2015

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Major cultural transformations took place in the southern Levant during the late prehistoric periods (ca. late 7th–4th millennia B.C.). Agropastoralists expanded into areas previously only sparsely occupied and secondary animal products played an increasingly important economic role. In the arable parts of the southern Levant, the olive in particular became increasingly significant and may have played a part in expanded exchange contacts in the region. Technological expertise developed in craft production, and the volume and diversity of status goods increased, particularly in funerary contexts. Mortuary and other ritual practices became increasingly pronounced. General study syntheses, however, rarely include more than a cursory mention of the more arid regions of the southern Levant (i.e., Negev, eastern and southern Jordan, and Syria). Recent investigations indicate that intensive exploitation of the regions may date to these late prehistoric periods, yet this evidence has been difficult to attribute to specific chronological period or cultural affiliations. The Eastern Badia Archaeological Project investigates two regions for a potential florescence of building and occupation during the late prehistoric periods in the eastern desert of Jordan.

Keywords: Neolithic, Jordan, pastoralism, desert, late prehistoric, funerary monuments

Introduction

The Eastern Badia Archaeological Project examines late prehistoric land and water use through two primary study areas in the eastern desert of Jordan, known as the *badia* (badlands), or the Black Desert. The name derives from the black basalt, or *harra*, stretching from south of Damascus across Jordan to the northern edge of the Nafud Desert in Saudi Arabia. An extensive, rugged series of lava flows weathered to create the present extensive boulder fields. The harra is bordered by the *hamad*, the open, relatively level gravel and low limestone hills with occasional patches of shrubs and grasses. Both the harra and hamad are incised at times by long, shallow wadis, such as the Wadi al-Qattafi, which drain into broad mud flats.

Situated in one of the most understudied areas of the Near East, both Wadi al-Qattafi and Wisad Pools include remarkable concentrations of collapsed basalt structures numbering in the hundreds, most of unknown date or function. Humans were in the area beginning in the Lower Palaeolithic, and these two regions were significant for hunters and herders over millennia. Our initial exploratory investigations in the region, however, suggest a remarkable florescence of building and seasonal occupation during late prehistory (Late Neolithic/Chalcolithic/Early Bronze Age, ca. late 7th–4th millennia B.C.). Such an expansion and spike in population is recognized during the Chalcolithic (ca. 4500–3600 B.C.) in the Mediterranean zones (Rowan and Golden 2009), but is largely unremarked in the scholarly literature about the badia (Rollefson 2001). If this expansion of building in the badia occurred primarily during the late prehistoric periods, this dating would corroborate assertions that pastoral desert groups recognized in the southern arid zone of Israel and Jordan (e.g., the "Timnian") (Rosen 2012) emerged as herding replaced hunting during the 6th millennium B.C., supporting the contention that relatively sophisticated pastoral economies developed (Levy 1983, 1992; Wasse and Rollefson 2005). Our overarching goal is to integrate the study of monuments, artifacts,

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DOI 10.1179/0093469015Z.000000000117

Figure 1 Map of Wadi al-Qattafi with Maitland's Mesa (M-4).

rock art, biological and paleoclimatological data, and human remains in this prehistoric landscape in order to focus on the poorly documented development of human use of the area. This region provides evidence for the emergence of a significant, desert-adapted Late Prehistoric society in general, and our analyses suggest that both areas attained particular seasonal, and possibly ritual, importance. For the present study, we summarize and contextualize the information collected in the area of Wisad Pools and Maitland's Mesa during the past four years. Ultimately, we are interested in how data from these two areas, in particular the monumental architecture, may provide the potential for tracking socio-economic complexity as herds expanded during the late prehistoric period.

Wadi al-Qattafi and Maitland's Mesa

Approximately 60 km east of Azraq, Wadi al-Qattafi is a major drainage running roughly north-south (FIG. 1). On either side of the broad, shallow wadi, approximately 30 basalt-capped mesas rise 40–60 m above the wadi bottom, ranging in size from 60×75 m to approximately 1.20×0.40 km. Another chain of about 20 mesas oriented roughly east-west lie about 8 km to the south, on the eastern side of Wadi Umm Nukhayla. The mesas, locally referred to as *ghura*, are remnants of eroded Miocene flood basalts (Rabba' 2005), representing the southern edge of the harra.

While flying British government mail between Cairo and Baghdad in 1924, Sir Roderic Hill marked the region as the "land of conjecture," noting that in

this area "…the hills rose like odious flat-topped slag-heaps" that filled him with a sinister foreboding (Hill 1929: 9, map III). Maitland's Mesa (M-4) was first noted and photographed by Royal Air Force Flight Lieutenant Percy Maitland as he flew the Cairo-Baghdad airmail route in 1927 (Maitland 1927: 203). Maitland compared the mesa with an Iron Age fort in Wales, drawing a parallel between the chain of small basalt structures on the mesa and a crenellated parapet—hence the site became known as Maitland's Hillfort. Both Maitland and Hill believed these mesas to be fortified. Since that time the site went largely unacknowledged until archaeologist Alison Betts once again mentioned locating the site in the 1980s (Betts 1983).

Since our initial brief field season in 2008, two additional seasons of research have been conducted at Maitland's Mesa (Rowan *et al.* 2011; Wasse *et al.* 2012). These explorations included visits to other nearby mesas, which revealed that most mesas had at least one large, basalt "tower" tomb on top, most of them looted. Animal pens, too, are commonly found along the lower slopes of the mesas. Maitland's Mesa (M-4), however, stood out among the mesas due to the high concentration of structures on top, ranging from animal corrals to small basalt stone features, many circular or elliptical. More striking is the long linear feature noticed by Maitland from his plane in the 1920s, a series of over 50 large rectangular to oval chambered cairns forming a chain along the southern edge of the mesa (FIG. 2). This accentuated the castellation effect atop the naturally fracturing basalt boulders along the edge, which may have looked like a defensive wall from the air. At least four similar chains of cairns were discovered at Wisad Pools as well (Rollefson *et al.* 2011) and similar features are known on the Arabian Peninsula (Braemer *et al.* 2001).

During these seasons, approximately 478 structures and features were identified on the summit and slopes of M-4; in addition, 10 sites of flint tool and debitage concentrations dated to the early Epipalaeolithic, Pre-pottery Neolithic (B), and Late Neolithic periods were also documented (Rowan *et al.* 2014). Adding to nearly 300 structures atop the mesa, two areas of building activity attracted our attention. One concentration of collapsed structures along the southern slope, notable for the use of extremely large basalt slabs, appeared similar to the *nawamis*, the 4th millennium B.C. roofed stone masonry burial structures documented in the Sinai (Bar-Yosef *et al.* 1977, 1986; Palmer 1872), but also known from central Saudi Arabia and Yemen. These structures at Maitland's Mesa and Wisad Pools have parallels with mortuary monuments documented across a large area of southwestern Asia (Braemer *et al.* 2001; Steimer-Herbet 2004; Zarins *et al.* 1981). Another area of less concentrated building activity is comprised of structures found along the western and northern slopes, generally located on the slope where access to the largest slabs are near, yet below the steepest aspect of the slope (FIG. 3). In addition to investigating and documenting the range of structures atop and on the slopes of M-4, our objective was to excavate a sample of these structures in order to understand their function and chronology.

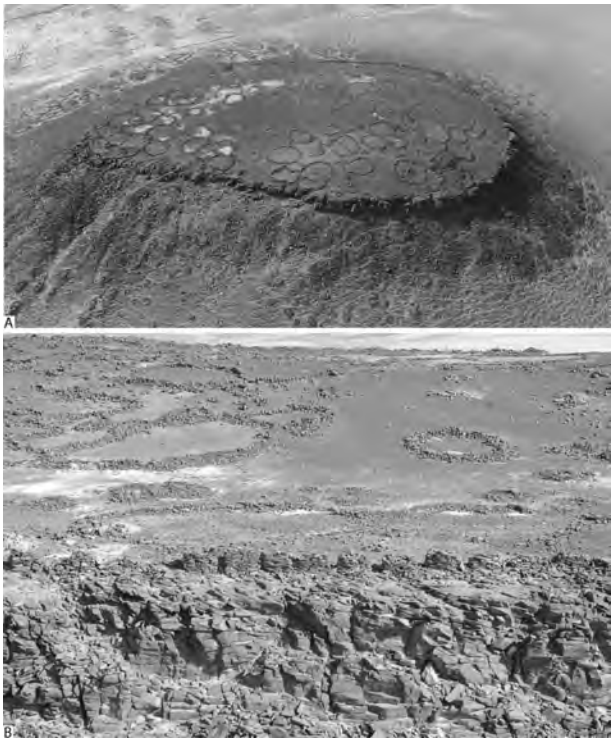

Figure 2 Aerial photograph highlighting tower tomb "tail" of chambers at Maitland's Mesa: A) chambers aligned with southern rim of mesa, looking south; B) chambers along edge of mesa, looking north. (Photograph by David Kennedy, courtesy of APAAME).

Excavations at Maitland's Mesa (M-4)

MESA TOP

The oval-shaped area of Maitland's Mesa flat top, covered with weathered basalt cobbles, has approximately 200 structures (FIG. 3). In addition to the aforementioned chain of cairns along the southern edge, corrals, single and double celled structures, and a few U-shaped features extend across the entire top. All are built with basalt cobbles, boulders, and slabs from the immediate surroundings. Although few artifacts were found, a small quantity of chipped stone debitage and tools were recovered, as well as a few non-diagnostic, undecorated potsherds.

Stone tools represent two different technological complexes: Lower Palaeolithic/Middle Palaeolithic Levallois and Late Prehistoric flake and blade technologies. The Levallois elements (n=4, including a flake, a point, a blade, and a flake/blade) have multifaceted platforms, including one with the *chapeau de*

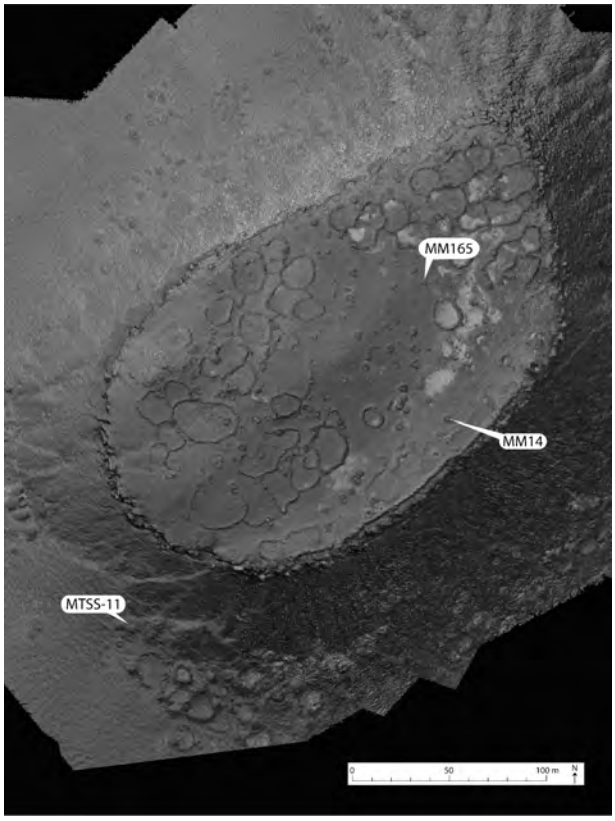

Figure 3 A photogrammetric contour map of Maitland's Mesa constructed from 12 oblique aerial photographs and a series of ground control points collected with a total station on the ground (MM-165=Str. 165 and MM-14=Str. 14). Aerial photographs were converted to a digital elevation model (DEM) in PhotoscanPro software and the resulting model was converted to a 1 m contour interval map in arcGIS. The underlying image of the site is an orthomosaic also constructed in Photoscan and output to ArcGIS.

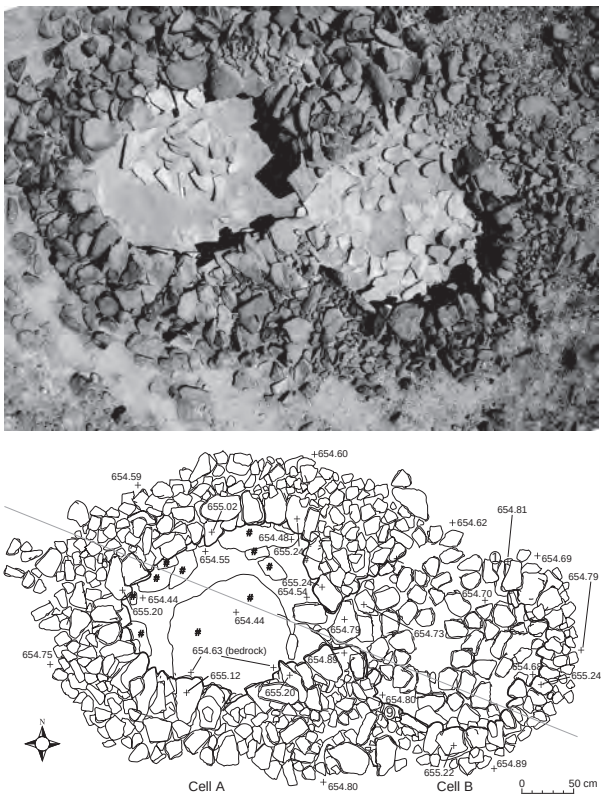

Figure 4 Double cell ghura hut 14 (Str. 14/MM-14) at Maitland's Mesa photo and line drawing.

gendarme shape. Other tools, such as a large crude borer on a cortical flake, scrapers, a denticulate, and tabular scraper fragments indicate Late Prehistoric knapping traditions, probably dating to the Late Neolithic or Chalcolithic (7th–4th millennia B.C.).

In 2012 we excavated two examples of the small circular stone features, one a single cell building (Str. 165/MM165) and a double cell example (Str. 14/MM14) (FIGS. 3, 4). Cells generally consist of basalt cobbles in a low circular to oval wall haphazardly piled upon each other, without an apparent intent to establish a wall more than a few courses in height. These low walls may represent the foundation to hold coverings over basic cells, called ghura huts, possibly used as shelters for shepherds.

Str. 165 was oval in shape with an entrance on the southeast, marked by two standing stones set about 30 cm apart defining the threshold (TABLE 1). Despite a slightly higher elevation than the surrounding exterior ground level, very little depth (10–15 cm) of sediment was excavated before basalt bedrock was exposed.

Str. 14 was selected because the well-defined double cell was intact and relatively well preserved, and it followed the familiar plan of one cell (B) with a broad opening leading to the second cell (A) with a narrower, more defined entrance (FIG. 4). Cell A had walls ranging from 34–43 cm in height; Cell B had walls up to 40 cm high (TABLE 1). A small lithic scatter was found on the surface of Cell A, but it included no diagnostic tools. Excavation within Cell A revealed two lines of fallen, flat stones. Their tight position suggested a fallen column or a central

Table 1 Dimensions of structures within area of interest.

Site	Structure number	Dimensions (m.)	Features
Maitland's Mesa	MM-165	1.68 × 1.33	Two standing stones
Maitland's Mesa	MM-14, Cell A	1.8 × 1.4	Pavement
Maitland's Mesa	MM-14, Cell B	1.95 × 1.70	Lines of toppled stones
Maitland's Mesa	SS-11	2.0 × 3.0	Attached storage room
Maitland's Mesa	SS-11, storage	1.88 × 1.45	Standing central pillar
Wisad Pools	W-66a	4.25 (N-S)	Standing central pillar
Wisad Pools	W-66b	3.25 × 3.25	3 standing stones

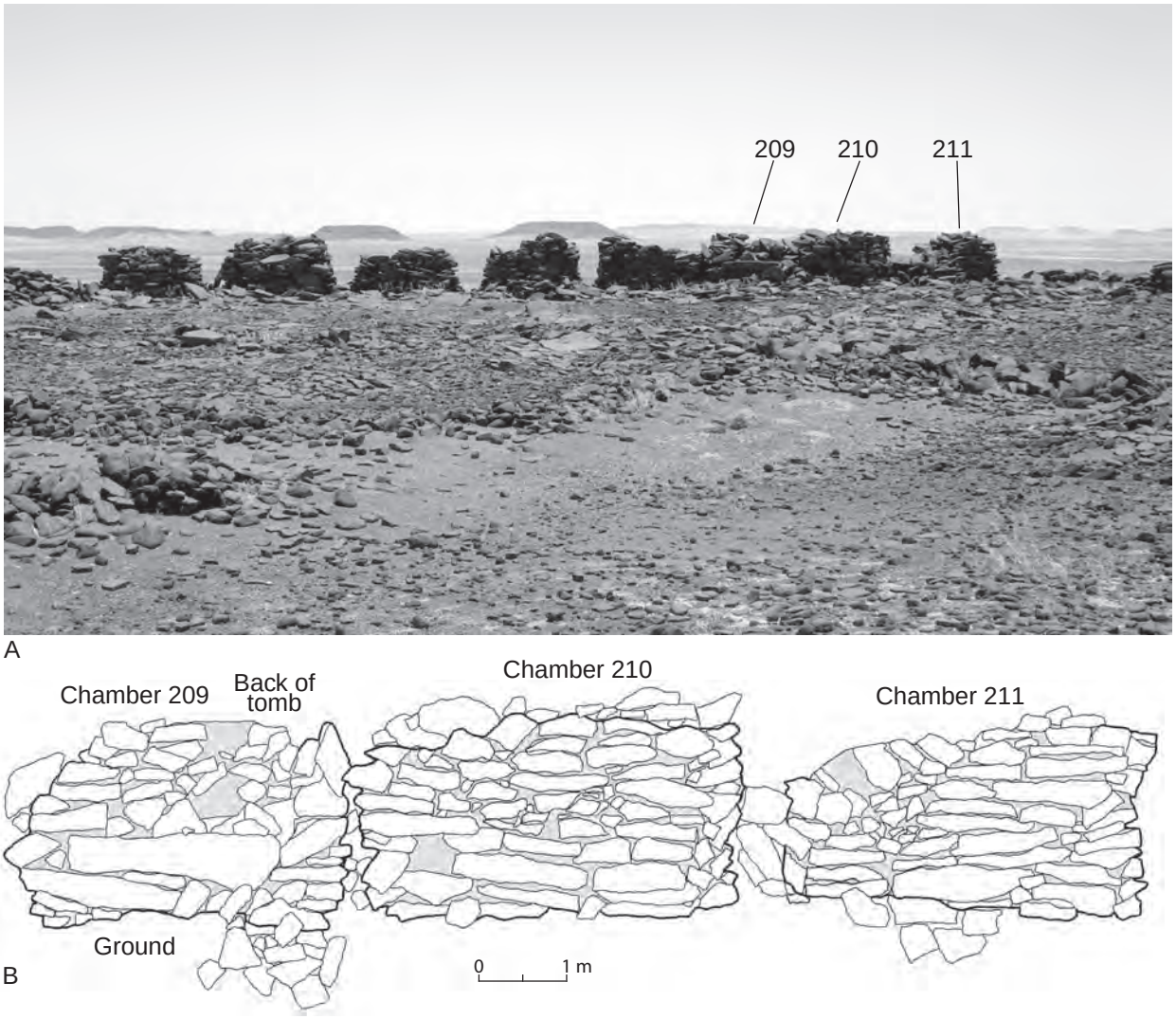

Figure 5 Photograph of a chain of cairns along edge of M-4 (Maitland's Mesa), with line drawing of 209, 210, and 211.

feature, although the "columns" are too short to have stood very high, and a central feature would make the small space even more confined. This feature might have simply held a central wooden support steady. In places, the interior cell wall is preserved up to 5 or 6 "courses" high, with longer, flat blocks used at the base. Cell B seemed to be paved, although some pavers were missing from the assumed floor (FIG. 4).

Both cells of Str. 14 were shallow, without diagnostic artifacts or discernible strata within the structure, and thus the function and dating remains uncertain. We speculate that these small stone cells were simple huts, used by shepherds; the lines of stone held down the edges of skin roofs. Many of the cells are contiguous features; in some cases, one cell appears to be paved with flat basalt cobbles, serving as the anteroom to the adjacent cell. Two larger upright stones typically demarcate the entrance from the first cell into the second cell.

The chain of cairns that form the "tomb tail" seem connected to the tower tomb at the eastern point of the mesa. Some cairns are so badly damaged and their stones removed so that their exact outline is unclear, so we are not certain of their number; we estimate that approximately 55 cairns, rectangular to elliptical in plan, extend along the southern edge of the mesa. Although many are recognizable only as a discrete pile of large basalt blocks, or the larger uprights that marked either end, a few remain virtually intact (FIG. 5). These are constructed of between 7–10 courses of large basalt blocks, with some massive flat slabs used to stabilize the initial courses on the long, lateral sides, and uprights on the narrow ends; all seem to have a hollow interior, without any clearly associated artifacts or bones. Overall, the size of the cairns range around 2.5–2.0 m in length, and 1.0–1.5 m in width; the few still standing to their full height are approximately 1.5 m high. We suspect that these are mortuary in nature, possibly commemorative rather than actual tombs, based on their association with the tower tombs and absence of human remains within.

Although structures are found atop other mesas in the immediate area, the concentration at M-4 is distinctive. We suspect that one reason may be the unusual surface contours. Close to the tower tomb on

the eastern end of the mesa, the mesa surface reveals a low area that collects rainwater, suggesting that water for animals would have been available during some wet months, providing an attractive, possibly defensive area to keep animals protected. This would explain the high concentration of ghura huts in contrast to other mesas.

SOUTHERN SLOPE, SS-11

On the southern slope, approximately 26 structures are visible, some quite large (ca. 10 m in diameter), with many others ranging between 2–3 m in diameter. Most buildings on the southern slope were circular and probably unicellular, with the exception of a two-roomed rectilinear structure (ca. 7.0×3.5 m) that appears dissimilar to the others. While some were apparently looted in both the recent and the distant past, others have simply collapsed since their ancient abandonment. Our primary focus of excavation during 2012 was a collapsed structure on the south slope, SS-11, though we identified approximately a dozen other structures similar to this feature. Excavation of this structure was reported in some detail elsewhere (Wasse *et al.* 2012) and is only summarized here.

Despite the collapsed nature of the structure, a doorway was still preserved, smaller yet similar to entrances known from the nawamis (Rowan *et al.* 2011). However, excavations exposed two characteristic aspects that quickly suggested that our presumed parallel to nawamis was incorrect. Clearance of the many collapsed basalt slabs revealed an oval plan, rather than circular, and a second low doorway was revealed on the eastern side of the structure (FIG. 6). In addition, wall construction that appeared similar to nawamis on the exterior was proven quite different on the interior. At least two major building phases were recognized. In the first construction phase, the initial interior of the building was small (TABLE 1) and built on the surface of the mesa's slope, with an intentional fill layer leveling the interior floor surface. We suspect that a long, shaped basalt slab ($79 \times 20 \times 6$ cm) found in the fill served as a central roof support. Even at this early phase of construction, the structure seemed to have a very low roof, necessitating crouching inside the building. The smaller volume to heat may have been a fuel-saving adaptation in the treeless area to cope with the cold winters, the most likely time people would have stayed in the area. A series of hearths were found above these lowest levels, suggesting repeated use. Interior wall construction included a range of large slabs placed vertically on edge, some stabilized with smaller stones inserted between, as at the Late Neolithic buildings at Burqu' (Betts *et al.* 1990: 11). On the northeastern aspect, the structure had a

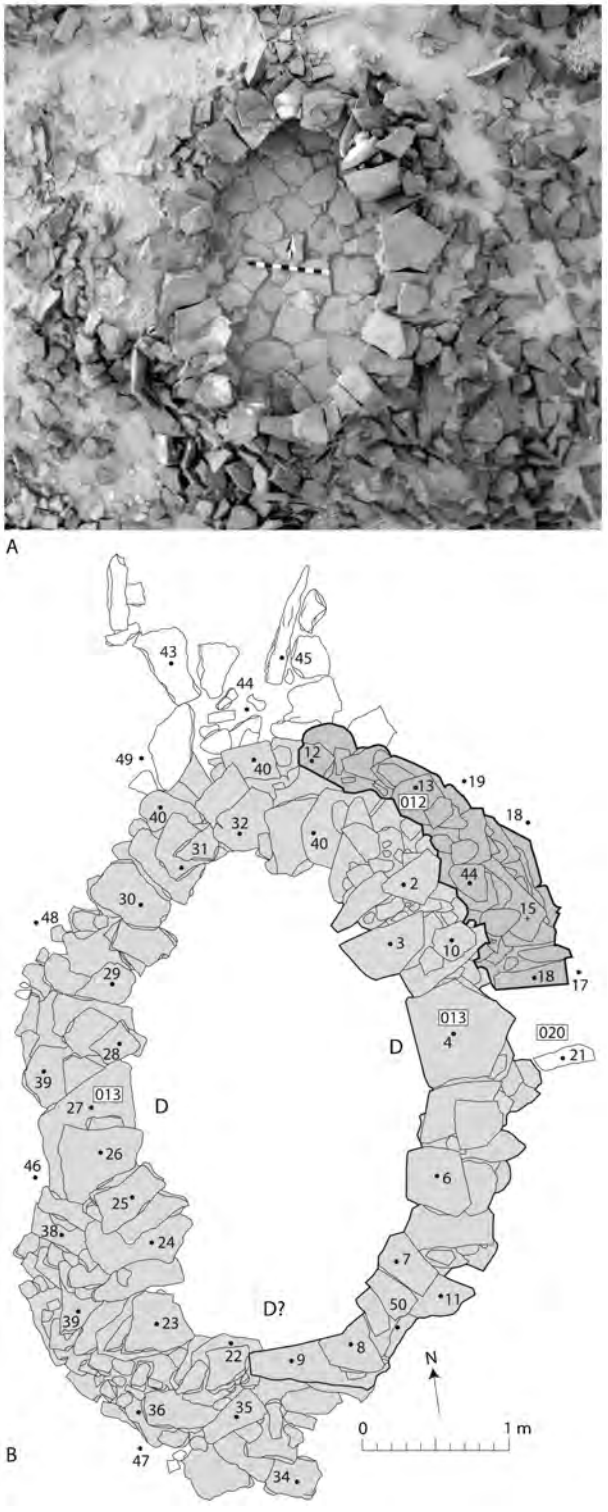

Figure 6 Structure SS-11 at Maitland's Mesa, photo and line drawing (D=doorway).

secondary wall added, perhaps to protect the building from slopewash.

As noted above, two doorways were built, one on the southwest, downslope side, the other opening on the northeast onto a courtyard (FIG. 7). Both doorways had vertical slabs topped by a lintel just under 1 m high. A possible third opening in the southern wall is perplexing in such a small structure with two doors, and this opening may have served as a window. One hearth (L.014) containing a dark ash,

Figure 7 Photograph showing the entrance to SS-11 on Maitland's Mesa, with openings to exterior storage area (L.018).

recovered from below the subfloor sediment inside of SS-11 near the western entrance provided sufficient carbon for dating, giving 6450 ± 40 B.P. (2σ 5480–5320 CAL B.C. [Beta-346614]), squarely within the Late Neolithic. Also unexpected was the preservation of associated exterior features. To the east, the courtyard included a small stone-lined fireplace (ca. 35 cm at base, 14 cm deep) with ash and charcoal. A substantial ash dump was found in the courtyard, just to the southeast of the courtyard entrance, underlying a later enclosure wall. Near this, along the southeastern edge, a low corbelled room (TABLE 1) with a single central pillar standing about 45 cm high was probably a storage area (L.018). Under the same roof on the northern aspect was a smaller triangular storage bin (ca. 90 × 24 cm). Both storage areas had openings to the courtyard, while the larger (L.018) apparently had an entrance on the south side as well.

The second phase of use saw the blockage of the eastern doorway and the construction of additional courtyard walls, enclosing an area approximately 15 m in diameter. These renovations included an additional reinforcing wall, apparently built to protect the storage facility (L.018), and two walls, one to the northeast and one to the southeast. More notable is the reconfiguration of the oval building's interior. Leveled again, the floor was carefully paved with flat basalt blocks (ca. 30–40 × 50 cm), with small basalt stones wedged between these slabs (FIG. 7, left). This paving significantly raised the floor level, rendering the interior roof lower such that crawling on hand and knees was probably necessary. In the center a triangular gap may have been where the long shaped pillar was set for additional roof support. A paver with a small, burned depression may have served as a hearth.

In contrast to the cells excavated atop the mesa, artifact recovery in SS-11 was common. Although only a few ground stone artifacts were recovered (a handstone and grinding slab fragment), and animal bone was similarly scarce, there were flint artifacts, which support the radiocarbon dating of the structure

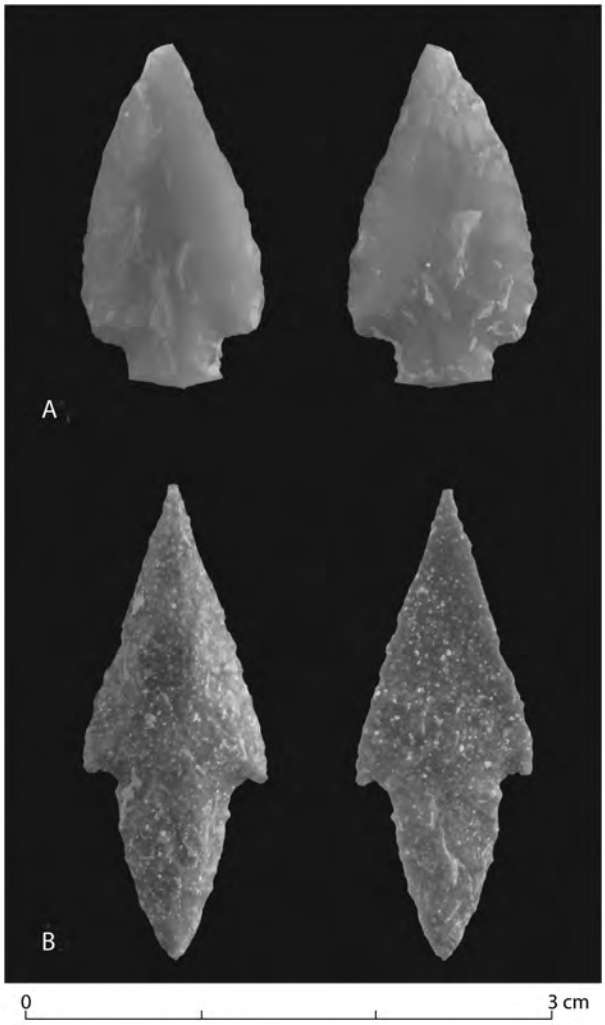

Figure 8 Projectile points from SS-11: A) Yarmouk point and B) Haparsa point.

to the Late Neolithic. In addition to burin spalls (uncommon in Chalcolithic or Early Bronze Age contexts), other chipped stone artifacts included tabular unifacial and bifacial knives, scrapers, notches, and denticulates, and a few points diagnostic of the Late Neolithic. A Yarmouk point, a Haparsa point, and the tang of a broken point (possibly also Haparsa) (FIG. 8) suggest a date somewhere between 6500–6000 CAL B.C.

Maitland's Mesa and Wadi el-Qattafi: Summary

Our assumption that structure SS-11 might represent a mortuary structure similar to the nawamis was proven incorrect soon after we began our excavations. Our experience with a similar configuration during the first season of excavation at Wisad Pools in 2011 (see below) meant that this did not come as a complete surprise. These findings challenge how we interpret the many other structures, particularly those ringing the lower slopes of Maitland's Mesa, as well as the recently recognized dense concentration of structures on the lower slopes between two other mesas, M-5 and M-7, 1 km north of M-4. Our preliminary visits indicate

that many of these are also corbelled, and that they are more numerous than those at Maitland's. We cannot assume contemporaneous building and use, but the profusion of structures on the slopes of Maitland's Mesa can no longer be viewed as unique to the region. Moreover, some buildings at Maitland's Mesa certainly seem mortuary in nature, but the initial results presented here suggest those may be far fewer than we originally believed.

Wisad Pools

Beyond the Wadi al-Qattafi, approximately 100 km to the east of Azraq, the area around Wisad Pools consists of hundreds of collapsed basalt structures scattered over more than 1 km sq. Similar to the Wadi al-Qattafi area, the landscape is notable for the Late Miocene basalts covering limestone formations, with low hills and the ubiquitous mudflats. Unlike the mesas of the Wadi al-Qattafi region, however, low plateaus and hills predominate, intersected by short, shallow wadis.

One such wadi forms the series of natural basins that lead from the edge of the basalt plateau down to a nearby large *qa'* (mudflat), a difference in elevation of only 8–9 m. The Wisad Pools are formed by basalt boulders blocking the wadi, creating reservoirs that collect rain runoff; these natural formations were further exploited by setting up barrages at some pools. Based on our measurements, the initial pool (#1) at the head of the wadi measures approximately 160 m in length, nearly 1 m in depth, and has an average width of ca. 14.3 m. Based on these rough measurements, we estimate that this pool alone contained a maximum of 2,000 cu m (>500,000 gallons) of water in the wettest seasons.

A variety of different sites in the general area of the pools, ranging in date from the early Epipalaeolithic to Safaitic (1st century B.C.– A.D. 4th century), indicate the central role the water resources played for many millennia. Dating the structures at Wisad is extremely difficult without excavation. Artifacts on the surface are uncommon in most areas, with a few exceptions, such as the "Late Neolithic Hill" which is across the pools from a concentration of pecked rock art (Rollefson *et al.* 2008), where a dense concentration of Late Neolithic and Epipalaeolithic chipped stone artifacts were recognized. Other scatters of flint debitage and occasional prehistoric tools are also found near the rock art, and just to the west of Pool 1. In other areas, occasional debitage pieces and tabular scraper fragments are similar to those found on the ground surface atop Maitland's Mesa, most likely dating to one or more of the Late Prehistoric periods of the Late Neolithic, Chalcolithic, or the Early Bronze Age.

Although hundreds of structures are spread across this large area, several dense concentrations indicate periods of intensive building activity. One example is the "Neolithic village," a concentration of collapsed basalt structures at the most southerly extent of the wadi, on the edge of the *qa'* where the last pool (#9) supplied a water source. Centered on Pool 1, a number of large tower tombs, all looted, are familiar from the parallels to the tower tombs known from the mesas at Wadi al-Qattafi. We surmise that, at least in some cases, these were Late Prehistoric tombs later reused and rebuilt by Safaitic peoples. Further afield, a variety of structures are probably campsite clearings and corrals of pastoralists, many situated along the edges of the *qe'an* (pl.), yet these too have mounds of basalt that are probably burials, including some that probably represent more recent Islamic Bedouin burial grounds.

If dating these structures is problematic, understanding their function is no less challenging. As noted above, the arid zones of the Levant are known for large dry masonry mortuary structures, with many similarities across the entire Arabian Peninsula (Braemer *et al.* 2001, 2010; Steimer-Herbet 2004), and thus we assumed that we might be looking at a vast necropolis, possibly spanning millennia. Rosen notes several large dry masonry hollow cylindrical structures in the southern Negev Desert (Rosen and Rosen 2003: 12–13, fig. 9) that are apparently similar to nawamis, but parallels between tower tombs and nawamis are limited. Tower tombs are large, round, dry masonry features, like nawamis, but they lack the entrance found on all of the documented preserved nawamis. Previously we suggested, following Rosen and colleagues (2007: 19–22) that these might date to the Neolithic (Rollefson *et al.* 2011: 274–275), predating the nawamis of the Sinai, which date to either the late Chalcolithic or Early Bronze Age (Bar Yosef *et al.* 1986: 163–185).

Large basalt slabs were used to construct the tower tombs (ca. 50–80 × 30–35 × 20–30 cm) that we estimate would weigh approximately 50–100 kg each. Many of these heavy blocks were lifted 2–3 m (possibly more) above the ground. Although most examples we examined seem to be standalone structures, one tower tomb at Wisad (WS-110) was unusual because we could detect additional foundational structures related to the construction, including a possible "courtyard" or cleared area, with the boulders used to create a massive boundary wall. Tower tomb WS-110, however, was complicated not only by the looting, but by the textiles revealed during our excavations of the looted area. The cloth suggests an age much later, and coupled with the Safaitic inscriptions and late rock art in the vicinity, we believe that this tower tomb was reconfigured later, possibly during the Safaitic period (ca. 1st century B.C.– A.D. 4th century) (Rollefson *et al.* 2012).

In addition to the tower tombs, a variety of structures were noted during our initial surveys (2008–2010). Substantial features such as these tower tombs and associated constructions are found to the west, but the core area of structures appears to be on the east side of the pools. A notable parallel to structures documented at Maitland's Mesa are tower tombs with an associated "tail," a term coined by Rees (1929: 391) to describe features he observed in the eastern badia. These are the chains of chambers, very similar to that aligned along the southern edge of Maitland's Mesa, in a linear fashion. Each chamber measures about 2×1.5 meters, with many knocked over, presumably by looters. There are only a few clear examples; WS-13 (1–51) is the longest chain at Wisad Pools, consisting of approximately 45 chambers to the west of a tower tomb (FIG. 9). This chain did not directly abut the tower but was separated by a paved rectangular platform with circular and subrectangular areas delineated on the platform by narrow standing stones (60–75 cm in height). Rather than circular, this tower is rectangular, and may have included more than one interior chamber. Another chain (WS 85) includes 13-chambered cairns.

Other structural forms are less easily defined or classified, but they were common, possibly accounting for up to one quarter of the structures at Wisad. These are the circular to subrectangular mounds of basalt blocks, usually with diameters over 10 m, and often with a preserved height of 1 m or more. Although some are looted, recently and long ago, others are apparently only collapsed; where looting occurred, this type seems to have more than one internal chamber (possibly as many as eight or more). An additional type is an elongated rectilinear structure, which is much less common than the tower tombs or the mounds. These seem to occur as a succession of four or five rectangular chambers, each ca. 1.5×1.0 m, ca. 0.75 m high, such as WS-7, or as a wall of a broad square paved area, such as WS-65.

Other types of structures and complexes are more difficult to categorize. Large circular enclosures, ranging from 8–10 m in diameter and built of massive basalt slabs often survived over 1 m high. A paved courtyard is attached to some (e.g., WS-72), demarcated by a wall of thin basalt slabs set on edge. These are much too complex and carefully built for animal pens, but beyond this, their function is difficult to assess without excavation. The temptation to consider them as something beyond a basic residential or domestic construction is guided by the complex features. There is great variety in these possible ritual complexes, adding to the diversity of architecture in contrast to Maitland's Mesa. Some may represent the modification and accretion of built features through time. These certainly warrant more attention in future investigations.

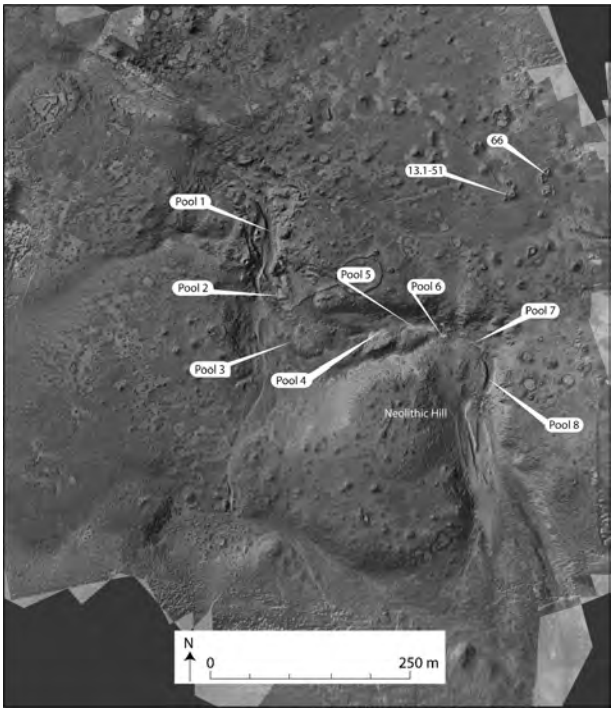

Figure 9 An orthomosaic image of Wisad Pools. This image was constructed using PhotoscanPro software; 442 aerial photographs were taken with a Kite Aerial Photography (KAP) setup, and ground control points were collected with a Total Station and GPS. The aerial photos were converted into digital elevation model (DEM) using PhotoscanPro, and then exported to arcGIS. In arcGIS, elevation data were converted into a hillshade model of the landscape and laid onto a composite orthomosaic of the area. The hillshading provides information about landscape relief as well as the spatial location of features.

W-66a and W-66b

W-66 was one of the many buildings we took to be tower tombs; this building complex was chosen because little or no looting had occurred, and despite the collapsed ceiling, no other disturbance was apparent. Similar in several respects to the Neolithic building (SS-11, discussed above) at Maitland's Mesa, the dimensions were impossible to determine because of the collapse of the large basalt blocks that once formed the walls and ceiling; many were about 1 m in length, ca. 40–50 cm wide, and 10–20 cm thick. This is the main structure W-66a, and the associated stone on the east is platform W-66b.

Excavation of the main structure exposed several phases of occupation, with some periods of abandonment or limited activity. The earliest phase is represented by a low circular or sub-circular single cell with a gypsum plaster floor preserved in places. Set into the center of the room stood a large basalt pillar ($102 \times 44 \times 30$ cm); we calculate that this basalt block weighed ca. 500 kg (FIG. 10). This floor, approximately 35 cm below the modern ground level, included an

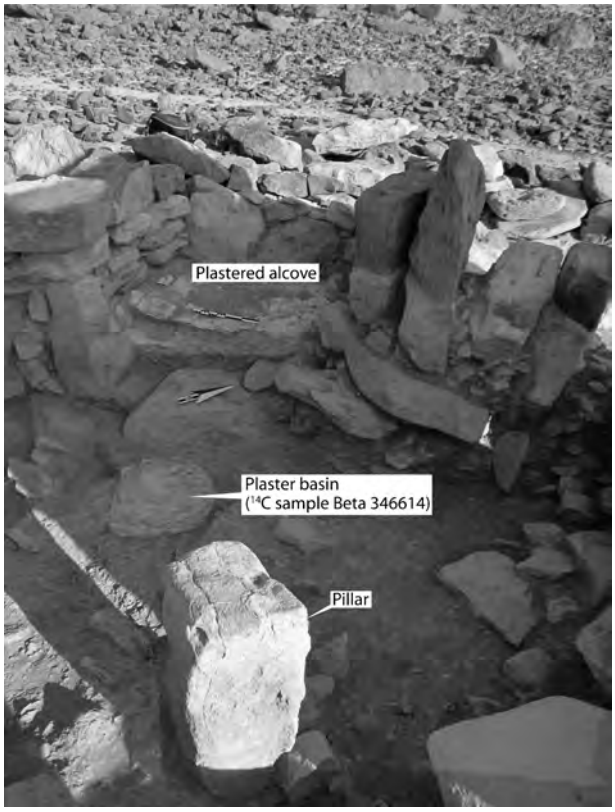

Figure 10 Wisad, Str. 66a, showing plastered alcove and central pillar support. Between them is the plaster basin where C14 sample was taken.

elliptical plaster basin (ca. $58 \times 44 \times 1$ cm) set into the western side of the room. At this phase, the room measured approximately 4.25 m (north-south). Charcoal embedded in this plaster was dated by AMS to 7690 ± 40 B.P. (Beta-346621; 6600–6460 CAL B.C.) (FIG. 10), conforming to a date early in the Late Neolithic based on material culture (see below).

The southern, southeastern, and western walls of W-66 were constructed of basalt slabs ca. 50 cm high stacked into several relatively straight wall sections, each angled slightly such that the interior was more angular than curvilinear. Successive stones above these stacked slabs were corbelled towards the center of the room, ultimately reaching the central pillar. These corbelled slabs are also quite large, many over 1 m in length, and as much as 80 cm in width in some cases; the largest of these we estimate were slabs that must weigh 200–300 kg. Evidently, additional columns of smaller flat slabs stacked at the interior ''corners'' added stability or support to the corbelled roofing slabs. Given the low corbelled roof, we can only assume that inhabitants were only able to crawl in the room, with a maximum height in the center and much lower near the walls. Possibly added during a later use of the building, an alcove measuring ca. 1.5 m (southwest by northeast) by 0.85 m (northwest by southeast) was plastered at least four times. The last plastering was about 28–35 cm above the surface level in the main room.

An accumulation of sediments on the floor marks the end of the first use phase; no replastering occurred during later phases. Notable accumulation of beetle pupation chambers indicates a period of abandonment during layer 5. Ground and chipped stone are rare, with only two grinding stone fragments recovered from this layer. In the subsequent layers (3 and 4), cobbles appear throughout the room; ground and chipped stone artifacts were much more common in these layers, as were faunal remains. Although layer 2 had fewer bones and tools, an apparent cache of nine pestles and a large handstone were placed in a niche in the southeastern corner.

To the east of W-66a, a platform about 3.25 m in diameter and 40 cm in height was apparently attached to the primary structure; despite excavations between them, we could never determine the exact relationship between the two structures. On the western and eastern edges of the platform, three standing stones (40–75 cm high, 40–70 cm wide, 10–20 cm thick) were situated such that the central standing stone is oriented to the east-northeast. Several layers of small ($25 \times 15 \times 5$ cm) flat stones were used to build the platform, which may have served as a work area based on the chipped stone debitage and tools. On the other hand, such a platform could have functioned as a dry storage surface area during wet months. Below the layer of flat stones, a horizontal basalt slab ($98 \times 37 \times 10$ cm) overlay a small triangular arrangement of small flat stones; below these stones was sterile sediment. No evidence of burning or human remains were found in the structure.

Study of the faunal remains and material culture is ongoing, but the diagnostic artifacts and single radiocarbon date support the initial construction of this structure during the early part of the Late Neolithic. Despite the rarity of ceramics, one sherd was a herringbone-incised, painted handle fragment from a Yarmoukian vessel, very similar to those found at 'Ain Ghazal (Kafafi 1990: fig. 10). More striking, we found more than 40 arrowheads from inside of these two structures, including Haparsa, transverse, and other Neolithic types (FIG. 11). In addition to thousands of debitage and retouched pieces, two possible figurines were recovered. The more likely example made of non-local fine grained sandstone could represent an animal (e.g., possibly a goat, sheep, dog, etc.), while the other, made of very fine-grained basalt is more ambiguous. Beads of malachite and Dabba marble were also found. Finally, a broken bladelet of Meydan Dag obsidian has a notch on the base.

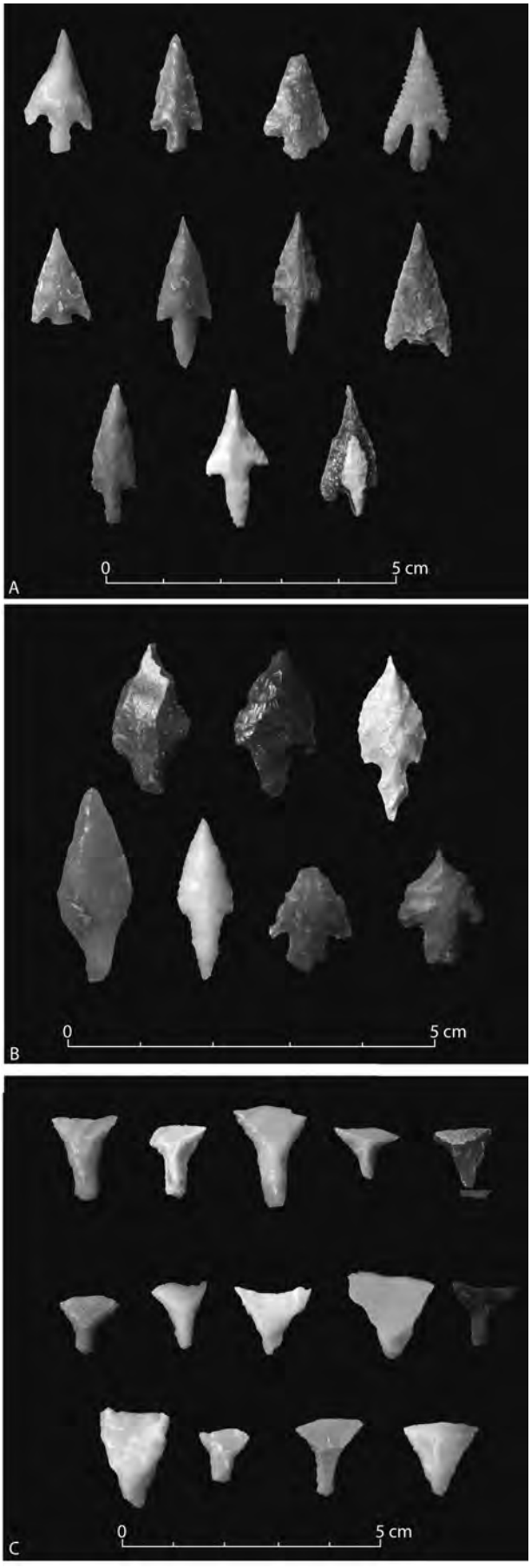

Figure 11 Neolithic arrowheads from W-66a and W-66b at Wisad Pools: A) Haparsa arrowhead; B) Nizzanim arrowheads; C) transverse arrowheads.

Discussion

After two seasons of survey and one very limited season of excavation at both Maitland's Mesa and Wisad Pools, a picture has emerged that challenges our preconceptions about these two areas, and the arid badia in general. Clearly, much more research is required before conclusions may be drawn, but in each case, the structures we initially suspected to be mortuary features are Late Neolithic residential structures without human remains. In both cases, structures W-66 and SS-11 were built with more permanence in mind (albeit based on some degree of seasonality), and were modified and reconfigured through time. Construction techniques for both buildings necessitated hauling and lifting extremely large and heavy slabs. We should emphasize the similarity in the corbelled construction for both buildings using massive basalt slabs, a construction technique unfamiliar to us for the Late Neolithic elsewhere in the region. Later, Early Bronze Age I corbelled roofs are different and incorporated several pillar supports (Braemer and Sorins 2011; Braemer *et al.* 2010).

Some structures, such as the tower tombs and associated cairn chains, no doubt served mortuary purposes judging by the human remains in the looter's back dirt, and other structures such as the ghura huts may have been temporary, expedient shelters, but the corbelled Neolithic structures highlight a previously unknown phenomenon for the eastern badia. If continued investigation reveals that many of the comparable structures are similar in function and dating, we must reevaluate our assumption that this area was similar to the current desiccated, stark landscape. Such an empty landscape holds a romantic allure to some modern sensibilities, but Late Prehistoric people were attracted to the region as well, apparently in greater numbers and intensity than previously assumed to take advantage of a countryside that was probably considerably more inviting to pastoral groups than what we see today.

This should come as no surprise. Management of runoff surface water through use of water catchment facilities are known from earlier PPNB phases both to the south along the edge of the Jafr Basin (Gebel 2010; Fujii 2010), and about 25 km north of Maitland's Mesa at Ibn al-Ghazzi (Betts 1986: 147; 1987: 225). By the Early Bronze Age they were established on a much larger scale at Jawa (Helms 1981, 1985). Similar to the Black Desert of eastern Syria, where the Early Bronze settlement of Khirbet al-Umbashi could not have been supported with the current soil conditions (Braemer and Échallier 2004), we must wonder whether or not topsoils that existed during the prehistoric era are now simply eroded. If topsoil once existed, water retention and the potential

for supporting flocks and intermittent agriculture might have been much more tenable than at present. Based on this evidence, we speculate that the barren region we currently see in the badia is quite different to that during later prehistory, with a landscape of lusher vegetation (Rollefson *et al.* 2014). The Dead Sea proxy for precipitation patterns does not synchronize with rainfall calculated on the basis of Soreq Cave speleothems; in fact, during the Late Neolithic, precipitation appears to have been higher than present at Soreq Cave (currently 500 mm annually), underscoring the need for a reliable badia proxy. In future seasons we hope to investigate the possibility that the region used to be a steppic grassland, possibly succumbing to desertification, particularly after a dramatic decrease in annual precipitation around 4,000 years ago (Bar-Matthews and Ayalon 2011: 168, fig. 6).

The labor invested in these constructions suggests that the denizens of Wisad Pools and Maitland's Mesa anticipated repeated visits, perhaps for months at a time, presumably during the rainy season. Moreover, our cursory surveys around and atop some of the 30 mesas along Wadi al-Qattafi suggest that there may be many more similar constructions, particularly on the slopes of Mesas 7 and 8. In addition to the products of pastoralists, these may be the same populations exploiting the ample flint resources for the production of the large cortical flake flint scrapers documented to the north near Ruweished (Müller-Neuhof 2006, 2013) and to the south around Jafr (Quintero *et al.* 2002; Wilke *et al.* 2007). In the Mediterranean settlements to the west, these "tabular scrapers" begin to appear increasingly during Late Prehistory, from the Late Neolithic to the Early Bronze Age, although some possible sources are also known in the Negev (Rosen 1983, 1997). The vast areas exploited at Jafr and near Ruweished, however, suggest intensive exploitation, providing another valuable resource.

The substantial structures around Wisad Pools and some of the mesas in Wadi al-Qattafi suggest populations spent longer periods of time in the region than previously recognized, and they invested heavily in these visits. Evidence is mounting that the current arid environment, lacking topsoil and trees, may have originated well after the Late Neolithic period. In addition to further methodical survey and excavation of other structures in both areas, we hope that sediment cores will reveal whether or not topsoils were present during the Holocene, possibly supporting greater vegetation for domesticates and wild animals. Although a great deal of research must be conducted to determine the dates and functions of other structural forms, and similar structures located in other, nearby areas, these initial results demand a reconsideration of the late prehistoric use and habitation of the area. Taken together with the research projects discussed above, the eastern badia of Jordan seems increasingly less empty, revealing new aspects of communities living and moving through the "land of conjecture."

Acknowledgments

We would like to take this opportunity to thank Dr. Ziad al-Saad, former Director-General of the Department of Antiquities and his staff for the privilege of undertaking this research. Research was funded in part by the Whitman College Louis B. Perry faculty-student research scholarship and the Oriental Institute of the University of Chicago. Dr. Barbara Porter (Director of the American Center of Oriental Research [ACOR]), Dr. Chris Tuttle (ACOR's Associate Director), and the ACOR staff were instrumental in the success of the multiple seasons of research in the badia. In addition, we are very grateful to Dr. David Kennedy and his staff of the Aerial Photographic Archive for Archaeology in the Middle East for his generosity in sharing aerial photos at Wisad Pools, Wadi al-Qattafi, and Maitland's Mesa. We would also like to thank Mr. Wesam al Talal, our representative from the Department of Antiquities, for his essential assistance in the field at Wisad Pools. In addition, we thank Dr. Tristan Carter for the identification of the obsidian fragment. The many hours dedicated to the digitization of field drawings by Roberta Schaffner is deeply appreciated. Isabelle Ruben contributed not only photographic skills, but worked in the field, offered advice, and logistical support in Amman; we are grateful for her constant support through the years. This research, and our time in the field, would be much poorer without the hard work and patience of Whitman College students Janna Rozar, Laura Evilsizer, Carrie Cecil, Emily Hanscam, Ian Kretzler, and Megan Du Bray, to whom we extend our thanks and appreciation.

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