was located on the southeastern end of its northeastern wall (Wall A02), which divided the Main Sanctuary and Hearth Rooms. About 4 m southwest of

8. The Hearth in the Hearth Room.

the hearth were two tables or benches (Installations A09a and A09b) built against the side wall (Wall A08) on either side of the entrance to the Hearth Room. Each bench measures 0.5 x 1.0 m and now stands 80 cm above the floor. North of these tables/benches were two stone-paved steps (Installation A23a) down from the Western High Place to the room through a stone pavement (Installation A23b).

The floor of the Hearth Room was partially covered with ash with its highest concentration in the hearth area. The ash layer was relatively sparse or absent on the southern side of the room, potentially indicating that ash originated either from the hearth or from fire in the wooden roof above the cultic installation. This incongruity suggests that the Hearth Room did not have a roof or at best was only partially roofed like the Main Sanctuary Room. The Hearth Room is likely to have been roughly the same size as the Main Sanctuary Room in terms of its length and shape and was deliberately built west of the main cultic room in a parallel manner.

East of the Auxiliary Sanctuary Room (Rooms A02-A03) was an open-air room (Rooms A11-A13) labeled as the Double Altar Room, measuring 6.5 x 11 m with a single entrance on the southeastern side of the room. Most conspicuously, this room included two altars (Installations A12 and A13; see **Fig. 9**) roughly parallel in shape and size, each measuring roughly 1.5 x 3 x 1 m and built side by side against the rear northwestern wall.

The Eastern High Place (Installation A15)

In 2008, on the northeast side of the Double Altar Room the excavation team uncovered a rectangular tower-like stone terrace that was built during the second phase of the temple (Stratum 8). As for its western counterpart, it most likely functioned as a high place. This structure currently covers an area of about 5 x 8 m and originally rose at least 2 m above the ground. The structure's impressive size as well as its location in close proximity to the temple buildings point to the cultic nature of the structure, probably justifying my identification of the structure as a high place (Installations A15a-A15d; the Eastern High Place hereafter). This structure, when initially constructed, was probably larger than what presently remains given that the northern and eastern parts of the structure were badly damaged by the Hellenistic and Mid Islamic settlers who removed stones from these sections in order to build walls and buildings (*e.g.*, Wall A30 in Figure 15; Walls A35 and A37 in Figure 18) that currently stand abutting the eastern and southwestern faces of the high place. The upper surface of the high place was floored with medium to large undressed stone blocks, seemingly without any superstructures or surface installations.

9. The Double Altars in the Double Altar Room.

Attached to the high place were ruins of a staircase (Installation A15a) made up of five steps for priests or people coming to the structure from the east side. The staircase appears to have been the sole means of ascent to the top of the high place. The steps, measuring 1.2 m long, 50 cm wide, and 40 cm high on average, were comprised of several medium-sized stone boulders except for the lowest one that was built of a stone slab. The excavation also showed that the Eastern High Place area was probably conveniently accessible from the Main Sanctuary Room through the back door of the sanctuary.

The investigation of the Eastern High Place indicates that it was built in three architectural phases. For the construction, the builders first constructed a rectangular structure (Installation A15b), which probably served as the principal facility where religious rites took place. The staircase (Installation A15a) was then added to the east facade of the rectangular structure, followed by two tower-like square structures (Installations A15c and 15d) flanking the stairs, one on each side. The uppermost step of the staircase appears to have functioned as a stepping stone or a small platform on the way lead-

ing up to the rectangular structure and the two square towers.

The Courtyards

The entrance from the western courtyard to the Western High Place and the Hearth Room was two-chambered, with rooms of similar size (*ca*. 2.2 x 2.6 m) on either side of the central aisle (see **Fig. 10**). These two chambers were fully exposed in 2010 and 2011 and subsequently named the Eastern (Room A08) and Western (Room A07) Entrance Rooms. The Western Entrance Room had a series of beaten-earth floor surfaces: the earliest floor date to early-mid Iron IIA with two subsequent late Iron IIA-Iron IIB floors and two Hellenistic soil layers (see below for the later floors). Equally challenging was the stratigraphy of the Eastern Entrance Room. As for the western room, the Eastern Entrance Room also had one layer of early-mid Iron IIA beaten-earth floor followed by two late Iron IIA-Iron IIB floors, one of which was plastered, and two late Hellenistic floors. The plastered Iron IIB floor was absent in the Western Entrance Room. The early-mid Iron IIA floor was assigned to Stratum 8; several fragments of cultic vessels were collected from these early-mid Iron IIA floors inside the two entrance rooms.

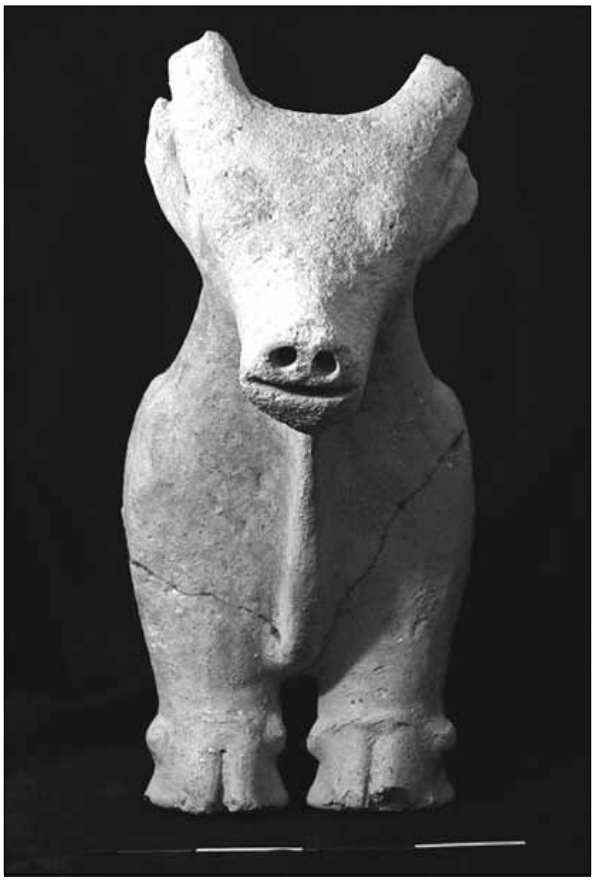
In front of the two entrance rooms was the Western Courtyard that contained a standing stone (Installation A10), one set vertically in the ground of the courtyard surface that is apparently dated to the early-mid Iron IIA period (see **Fig. 10**). The standing stone, reminiscent of the one in the Main Sanctuary Room, measures approximately .5 x .6 x 1.3 m and still stands upright *in situ* in the Western Courtyard. Immediately northeast of this standing stone was a small square-type bench or table (Installation A11; *ca*. 50 x 50 x 30 cm). This seems to have been built for the placement of offerings for those who accessed the Western High Place or temple buildings through the Western Courtyard.

10. The Entrance Rooms and Standing Stone in the Western Courtyard (View from Southeast) (Photo by B. J. Kim).

Turning to the southeast of the sanctuary complex, the excavation team identified a courtyard, named the Central Courtyard, with an array of square or rectangular altars (Altars A1-5; Installations A17-A21) in various sizes, ranging from .5 x .5 m to 3.5 x 4.5 m. All these altars were associated with the second phase of the temple period (Stratum 8), except for Altar A3 (Installation A20) which was built and reused during the first and second phases of the temple construction, in the order specified. Altars A1 and A3 (Installations A17 and A20), respectively, had a stair attached to the installation, one buttressing the lower portion of the altar walls. In particular, the step for Altar A1 (Installation A17) was impressive: it was made up of three rectangular stones in a row measuring a total of 3 m in width together (30 cm long and 30 cm high). A cluster of several altars in a relatively small open area leads one to postulate that this area corresponded to the main courtyard of the temple where animal sacrifice took place for offering and other religious rites.

Two more architectural features appear in the Central Courtyard. Between Altar A3 (Installation A20) and the Main Sanctuary Room was a stepped structure (Installation A22) adjacent to the southeastern wall of the sanctuary, which apparently was carefully built against the wall during the second phase of the temple. The entire structure was comprised of four broad steps, each step measuring about 20 cm high and 7 m wide. In addition, to the west of Altar A5 (Installation A21) was a rectangular building (Room A15) without any interior compartment walls except for a possible bench or doorstep located along the northwestern wall. Inside the building were three Iron II soil layers or beaten-earth floors under a Mid Islamic layer of occupation. The last two Iron II floors contained a large number of cultic objects and vessels including a large terracotta bull statue (see **Fig. 11**), but the exact nature of the room remains uncertain.

Turning to the east side of the courtyard, im-



11. The Bull Statue from the 'Atarūz Temple (Photo by J. H. Park).

mediately east of Altar A1 was Room A18 (approximately 6 m x 10 m) without any interior installations. This room was only partially excavated, but it appears to have been part of the second phase temple complex. The walls of this room are preserved up to 1.3 m. Several walls in Field E seem to have adjoined to this room; their construction dates await further excavations, however. This is also the case for several wall lines uncovered to the east of the Eastern High Place.

Defense Wall

My investigation in Field D uncovered portions of the enclosure wall that once surrounded the entire city of 'Atarūz (see **Fig. 12**). The wall was constructed of undressed blocks of local limestone. It was three rows wide (measuring *ca*. 80 cm) and currently stands 5 courses high to a height of 1 m. This wall system was most likely built to protect the city as was the dry moat dug outside of the defense wall.

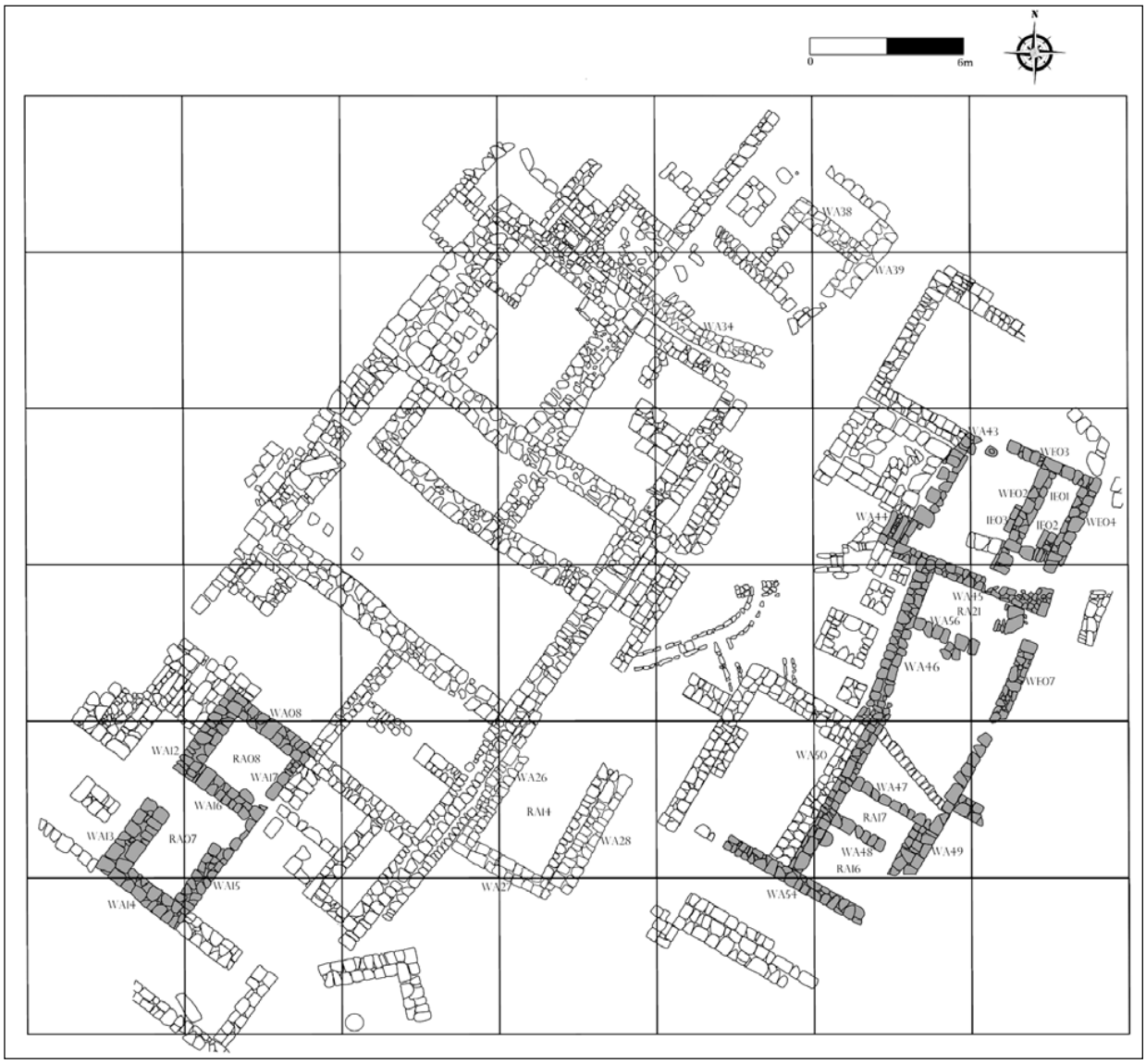
12. The Defense Wall in Field D (Photo by J. H. Park).

Work in Field D immediately west of the defense wall revealed a beaten-earth floor or surface associated with the construction of the defense wall. Ceramic forms from this floor include early Iron II bowls and storage jars that are characteristic of the Strata 9-8 floors inside the temple complex. This ceramic affinity indicates that the defense wall was associated with the temple in Fields A and E and most likely built concomitantly with the second phase of the temple.

Late Iron IIA-Iron IIB (Temple Phase III; Strata 7-6)

Stratum 7

As shown in **Fig. 13**, the end of the early-mid Iron IIA era was marked by the abandonment of the main cultic buildings and high places adjacent to the temple, suggesting a possible decrease in the prominence of 'Atarūz as a religious center. Khirbat 'Atarūz nevertheless continued to function as a cultic place in late Iron IIA and Iron IIB as attested to by a rectangular tower-like altar (Installation E01) in Field E. This altar, unlike Altars A1-A5 in the central courtyard, took the form of a rectangle measuring 3 x 6 m in size that now stands about 50 cm high. A small step (Installation E03), measuring 0.2 x 1.0 x 0.3 m, led to the top of the altar from a beaten-earth floor to the west of Altar E1. Near this step an almost complete stone column was found *in situ* in front of Altar E1 along with a couple of broken cultic stone objects. These cultic objects and Altar E1 together indicate that as for early-mid Iron IIA, a religious community existed at 'Atarūz during the late Iron IIA and



13. Late Iron IIA- Iron IIB Building Remains in Fields A and E (Stratum 7) (R: Room, W: Wall, I: Installation).

Iron IIB periods.

What is also evident from Field E is that a couple of small-scale building projects were carried out principally by adding a new course of walls outside of the Stratum 8 temple courtyard. This building project might have led to the completion of a series of rather small rooms (Rooms A16, A17, and A21) all sharing the southeastern wall (Wall A46) of the Iron IIA temple courtyard as their party walls. Those rooms were located southwest of Installations E01 and appear to have been used mainly for kitchen and storage purposes. This architectural development postulates that upon the destruction of the Iron IIA temple, ʻAtarūz was transformed from a massive urban cultic center to a medium-sized town for residence but one continuously supporting important cultic activities. The lion's share of all these building remains was centered at the east and southeast side of the Iron IIA Central Courtyard, implying that the late Iron IIA-Iron IIB buildings (Strata 7-6) were clustered outside of the enclosure of the early-mid Iron IIA temple.

Turning to the Western Courtyard area, the two aforementioned entrance rooms (Eastern and Western Entrance Rooms) were reused by late Iron IIA-Iron IIB settlers. Two thin 20 cm soil layers were put above the early-mid Iron

IIA floor, a fact which separates the late Iron IIA-Iron IIB period into two sub-phases, one to Stratum 7 and the other one to Stratum 6. As stated above, the remains of an earlier floor and early Iron II sherds, which are attributed to the late phase of the early-mid Iron IIA temple period, were exposed under these two late Iron IIA-Iron IIB floors. This finding clearly points to the fact that late Iron IIA settlers reused the early-mid Iron IIA entrance rooms with some renovations such as putting a cross wall (Wall A16) between Walls A12 and A17 and blocking the outer gate of the entrance to the Western High Place. But, unlike early-mid Iron IIA when the entrance rooms were used together for religious purposes, they were transformed into two separate, enclosed rooms for residential purposes during the periods of late Iron IIA and Iron IIB.

Stratum 6

The period represented in Stratum 6 is characteristic of the frequent appearance of fine and coarse painted ware with strong Ammonite influence. **Fig. 14** illustrates that the most notable new architectural feature from Stratum 6 was a network of water channels (roughly 30 cm wide and 30 cm deep) cut into the early-mid Iron IIA temple courtyard. The channel system (Installations A22) carried rainwater collected from various parts of the ground surface of the acrop-

14. Iron IIB Building Remains in Fields A and E (Stratum 6) (R: Room, W: Wall, I: Installation).

olis to the temple courtyard area. No cistern or pool connected with this water catchment and delivery system, however, has as yet been found. The interior of the water channels were carefully plastered and then covered with small stone slabs to minimize water evaporation. Other parts of the acropolis area were examined, but for a full comprehension of the aqueduct system and its basic plan more excavations are warranted. This limit notwithstanding, the water channels demonstrate that the Iron IIB settlers at ʻAtarūz employed better water management skills as compared to their Iron IIA predecessors in collecting and bringing water to their residential area.

Excavations in the southern area of Field A uncovered a rectangular room (Room A14) roughly 3.5 m wide and at least 6 m long. This room is assigned to Stratum 6. The northwestern wall (Wall A26) of this room was built against the southeastern exterior wall of the early-mid Iron IIA temple complex. In addition, the late Iron IIA-Iron IIB altar in Field E (Installation E01) was continuously in use during this period. The presence of a new beaten-earth floor on top of the late Iron IIA-Iron IIB floor, both closely associated with the altar, attests to a peaceful transition from Stratum 7 to Stratum 6 with religious and settlement continuity.

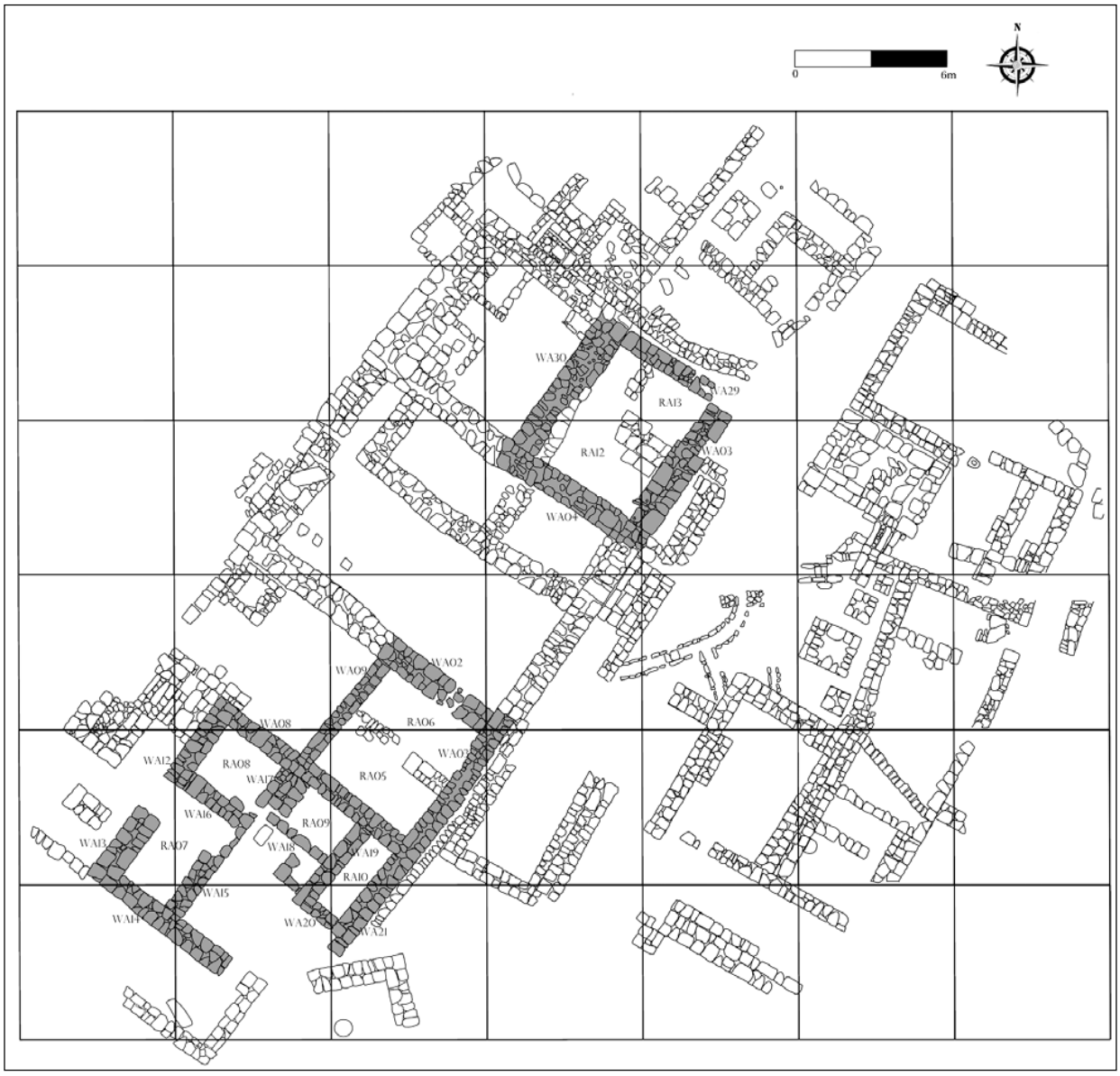
As previously stated, the later phase of the Iron IIB floor inside the Eastern and Western Entrance Rooms in the western courtyard must be assigned to Stratum 6 as well. In the Eastern Entrance Room, a mixture of lime and sand, strengthened with small rocks, was applied to the surface of the earlier Stratum 7 floor to harden it. This plastered Stratum 6 floor is reminiscent of the partially plastered courtyard to the west of Altar E1 (Installation E01), which is also attributed to Stratum 6. Further, recall the aforementioned water channels in the central temple courtyard. Plastering seems to have been a common architectural feature of Stratum 6 at Khirbat ʻAtarūz.

Finally, before turning to the Hellenistic period, it is appropriate to note that in contrast with that of Iron IIA and Iron IIB, late Iron II and Persian evidence is sparse at Khirbat ʻAtarūz, except for some possible late Iron II pot sherds. No distinctive building remains can as yet be securely assigned to these periods. The absence of the late Iron II and early Persian period is particularly striking because the seventh-fifth centuries BC were prosperous times at other major Iron II sites in the region, such as Tall al-ʻUmayrī (Herr and Clark 2007), Tall Jalūl (Younker 2007), Khirbat Mudaynat ath-Thamad (Daviau and Chadwick 2007), and Dhībān (Porter, Routledge, Steen, and al-Kawamlha 2007). It is possible at this point to make a provisional remark that ʻAtarūz was likely abandoned during the Iron IIB period, and a long occupational gap ensued until the second century BC when Hellenistic settlers re-occupied the site.

Late Hellenistic Period (Strata 5-4)

At Khirbat ʻAtarūz, as presented in **Figs. 15 and 16**, late Hellenistic remains are ubiquitous and well displayed in Fields A and C. First, Figure 15 shows that the southern half of the Hearth Room was used by late Hellenistic residents who divided the Hearth Room by building a cross compartment wall (Wall A09) between its northeastern and southwestern end walls. Besides the wall remains, one beaten-earth floor was identified inside the room (Rooms A05 and A06). The rooms and floors appear to have been used for the purpose of storage, granted that the majority of late Hellenistic sherds found in the area were from storage jars and pithoi. Cooking pots, bowls, and kraters were relatively sparse in the room. The late Hellenistic compartment wall still remains almost intact standing about 1 m high above the ground. Later, the wall was reused in the early and mid Islamic residents who used the same southern part of the Hearth Room area for both cooking and storage.

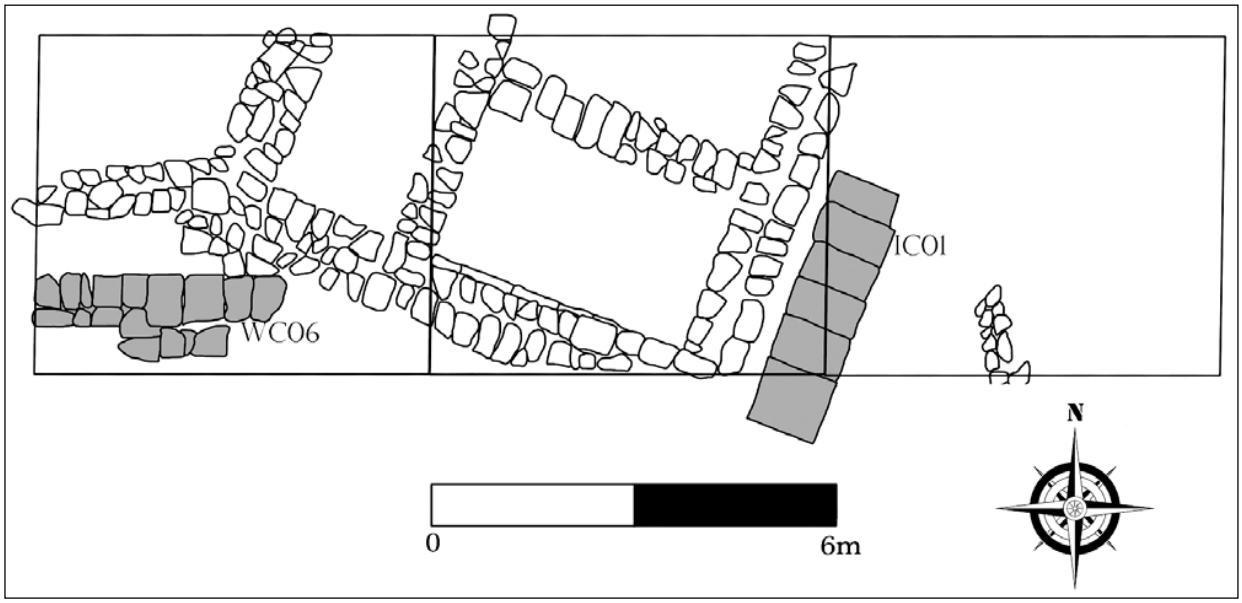
To the south of the Hearth Room, Rooms A09 and A10 constructed of undressed fieldstone were unearthed, rooms about 10 m southeast of the Western High Place. As for Rooms A05 and A06, these rooms and their adjacent area were apparently used for storage purposes, granted a large number of storage jar sherds found within and outside the rooms. Two successive Hellenistic beaten-earth floors were associated with Rooms A09 and A10, which were reminiscent of two thin Hellenistic soil layers (Strata 5-4) inside the Western and Eastern Entrances Rooms, in the order given. Probably, unlike Rooms A09-A10, the two entrance rooms were utilized for residence during the Hellenistic period.



15. Late Hellenistic Building Remains in Fields A and E (Strata 5-4) (R: Room, W: Wall, I: Installation).

Another impressive late Hellenistic wall was found in the northern part of Field A, in which the residents built a thick and high wall (Wall A30) to separate the southern half of the Double Altar Room from its northern half. Late Hellenistic residents then used the southern part of the room (Rooms A12 and A13) for domestic and residential activities. They cleared Iron II temple floors in this area and put one new layer of beaten-earth floor as they did in Rooms A05 and A06.

Turning to the southeastern slope, as depicted in Figure 16, a wall line (Wall C06) and small plastered bath in Field C seem to date to the late Hellenistic period. The bath was cut into limestone bedrock along with a set of five stairs (Installation C01) descending down to a small rectangular subterranean bedrock court, one at the same level as the doorway into the bath (see **Fig. 17**). Five steps led down into the bath from the doorway in the western wall of the bath. The inside of the bath was plastered. Apparently, the steps were cut for human entrance into the pool. The bath area was later inhabited by Mid Islamic residents. Two potsherds from inside the broken plastered wall of the bath, however, point



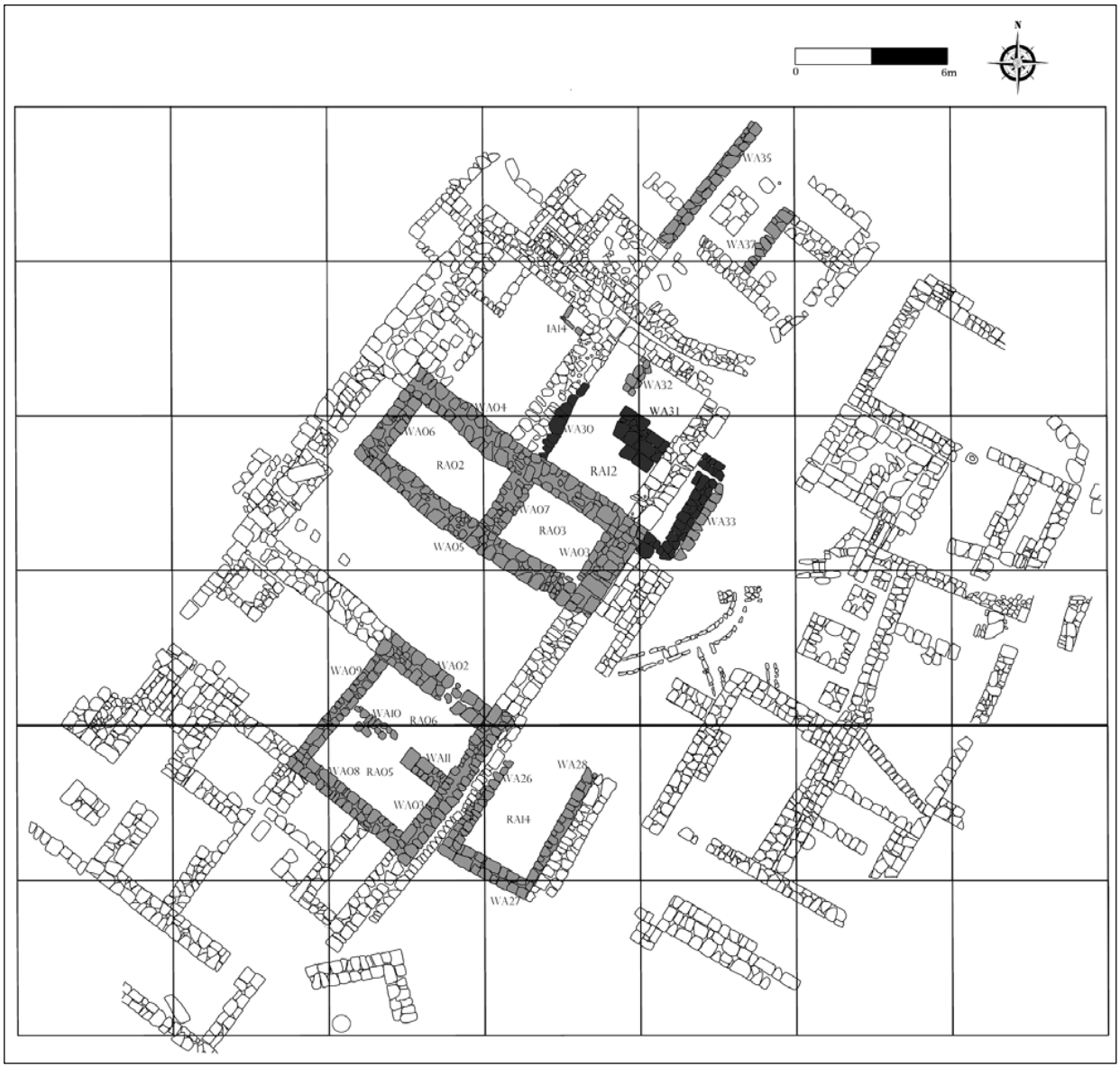
16. Late Hellenistic Building Remains in Field C. (W: Wall, I: Installation).

17. The Late Hellenistic-Early Roman Bath in Field C.

to the late Hellenistic-early Roman period as its construction date.

Early Islamic Period (Stratum 3)

After a rather long hiatus in the late Roman and Byzantine periods, a human settlement was again established at ʻAtarūz probably near the end of the Early Islamic period. In light of the excavation results shown in **Fig. 18**, thick but fragmentary walls (Walls A31 and A33) built by



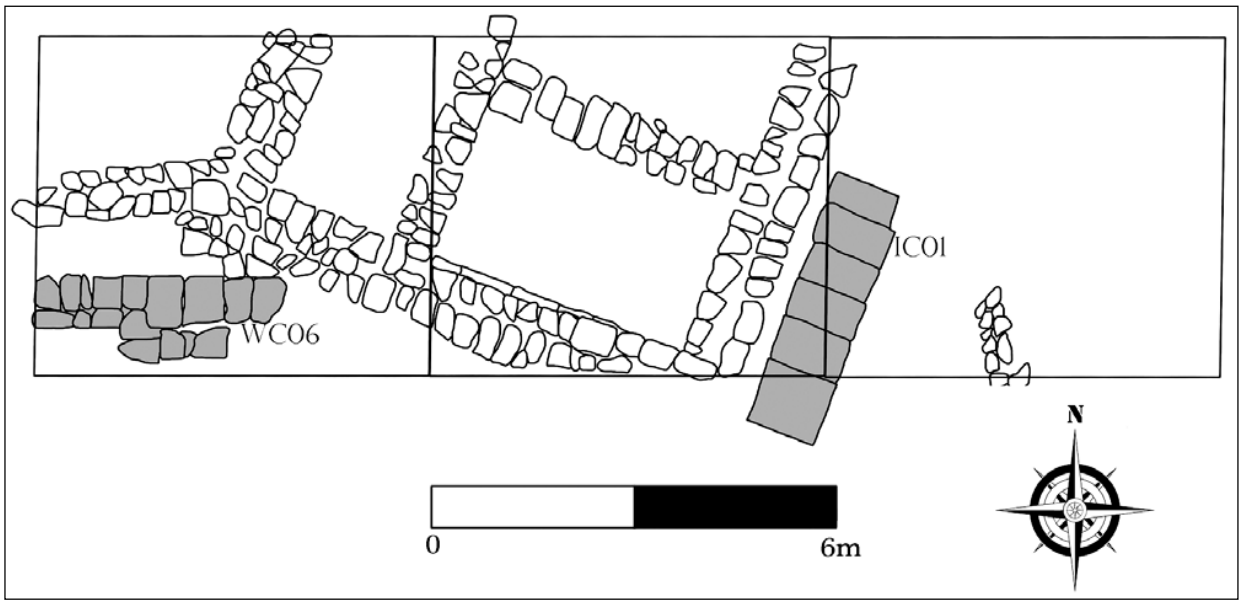
18. Islamic Building Remains in Fields A and E (Strata 3-1) (Black Color: Early Islamic, Gray Color: Mid Islamic; R: Room, W: Wall, I: Installation).

Early Islamic residents are present in Field A. In addition, they put buttress walls (Wall A30) against the Iron II and late Hellenistic walls to reuse the late Hellenistic room (Room A12) for domestic purposes. As in the late Hellenistic period, Early Islamic people used large rectangular stone blocks for their houses. One possible floor surface associated with the Early Islamic period was discovered at the northeastern edge of the temple's Central Courtyard, one containing several diagnostic Early Islamic and Iron II sherds but without any Mid Islamic remains.

Overall, Early Islamic evidence is as yet scanty and preliminary relative to the Iron II, Hellenistic, and Mid Islamic periods. Distinctive Early Islamic walls and buildings are yet to be found. Further work is necessary to suggest a basic picture of Early Islamic settlement at Khirbat ʻAtarūz.

Mid-Islamic Period (Strata 2-1)

The remains of a three-room house complex in Field C, mostly excavated in 2006, belong to the Mid Islamic period (see **Fig. 19**). The buildings were built above a bedrock slope between the seemingly Iron Age city wall south to Field



19. Mid Islamic Building Remains in Field C (Strata 2-1) (Gray Color: Stratum 2, Black Color: Stratum 1; R: Room, W: Wall, I: Installation).

C and its dry moat that surrounded the entire city for defense purposes. The three rooms (Rooms C01, C02, and C03) were all rectangular in shape and were built side by side in a row. They appear to have been accessed directly from the northern courtyard or street; they were not connected to one another by entrances. These rooms represent the only original Mid Islamic buildings found so far at ʻAtarūz, buildings built by Mid Islamic populations without reusing earlier walls. Rooms C01 and C02 had two building phases (Strata 2-1), evidenced by two raised floor levels and the addition of an arch (Installation C02) inside the eastern room (Room C01).

Apart from Field C, Mid Islamic walls are also scattered in Field A, but they mostly represent compartment or buttress walls built against or across Iron II and Hellenistic remains to renovate the early architectural remains. As in Figure 18, the Mid Islamic buildings here lack any cohesive town building plans. For example, two walls (Walls A10 and A11) southeast to the Hellenistic wall in the Hearth Room should be assigned to the Mid Islamic period. These walls are nothing but 2 m. long walls erected in a haphazard manner as compartment walls to divide the Hellenistic room into two parts (Rooms A05 and A06), one (Room A05) of which appears to have been used primarily for food storage. This was also the case for the two compartment walls (Walls A06 and A07) built across the Auxiliary Sanctuary Room in order to create two rooms (Rooms A02 and A03), probably for residence. Further, Room A14 appears to have been reused as an animal pen after putting one course of buttress walls inside the mid Iron II walls.

Mid Islamic residents also used the area east of the Eastern High Place for cooking and for some unknown activities. Walls A35 and A37 probably belong to the Mid Islamic period. These building activities almost completely destroyed most of earlier Iron II remains in the area, clearly removing part of the Eastern High Place as well as several cultic installations that were possibly erected east of the high place.

Conclusion

The excavated evidence from Khirbat ʻAtarūz highlights four phases of cultic activities at the site during the period of late Iron I to mid Iron II. During this period, Khirbat ʻAtarūz was apparently a thriving cultic center, which seems to have been built and maintained by a national or at least regional political entity.

Archaeological and ceramic evidence suggests that ʻAtarūz was founded near the end of the Iron I period or slightly later and lasted about one century or less before it was violently destroyed in the middle of the Iron IIA period. The stratified evidence points to a rather short-

term cultic and human occupation during the early-mid Iron IIA period despite two phases of extensive building activities at the site, those corresponding to Strata 10 and 8.

Although descriptions of the entire plan of the second phase Iron IIA temple and its precinct may warrant some modest modifications if further excavations are ever allowed to expand to the modern cemetery area located north of the acropolis area, it now seems obvious that during the second phase, the main section of the cultic area contained a large impressive building with a bipartite central sanctuary hall along with at least two courtyard-like long rooms adjacent east and west of the sanctuary and two high places built at the northeast and southwest sections of the temple precinct. That is to say, the central part of the second phase Iron IIA temple was a multi-chambered structure comprised of at least three long parallel rooms built side by side with varied cultic installations including high places and several altars for animal sacrifice.

Khirbat ʻAtarūz was then reused and rebuilt, which is attested to by two successive strata (Strata 7-6) attributable to the late Iron IIA and Iron IIB periods. Pottery from this post-early-mid Iron IIA temple period suggests a relatively long-term human occupation that is contemporaneous with the late Iron IIA-Iron IIB towns in the Mādabā Plains and the Dhībān Plateau. Kitchen remains, storage facilities, and aqueducts provide a rather clear portrait of normal village life, even though part of the earlier Iron IIA courtyard and its building remains were possibly continuously used for animal sacrifice and other cultic activities. Clearly, ʻAtarūz functioned as an urban cultic center before and after the destruction of the early-mid Iron IIA temple.

Khirbat ʻAtarūz was reconstructed during the late Hellenistic period. The original late Hellenistic structure contained two long walls inside the Hearth and Double Altar Rooms in the early-mid Iron IIA temple. Also several walls and rooms in the southwestern part of Field A should be attributed to the Hellenistic period. Although the entire town plan of the late Hellenistic settlement is as yet unclear, I can provisionally suggest that the rooms inside the early-mid Iron IIA temple complex would be residential, rather than administrative, industrial, or military. Also, in Field C, excavations along the north side of Khirbat ʻAtarūz have revealed late Hellenistic walls and bath installations. The recovery of a large volume of storage jar sherds testifies to the agricultural wealth of the late Hellenistic settlement as a whole. The late Hellenistic town of Khirbat ʻAtarūz was most likely engaged in cereal farming probably along with oil or wine production. The evidence for industrial activities such as metal, weaving, and textile production is as yet relatively sparse for Hellenistic ʻAtarūz compared to the Iron IIA and IIB periods.

The Mid Islamic residents re-established ʻAtarūz as a medium-sized village as indicated by a number of walls possibly associated with this period. But there are difficulties in determining the exact plan and size of the Mid Islamic town, since Mid Islamic residents chose to reuse earlier walls as much as possible, rather than erecting new walls, in constructing their domestic buildings and residential rooms. For this reason, many of the building blocks of the early-mid Iron IIA temple complex were dismantled during the Mid Islamic period, a practice that was particularly extensive in the area to the north of the acropolis. Notwithstanding, it is clear that ʻAtarūz was a rather populous and thriving village during the Mid Islamic period.

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TALL AL-ḤAMMĀM SEASON SIX, 2011: EXCAVATION, SURVEY, INTERPRETATIONS AND INSIGHTS

Steven Collins and Hussein Aljarrah
with contributions by
Gary A. Byers, Steve McAllister, Jehad Haroun, Carroll M. Kobs, Khalil Hamdan, Kennett Schath, Lucy A. Clayton, John Leslie, Qutaiba Dasouqi, Adeib abu-Shmais

Abstract

The Tall al-Ḥammām Excavation Project (TaHEP) is a joint scientific project between Trinity Southwest University, Albuquerque, New Mexico, USA and the Department of Antiquities of the Hashemite Kingdom of Jordan. The goal of TaHEP is to study the relationship of this immense and strategically-located site within its ancient period socio-cultural, economic and political contexts, and to ascertain its position, function and influence within those contexts.

In addition to this broader focus incorporating historical and archaeological data from neighboring sites in the southern Jordan Valley and beyond, the Project is studying the site as a microcosm of life and activity within its own local environment, seeking to determine its phases of settlement, urbanization and the reasons for its decline, destruction and/or abandonment at archaeological period interfaces.

Within this micro-context the Project seeks to shed light on how the inhabitants of Tall al-Ḥammām adapted to the local environment and environmental changes, and utilized available resources, enabling them to attain levels of city planning and building on a resultantly large scale, particularly during the Bronze Age.

The present report seeks to provide a general overview and introduction to the geographical, chronological, and archaeological data distilled from six seasons of exploration and excavation at this remarkable site, and to foster interest in Tall al-Ḥammām as a significant source of present and future information regarding the history of the southern Jordan Valley and, indeed, of the southern Levant.

Introduction

The Tall al-Ḥammām Excavation Project (TeHEP) began Season Six under the auspices of the Joint Scientific Project Agreement signed in 2008 between Trinity Southwest University (TSU) and the Department of Antiquities of Jordan (DoA) for the duration of five years, extending through the 2013 season. On 30 December 2010, a new Joint Scientific Project Agreement was signed by Dr. Steven Collins (TSU) and Dr. Ziad Al-Saad, Director General of the DoA. The former 5-year Agreement was thus replaced by the new 10-year Agreement, extending TeHEP through what will be Season Sixteen in 2020.

Season Six (for previous seasons see Collins, Byers, Luddeni 2006; Collins, Byers, Luddeni, Moore 2007; Collins, Abu Dayyeh, *et al.* 2008; Collins, Hamdan, *et al.* 2009a; Collins, Hamdan, *et al.* 2009b; Collins, Hamdan, *et al.* 2010) of the Tall al-Ḥammām Excavation Project, including set-up and wrap-up, was conducted from 10 December 2010 through 27 Januray 2011, with the authorization and support of Dr Ziad Al-Saad, Director General of the DoA. TeHEP Season Six was co-directed by Dr. Steven Collins (Dean, College of Archaeology, TSU; Chief Archaeologist) and Mr. Hussein Aljarrah (Regional Director, Middle Jordan Valley Directorate of Antiquities, DoA; Senior Archaeologist), with the assistance of Mr. Jehad Haroun (DoA, Head of Excavations and Surveys; Senior Archaeologist), Mr. Khalil Hamdan (DoA; Excavation Sector; Senior Archaeologist), Mr. Gary Byers (TSU, Senior Archaeologist), Dr. Steve McAllister (TSU, Senior Archaeologist), Ms. Carroll Kobs (TSU, Field Archaeologist), Mr. Michael C. Luddeni (TSU, Director of Photog-

raphy), Dr. Carl Morgan (TSU, Field Archaeologist), Mr. Hal Bonnette (TeHEP Field Methods Instructor, Field Archaeologist), Ms. Lucy Clayton (Binghamton University; Senior Anthropologist), Mr. Kennett Schath (TSU; Field Archaeologist), Dr. David Graves (Crandall U.; Field Archaeologist), Dr. Scott Stripling (Wharton Co. Junior College; Field Archaeologist), Ms. Heather Reichstadt (Conservator), Dr. John Leslie (TSU; Osteologist), Dr. John Moore (TSU; Osteologist, Geographer), and Mr. Qutaiba Dasouqi (DoA, Surveyor). Mr. Adeib abu-Shmais (former DoA Archaeological Inspector of Amman; Senior Archaeologist) served as principal diagnostician during the analysis of ceramic indicators. Dr. Leen Ritmeyer (Cardiff University, Wales; Architectural Reconstruction Specialist, Ritmeyer Archaeological Design, Wales) joined the TeHEP Team once again toward the end of the season to continue his work on the master top plan of the site, and section and reconstruction drawings for publication.

TeHEP professional archaeologists and specialists were assisted by a team of Square Supervisors consisting of TSU graduate and doctoral students in archaeology, along with independent scholars: Mr. Thomas Winder, Ms. Jennifer Fair, Ms. Brandy Forrest, Mr. Matt Ewert, Mr. Chris Craig, Ms. Carolyn Dunaway, Mr. Carl Fink, Mr. Kip Tyler, and Mr. Scott Handlin. Volunteer excavators from the USA, Canada, Germany, and Russia, along with 30 local workers, rounded out the TeHEP Season Six Team.

Tall al-Ḥammām (TeH) is located 12.6 km NE of the Dead Sea, 11.7 km E of the Jordan River, 8 km south of the modern village of South Shūna (the location of Tall Nimrīn), and approximately 1 km SSW of the Kafrayn Dam. This area of the southern Jordan Valley, particularly the eastern half of what should properly be called "the Jordan Disk"[1] (the circular alluvial area north of the Dead Sea, approximately 25 km in diameter, also called the middle Ghawr), lies on the crossroads of the region's ancient N/S and E/W trade routes.[2] Several significant sites, all variously occupied during the high points of Levantine Bronze Age.[3] civilization, hug the eastern edge of the Jordan Disk beyond the spread of the ancient flood plain, bounded on the north by the throat of the Jordan Valley, and on the south by the rocky terrain of the Dead Sea area—Tall Nimrīn with Tall Bulaybil and Tall Muṣṭāḥ in close proximity, and sprawling Tall al-Ḥammām encircled by Tall Tāḥūna (NE), Tall Barakāt (N), Tall Kafrayn (NW), Tall Rāmā (SW), Tall Muways (SSW), Tall Iktānū (SSE), and several small un-named sites, all within a .75 to 2.7 km radius of Hammam (Glueck 1945; Ibrahim and Yassine 1988; Khouri 1988; Leonard 1992; Chang-Ho 2002). Although the ancient eastern Jordan Disk towns and villages vary site to site as to periodization, particularly during the Bronze Age, Tall al-Ḥammām was their connecting common denominator positioned at the center of what must surely be described as a city-state—and a relatively large one at that.

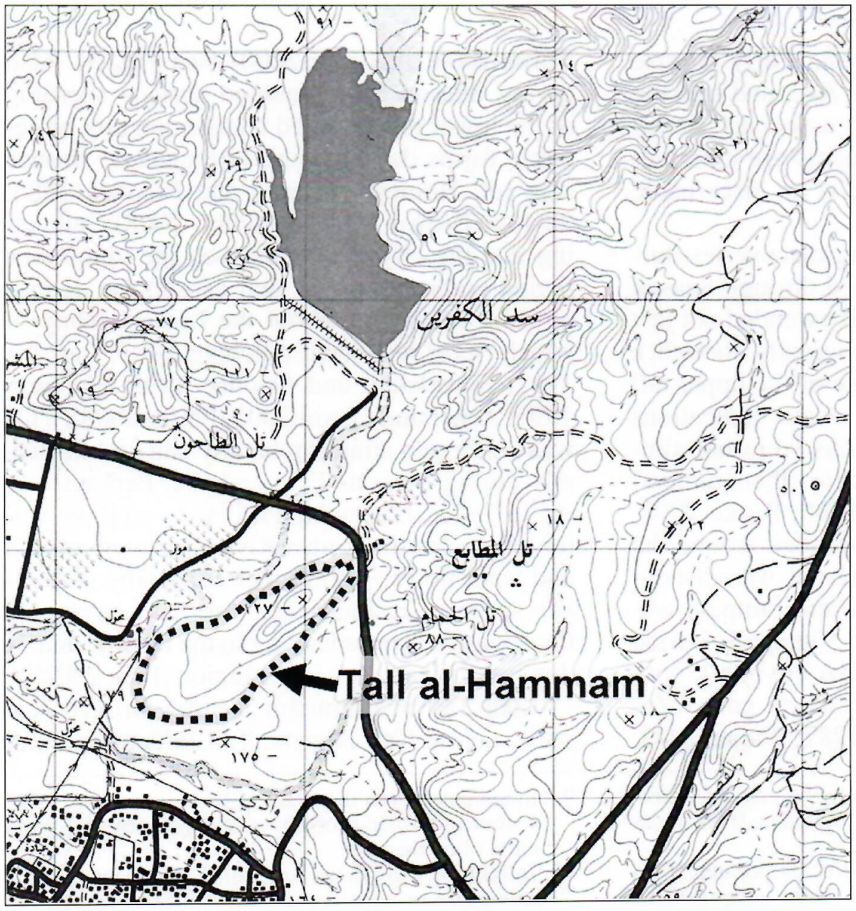
Also nearby are several large dolmen fields (Prag 1995; Aljarrah tbp) and tombs that, for the most part, remain unexcavated or robbed out.[4]

1. The wide, circular, flat alluvial area of the southern Jordan Valley immediately north of the Dead Sea is approximately 25 km in diameter, and split down the center by the Jordan River. The biblical term for this phenomenologically disk-shaped region is *kikkar* (= disk, circle), appearing as *hakikkar* (the disk/circle) and *kikkar hayarden* (disk/circle of the Jordan River). When not used geographically, *kikkar* refers either to a talent (flat, circular weight of metal) or a flat, circular loaf of bread. Although cognate forms of *kikkar* appear in virtually all ANE languages (including Akkadian, Ugaritic, and Egyptian), the term is never used in a geographical sense outside the Old Testament, but always refers to a disk-like "talent" or "loaf." The rare, geographical usage of *kikkar* lies at the core of the phrases "Plain (*kikkar*) of the Jordan River" and "Cities of the Plain (*kikkar*)" as seen in Genesis 10-19. The entire area was visible from the highland hilltops near the Jordan Valley WNW of Jericho, the location of Bethel and Ai (see Genesis 13:1-12).
2. There is debate regarding whether or not some kind of traversable road or trail existed on or near the eastern and western shores of the Dead Sea by which travelers could move N and S through the Dead Sea Valley. Even though much of the terrain was difficult, it is hard to believe that at least some kind of stable footpath did not exist, affording one the opportunity to move from towns/sites near the Dead Sea shore northward into the Jordan Valley without having to mount up into the high terrain to connect up with roads on the Trans- and Cis-jordan plateaus, then return to the Jordan Valley at a location farther to the N.
3. See the new archaeological period abbreviations in section, "Stratigraphy" in Collins, Hamdan, Byers *et al.* 2009a.
4. The Ḥammām (ar-Rawḍa) dolmens tend to be on the higher, flatter parts of the hills to the ESE of Tall al-Ḥammām, while the tombs are below them in the steeper walls of the wadis. However, there is evidence that at least a few dolmens were located very close to the tall itself, on the adjacent alluvial plain.

The Hellenistic, Roman, and Byzantine periods are represented architecturally at and near the site, including forts, guard towers, aqueducts, large cisterns, and by at least one monumental structure located on the S side of Tall al-Ḥammām near two springs, one thermal, one sweet.[5]

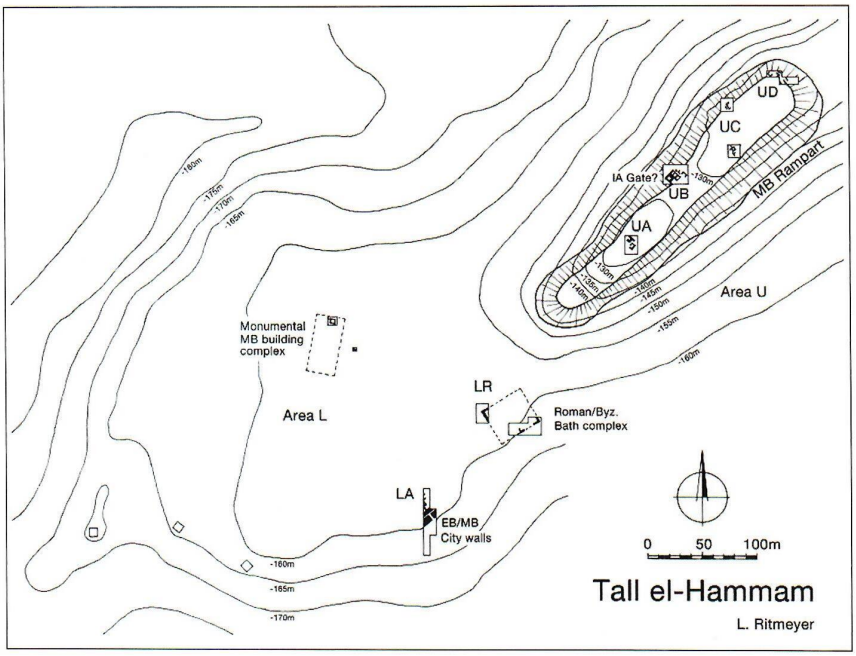
Tall al-Ḥammām is the largest of the Jordan Disk sites. It is certainly one of the largest, of not the largest, Bronze Age site in Jordan. The tall proper spreads over approximately 36 ha (360 dunams), bounded by the Wādī al-Kafrayn on the north and the Wādī ar-Rawḍa on the south, and by the main road to the E of the tall, against the foothills, and the confluence of these two wadis to the W (see **Figs. 1 and 2**). The site footprint for general settlement is well over 400 dunams (100+ acres). These dimensions approximate the areas of the site occupied in more remote antiquity, from at least the Chalcolithic Period through the late Iron Age (there are likely period gaps in some locations on the site footprint)[6]. There is, additionally, ample evidence of Hellenistic/E Roman/Byz Period occupation just off the upper tall to the immediate south (see **Fig. 2**). Reports about the site from the late 19th century (Tristram 1874: 330-333; Thomson 1882: 371-376) describe an aqueduct that fed the area south of the upper tall, much of which we have identified. There also seems to have been some re-use of earlier structures on the upper tall (particularly those built initially during the Iron Age) periodically from the Iron Age through the Late Islamic Period. However, sherds from the Islamic Period are rare.

Surface surveying and excavation reveal occupation beginning at least during the Chalcolithic Period (some Pottery Neolithic material may also be present) and extending with de-



1. Location of Tall al-Ḥammām relative to the al-Kafrayn Reservoir.

5. Dr. David Graves and Dr. Scott Stripling reason that this must somehow be connected to the ancient Roman city of Livias, perhaps a guesthouse or palatial structure on the eastern edge of the Livias precincts.
6. For example, the smaller Iron Age occupation, confined to the upper tall, covers approximately 12 ha.



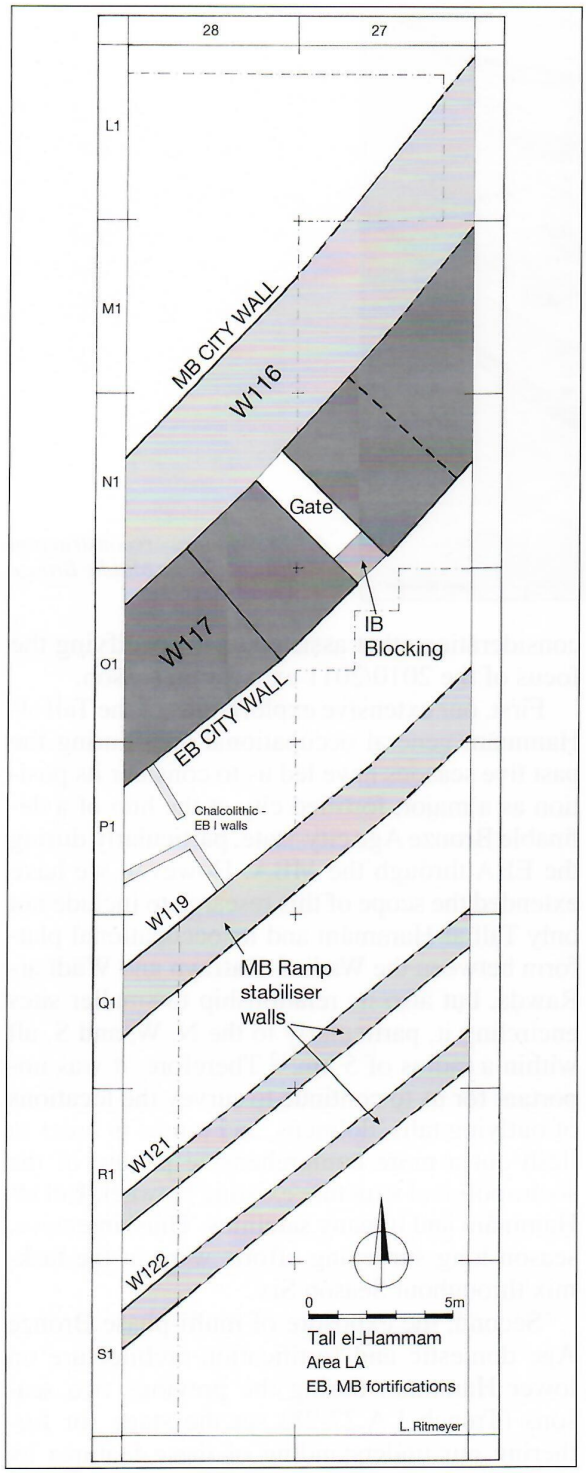
2. General Plan showing excavation Areas and Fields.

tectible consistency through the Early Bronze Age, the Intermediate Bronze Age, and into the Middle Bronze Age (all with associated architecture). Late Bronze Age sherds are extremely rare in the area, and there is no discernable LBA[7] architecture thus far.

One of the more surprising discoveries during Season Four and confirmed through Season Six was that the EBA city wall extended not just around the lower tall (as originally thought), but also around the entire base of the upper tall as well. Equally surprising were indications that the MBA city fortifications were not simply confined to the mudbrick/earthen rampart ringing the upper tall (Parr 1968; Burke 2008; McAllister 2008), but also extended around the lower tall. During Season Five, it was discovered that the MBA city wall and rampart system, aggregately from 33m to 50m thick, buried and dwarfed the 6m-thick EBA city wall, with many towers[8] and (likely) multiple gates (Zayadine, Najjar, and Greene 1987; Najjar 1992; Burke 2008; Falconer 2008) (see **Fig. 3**). Also during Season Five, detailed surface sherding of the lower tall revealed a large quantity of ceramic forms dating to the Intermediate Bronze Age (cf. Homès-Fredericq and Franken 1986: 98-114; Brown 1991; Palumbo 2008), indicating that the city likely survived the ubiquitous period-ending calamity that caused the demise of EBA cities throughout the Levant, many of which never recovered (Richard 1987; Ben Tor 1992; Finkelstein and Gophna 1993; Harrison 1997; Avner and Carmi 2001; Philip 2008). This was confirmed stratigraphically and architecturally during Seasons Five and Six. Perhaps owing to Tall al-Ḥammām's access to multiple water resources (the Jordan River, seasonal rainfall and wadi flows,[9] and numerous nearby and on-site springs), residents seem to have overcome the negative factors leading to the decline and/or demise of other cities in the region (Prag 2007).[10]

Like Tall al-Ḥammām, nearby Bronze Age sites such as Tall Nimrīn, Tall Iktānū, and Tall

7. See the new archaeological period abbreviations in section "V. Stratigraphy" in Collins, Hamdan, Byers *et al.* 2009a.
8. One particularly massive tower structure located at the far W extremity of the lower tall seems to be of MBA design, using large boulders (some slightly squared) not typical of EBA builders. MBA pottery is present in the area, but no excavation has taken place there to date.
9. In antiquity, both the Wādī al-Kafrayn and the Wādī ar-Rawḍa/Ḥisbān probably sustained perennial flows more often than not.
10. Tall Iktānū, 2 km to the S of Tall al-Ḥammām, also has strong IBA occupation, but not fortified. Although Tall Iktānū has generally been seen as a defining IBA representative in most of the relevant literature, it must now be interpreted as one of many satellites of the much larger, and fortified, Tall al-Ḥammām.



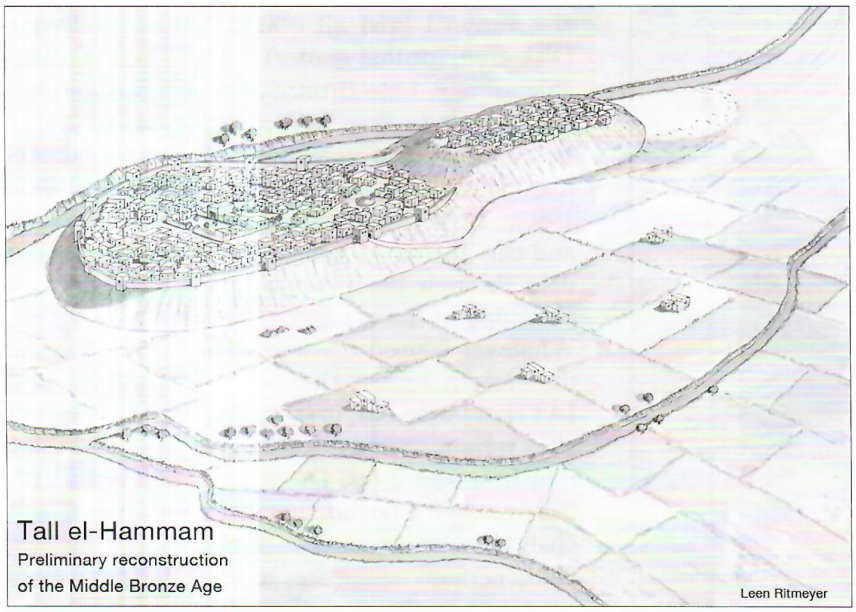
3. EBA city wall (W117) and gate with IBA blocking; MBA city wall (W116) and mudbrick rampart with stone stabilizing walls (W119, W121, W122).

al-Kafrayn[11] (and all others in eastern Jordan Disk area, for that matter) seem to lack discernable, or any, Late Bronze Age occupation (Dornemann 1990; Prag 1974, 1991; Strange 2008). Is the "LBA gap"—as the Tall Nimrin excavators call it (Flanagan, McCreery, Yassine 1990, 1992, 1994, 1996)—a regional phenomenon, and can TeH shed light on what caused it? The data through the first six seasons of excavation support the existence of such a gap at TeH. Whatever caused the absence of occupation at the eastern Jordan Disk sites during the LBA/IA1 timeframe did, in fact, not continue, as most sites were resettled toward the end of Iron Age 1 into Iron Age 2 (cf. Dornemann 1983). Indeed, the Iron Age 2 occupation at TeH is quite extensive, and surrounded by a 3+m thick fortification wall, perhaps casemate, at least in part. What gave rise to the site's Iron Age city, and what brought about its demise? The answers to these questions are only beginning to be answered.

During Season Six we concentrated our efforts in Field A on the lower tall, extending excavations in three principal locations: Trench LA.27-28 (the city's southern defenses and adjacent domestic architecture), Trench LA.47 (another section of the city's southern defenses), and Trench LA.35-45 (the sacred precinct at the geographical center of the lower tall). Each of these segments of the excavation has yielded important results in terms of the site's occupational profile and phasing, with some remarkable results. Throughout season six we continued to examine closely and make survey notes on TeH's many surface-visible features that are 'readable' stratigraphically by comparison with, and physically traceable to, excavated and ceramically dated features. A very good general understanding of the layout of the Bronze Age city is now emerging, and preliminary reconstruction drawings of the EBA/IBA and MBA cities at Tall al-Ḥammām are now available (see **Fig. 4**).

Season Six also produced excellent advancements in the area of landscape archaeology and anthropology in terms of the Hammam city-state as a phenomenologically-defined, holistic integration of urbascape, agriscape, sacrescape, necroscape, and infrascape. The inter-relation-

11. Although not much has been published on the ongoing excavation at Tall al-Kafrayn, our personal contact with the director of the excavation confirms that there is not an LBA architectural presence at the site. There is a strong EBA and MBA presence, as at Tall Nimrin.



4. Preliminary reconstruction drawing of the Middle Bronze Age city.

ships between these city-state components is leading us to consider new ideas about socio-cultural-religious-economic aspects of the EBA-IBA-MBA urbanization processes, based on data and observations from six seasons of excavation and related research and exploration during intervening off-seasons. We have no doubt that new insights on, and interpretations of, the southern Levantine Bronze Age will emerge from this growing body of material.

Tall al-Ḥammām certainly holds key pieces of the archaeological puzzle from which a greater comprehension and appreciation of the regional history can emerge. The focus of the sixth season of excavation was to continue to identify and sound sections of the site determined to offer reasonable opportunities to expose stratigraphic sequencing on the lower tall (Area L) while, at the same time, continuing to survey, map, and document important geographical features and archaeological sites on the eastern Jordan Disk, with a view to determining the relationship of Tall al-Ḥammām to the territory under its hegemony and to surrounding polities.

Methodology

When considering its constituent components collectively, TeH is enormous. But there are four considerations that assisted us in specifying the focus of the 2010/2011 excavation season.

First, our extensive explorations of the Tall al-Ḥammām general occupational area during the past five seasons have led us to consider its position as a major, fortified city at the hub of a definable Bronze Age city-state, particularly during the EBA through the MBA. However, we have extended the scope of this research to include not only Tall al-Ḥammām and its occupational platform between the Wadi al-Kafrayn and Wādī ar-Rawḍa, but also its relationship to smaller sites encircling it, particularly to the N, W, and S, all within a radius of 5 km.[12] Therefore, it was important for us to continue to survey the locations of outlying talls, dolmens, and tombs in order to flesh out a more comprehensive picture of the socio-political structure existing between Tall al-Ḥammām and it many satellites. Thus, intensive, season-long surveying efforts were in the task-mix throughout Season Six.

Second, the exposure of multi-phase Bronze Age domestic and fortification architecture on lower Hammam during the previous two seasons (Trench LA.27-28) set the stage for furthering our understanding of these features by continuing to expand those excavation squares during Season Six. The area was originally sin-

12. Many of these sites tend to hug the circle of foothills to the S and N, while others occupy positions on the alluvial plain to the SW, W, and NW. Distances from the center of Tall al-Ḥammām range from .25 km to approximately 5 km. All are within direct line-of-sight from the top of al-Ḥammām's upper and lower talls within a visually and geographically defined and defensible space.

gled out for several reasons: (a) it was adjacent to, and included, a well-defined section of the city wall(s); (b) it included several visible (what appeared to be) domestic structures; (c) it was a raised area offering the potential of deep layering; (d) it had dense Bronze Age sherd scatter; and (e) it had not fallen prey to "deep ripping" agricultural activity. Indeed, the Season Five work in this trench suggested unbroken occupation in the form of Chalcolithic, EB1-2-3, IB1-2, and MB1-2 architectural remains, but further clarification was needed. Thus, the continuation of excavations in Trench LA.27-28 was a key focus. As an extension of the excavation of the EBA-IBA and MBA fortifications in LA.27-28, we decided to add another key trench (LA.47) further to the W where the exterior slope of the MBA rampart clearly rose several meters higher.

Third, the large Roman/Byzantine structure in Area L, Field R needed continued work as the central Classical Period feature at the site. Thus, we designed to expand upon what was accomplished there in previous seasons. Several architectural phases are now visible.

Fourth, the excavation process over six seasons, with subsequent erosion, has created the necessity of stabilizing selected stone foundations and other features against further erosion and potential damage due to collapse. Additionally, the requisite conservation of objects, plasters, and select skeletal remains required the attention of our conservator, Ms. Heather Reichstadt.

Fifth, because archaeological interpretations of excavated data can often be rather two-dimensional, we knew that, for the city-state of Tall al-Ḥammām, a holistic integration of multiple lines of inquiry was in order. The growing body of field data from surveys, excavations (in the urban center, dolmens, tombs, stone circles and menhir alignments), observations vis-a-vis landscape usage and alteration, and data from surrounding sites required intensive on-site consultation with TeHEP Anthropologist, Ms. Lucy Clayton.

Sixth, due to the extensive bulldozing and agricultural activities which have taken place on Tall al-Ḥammām over the past decades, we determined that a select overburden of disturbed soil/stone debris should be removed from two principal locations: a) .50m of soil/stones badly scoured and ripped by both military and agricultural activity over several Squares of Trench LA.35-45; and b) various depths (generally 1m or less) of bulldozed soil/stone rubble across the southern wall of the Roman/Byzantine structure in Field LR.

Seventh, as a result of (now) six years of comprehensive exploration, surveying, and excavation on both upper and lower Tall al-Ḥammām [along with the nearby megalithic field(s) and tombs], we have assembled adequate data allowing us to continue the site-mapping and reconstruction drawing begun last season by archaeological architect, Dr. Leen Ritmeyer. This season we set forth to incorporate new stratigraphic and architectural data into our formal site plans, section drawings, and reconstruction drawings for publication purposes.

During Season Six, we were able to successfully address all of the methodological procedures outlined above.

Survey Activity

GIS/MJ Topographical Survey

TeHEP Surveyor, Mr. Qutaiba Dasouqi, continued to survey and 'boom' photograph working excavation squares throughout the season. Many additions were made to the topographical site-map, including newly-observed features. The grid was also expanded to include several areas where sherd/object-scatter revealed extra-defensive settlement areas. Additionally, aerial balloon photos were also taken after the end of the season under the direction of co-Director, Hussein Aljarrah.

GIS/MJ Excavation and Feature Documentation

Each square is routinely photographed from a 7m boom camera with walls, installations, and features incorporated into the site grid and GIS, with layered drawings and photographs available to Square Supervisors the next morning. Important finds are also located in three dimensions on the survey, with embedded photographs.

GPS/GIS/MJ Survey of the Hammam Megalithic Field

With the Hammam Megalithic Field surveyed and mapped in detail during Season Five, the concentration in Season Six was to survey and 'boom' photograph all the features in Discreet Field A (the sub-field in which intact dolmen HD.78 was excavated during Season Five).

That clan(?)-field not only holds numerous symmetrically-placed dolmens, but also several menhirs and stone circles with alignments of (likely) astronomical significance. Hussein Aljarrah, DoA Director for the Middle Jordan Valley, had already performed a detailed survey of what has generally been called the ar-Rawḍa Dolmen Field (still awaiting publication as of the date of this report), documenting more than 220 of what had been a much larger number of the funerary monuments in antiquity (Aljarrah tbp). Most of these dolmens fall well within a .5 to 2.5 km radius of Tall al-Ḥammām's extensive EBA/IBA/MBA city, mostly to the E and SE. During Season Five we extended the size of that dolmen field by re-surveying, photographing, and describing all of the previously documented dolmens (adding 5% to that dolmen total), and extending our documentation efforts into contiguous areas to the N, E, S, and W. Through Season Six, we have now—in total—registered more than 500 dolmens, and have continued to identify areas where dolmens have obviously been destroyed by military activity and residential development. When extrapolations of the number of now-missing dolmens are projected, it is now clear that the original number of the ancient megalithic monuments in the area may have approached or exceeded 1,500. We now refer to this collective field as the Hammam Megalithic Field (HMF), which reveals that TeH was the epicenter of the funerary/cult rites/activities that created and used a significant repertoire of megalithic monuments and alignments beginning in the Chalcolithic Period and extending through the Middle Bronze Age (Prag 1995).

Activity in Area U: Upper (NE) Tall

Field UB: Stabilization

Several places in the E monumental IA2 gate tower needed to be packed against possible collapse. A removable-but-stable mixture of sand, lime, and local soil were applied to the wall segments in question.

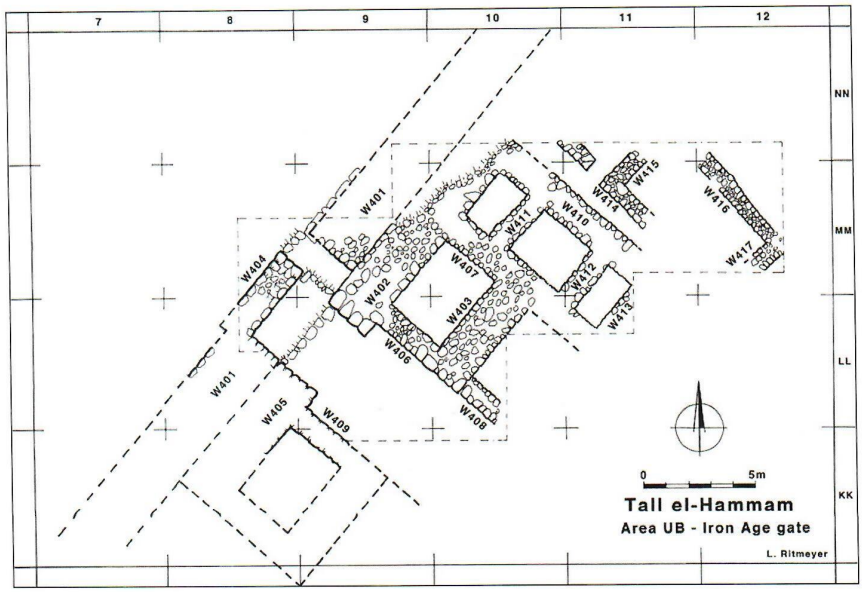
Field UB: Section and Reconstruction Drawings

The primary focus of excavations in Field UB in past seasons was the Iron Age 2b/c monumental gateway. This is a four-chambered (two opposing chambers on each side of the entrance) gate system, flanked by two massive towers, and entered by making a right, then a left turn into the entrance (see **Figs. 5 and 6**). Additional measurements, photos, and sketches were done. The area was also assessed for future excavation and preservation.

Activity in Area L: Lower (SW) Tall

Field LR: Excavation and Stratigraphic Interpretation

Excavation of the monumental Roman building continued this season. The length of the southern wall of the structure was exposed, revealing the use of massive stones on the cor-

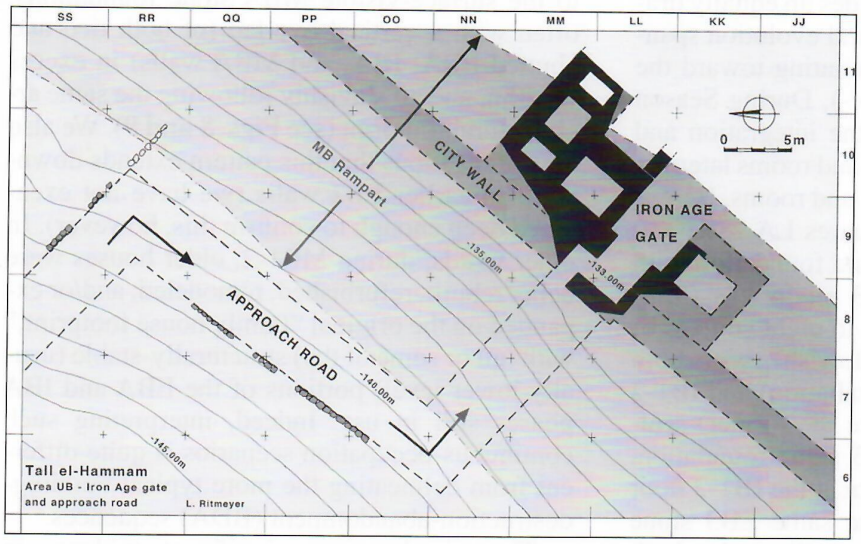


5. Top plan of the Iron Age 2 city gate, upper tall (Area U, Field B).

ners (the SE corner had been excavated to its foundation footing last season). Construction of this magnitude suggests some sort of water retention system, even fortification architecture, that may later have been converted into a bath complex and/or other public building or palatial residence. The LR team unearthed a beautiful Byzantine-to-Umayyad, finely-plastered bathing pool with multiple 'single' benches and drains (See **Fig. 7**).

Field LA: Excavation and Stratigraphic Interpretation

During Season Four we laid out a trench down the 28 N/S gridline comprised of Squares LA.28J[1], LA.28K[1], LA.28L[1], LA.28M[1], LA.28N[1]. LA.28O[1], LA.28P[1], LA.28Q[1], LA.28R[1], and LA.28S[1].[13] In previous reports, we refer to this as Trench LA.28. Initially we thought that a surface-exposed, 4m-thick wall was probably an EB3 city wall phase of boulder-and-chink construction (EB1c and EB2 city walls were generally made mostly of mudbrick; Rast and Schaub 1980; Schaub 2007), but excavations in Season Five and Six overturned that speculation, revealing that it was, in fact, the MBA city wall, replete with a complex mudbrick rampart system (see **Fig. 3**). This season, we extended the trench to the E by the width of an additional square (6m) widening it to 12m



6. Juxtaposition of the IA gate system, with approach road, over the MBA upper city defensive rampart.

7. Portion of the bath complex used during the Roman, Byzantine, and Umayyad Period.

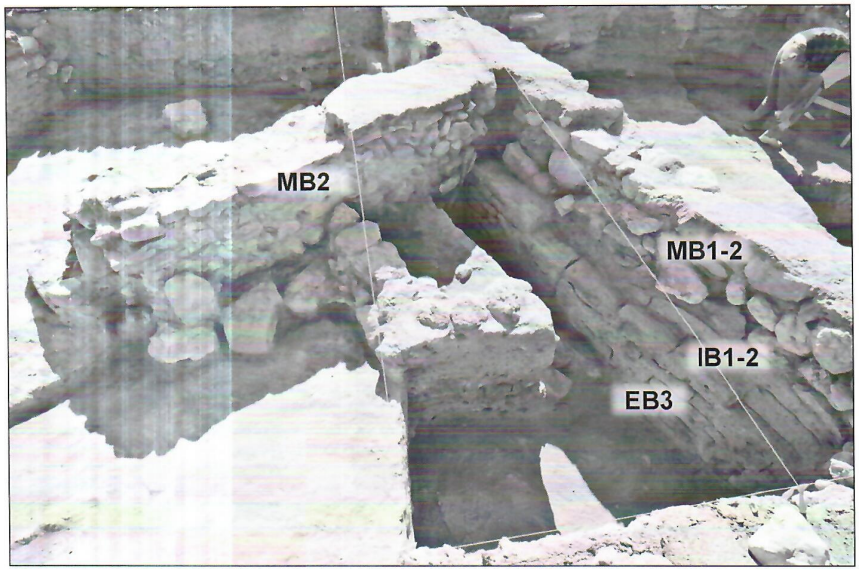
13. A note on the size of Tall al-Ḥammām: Our surveyed site grid now contains over 12,000 6mx6m squares spreading over 43 ha.

in most places. We now refer to it as Trench LA.27-28, and it spans 60m N to S.

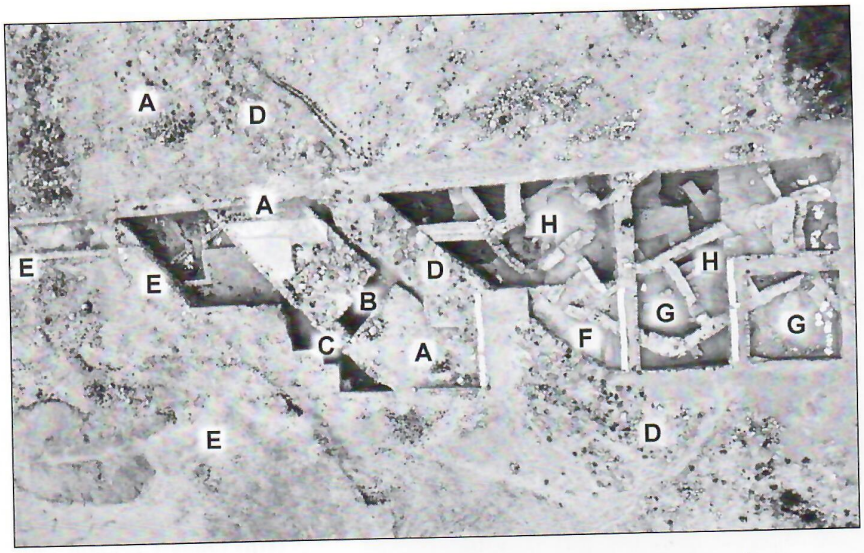
Ceramic reads from mixed and sealed loci in Trench LA.27-28 suggest that no break in occupation occurred at this location on the site from the Chalcolithic Period through MB2. Thus far, Trench LA.27-28 reveals that, whatever befell the residents of Tall al-Ḥammām through the EBA, IBA, and MBA, they reorganized quickly to rebuild, refurbish, and re-create their urban environment.

While the development of Tall al-Ḥammām's defensive systems reveals an unbroken occupation from the late Chalcolithic through MB2, the adjacent domestic architecture to the immediate N of the MBA city wall provides an equally dramatic testimony of architectural evolution spanning some 2,000 years, terminating toward the end of MB2 (ca. 1600 BC +/-). During Season Six, we were able to trace the integration and continuing use of older walls and rooms laterally and vertically into later walls and rooms. Here is a specific example from Squares LA.28K[1] and LA.27K[1]: EB3 domestic stone foundation with six to eight courses of EB3 mudbricks (firm; brown), topped (tied) by six to eight courses of IB1-2 bricks (crumbly; yellowish), with both EB3 (w/EB3 jar-in-floor installation) and IB1-2 floors (the latter 20cm above the former) sealing against the original EB3 stone foundation, with door-socket-stone *in situ* at the IB1-2 floor level (both phases using the same EB3 stone threshold), with IB1-2 plaster still coating both the IBA and EBA bricks; the IBA mudbrick wall portions are, in turn, built against and tied into by MB1 mudbrick wall segments with additional MB1-2 stone foundations (acting as wall stabilizers where the earlier/lower wall segments were still in use) following the exact same wall lines, with MB1-2 mud/ash plaster still covering portions of the surviving MB1-2 stone additions (also topped by mudbricks) and extending down onto the IBA and EBA wall surfaces. Further, MB1-2 pottery sherds were found as far down as the IBA floor associated with the EB3 foundation. All of these domestic structures throughout Trench LA.27.28 extend upward for as much as 3m from the lowest EB3 floor level to the surface-visible MBA stone foundations, often with a vertical overlap (of both tied and abutted EBA, IBA, and MBA walls) in excess of .50m, and all slavishly following the same architectural footprint (see **Figs. 8 and 9**). We also have indications that this pattern extends downward to earlier EB2 walls (we have not excavated deep enough to confirm this, however). In other words, during MB1-2, older houses were being rebuilt, refurbished, remodeled, and/or expanded on the original "family house footprint," with (all or some of the) structurally-stable (usually lower level) portions of the EBA and IBA phases still in use. Indeed, interpreting such continuous-occupation scenarios is quite different from delineating the more typical building-destruction-abandonment (BDA) sequences.

There is, however, significant evidence in



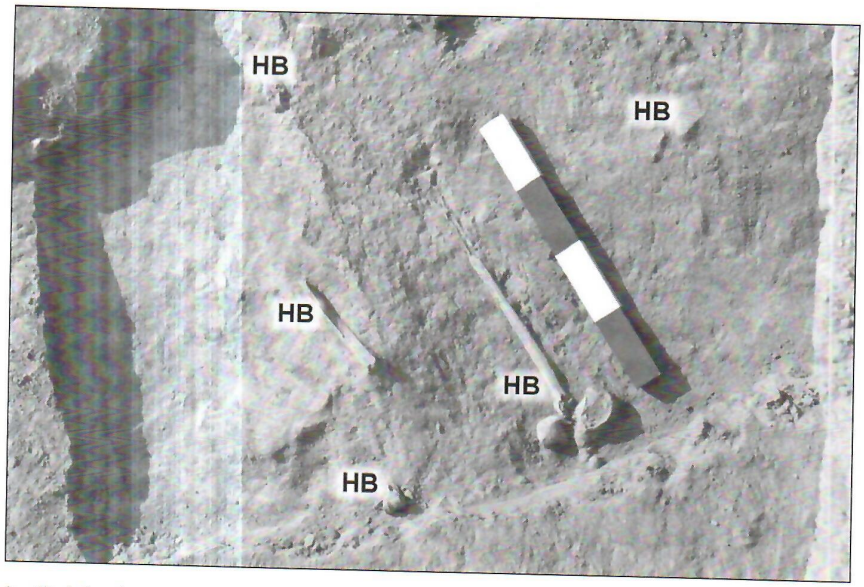
8. Squares LA.27K[1] and LA.28K[1] showing the EBA, IBA, and MBA structural evolution of a single dwelling. Note that the IB1-2 (X), and MB1-2 (X) renovations and additions follow the original structural footprint laid down during EB3 (X). This pattern of architectural evolution is present for all the domestic structures in Field LA excavated thus far (see Figure 9).



9. Aerial photograph of Trench LA.27-28 showing the EB2-3 city wall (A) and gateway (B), an IBA blocking of the gateway (C), the MB1-2 city wall (D) and components of the defensive rampart system (E), and domestic area including ring-road (F), courtyards (G), and houses (H).

Trench LA.27-28 of an MB2 terminal destruction of the city (which is also clearly present on the upper tall) which exhibits evidence of a major conflagration (similar indicators of this event are seen across the eastern Jordan Disk). We say 'terminal' because there is a six-to-seven-century occupational hiatus after said destruction horizon. During Season Six, Square LA.28K[1] revealed a significant amount of human skeletal remains as part of the MB2 destruction matrix marking the end of the Bronze Age at the site. The circumstances and condition of the bones and bone fragments signal that they were deposited within the associated ash layer by some kind of violent incident. Osteologists J. Leslie and J. Moore examined *in situ* portions of two sets of human adult and one set of child bones (the following observations are adapted from Leslie's field analysis). In both adult cases only the lower extremities were preserved. The adult bones and child bones were well formed, i.e., not showing evidence of rickets, osteoporosis or bone tumors, and were preserved-but-friable (possibly due to leaching or burning). They were encased in ashy, clayey matrices, including fragments of mudbrick, without any associated jewelry or clothing.

In the adults the knees, ankles, and foot bones (of those available) remained in proximity to each other; yet many of them showed some degree of disarticulation. The southernmost set from LA.28K[1] revealed a rotation of 70-90 degrees of the left knee femur to tibia bones. The body was rotated onto its right downward side, and the legs were not crossed. The height was calculated by an intact right tibia length (with no growth plate present) and was approximately 173cm (5 feet 8 inches). As for the preserved northernmost adult extremities (from LA.28K[1]; see **Fig. 10**) the bones were intact from mid-femur to the complete presence of the feet. The body was rotated face downward. The right femur had been fractured in antiquity, as a proximal section was separated from the more distil and had become calcified in the ground (with the same kind of calcite crystals present on much of the associated Bronze Age pottery). Approximately 10cm of the remaining (proximal) portions of both femurs showed evidence of burning, including the separated proximal section. The lower legs were crossed left over right, knees downward. The knees appeared to be approximated but the left tibia/femur were rotated in relation to each other. The feet were rotated 90 degrees to each other. As well, the tibia/calcaneus joint surfaces in both ankles were subluxed and abnormally rotated in relation to each other. The right foot was subluxed as well: proximal meta-tarsal bones were hyper-extended, with the proximal phalanges hyper-flexed at almost 90 degrees to the meta-tarsal bones. As well, a fragment of the left arm containing only the elbow region (assuming a relationship with the leg bones) was found in the deposition matrix several centimeters above and to the left of the left leg; and a rib fragment was found at the same level as the elbow piece at about the mid tibial area of the left leg. The height of this



10. Ash layer of the terminal MBA destruction showing in situ human bones and bone fragment scatter (HB) (Square LA.28K[1], locus 3).

individual was approximately 165cm (5 feet 5 inches) based on an intact left tibia.

The child bones were found in the removal of the LA.28K[1] north balk. It is unclear how much of the upper torso was present originally at the time of deposition, but fragments of what appears to be calvarium were initially extracted along with a fragment of mandible with an un-erupted molar tooth. Some of the bone material was friable-to-powdery, perhaps due to exposure to heat, or simply decomposition. The lower extremities from the pelvic bone (left) to above the ankles were in a much better *in situ* state of preservation. The femurs and tibia/fibulas were in an extended position and face down, legs not crossed. Both knees were disrupted, lying positioned over a cobble-sized stone. The left femur was completely disarticulated from its tibia; and the right knee joint, as well, was abnormally hyper-extended, likely as a result of the legs having impacted against the stone with enough force to hyper-flex the knee joint opposite its natural direction. The acetabulum and its orientation to the femoral head was intact on the left side. There was a growth plate present. The intact femur and the un-erupted tooth suggest an age of approximately 6-8 years, and a height of 123cm (4 feet 1 inch).

While the skeletons are incomplete, there are several observable phenomena which argue for catastrophic (perhaps violent) burial: 1) the disarticulation of several of the joints in all three skeletons, generally severe; 2) the presence of burning on the femurs at their fracture point (N adult); 3) the fracture in antiquity of one femur with subsequent crystal-calcification of a portion of it (N adult); 4) the lack of demonstrable disease deformation, and their friability which is consistent with leaching or burning; 5) the lack of any indications of purposeful burial (indeed, the presence of numerous signs of sudden, simultaneous burial); 6) the proximation of the bones within ashy-clayey layers with clay brick fragments over, under, and around them; and 7) the presence of disintegrated human bone scatter through the ashy matrix. It is also worth noting that the balks of LA.28J[1] and LA.28K[1] show the continuation of this same ashy destruction layer also strewn with human bones and bone fragments, particularly to the west (which will provide ample opportunities for the continued study of these phenomena toward a possible explanation for their occurrence).

Trench LA.27-28 has also given us a detailed look at the phases of fortification evolution from the EB2 (first city wall) through the MB1-2 (final fortifications of the Bronze Age). Ceramic reads are now relatively clear that the 30m- to 50m-thick MBA defensive wall and rampart system (built of mudbricks and interior stone stabilizer walls) was constructed during MB1 (MB IIA in the older chronologies). It is also apparent that it was continuously used (with constant maintenance and repairs) through MB2, until the final destruction of the MBA city. We now have a very good handle on the construction of the MB1-2 city wall and rampart defensive system from Trench

LA27-28 (Season Four, Five, Six), Trench LA.38 (Season Five), Trench LA.39 (Season Five), and Trench LA.47 which was started in Season Six. The width of the MBA wall and rampart system in Trench LA.47 exceeds 50m. We have good reason to believe that it was a tiered rampart system, using multiple 30-36° slopes interspersed with gentle-sloping terraces between stone stabilizer walls which prevented erosion at the resultant angles (in the rampart profile).

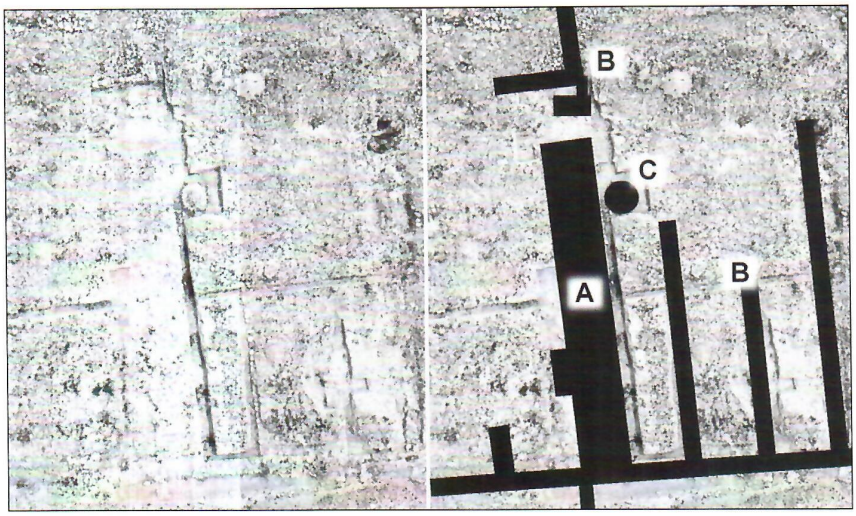
Based on three seasons of surveying, measuring, and excavating TeH's two mudbrick rampart systems (one around the upper tall, and another around the lower tall; see **Fig. 4**), we have now been able to arrive at their dimensions and the approximate volume of materials (mudbrick, stone, fill) in each. The linear dimension (length) of the lower rampart (not including the portions 'shared' with the upper rampart with which it connects) is 1,300m. With a general width of 33-50m at a 30-35° slope (supplemental rampart type; Burke 2008) on the outside of the city wall, rising from its lowest, outer grade to an average height of 22-25m, and 40-45% of that height taken up by the sloping/undulating bedrock beneath, the lower rampart system had an original volume of ca. 520,000m^3. Thus, the construction of the lower rampart required an estimated 40-45 million mudbricks, given the average size of TeH's MBA mudbricks (25x50x10cm), with 80 mudbricks per m^3.

The computation for the upper rampart is slightly different, given its freestanding form (cf. Burke 2008) with both inner and outer 35-38° slopes (with 500m^3 rather than 400m^3 per linear meter of rampart), resulting in a rampart volume of ca. 400,000m^3 requiring the manufacture and installation of ca. 30-35 million mudbricks, depending upon the contours of the substrate. The total number of mudbricks used in the TeH MBA integrated defensive ramparts is, therefore, between 70 and 80 million (not including the mudbrick superstructure of the lower city fortification wall). We have yet to calculate the amount of material required to build the city wall topping the lower city rampart (the upper/inner city rampart has no topping wall). The preserved stone foundation of the MBA city wall averages 4m in thickness, with a height of up to 2.5m (All of this will be published subsequently in detail, but suffice it to say that the site's defensive architecture is substantial.)

Toward the end of Season Four, approximately 200m NNW from Trench LA.27-28, we discovered and surveyed what appeared to be a monumental Bronze Age building measuring over 20x60m, with many interior walls, and perhaps surrounded by platform terraces. It sits on a rectangular, raised area at the geographical center of the city wall perimeter of the lower tall. Whatever its function, it must have been central to the daily life of the city. Last season, with the adjacent banana field to the E of this location removed, we could see that the raised platform area was approximately 100x100m. With the prospect of the banana trees returning later in the spring, we decided to do a quick probe to see what was below the 50cm rip-plowing depth which had destroyed many structures, evidenced from the thousands of medium-to-large stones covering the surface. We now know that most of the surface-visible stone foundations on the lower tall date to MB1-2. Thus, we were quite safe in assuming that most of these stones had once constituted MBA foundations. In short, the probe almost immediately revealed a 3m-thick stone foundation that we traced for 12m, and that was extended out to 22m by the end of the season. We have now found an opposing 3m-thick wall, several corners and smaller walls (1-1.4m), a section of stone pavement, and a circular altar in a courtyard to the immediate S.

The MB1-2 ceramic assemblage (mostly fragments) coming out of this severely damaged area has a high frequency of fineware including carinated bowls and chalices, piriform juglets, chocolate-on-white ware, and a host of forms typical of temples and ritual precincts. These are obviously the foundations of a monumental temple (the 3m-thick load-bearing S wall runs E-W for 22m with a parallel wall likely of the same dimensions to the N) and its associated buildings and courtyards (see **Fig. 11**). This kind of raised platform with a monumental building in the center of a surrounding precinct of large-but-less-substantial structures is reminiscent of several MBA cultic complexes in the southern Levant (cf. Warner 2008).

We have also opened up several squares on the W half of the sacred precinct terrace, the location of the 20x60m monumental building servicing the temple (Square LA.42J[1] and adjacent squares). The surface walls (70cm in



11. Aerial photograph of the geographical center of the lower tall (left, raw photo; right, visible architecture enhanced): Clearing of agricultural ripplowing debris reveals a foundation wall of a monumental building, 3m thick and 22m long (A; temple?), with associated (administrative? storage?) structures (B), and a circular altar (C). The large (20x60m) building (see Figure 14) to the immediate W of these structures is contiguous, and seems to date to the MB2 terminal phase of the city.

width) seem to date to MB1-2 based on diagnostic ceramic reads, but there are indications that some of the rooms have an IA2 "squatting" presence. Many lower walls on various levels came to light in the probe from the previous season, but we have now opened up additional squares in the area in order to get a wider look at the structure (which also has several underlying structures). What we had thought (previous season) was perhaps an IA2 'farmhouse', now looks more like a modest cultic center (likely of the open-air variety). There is a good concentration of IA2a-b pottery (cooking pots, juglets, and storage vessels), but some of the artifact distribution, 're-use' features, and the presence of a plaque figurine (see **Fig. 12**) and stone altar (see **Fig. 13**) suggest that the IA2 occupants may have performed fertility rituals within the enclosing walls of the then-ancient ruins of the MBA temple precinct (see **Fig. 14**).

Currently, the stratigraphy has taken us from the meager remnants of the 'squatting' IA2 'cult center', onto a massive spread of MB1-2 monumental walls, and down through variously-aligned walls from IB1-2, and EB3; and all of that at only 1.5m depth. To say that there is much more to come from this segment of Field LA is an understatement.

12. Asherah with a frame-drum; IA2 cultic space; Square LA.42J-K.

Activity in the al-Ḥammām Megalithic Field (Necroscape): Dolmens and Tombs

Al-Ḥammām Dolmens 'A', 'B', and 'C': Excavation and Interpretation

In Season Five, HD.78 was selected for excavation because it gave all indications of being intact, which is extremely rare. It was, in fact, intact (sealed in antiquity after its final use), and contained a remarkable range of vessels and bones that have significant interpretive potential

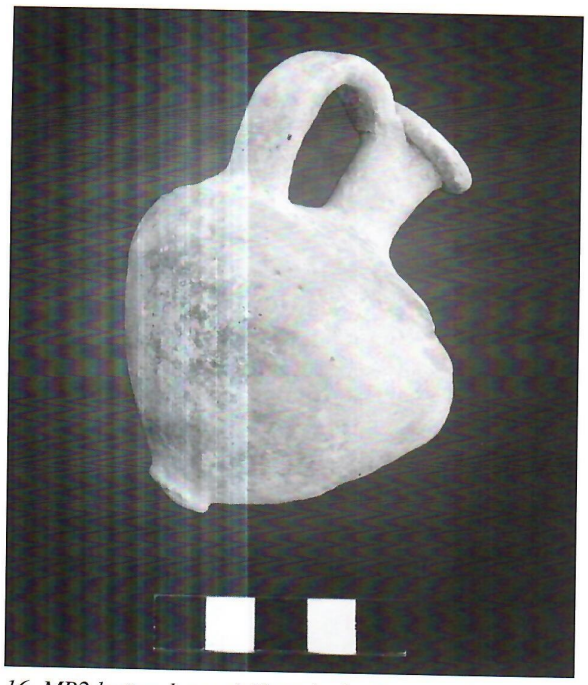
(see **Fig. 15**). This season, dolmens A, B, and C (pending assignment of survey numbers) gave us corroborative data, with one remarkable addition: Two of the vessels from undisturbed Demi-Dolmen A dated to MB2 (a small carinated bowl and a button-base piriform juglet; see **Fig. 16**). This is highly significant, for it mirrors the long, unbroken occupation of the site (at least) from the late Chalcolithic through the MBA, and signals an enduring-yet-fluid socio-religio-cultural community, likely nurtured by genetic (tribal) continuity.

Without going into possible anthropological meanings, it seems clear that the Ḥammām dolmens were not tombs in the formal sense of containing primary or secondary burials. Although

13. Stone altar/incense burner; IA2 cultic space; Square LA.42J-K.

15. Bronze Age ceramic vessels from the excavation of an intact dolmen (HD.78) laid in a spatial arrangement approximating in situ context.

14. IA2 cultic space (X) "squatting" within a much larger MBA sacred precinct (administrative?) structure (Squares LA.42J-K).



16. MB2 button-base piriform juglet from a dolmen "memorial deposit" (demi-dolmen HD.A).

there were scattered bones from (likely) several individuals, including some in the infantile state, there were no indications that whole skeletons were ever interred in the chambers. About twenty intact and mendable vessels (mostly small) were found in HD.78, along with fragments and sherds from at least 20 others, ranging in date from the Chalcolithic Period, EB1, EB2, EB3, and IBA, with demi-dolmen A (from the present season) extending the tradition of dolmen ceramic deposits to MB2.

It seems likely that the 'token' bones and small vessels comprising the contents of the dolmen chambers were periodically placed during rituals linked to ancestor worship and/or memorial practices according to a prefigured astronomical calendar of both solar and lunar alignments as suggested by solstice/equinox and lunar menhir alignments closely associated with discreet dolmen groups. There also seem to be obvious alignments of menhirs and dolmens with the sacred precinct platform at the center of the lower tall. Several members of the TeHEP Team were in the dolmen field at the winter solstice sunrise and sunset to observe and make notes, and we were able to gather some interesting data. All these features are under study, and will be published in the near future.

Al-Ḥammām Monumental Tomb 'A': Screening and Interpretation

This particular feature seems unique in the Hammam Dolmen Field. It is a square-ish structure (c. 5x5m) with an outer wall built from large boulders. The resultant enclosure has been partially robbed out by 'night diggers', and the cast-up debris from their activities is full of human bone fragments and pottery dating (thus far) from the IA2b and MB1-2. This material was screened, and several carnelian beads were also found. Perhaps it is a monumental tomb of some sort. The inner 'chamber' seems to be undisturbed below the relatively shallow diggings of the tomb robbers. This will continue to get careful attention, and is scheduled for excavation during Season Seven (2012).

Stratigraphy: Insights through Season Six

When no subperiod designations are identified, general references to the archaeological periods use the following abbreviations: Pre-Pottery Neolithic Period = PPNP; Pottery Neolithic Period = PNP; Chalcolithic Period = CP; Early Bronze Age = EBA; Intermediate Bronze Age = IBA; Middle Bronze Age = MBA; Late Bronze Age = LBA; Iron Age = IA; Hellenistic Period = HP; Early Roman Period = ERP; Late Roman Period = LRP; Byzantine Period = BP. Islamic Periods use the traditional designations.

We are applying the following general chronology (Collins, Hamdan, Byers *et al.* 2009a), with new abbreviations given first:

PN1: Pottery Neolithic/early	**6000-5500 BC**
PN2: Pottery Neolithic/middle	**5500-5000 BC**
PN3: Pottery Neolithic/late	**5000-4500 BC**
CH1: Chalcolithic/early	4500-4100 BC
CH2: Chalcolithic/middle	4100-3800 BC
CH3: Chalcolithic/late	3800-3500 BC
EB1a: Early Bronze 1/early	**3500-3350 BC**
EB1b: Early Bronze 1/middle	**3350-3250 BC**
EB1c: Early Bronze 1/late	**3250-3100 BC**
EB2a: Early Bronze II/early	3100-3000 BC
EB2b: Early Bronze II/middle	3000-2900 BC
EB2c: Early Bronze II/late	2900-2800 BC
EB3a: Early Bronze III/early	**2800-2650 BC**
EB3b: Early Bronze III/middle	**2650-2500 BC**
EB3c: Early Bronze III/late	**2500-2350 BC**
IB1: Intermediate Bronze/earlier	2350-2200 BC (old EB IV)

IB2: Intermediate Bronze/later	2200-2000 BC (old MB I)
MB1: Middle Bronze I	**2000-1800 BC (old MB IIA)**
MB2: Middle Bronze II	**1800-1550 BC (old MB IIB-C)**
LB1: Late Bronze I	1550-1400 BC
LB2a: Late Bronze IIA	1400-1300 BC
LB2b: Late Bronze IIB	1300-1200 BC
IA1a: Iron IA	**1200-1100 BC**
IA1b: Iron 1B	**1100-1000 BC**
IA2a: Iron IIA	1000-900 BC
IA2b: Iron IIB	900-700 BC
IA2c: Iron IIA	700-539 BC
IA3: Iron III/Persian Period	**539-332 BC**
Hellenistic Period	332-63 BC
Early Roman Period	63 BC-135 AD

The stratigraphic profile of Tall al-Ḥammām had long been suspected, but has needed to be confirmed by excavation (Prag 1974, 1991; Ibrahim, Yassine, and Sauer 1988). The following is a theoretical stratigraphic profile based on observations from extensive sherding, clearing and clarification of MT disturbances, and the results of scientific excavation through six seasons. By "theoretical stratigraphy" we mean what is suggested by a "general assessment" of the ceramic indicators over the whole of the site, giving consideration to the frequency of certain period diagnostics. In other words, significant amounts of pottery from a given period would indicate, theoretically, that an architecturally-based occupation would be likely. On the other hand, rare occurrences of ceramics from a given period would suggest, theoretically, the unlikelihood of a substantial architectural complex dating to that timeframe. Of course, only excavation can reveal the *actual* stratigraphic profile of a given location on the site. Ceramic indicators with associated architecture suggest the following occupational sequence at Tall al-Ḥammām:

Early-to-Late Islamic Periods

These ceramic forms seem to be mixed into contexts with the latest (surface) structures on the upper and lower talls. Re-use of older structures may account for this, especially in the area of the Roman/Byzantine bath complex on the lower tall (Field LR), where Umayyad pottery is fairly common. However, such sherds are extremely rare on the site as compared to Bronze and Iron Age pottery forms. Only an occasional campsite can be extrapolated from these few Islamic sherds.

Late Hellenistic/Early Roman Period and Byzantine Period

The Late Hellenistic and Early Roman periods are represented at the site, but play a minor role in comparison to the Bronze and Iron Age ceramic assemblages. Roman and Byzantine sherds are present, but are mostly found in two isolated locations, Field LR (monumental building) and Field UA (small guard tower).

Iron Age 1, 2, 3

The Iron Age city is quite extensive on the upper tall, but at this point periodization/phasing is not entirely clear. Iron I pottery is infrequent at this point, but present (such as the IA1b pilgrim flask found in Field UB). The IA2b-c monumental gateway in Field UB has an earlier phase dating to IA2a (perhaps late IA1b), with the terminal phase dating to IA2c, perhaps IA3. The principal Iron Age city at Tall al-Ḥammām seems to have been built during IA2a-b. IA3 (Persian Period) sherds are present-but-infrequent at this point.

Late Bronze Age

Material from the Late Bronze Age are systematically absent from the tall proper. However, LB2 pottery vessels were found in a nearby tomb containing vessels dating from the Chalcolithic Period through the Iron Age. Thus, some kind of LB2 presence in the area can be surmised; however, no architecture from that period is known in this vicinity of the valley E of the Jordan River.

Middle Bronze Age

Both MB1 and MB2 are strongly represented in the TeH ceramic repertoire, typical MBA bronze weaponry (see **Fig. 17**), and in related fortification, monumental, and domestic architecture on both the upper and lower talls. That the strongly fortified MBA city spread over most or all the site footprint is now clear.

Intermediate Bronze Age

IB1 and IB2 pottery forms appear with high frequency across the entire site. These occupants also seem to have re-built and re-used many of the

17. One of several MB2 bronze "battle axes" unearthed at Tall al-Ḥammām.

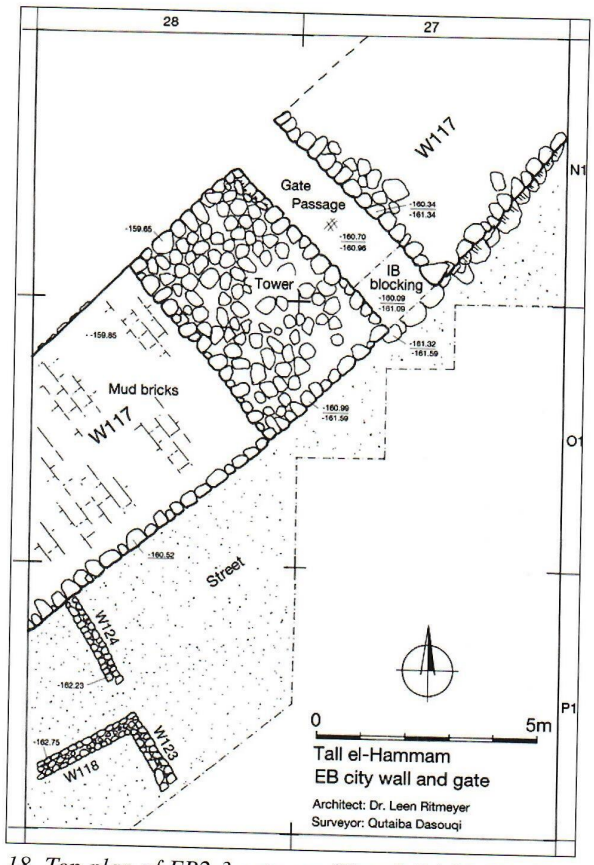
previous EB2/EB3 structures including the city fortifications. IBA domestic structures are clearly confined inside the city walls, with relatively clear indications of fortification alterations (such as the blocking of one of the EB2/3 gateways).

Early Bronze Age

The EBA city of Tall al-Ḥammām is unmistakable and massive. On the basis of excavations during Season Five, three phases of the EBA city are clearly visible. EB1 houses protrude from under the EB2 city wall foundation and associated outer roadway (see **Figs. 18, 19, and 20**). The 5.2m-thick EB2 city wall was dramatically strengthened during EB3. The EBA fortification system surrounds both the lower and upper talls (around the base of the upper tall).

Chalcolithic Period

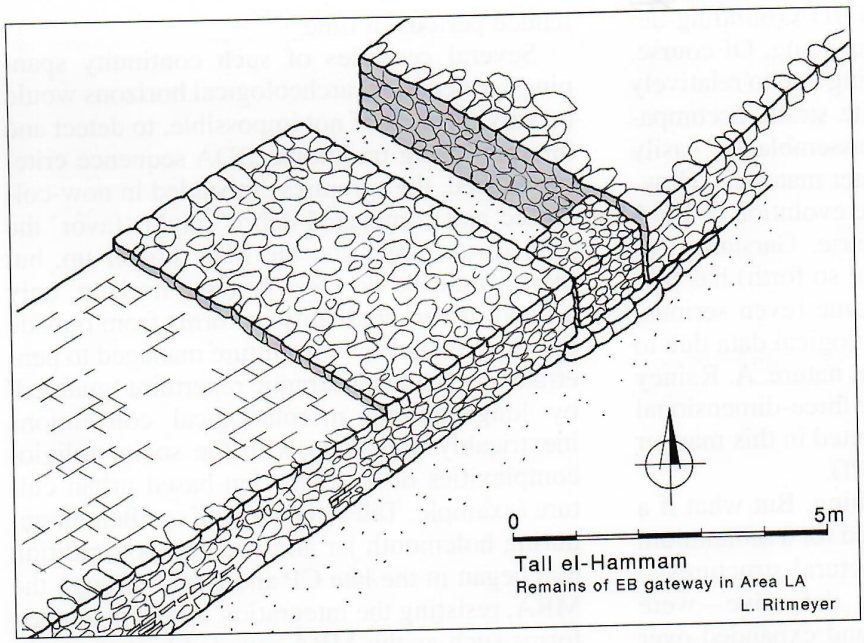
Chalcolithic pottery forms of the Ghassulian variety are found with some frequency, as are various basalt bowl fragments. The lithic artifacts from this period are fairly common. It would be understandable if Chalcolithic residents (perhaps moving from Tulaylāt al-Ghasūl?) had come to Tall al-Ḥammām to take advantage of its abundant water resources. Given the immense size of the EBA city, it is in the realm of possibility that the footprint of an underlying Chalcolithic settlement at TeH might eventually come to light. Season Five has now revealed Chalcolithic architecture (broadhouses) built on bedrock.



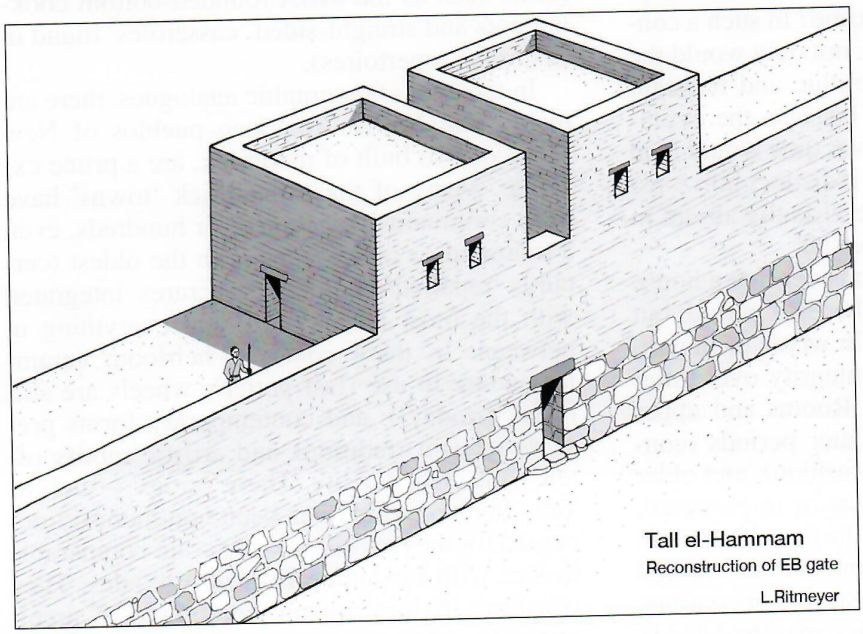
18. Top plan of EB2-3 gateway (Trench LA.27-28). Note the remnants of two Chalcolithic/EB1 broadhouses (W124, W118, W123) likely demolished when the EB2-3 city wall was constructed. The street is contemporary with the city wall, and covers the earlier domestic structures.

Confirmed Stratigraphy

A Chalcolithic architectural presence is now confirmed at TeH. The EB2 occupants of the site were the original builders of the extensive fortification systems that surround both the upper and lower talls, strengthened significantly during EB3 (Mazar 2002; Schaub 2007; Schaub and Chesson 2007). The Intermediate Bronze Age occupants seem to utilize most or all of the EBA footprint, including the fortifications. Excavation on the lower tall suggests a continuous occupation from the CP through MB2. The Middle Bronze Age is strongly attested architecturally at TeH, particularly in its fortification ramparts and walls on both the upper and lower talls, and in numerous domestic contexts. No structures belonging to the Late Bronze Age or Iron Age 1a are presently known. Perhaps one structure in Field UB can be dated to IA1b, but that identification still needs



19. *Isometric rendering of the EB2-3 city wall and EB3 gateway (there is evidence for numerous such gate passages at the site), subsequently blocked during the IBA when more limited access to the city may have been a response to the social disruptions of that period.*



20. *Reconstruction drawing of one of Tall al-Ḥammām's EB3 city gates. 100% of the stone foundation (6m thick x 5 courses) and several courses of the original mud-brick superstructure are still intact in Trench LA.27-28.*

more study. The IA2 city is extensively attested by both monumental and defensive architecture, and in domestic contexts. Iron 3 seems present, but yet unconfirmed by anything more than re-use of older buildings. Hellenistic, Roman, and Byzantine architecture (re-used?) seem confirmed on the south side of the site, and perhaps in Field UA on the upper tall. Islamic structures are presently unknown, except (perhaps) some minimal re-use of earlier architecture.

Methodological Insights for Determining Stratigraphy Based on Data and Observations at Tall al-Ḥammām

Based on our stratigraphic analysis of Tall al-Ḥammām, we offer the following observations and insights in light of the 'traditional' interpretive criteria generally applied in S. Levantine archaeology (such as the Wheeler/Kenyon approach).[14]

Conventional excavation/interpretation is

14. Based on the research and analysis of TeHEP Chief Archaeologist, S. Collins.

based on what may be called BDA (building-destruction-abandonment) sequencing. Of course, such sequences do exist, giving rise to relatively clear cultural horizons in site strata, accompanied by discreet ceramic assemblages easily separable from earlier and later materials. However, we now suspect that the evolution of BDA interpretive criteria (a la Petrie, Garstang, Albright, Wheeler, Kenyon, and so forth) has perhaps been responsible for some (even serious) misinterpretations of archaeological data due to its generally two-dimensional nature. A. Rainey has wisely noted that sites are three-dimensional in nature and must be interpreted in this manner (Rainey and Notley 2006: 23ff).

A BDA sequence is one thing. But what if a site was continuously occupied for a millennium or more, wherein the architectural structures—domestic, monumental, and defensive—were used, re-used, re-furbished, and expanded over an extremely long period of time? In such a continuous-occupation scenario, not only would the local culture be more monolithic and resistant to change from 'outsiders', but also the evolution of the material culture over time would lend itself to 'blurred', generally indistinct horizons; indeed, separability might be virtually absent in many locations around a give site.

By way of an example, consider that a house was originally built during the EB3 period, but was continuously occupied (in whole or in part, depending on its structural integrity over time) through the IBA and MBA. Rooms and upper floors may be added on in later periods (continuously in an evolutionary fashion), and older sections of the same house may be re-plastered, re-floored, or re-buttressed during subsequent times. Certain lower/older rooms might be filled in with debris for structural reasons, or continue to be used. Some upper stories may be later in construction, or earlier, and some lower ones may also be earlier or later, as the structure(s) evolve bit by bit in response to accidental fires, natural (annual) deterioration (typical of mudbrick construction), earthquakes, replacement of rotting roof beams (vigas and latillas in Spanish) and associated floor plasters, the necessity of adding storage and living space, etc., over extended periods of time.

Several centuries of such continuity spanning conventional archeological horizons would be very difficult, if not impossible, to detect and interpret using traditional BDA sequence criteria. Indeed, the ceramics embedded in now-collapsed and compacted debris might 'favor' the EB3 lower down and the MB2 higher up, but there would be no clear ceramic horizon, only a trend-driven graduality as forms from outside the city's enduring core culture managed to penetrate into the local ceramic repertoire 'guarded' by long-standing morphological conventions inextricably bound up with the socio- religio-complexities of a tribal, clan-based urban culture (example: Tall al-Ḥammām's millennia-enduring holemouth jar and cooking pot tradition that began in the late CP and lasted through the MBA, resisting the integration of the more open forms such as the MBA rounded-bottom cooking pots and straight-sided 'casseroles' found in Cisjordan repertoires).

In terms of ethnographic analogues, there are many. The Native American pueblos of New Mexico, also built of mudbrick, are a prime example. Many of these mudbrick 'towns' have been continuously occupied for hundreds, even a thousand or more years, with the oldest (certainly repaired/modified) structures integrated with the most recent ones, and everything in between. In these contexts, heirloom ceramics endure in use (fast potter's wheels are still resisted today!), and contemporary forms preserve ancient traditions and artistic motifs often with great fidelity. These 'cities'—such as Taos Pueblo, which has been continuously occupied for the past 1,200 years—are comparable in size with Levantine Bronze Age sites. They constitute living, organic complexes of architectural evolution without a 'traditional' stratigraphic character in the generally-understood ANE sense. Indeed, at Taos, residents continue to maintain, refurbish, and dwell in houses with foundations, walls, and floors spanning the pueblo's 1,200-year history.[15]

Such an enduring city, when approached by the archaeologist after millennia of abandonment subsequent to its many centuries of con-

15. Co-author, S. Collins, is intimately familiar with Taos Pueblo and has personally examined the site on numerous occasions. His background in Southwest Native American ethnology has been extremely beneficial in helping to interpret the occupational patterns at Tall al-Ḥammām.

tinuous occupation—perhaps followed by one or more BDA sequences—would, minimally, be extremely difficult to interpret via the traditional stratigraphic concepts of BDA-based analysis. In such a context, there may very well be MB2 material sitting directly on an EB3 floor. There may be an IBA floor added into an EB3 room with MB1 sherds on that floor. There may be an MB2 installation built on/into an IBA floor and sealing up against an EB3 mudbrick wall plastered over (again) during MB1. These are only a few scenarios that obtain from a continuously occupied, architecturally-evolving site, not to mention all of the socio-cultural dynamics that would have attended such instances.

These are exactly the kinds of phenomena we are observing on the lower city at Tall al-Ḥammām. In several places it is possible to trace the evolution of the same basic domestic structure from its EB3 foundations, IBA rebuilds/additions, and MB1/2 refurbishments and additions, all following the same basic footprint and wall-lines, producing a dramatic three-dimensional record of architectural evolution spreading not only horizontally, but also vertically.

There is no rational means of interpreting such complex phenomena when relying on BDA-based methods alone.

Therefore, we are suggesting the development of a new interpretive methodology with (at this point) four main categories of stratigraphic sequencing criteria (we thought it prudent to document some of our thinking in this regard in this report while the data from the most recent season are still fresh in our minds):

Building-Destruction-Abandonment (BDA) Sequence: An enumerative explanation of predictive, observable phenomena (criteria) resulting from a BDA sequence (we will not burden the reader with the details here, but one will see the pattern).

Continuous-Occupation-Expansion (COE) Sequence: An enumerative explanation of predictive, observable phenomena (criteria) resulting from a COE sequence, i.e., a site that is continuously occupied and growing architecturally, with no intervening BDA sequences.

Continuous-Occupation-Maintenance (COM) Sequence: An enumerative explanation of predictive, observable phenomena (criteria) resulting from a COM sequence, i.e., a site that is continuously occupied and maintaining an architectural status quo, with no intervening BDA sequences.

Continuous-Occupation-Reduction (COR) Sequence: An enumerative explanation of predictive, observable phenomena (criteria) resulting from a COR sequence, i.e., a site that is continuously occupied but diminishing architecturally, with no intervening BDA sequence in some locations, but with a BDA sequence(s) in other locations.

One must also consider potential ephemeral (tents? squatting?) occupation, erosion, period site alteration/destruction, modern farming and military activities, and host of other factors.

What we hope to accomplish through this is a rational, logical means of assessing architectural, artifactual, and depositional data (with an attending excavation methodology) that is sensitive to both BDA and continuous-occupation sequences and their attending phenomena (criteria).

Based on some recent examination of excavation reports and even final publications, we detect what is perhaps a degree of potential misinterpretation of data in terms of alleged site abandonments and even alleged site continuation. Perhaps this kind of approach will free some from the straightjacket of previous methods of stratigraphic analysis, allowing a clearer assessment of what, heretofore, had been virtually un-interpretable. Indeed, the concept of a 'sealed' locus would only be categorically applicable in a BDA or COR context, whereas the stratigraphy of a COE or COM sequence would manifest itself in the temporal evolution of at least some components of a site's architectural repertoire (this would be particularly true of domestic architecture, and perhaps less true as a generalization in terms of monumental and defensive architecture).

Insights on Landscape Archaeo-Anthropology from the Tall al-Ḥammām City State

That Tall al-Ḥammām was the political and cultural epicenter of a significant Bronze Age city-state is by now quite obvious. One can easily comprehend the ancient phenomenological interpretation of the definable and defensible landscape visible from Tall al-Ḥammām when standing at almost any location on the site. Field

UA (location of the MBA palace) provides a particularly dramatic vantage point from which to view the territory under TeH's control (the most logical candidate for the formulaic geography of the Cities of the Plain in biblical lore). In order to make sense of the interwoven complexities of such a socio-political entity, a holistic, integrative approach to the archaeology and anthropology of the area is required.

For purposes of studying the interrelated features of the city-state—such as its central city, outlying towns, villages, and hamlets, agricultural fields, dolmen/menhir fields and tombs—we propose a theoretical structuring of city-state components in terms of landscape utilization based on the readily observable (obvious) partitioning of the local geography by its ancient inhabitants. Since it is clear that the citizens of the TeH city-state incorporated virtually every square kilometer (indeed, square meter) of their landscape environment, the terminology we are suggesting seeks to describe the purposes for which they utilized, augmented, and altered the local terrain. For the TeH city-state in particular, we have (thus far) organized it into five principal macro-features: *urbascape*, *agriscape*, *sacrescape*, *necroscape*, and *infrascape*.[16]

Urbascape: that portion of the landscape utilized, augmented, and altered by the principal population of a city-state incorporating political, religious, administrative, economic, domestic, and defensive architecture, the perimeter of which is defined by fortifications, the aggregate of which is phenomenologically defined by the city-state's inhabitants as the 'core' of their 'kingdom'.

Agriscape: that portion of the landscape utilized, augmented, and altered by the collective agricultural enterprises of the city-state for fields and groves, water management, housing laborers, processing installations, storage and distribution facilities, and the handling of traded agricultural commodities, including interspersed towns (perhaps fortified), villages, and hamlets inhabited by farmers, workmen, and their families.

Sacrescape: that portion of the landscape utilized, augmented, and altered by the collective religious/ritual practices of the city-state community, including many or all of the following components: sacred architecture (such as temples and ritual enclosures), ritual monuments (such as menhirs, stone circles, megalithic alignments, and dolmens), sacred places (such as hilltops, groves, and other topographical features of ritual significance), the necroscape, and the processional thoroughfares by which they are connected and accessed.

Necroscape: that portion of the landscape utilized, augmented, and altered by the collective funerary activities of the city-state community, where the dead are treated, tended, buried, and memorialized, including tombs and monuments of all types devoted to the passage, remembrance, or worship of ancestors, such as cave and shaft tombs, dolmens (various types), menhirs (+ alignments), stone circles, and ritual avenues.

Infrascape: that portion of the landscape utilized, augmented, and altered by the collective activities of the city-state population in support of building and maintenance activities, transportation needs, refuse/sanitation management, and various industries, including stone, earth, and clay quarry sites, roadways, production facilities for mudbricks, ceramics, metallurgy, stonework, wood-work and other materials.

Each of these macro-components of the TeH city-state has a distinct, visual impact on the observer. These are the 'larger-than-life' physical manifestations of city-state life which incorporate, overlay, and sculpt the landscape via the human enterprise of surviving and thriving within a local environment. As the Tall al-Ḥammām Excavation Project continues through the present decade, it will provide a wealth of data and insights for understanding Bronze Age civilization at the city-state level in the southern Jordan Valley.

Thoughts, Conclusions and Recommendations

The eight-week 2010/2011 excavation season was successful in clarifying the answers to many questions remaining from previous seasons, and has also provided a good foundation for the bal-

16. This is the terminology developed by S. Collins, TeHEP co-Director. This section is based on the research and analysis of S. Collins and L. Clayton, TeHEP Senior Anthropologist in collaboration.

ance of the Project. Of course, many new questions have arisen that must be answered in future seasons. Not only has the excavation proper continued to clarify a great deal on the lower tall relative to the EBA and MBA defensive systems, but also it has given us a dramatic look into the EBA, IBA, and MBA occupations on the lower tall vis-à-vis clear 'stratigraphic' horizons.

Further, additions to the topographical and area surveys—including dolmens, tombs, and related town/village sites—has given us a much clearer picture of Tall al-Ḥammām's central role in the history of the eastern Jordan Disk and the region in general. Indeed, at approximately 36ha, the sheer size of the heavily fortified Bronze Age city (EBA, IBA, MBA) at Tall al-Ḥammām—with its many satellite towns and villages tightly clustered around it—is shedding new light on the interpretation of the evolution of urban polities in the Transjordan context. It is becoming increasingly clear that most of the archaeological sites in the vicinity, upon which interpretive analyses of the Transjordan Bronze Age have heretofore been based, were, in fact, subordinate satellites within the gravity of Tall al-Ḥammām's political influence (cf. Levy, Michele Daviau, Younker, Shaer: 2007; Adams 2008; Collins, Hamdan, Byers *et al.* 2009b).[17] This is no casual cluster (cf. Savage, Falconer, and Harrison 2007). What we have here is an EBA/IBA/MBA city-state configuration of significant proportions that, until the present work at Tall al-Ḥammām, has not found its way into any of the past or recent discussions of the Transjordan Bronze Age[18] (cf. Dornemann 1983; Najjar 1992; Savage, Falconer, and Harrison 2007; Falconer, Fall, and Jones 2007; Falconer 2008; Palumbo 2008; Philip 2008).

The complex Bronze Age fortifications at Tall al-Ḥammām, including outer and inner city walls and mudbrick/earthen ramparts, are reminiscent of some Bronze Age urban centers in Mesopotamia (Burke 2008). TeHEP is contributing significantly to our understanding of the Transjordan Intermediate Bronze Age (aka EB IV or Intermediate EB-MB), as all indicators seem to support that Tall al-Ḥammām was both large and fortified during that enigmatic period, and surrounded by smaller IBA sites—such as Tall Iktānū—in close proximity (cf. Richard and Long 2007), for which a city-state interpretation is not out of the question.[19]

The 100x100m raised platform of the sacred precinct at the center of the lower tall contains a massive Canaanite-style temple and associated buildings and courtyards, the study of which in coming seasons will enhance our knowledge of such religious complexes (cf. Warner 2008).

Although not as large as the Bronze Age occupation, the Iron Age city at Tall al-Ḥammām was obviously an important crossroads center that played a considerable role in the local socio-political milieu. Without a doubt, the excavation of this magnificent site will contribute a wealth of new information for all of its represented periods. It is possible that it has direct links to Solomonic Jerusalem and the subsequent Israelite hegemony as a Transjordan district commercial center.

Further, the continuation and building of relationships with local officials and residents, the extensive exploration of area geographical features and archaeological sites, and the experience of working side by side with our colleagues from the Department of Antiquities, have all come together to build positive expectations for the continuation of TeHEP over the

17. Tall al-Ḥammām and its intimate geographical cluster of sites is systematically absent (save for a few graphs of site-size comparisons listing TeH at 15 ha) from all past and recent discussions of the Transjordan Bronze Age both for the southern Jordan Valley, and Jordan in general. The only exception to this is the 1990 probe excavation on TeH by Kay Prag (1991). Dr. Prag was, and is, well-familiar with the size and prominence of TeH, but her work at the site is little known and less considered. Drs. Prag and Collins explored the expanse of Tall al-Ḥammām together at the end of the 2009 season.

18. This is not meant as a criticism, simply a statement of fact. One cannot expect an unexcavated, unpublished site, regardless of its size, to play a very large role in the interpretation of a regional archaeological picture, however inaccurate the picture may be without it. New interpretations will arise as information from Tall al-Ḥammām is integrated into the available corpus of archaeological data. But again, Prag's probe excavation report and description of TeH have been available since 1991, so it cannot be said that information about the site was altogether invisible.

19. Once again we have an example in which a secondary townsite, Tall Iktānū, had, by default, become the interpretive epicenter for understanding the IBA in the southern Jordan Valley, even for much of the region. Tall al-Ḥammām will now be able to interject relevant data from a primary IBA urban site into the discussion.

next ten years of the new Joint Agreement.

As is now widely accepted, Tall al-Ḥammām remains the most logical candidate for biblical Sodom based on a detailed analysis of the relevant biblical and historical materials regarding the chronology and location of the city (Tristram 1874: 330-333; Thomson 1882: 371-376; Collins 2002a, 2002b, 2002c, 2008; cf. MacDonald 2000: 45-61). Extensive research, along with archaeological data from five seasons of excavation, are now leading many scholars to entertain or adopt this theory on its evidential merits. That the enduring and powerful presence of Tall al-Ḥammām and its associated towns and villages on the eastern Jordan Disk during the Bronze Age gave rise to the Cities of the Plain tradition reflected in the stories of Genesis 10-19 is a reasonable theory commensurate with all of the available geographical and archaeological data. Future tourism potential for such a site as Tall al-Ḥammām must not be overlooked or underestimated. From all perspectives, preservation of this highly important site is imperative.

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A PLAQUE FIGURINE AT TALL AL-ḤAMMĀM, SEASON SIX (2011)

Carroll M. Kobs, Steven Collins, Hussein Aljarrah, and Hal Bonnette

Abstract

The subject of Iron Age figurines in the Southern Levant is frequently addressed. From typological studies, to speculation of function, to the more tentative research on subtopics such as gender roles and religion, these artifacts continue to fascinate and draw out new theories. This paper is a broad overview of past investigations concerning female figurines with a disk, as well as the study of a specific figurine discovered during Season Six (2011) at Tall al-Ḥammām in the Middle Ghawr. Excavators found the figurine *in situ*—in an IA2 context—among related ceramic and stone objects. We will examine the similarities and differences between this artifact and other Transjordan figurines in order to provide additional insights into the purpose(s) of this form of representational art.

Introduction

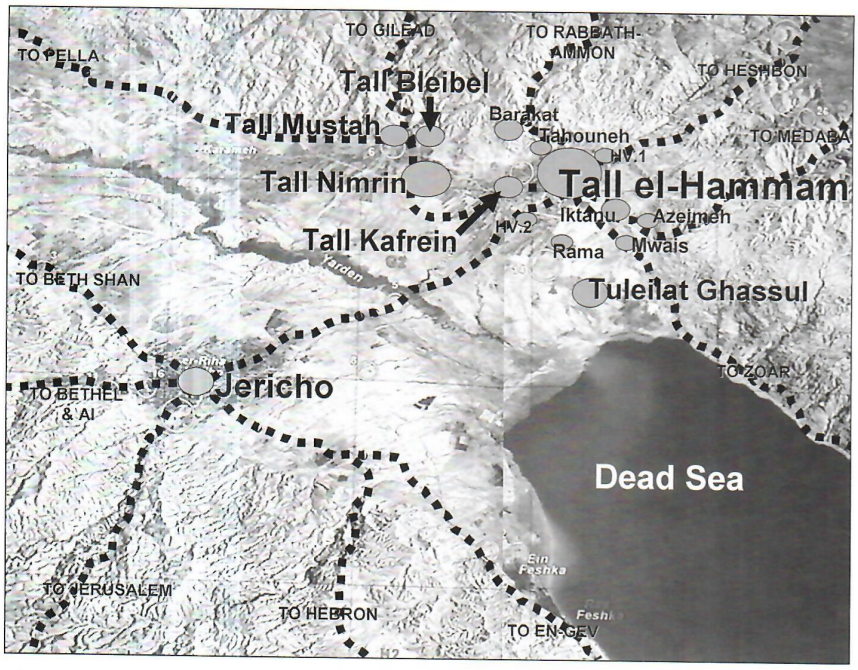
The Tall al-Ḥammām Excavation Project (TaHEP) is a joint venture of Trinity Southwest University (TSU) and the Department of Antiquities (DoA) of the Hashemite Kingdom of Jordan, under the co-direction of Dr. Steven Collins (TSU) and Mr. Hussein Aljarrah (DoA), under the auspices, and with the support, of Dr. Ziad Al-Saad, Director General of the DoA. TSU began the excavations in 2005/6 (Season One), and entered into the Project partnership with the DoA in 2008 (Season Three). In December of 2010 (Season Six), TSU and the DoA extended their cooperation by signing a new ten-year Joint Scientific Project Agreement. Detailed Season Activity Reports are filed with the Department of Antiquities: Season One (Collins, *et al,* 2006); Season Two (Collins, *et al.,* 2007); Season Three (Collins, *et al,* 2008); Season Four (Collins, *et al,* 2009); Season Five (Collins, *et al,* 2010); and Season Six (Collins, *et al,* 2011).

The figurine that is the subject of this paper emerged from the Field LA excavations during Season Six, which occurred during December 2010 and January 2011.

A Brief Geography and Physical Condition of Tall al-Ḥammām (Fig. 1)

The tall itself is situated in the southern Jordan Valley 12.6km northeast of the Dead Sea and 11.7km E of the Jordan River (Collins 2009: 385). The name "Ḥammām" refers to its hot springs and abundant fresh water springs that still flow today. The site is comprised of both an upper and lower tall with an occupational footprint extending N/S from the Wādī al-Kafrayn to the Wādī ar-Rawḍa measuring approximately 36 hectares.[1] The site straddles the intersection of the ancient E-W trade route from the 'Amman Citadel and Ḥisbān (Heshbon) to Jericho and Jerusalem (Collins 2009: 386). Overall, the

1. In the early 1990's, K. Prag estimated the size of Tall al-Ḥammām at more than 15 hectares (Prag 1993: 272). Due to TaHEP's extensive surveying of both the upper and lower talls, evidence now shows the total area to be around 36 hectares. S. Collins and C. Kobs performed surface sherding during Season Six on the far E side of the tall that had not taken place before due to intensive farming. Positive results from this surface survey considerably expands the occupational footprint of the site. The (now) square-kilometer general occupation area of Tall al-Ḥammām does not include the contiguous sacrescape and necroscape (dolmens, tombs, menhirs, megalithic stone alignments, stone circles, and ritual avenues) to the NE, E, SE, and S of the site. Remnants of several dolmens and tombs are even evident at both the western and eastern extremities of the lower tall. Unfortunately, the present expansion of ar-Rawḍa is demolishing many of these important features.



1. Map showing Tall al-Ḥammām and surrounding ancient sites, roads and highways (courtesy, S. Collins).

site was the largest Bronze Age city in the southern Jordan Valley, and included numerous satellite towns and villages within its hegemony.

Tall al-Ḥammām's upper city sits astride a natural hill resulting in a total height of approximately 30m above the lower tall. Unfortunately, the upper tall is somewhat marred by (past) military trenches and ingress-egress roads. Other than this minor imposition, no prior archaeological activity took place on the upper tall—except for surface surveying—before Season One of TaHEP. One of the earliest examinations and recordings was accomplished in the 1940s by N. Glueck (Glueck 1945: 378-382).

While excavating at Tall Iktānū (c. 2km S of Tall al-Ḥammām) in 1990, K. Prag briefly excavated a small area near the western edge of lower Ḥammām where she initiated several probes (Prag 1993: 271-273). Her work was abruptly terminated due to the discovery of landmines (Prag 1993: 273). In addition to these soundings, data regarding Tall al-Ḥammām were also published in past surveys; however, much of this material has proved inadequate due to its cursory nature.[2] Beyond these few observations and publications, TaHEP is the first project to provide rigorous scientific research, exploration, and excavation of this important site.

In the past and currently, the area occupied by Tall al-Ḥammām has suffered from aggressive agricultural activities, particularly the lower levels. Each season, local banana and vegetable crops have interfered with our excavation plans, at times making research and work in some areas of the tall difficult. Despite these hindrances, Tall al-Ḥammām, historically and presently, is often described as "outstanding and impressive" (Glueck 1945: 379) and "one of the largest ancient ruins in the Jordan Valley" (Ji and Lee 2002: 188). Indeed, its sheer magnitude continues to impress all those who visit the site.

A Broad Overview of Archaeological Strata at Tall al-Ḥammām

Tall al-Ḥammām continues to make an impact with its long, seemingly continuous Bronze

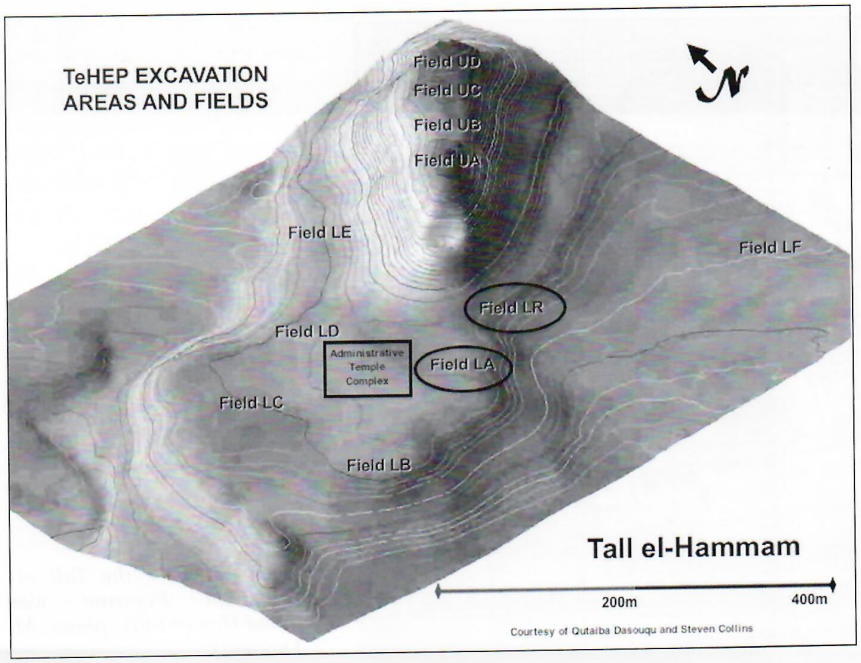
2. The second part of "The East Jordan Valley Survey" in 1976 focused on the region of Tall al-Ḥammām. Their report indicates that Tall al-Ḥammām was inactive during Middle Bronze 2 (Ibrahim et al. 1988: 196). However, while they missed the massive MB1-2 mudbrick rampart system surrounding the upper tall (now well known through excavation), they also failed to account for the tremendous quantity of MB1-2 pottery across the lower tall. (Perhaps these omissions were due to the fact that large portions of the site were being used for military purposes at the time, and were possibly inaccessible.) At the writing of this paper, of the 3,925 diagnostic pottery sherds documented from excavated strata through Six Seasons, 1,058 are from Middle Bronze 2 (27 %).

Age occupation and later Iron Age strata. During each season we have encountered increasing evidence that the city was periodically rebuilt despite destruction indicators (earthquakes?) from the Chalcolithic Period through the Middle Bronze Age. Thereafter, a lengthy occupational gap exists through Late Bronze Age and most of Iron Age 1. Settlement reappeared on the upper tall in Iron Age 2 (beginning ca. 1000 BC). At the SW base of the upper tall is a Roman bath/cistern complex, and a few minor Roman and Hellenistic architectural features remain on the eastern extremity of the upper tall.

During the first three seasons, work was confined to the upper tall. The strata were predominately MB2 and IA2, and included a massive MBA rampart encircling the upper city. Excavation revealed a former EBA structure in one square, but more exposure is needed to determine its purpose. Although two figurine fragments were unearthed on the upper tall, they were not as enlightening as the Season Six figurine.

In Season Four through Season Six, we concentrated our efforts in three locations on the lower tall: one in Field LR, and two in Field LA. (One of the Field LA locations was selected after a local landowner/farmer had removed a sizeable banana grove and generously offered to refrain from future planting so we could excavate). Several squares were positioned in the Roman area (Field LR) near the hot spring. Additional squares were placed in two locations in Field LA; the first set constituted a N/S trench (Trench LA.27-28) excavated for 60 meters (now clearly visible on Jordan MEGA), and the second set of squares in Field LA were placed in a probable (now confirmed) sacred precinct at the geographical center of the lower city (**Fig. 2**). The architecture, ceramics, and material finds from Trench LA.27-28 have all dated from the Chalcolithic Period through Middle Bronze Age with no period or phase gaps, signifying continuous occupation through the successive strata. Indeed, Tall al-Ḥammām's Bronze Age inhabitants created the bulk of the lower tall.

So, it was a complete surprise to the TaHEP staff when, during Season Six, Iron Age 2 artifacts emerged just centimeters from the surface of a newly-opened square inside a large building within the Bronze Age sacred precinct. It presently appears that IA2 inhabitants constructed a small religious precinct of their own within the larger perimeter of a (much) earlier Bronze Age temple platform. Whether these Iron Age religious practitioners actually re-built and re-used parts of the (already ancient) Bronze Age sacred space, or were simply "squatting" within the ruins of the former religious complex, is yet to be determined. (Had they ascertained the sa-



2. Topographical map of excavation areas (courtesy, Q. Dasouqi and S. Collins).

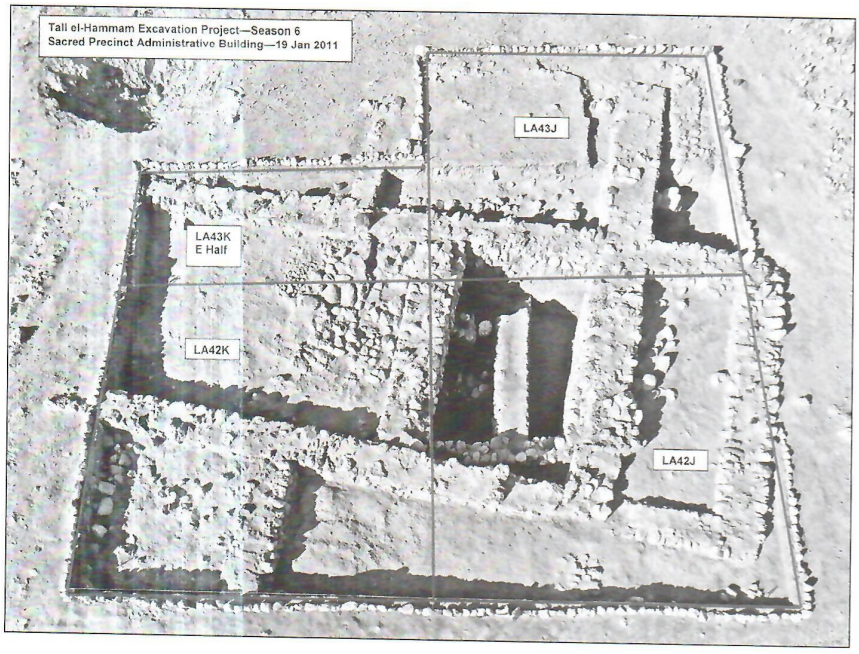
cred character of the location they had chosen to practice their rituals? Perhaps future excavations and analyses will suggest an answer to this question.)

Context of the Figurine and Surrounding Objects (Fig. 3)

At the beginning of Tall al-Ḥammām Season Six, an Iron Age 2 plaque figurine (holding a disk) excavated from Square LA.42K entered the archaeological spectrum. The figurine (Object 391) was found in a room located in the NE corner of a large (20x60m) "administrative" building in what is believed to be a sacred precinct originally constructed during the Bronze Age. (The building to the E has the dimensions of a large temple, based on its 3m-thick walls and associated circular stone altar.) A 4.5x2.5m probe—constituting a full room within the building—was excavated within LA.42J during previous season. That probe went down 1.5m and exposed four successive levels of stone foundations from the EB3, IBA, and MB1/2. Based on this and the small size of the probe, we made the decision during Season Six to expand the excavation area to incorporate the four contiguous 6x6m squares around the probe (i.e., Squares LA.42J and LA.43J W of the probe, LA.42K S of the probe, and LA.43K SW of the probe).

Squares LA.42K and LA.43K included, in part, a room bounded by a stone foundation on the probe's south side. The room is approximately 4.5x7m. In the loci immediately under surface soil within that room were found multiple IA2 vessels and artifacts among which were the plaque figurine, a cylindrical limestone incense altar (**Fig. 4**), two cooking pots, and a juglet. The larger of the two cooking pots (Object 394) was found in Locus 1 of LA.42J (**Fig. 5**), broken but mendable. About 30cm south of

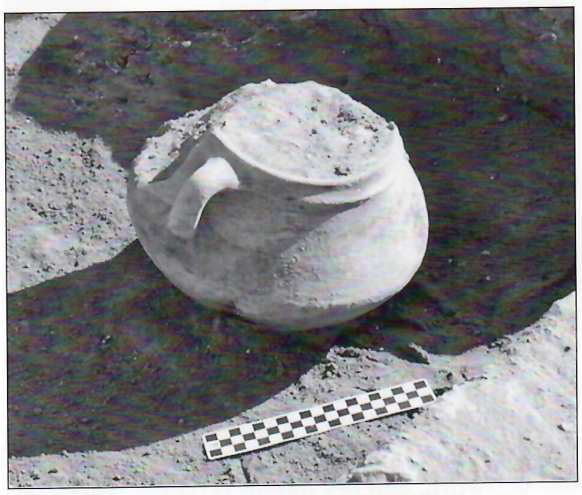
4. Stone incense altar (Object 393) (photo, M. Luddeni).



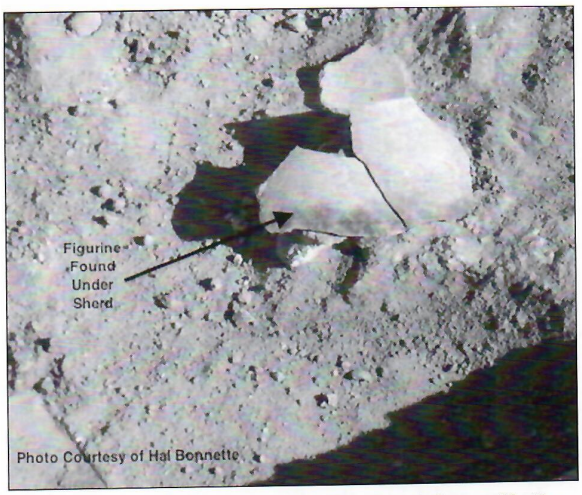
3. Squares where the Tall al-Ḥammām Figurine was found (lower tall) (photo, M. Luddeni).

the cooking pot were two additional pieces of the pot. The figurine lay facedown in two pieces underneath the two sherds, just 24cm below the top of Locus 1 (**Fig. 6**).

The stone incense altar is significant in relation to the figurine. Similar incense altars are known from the Bronze and Iron Age, and were in use until the classical periods. They seem always associated with worship and cultic practices. Observances involving incense altars often included chalices and figurines (Gitin 2002: 95). Most of the stone incense altars W of the Jordan River studied by S. Gitin were of the "horned" type, but there were various other styles. Examples include five incense altars without horns excavated at Tel Dan. Of these, two were cylindrical like the one found in Square LA.42J. They



5. In situ IA2 cooking pot (photo, M. Luddeni).



6. Sherds overlaying the disk figurine (photo, H. Bonnette).

date to the 10th century BC, discovered *in situ* at the entrance to a temple. Hornless incense altars are also known from Arad and Ekron. Overwhelmingly however, horned altars and "block" forms were among the earlier styles. Later, the horns became flattened and, by the 7th century BC and beyond, small stone altars were virtually hornless (Gitin 1989: 62).

The *in situ* appearance of both a ritual figurine and a stone altar within the same stratum (IA2b-c) is noteworthy from an historical perspective. From the biblical text, Jeremiah 44:23-25 mentions offerings made to "the queen of heaven," while v.17 of the same chapter mirrors this 7th/6th century BC tradition whereupon devotees would "make offerings to the queen of heaven and pour out drink offerings to her... both we and our fathers...in the cities of Judah and in the streets of Jerusalem". The language of this passage implies an ancient tradition whereby the practice of making offerings to a female deity were handed down in a ritualistic setting from generation to generation. The association of altars with idols (figurines) is found in other biblical texts, both in warnings by prophets as well as in descriptions of "legitimate" celebrations with burnt offerings. Ezekiel 6:4, 6:6, Isaiah 17:8 and 27:9 speak of these two objects in the same phrase, suggesting a common ritual linkage between them.

Features of the Tall al-Ḥammām Figurine with a Disk (Figs. 7, 8, and 9)

The object from Tall al-Ḥammām is a female plaque figurine measuring 7.5cm in height and 4.5cm in width. She is mold-made without a flat, widened background, lending credence to a date of IA2b-c. Formerly, molds tended to leave a border of clay surrounding the actual figure. As time progressed, this extra margin of clay became narrower or nonexistent (Moorey 2001: 43). The portion below the waist of the Tall al-Ḥammām "lady" is lost due to breakage in antiquity, but her significant features are still intact.

Although the figurine is well-worn (by handling?), her facial features are identifiable. The left hand supports a disk-like object from its "bottom" edge, while the right hand is placed above the left on the "top" of the disk. Her fingers are beautifully delineated and without signs

7. Tall al-Ḥammām figurine in the field immediately after extraction (photo, M. Luddeni).

8. Tall al-Ḥammām figurine with a disk (illustration, L. Ritmeyer).

of jewelry. The disk itself is large—covering most of her upper torso—with a "band" along its circumference. The hairstyle falls in long

9. Tall al-Ḥammām figurine photo for Object Catalogue (photo, M. Luddeni).

ringlets behind her ears, and the bangs suggest rolled locks. Her eyes and ears are disproportionately large. The outline of her nose is visible-yet-worn, and her mouth is barely detectible due to deterioration. The clay fabric is reddish and coarse. (Currently, she resides in storage at the as-Salṭ Museum with Tall al-Ḥammām's other artifacts.)

With the figurine's discovery many questions arise. Who or what did she represent—a goddess, motherhood, fertility? What do similar artifacts reveal about her? What is the disk she tightly holds—a tambourine, a loaf of bread, an offering tray? What does the disk signify? Were similar figurines common to the Transjordan? Was she made locally or traded in from another place? How was this figurine used in ritual practice?

A Forewarning

In researching the figurine it became clear that several factors required attention before

the above questions (and others) could be addressed. Initially, there is the fact that numerous figurines have been published without proper framework and/or context. Unfortunately, well-reasoned dates are not available for such artifacts and, therefore, one can only compare them to those excavated *in situ*. Surface and unprovenanced figurines must be studied with this in mind as comparisons are made.

As "disk" figurines predominately date from the Late Bronze Age to the late Iron they are not uncommon and it is possible that we might be able to identify our "lady" and her disk, or at least make a reasonable connection with other figurines. However, the popularity of certain goddesses varied period to period and locale to locale, and it is not out of the question that the same "basic" image could have represented different deities through time and geography. So, if her association with a specific goddess is inconclusive, we may have an identity crisis on our hands!

Another issue to bear in mind are the agendas of given authors. While archaeological reports chiefly provide facts and details about their figurines (Daviau 1997; O'Bryhim 1997), other works may have hidden (or acknowledged) agendas. C. Meyers approaches the subject of "female figurines with a disk" from the standpoint of gender in ancient societies (Meyers 1991), while S. Paz views them from a musical perspective (Paz 2007). T. Burgh takes a rather fluid view of figurine identity by positing a hermaphrodite angle, but his ideas about the possibility of male cross-dressing seem farfetched (Burgh 2004). While these diverse views might lend some understanding and/or depth to the subject, one should be wary of a writer's preconceptions and propensities.

Lastly and unfortunately, we have become aware of the problems of inadequate publications and resultant difficulties in obtaining complete catalogue lists of figurines. Thanks to the Jordan Department of Antiquities, we now know of several figurines found in Jordan which had not been published. K. Hamden from the DoA was instrumental in guiding us to D. Sugimoto's book dealing specifically with female disk-bearing figurines (Sugimoto 2008), and J. Haroun from the Department enlightened us concerning several Transjordan figurines from excavated contexts.

Female Figurines with a Disk

In order to understand this type of artifact, one must examine the range of types and descriptions of all female figurines with a disk. J. Pritchard studied 294 figurines, grouping them into seven classifications. Of these seven, Type Five was the disk-holding figurine, and included both the plaque and pillar types (Pritchard 1943: 19-21). Plaque figurines were made from a mold and not intended to stand by themselves. Pillar figurines, however, were formed in two parts and made to stand independently. The head and upper torso were molded or handmade, then attached to a cone-shaped body that was usually hollow, but some solid forms are known. Most pillar figurines do not show individual fingers, whereas plaque figurines generally do. Overall, Type Five forms vary greatly. Their disks are held on either side, at the waist, or centered (Sugimoto 2008:17-35). They could be clothed or nude—veiling and jewelry optional—with hairstyles ranging from plain to ornamented. Several examples are even pregnant or holding a bird (Pritchard 1943:19-21).

Disk figurines appeared in most regions of the ancient Near East beginning in the Late Bronze Age. Pritchard notes that their prototypes are found in Mesopotamia, which correlates with Paz' musicological research that frame-drums originated in that area (Pritchard 1943: 14-17; Paz: 89-90). Plaque-style disk figurines first appeared in the Late Bronze Age, but underwent several changes in form. At first, the background was wide and flat as if the female were lying on a bed. Later, in the 12th century BC and onward, the background slowly narrowed, disappearing altogether in the late Iron Age (Moorey: 43). Plaque figurines from coastal cultures—the Phoenicians in particular—are often hollow, have exaggerated ears, and sport shoulder-length locks (Kletter 2001: 183). These features match the Tall al-Ḥammām figurine. Pillar types originated later than the plaque varieties, and those with a perpendicular disk were mainly Phoenician.

Overall, from studying the regional popularity of Levantine disk-holding figurines, it appears they were common in both the Cisjordan and the Transjordan from IA1 through the mid-9th century BC. After the mid-9th century there was a sharp decline of the figurines in Israel

and Judah, perhaps due to religious reforms or the subsequent Assyrian and Babylonian conquests. However, as Phoenician culture rapidly advanced, the popularity of these figurines increased in the coastal areas, while retaining ritual status in Transjordan and Edom (Sugimoto 2008: 74, 109-112).

Theories regarding possible motivations for the creation of disk figurines abound. Some have proposed that they were fashioned as toys, or even educational "props", although many were found in tombs. Others suggest that they were representations of deceased people. Still others conjecture that they served as offerings in temples or souvenirs of temple celebrations. Nonetheless, the majority of researchers define them as private devotions, perhaps magical petitions, for cultic functions (Sugimoto 2008: 1-14; Paz: 118; Moorey 2001: 7-8).

Are these figurines found solely in ritual settings such as the one at Tall al-Ḥammām? In analyzing the locations of disk figurines from houses, cultic installations, and tombs in both the Cisjordan and Transjordan during the 9th century BC, 54% of plaques and 52% of pillars were from cult-related contexts. After the 9th century, these objects continued in popularity only in Phoenicia and Transjordan and were absent in Israel (Sugimoto 2008: 51-64). As discussed below, this evidence suggests a potential motivation for the production of the figurines, and leads to a possible identification of both the figurine and her disk.

Identification of the Disk

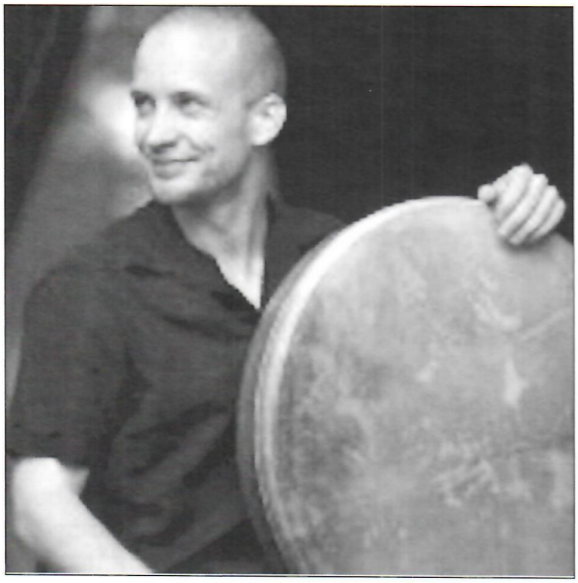
What is she holding? Over the past decades, interpretations of the disk have not been in short supply. In the 1960s, some compared the disk of a figurine from Gezer to Syrian solar disks (Sugimoto 2008:9). Because of the popularity and significance of the sun and moon in antiquity, this seems reasonable, especially in light of the Egyptian figures with sun disks. Later, the discovery of a new Cypriot form gave rise to the idea that the disks were spheres representing sacred stones called baetyls. Baetyls were actually iron meteorites that the goddess held as she stood in the temple (O'Bryhim 1997: 40). P. Lapp, in his excavations at Ta'annek, first identified the disk as a loaf of bread. Four years later he changed his mind, hypothesizing that the object was a musical instrument (Lapp 1964: 39, 1967: 36).

The "drum" hypothesis is the current favorite among scholars, although there are differing opinions as to the specific type of instrument. The disk is frequently identified as a tambourine, and has been classified as such by several interpreters; however, nothing on the disk suggests the representation of cymbals. A more reasonable suggestion is that the disc represents a frame drum (**Fig. 10**). Paz discusses and sets forth criteria for membraphones at great length. A frame drum consists of a membrane, generally made of leather, stretched tightly over a circular frame. When struck, the membrane produces a typical "drum" sound. Various cuts and/or indentions in the outer edge of the frame itself can modify the performance of the instrument, thus altering the sound. The disk of the Tall al-Ḥammām figurine does have an indention along its edge.

The conclusion that the disk is a musical instrument is further substantiated when the figurine is compared to a disk in the Ashdod "stand of musicians". Although the figurines on this artifact are all male, one of the Ashdod figures holds a similar disk while other figures hold various musical instruments (Paz 2007: 104).

Harlot, Goddess, or Lady?

The identification of the female herself con-



10. Example of a frame drum (courtesy, D. Kuckhermann).

tinues to generate interest. Whom or what does she exemplify? Was she a sacred prostitute, priestess or goddess, or did she simply represent the female gender of a particular era? Unfortunately, there is no known inscriptional evidence attached to any female disk-bearing figurine (Moorey 2001: 38).

In Mesopotamia and the Levant, certain female plaque images have been dubbed "Woman at the Window". A window frames her face, and she has ornate ringlets with large eyes and ears similar to the Tall al-Ḥammām figurine. These objects are clay or ivory and date from the late 9th to the 7th centuries BC. Because they were manufactured in Phoenicia for a Mesopotamian market, they are often associated with the Sumerian goddess, Inanna, and the Babylonian goddess, Ishtar, both of which can carry the title "deity of (ritual) prostitutes". She is also known as Kalili, which means "garlanded one" (Stuckey 2007: 1-7). While these particular figurines were presumably furniture decorations and do not hold a disk—one does hold a large ring—the similarities cannot be ignored; thus, ours might be the "Harlot of Hammam".

Both Paz and Meyers view the represented female as a mortal. Paz notes that drumming was a feminine tradition, and that the figurines perhaps served as amulets or temple offerings, but not as objects of worship. If anything, they could represent drummer-priestesses in a cult, but not goddesses. This stems from the idea that, in the late 8th century BC Cisjordan, Yahweh had become the prominent male deity while Asherah, Ashtoret, or Anat played a minor role as Yahweh's female attendant, but not his equal (Paz 2007: 104, 114-118). Therefore, it is argued, she would not have taken on god-status in her own right, but was perhaps represented by sacred prostitutes both in flesh and clay.

In an attempt to shed light on the subject, Meyers discusses the feminine nature and activities of Israelite women during this period. She focuses on female images in plain, unadorned dress, suggesting that painted lines represent clothing lines and not jewelry. However, she fails to address figurines that do not conform to these peculiarities. She does document specific texts describing post-warfare celebrations in which female musicians played in honor of the victorious army. Thus, Meyers argues, the women exercised "control and prestige" if only temporarily (Meyers 1991: 19, 23, 25). Because her research focuses on what the feminine iconography might say about the roles of women in ancient societies, her approach is not a systematic analysis of the female figurines.

Perceived associations between female figurines and goddesses are widely published. In the Late Bronze Age there were numerous female deities that the figurines could have represented. However, during Iron Age 2, only Asherah and Astarte were renowned (Sugimoto 2008: 3).[3] Asherah gained notoriety among current scholarship when two 8th/7th century BC inscriptions surfaced, revealing a relationship between "Yahweh and his Asherah" (Moorey 2001: 3-4), and spawning a significant amount of literature on the subject. Asherah had been widely represented in the Late Bronze Age—Ashirat at Ras Shamra—but in later Phoenician texts she became strictly Astarte. The earliest example of the name Astarte appears on an ivory box from Ur dating to the 7th century BC. In addition to her functions—principally related to fertility—in the Mesopotamian and Phoenician cultures, Astarte doubled as an Egyptian war-goddess for the 18th Dynasty (Pritchard 1943: 65-72). Sugimoto's text on "figurines with a disk" also identifies Astarte as the most likely candidate for the female image (Sugimoto 2008: 85-87).

"Goddess" seems to provide a relatively well-defined identity for the disk figurines, an idea supported by their frequent appearance in cultic contexts. If the figure is holding or playing a frame drum, she very well could represent Astarte as a war goddess, whereupon Meyers' textual examples of victory celebrations would make sense. This, coupled with the idea that Astarte had war connections within Egypt's convoluted pantheon, takes the figurine identity a step further. Sugimoto addresses this in his analysis of the Hebrew word *top* = frame drum. In the sixteen of seventeen times "frame drum" is found in the Old Testament, it appears in the context of worship, banquets, and the welcom-

3. In Egypt, Hathor was a household deity, but most of the Hathor-style figurines held a lotus plant (Moorey 2001: 36-37).

ing of returning armies. In the cases of worship and banqueting other musical instruments and musicians are also present. Only in the war-victory march are women mentioned independently as the frame drummers (Sugimoto 2008: 69). Thus, "Astarte beating a drum" is a plausible, even likely, motif for the ancient Near East.

If "Astarte with a drum" is the representation of the Tall al-Ḥammām figurine, it is likely that her significance both as a fertility deity (TaH's walled Iron Age town relied on agricultural production) and as a goddess of war (protection was critical for survival) is a reasonable assumption. It seems that the fertility dimension must play a key role in identifying the ritual function of the Ḥammām figurine due to the simple fact that the "cultic context" from which she was excavated lies on the lower tall well outside the city wall in what was likely an agricultural setting.

Other Transjordan Figurines

Throughout Jordan, female figurines continue to appear both in and out of excavated contexts. At the 'Amman Citadel, most of the figurines discovered are ceramic plaques from various molds, consisting of coarse fabric similar to the Ḥammām figurine, with the same reddish-to-pinkish color. The 'Amman Objects 28, 29, and 43 held disks but, unfortunately, their heads were not intact. One was nude, one was clothed, and one had a detailed design of concentric circles on the frame drum, with the hands positioned like those on the Tall al-Ḥammām plaque. Amman Objects 11-13 are heads only, with Object 13 having the most striking features in comparison to the Ḥammām figurine, particularly the large ears and eyes. A portion of Amman Object 13 was handmade (Mansour 2005: 551-555)—perhaps a hand-correction of an imperfection resulting from the molding process.

At Tall Jāwā excavators found eight female figurines. All were mold-made and found either in domestic contexts or as surface finds. None were found in religious buildings (Daviau 2002: 52-65). Near Jāwā, Khirbat al-Mudayna's ancient dump is the predominant place for figurine finds, where excavators discovered the torso of a female figurine with a disk at the waist, with both hands clutching it. Within the same area, in the remains of a one-room house, two additional disk figurines were unearthed (Daviau 1997: 225).

Author, C. Kobs, first noticed the Tall Ṣāfūṭ figurine at the Salṭ Museum while cataloging objects from Tall al-Ḥammām. Tall Ṣāfūṭ is 12km north of 'Amman. O. Chestnut is currently re-evaluating Tall Ṣāfūṭ, as prior excavations were neither detailed nor adequately published. The site has yielded many mold-made female figurines with features similar to the one from Tall al-Ḥammām (**Figs. 11 and 12**). They were found in a casemate room containing other cultic objects including horse and the other female figurine heads, chalices and lamps.

Conclusions

With all the appropriate caveats in place due to the speculative nature of any discussion of "mute" artifacts, it is reasonable to conclude that the Tall al-Ḥammām figurine is probably a representation of the goddess Astarte, and that the object she holds is a frame drum. Her features are not realistically proportioned as those of a typical woman. Perhaps the large, round eyes and oversized ears belong to a goddess who is eager to see and hear the supplications of her devotees.

The facial features, together with the long, curling locks of hair, suggest that her design originated along the Levantine coast (likely

11. Tall Ṣāfūṭ figurine (courtesy, O. Chestnut).

12. Tall Ṣāfūṭ figurine heads (courtesy, O. Chestnut).

Phoenicia), as she closely resembles figurines from that area. The fingers are well formed (even exaggerated), as they are on most plaque figurines with a disk, perhaps signifying the dexterity needed to play her instrument.

There is a single circle outlining the outer edge of the frame drum. It is not out of the question that it represents a "tuning-band" and not merely a decoration. Without any features that might signal the presence of cymbals, it is not likely that the instrument is a tambourine.

Her left hand holds the frame drum from underneath, while her right hand is higher and, in authentic fashion, seems to beat the disk/drum from above. It is not unreasonable to imagine that such drums provided accompaniment for songs associated with cultic rituals and celebrations. Perhaps drumming by female cultic practitioners (as embodiments of Astarte) provided calls to prayer and worship.

As a goddess of war (protection), the "lady" of 8th/7th century Tall al-Ḥammām—modeled in the flesh by female religious practitioners (conceivably sacred prostitutes) and commemorated on plaque figurines—undoubtedly greeted soldiers with victory songs, accompanied by frame drums, upon their safe return.

The disk figurine from Tall al-Ḥammām has a well-defined date-range within IA2b-c as a result of its sealed locus context with pottery vessels lying directly on top of and near the figurine. The discovery of the figurine within the perimeter of the raised (100x100m) platform belonging to the more-ancient Bronze Age sacred precinct indicates that the religious practitioners responsible for the Iron Age 2 ritual installation may have possessed a sense of the location's cultic past. The nearby incense altar virtually confirms that the Ḥammām figurine and its associated objects were used in a cultic setting.

Compared to the then-already-centuries-old buildings of Ḥammām's massive Bronze Age temple complex, the IA2 cultic operation was little more than a squattage in the midst of what must have been sprawling ruins. Nonetheless, they plied their rituals, likely for the benefit of the local population—mostly farmers and laborers—living outside the defensive walls of the IA2 town perched atop the upper tall.

The many biblical references to incense offerings and idols during this period lend further credence to religious applications for the goddess of Ḥammām. Whether under the influence of Ammonite or Israelite religious traditions (likely both), those who ritually used Tall al-Ḥammām's drumming female plaque figurine played an important role in the daily life of the local inhabitants.

Acknowledgments

Principal author, Carroll M. Kobs, offers the following acknowledgements: I would like to thank Dr. Steven Collins and Mr. Hussein Aljarrah, Co-Directors of the Tall al-Ḥammām Excavation Project, for their contributions to this paper. Their guidance and leadership is greatly appreciated. I also want to acknowledge Dr. Ziad Al-Saad, Director General of the Department of Antiquities of Jordan, who has taken a keen personal interest in TaHEP. I thank each of you for allowing me to work on this publication. In addition, I want to express special appreciation to TaHEP Assistant Director, Mr. Gary Byers; Reconstruction Architect and Artist, Dr. Leen Ritmeyer; and TaHEP Photographer, Mr. Michael Luddeni. Their professionalism—coupled with support and oft-needed humor!—lends a unique feature to the excavation of this magnificent site. I also owe a debt of gratitude to my colleagues in the field: Hal Bonnette (especially) in whose Square the figurine was excavated; Je-

had Haroun of the DoA for his helpful interactions and sources; Khalil Hamden of the DoA for his suggestions and kind direction; Qutaiba Dasouqi from the DoA for his valuable input; and Adeib abu-Shmais, now "retired" from the DoA, for his expertise on the Iron Age in Jordan. I commend the entire TaHEP Team—both staff and volunteers—who contribute their time, energy, and resources to the Tall al-Ḥammām Excavation Project both in and out of the field.

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