

## TALL ḤISBĀN 2016 EXCAVATION SEASON: HOUSEHOLD ARCHAEOLOGY IN THE MEDIEVAL VILLAGE

*Bethany J. Walker, Tarina Greer, Reem al-Shqour, Aren LaBianca, Robert D. Bates,  
Jeffrey P. Hudon, Warren Schultz, Julian Henderson, Chiara Corbino, Sofia Laparidou,  
Annette Hansen, and Øystein S. LaBianca*

### **The Medieval Village: Tall Ḥisbān and the Late Byzantine and Islamic Periods**

The Ḥisbān Cultural Heritage Project returned to the field from 15 May – 1 June, 2016 for a three-week field season. Excavations this year, which are part of a larger program of heritage preservation and site presentation, focused on the western, northern and southern slopes of the Tall, to better document the history of occupation of the village associated with the public buildings on the summit of the Tall in the medieval (Byzantine and Islamic) periods. The international team consisted of 35 students and staff, (the majority from the United States and Germany), and 16 workmen from Ḥisbān. The excavation was run as a field school for both undergraduate and graduate students from Andrews University, Missouri State University, and Bethel College, as well as a field school in Mamluk archaeology for an international group of graduate students and post-doctoral scholars from the University of Bonn<sup>1</sup>.

Excavations at the site have, since 2013, centered on the architectural remains of the part of the medieval village that occupied the slopes and base of the Tall (within the fenced area of the Department of Antiquities site), on the summit of which was perched the Mamluk-era citadel, Byzantine basilica, and earlier monumental Roman buildings (**Fig. 1**). The structures in the civilian settlement, identified as

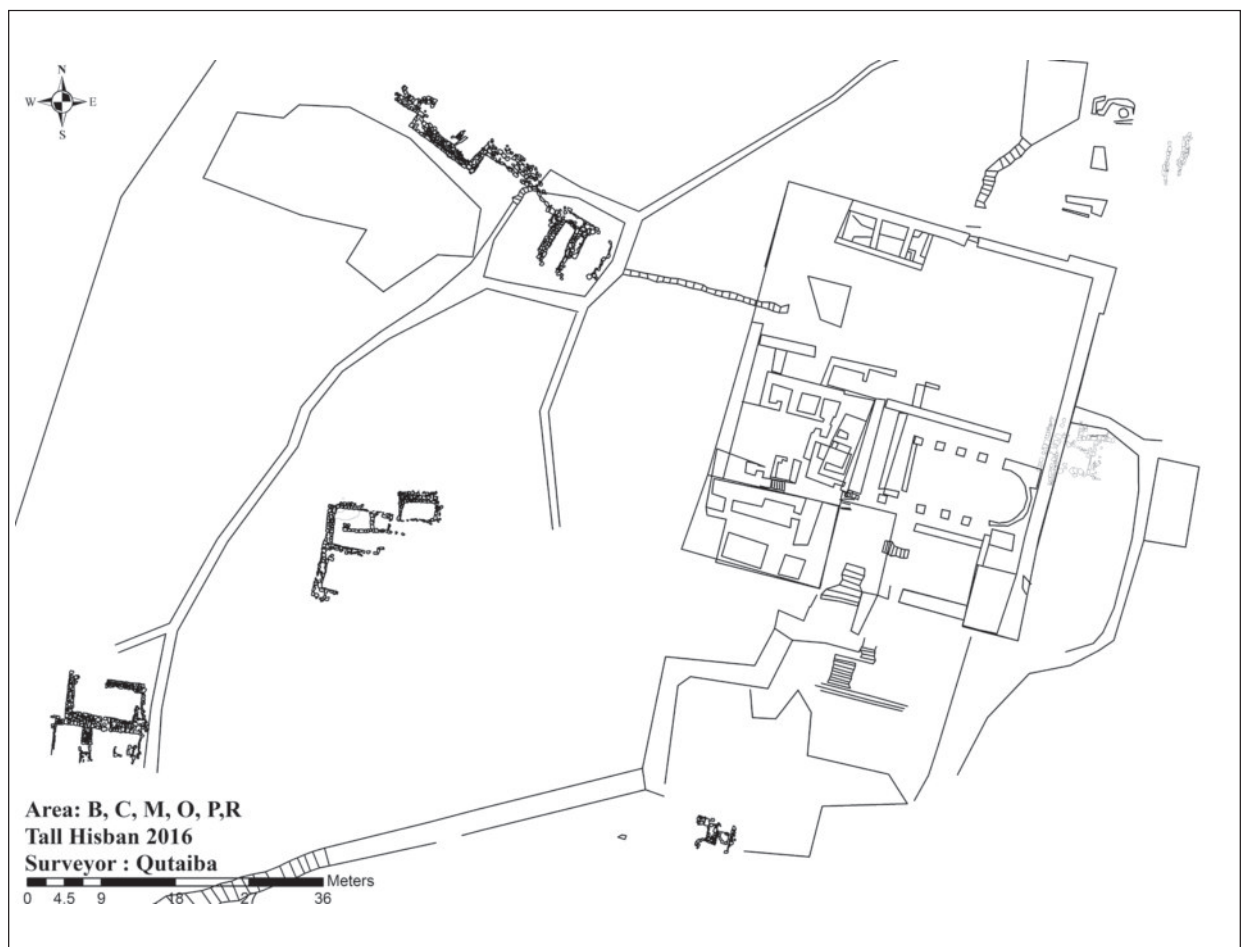
farmhouses, belong to a common architectural koine for the region and adhere to a common plan: single-room, barrel-vaulted buildings of local stone with a single door, roughly 5 x 7 meters in dimension, with plastered walls and floors. The regional architectural tradition of low-sprung, barrel-vaulted buildings has a frustrating longevity, spanning the entire medieval and modern periods (McQuitty 1986, 2007; McQuitty and Lenzen 1989; Porter 2010; Walker 2017). Therefore, the goals of this season were to confirm the original construction date of these structures, document their physical and functional development over time, and investigate the structure of the medieval settlement as a whole, with its neighborhoods and pathways, as well as assess the spatial patterning of their abandonment (as in Walker 2014). The clustering of these farmhouses (in a row, rather than in a circle around a courtyard) represents a special spatial pattern, which likely reflects the ways in which extended families shared resources and pooled labor and use of the slopes for drainage. This season was, then, a first step towards studying family structure and community development in the Byzantine and Islamic eras. For this effort, use this season was made of photogrammetry and 3-D modeling of architecture (**Fig. 2**)<sup>2</sup>, extensive material culture analysis (with laboratory analysis to support results), and a closely coordinated

---

1. Andrews University was represented by the Department of Anthropology and the Institute of Archaeology. The University of Bonn was represented by graduate students and staff of the Research Unit of Islamic Archaeology, as well as post-doctoral fellows of the Annemarie Schimmel Kolleg (an institute of advanced research of Mamluk Studies, funded by the German Research Foundation). The Ḥisbān Cultural Heritage Project is under the senior direction of Prof. Øystein S. LaBianca. The

excavations are directed by Prof. Bethany J. Walker..

2. Nicolò Pini, a doctoral student at the University of Cologne, provided the expertise for this work. As photography with remote, miniature aircraft was again not possible this season, such photography, aided by “boom shots” and panorama photography, provided a great deal of information on architectural development and technology, and the relationship of neighborhoods to the local topography.



1. Plan of the archaeological site of Tall Ḥisbān and current fields of excavation (courtesy Qutaiba Dasouqi).

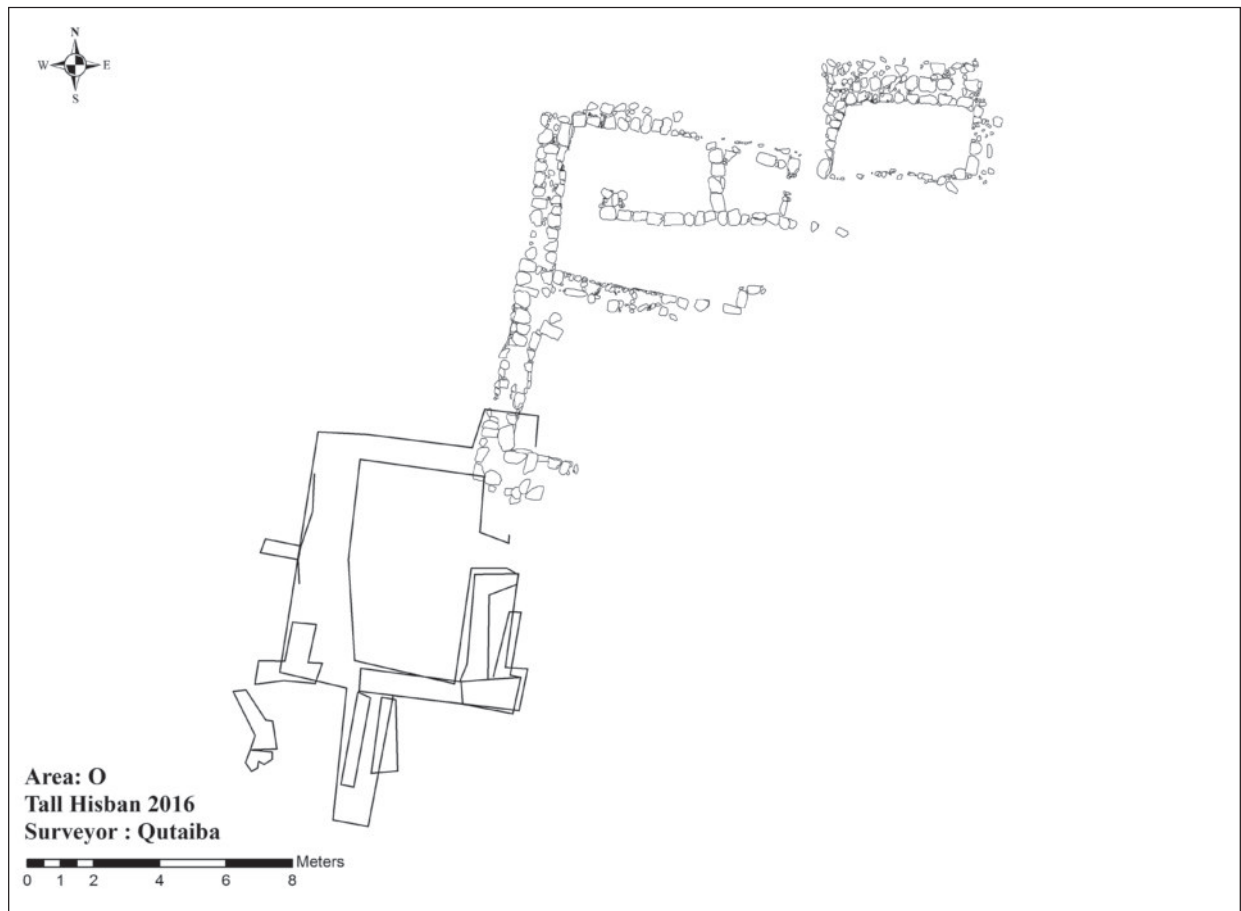


2. Panorama photo of Field C cluster of farmhouses in their topographical context on west slopes of the tell (courtesy Nicolò Pini, University of Cologne).

environmental project, developed over the last two seasons of excavations, in support of the study of diet and land use.

*Field O: Stratigraphic Report (based on report by Tarina Greer; Fig. 3)*

Field O is located on the undulating base



3. Plan of Field O farmhouse cluster (courtesy Qutaiba Dasouqi).

of the tell slope to the southwest, and has been excavated for a total of four seasons. In 2007, excavation began with the opening of four squares (105, 107, 109, and 110), which revealed two one-room structures (identified as farmhouses), built against one another. The season was largely devoted to clearance of vault collapse, though a beaten earth surface (Locus O5.4), representing the last phase of occupation in the southernmost house) was reached by the end of the season. In 2013, these same squares were excavated further, renumbered 5, 7, 9 and 10 (with the re-alignment of the site grid to true north), reaching the latest of the plaster floors (L. O10.14) (as the last phase of occupation in this building) and bringing part of the northernmost house into phase. During the 2014 excavation of Field O, three squares were re-opened, two in interior spaces (Squares O9 and O10) to reach foundation levels and better understand the complex's history of occupation and physical and spatial development, and

one in the external courtyard (Square O.11). A cross wall running east-west (L. O9.26) was also uncovered, which divided the living space of the Mamluk farmhouse. Shallow channels (L. O10.41) were cut into the plastered floor (L. O10.14) of the space south of the wall, the function of which at the time was unknown. Several middens and hearths in the same floor were sampled for macro- and micro-botanical analysis (see discussion below). Excavations in the courtyard documented two cisterns and several beaten earth surfaces, identified with domestic activities conducted outside. The courtyard produced some of the highest concentrations of small finds (pottery, plain glass and glass bangles, metal fragments), suggesting that the courtyard was used for domestic disposal at a time contemporary with (and possibly after) occupation of the farmhouses.

In 2016, fieldwork in Field O continued in the same farmhouse complex, with the aim

of securing dates for the original construction and documenting family structure and daily activities; through house arrangement, spatial division of activities, and use of courtyard space. Excavations were centered on the northernmost house of the complex in Square 14 (previously square 10 in the 2014 season), which uncovered the complete floor plan of the farmhouse in its latest phase of occupation. Excavations continued in the southeast corner of the square, which led to the uncovering of a second cross wall (L. O14.12), oriented north-south and abutting the east-west Wall O9.26 (of the old grid). This blocked off a small section of the house in its northwest corner. Here, the plastered floor in its last phase of use was covered with a flagstone pavement (L. O14.9) of large, roughly cut octagonal stones of purple-colored flint (locally procured) and soft limestone, seemingly recreating the kind of polychrome, marble flagstone floors of octagonal design popular in the public buildings in Cairo in the 14<sup>th</sup> century (**Fig. 4**). The contents of this “room” were quite unusual for the site: a heavy concentration of fine, enameled and lustered glass beakers and bowls (likely Syrian imports of the late 14<sup>th</sup> century, discussed below), along with a range of glazed vessels. As the contents of this room and the flagstone floor were sealed by vault collapse, this storage space represents a final phase in the use of this building before abandonment. In light of this evidence, it appears there were three phases of occupation (and building development) in the Mamluk period, as has been documented in other fields of excavation (and most clearly in Field M on the north slope of the Tall). During the last phase, sometime in the late 14<sup>th</sup> c. or



4. Detail of flagstone floor in O14 storeroom.

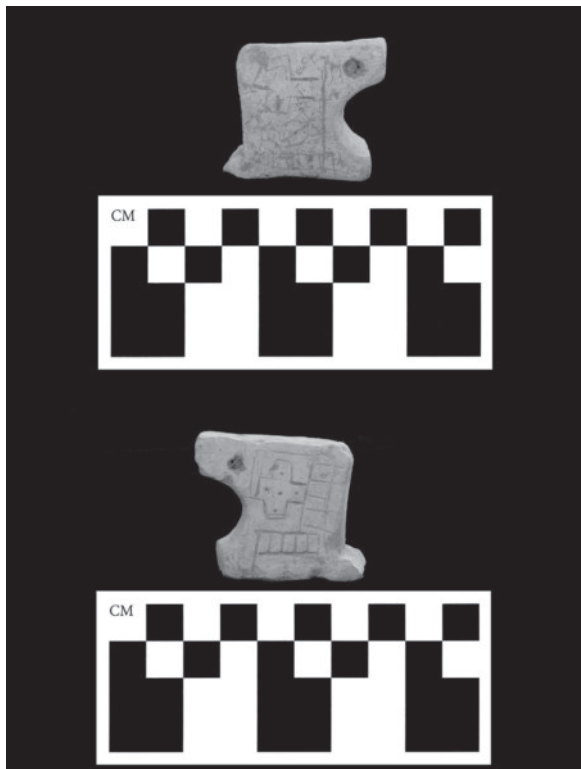
shortly thereafter, the southeast corner of the room was cordoned off by a low wall and the floor paved, transforming the space into a storage area for fine tableware. At the same time, the living space of this house was divided into two by cross-wall O9.26, with the southern half of the house used for cooking and channels cut into the floor, possibly for carrying water to a cistern, though this is still unclear at this point. Together this may represent the same phase of short-term storage (and possibly brief abandonment), temporary reoccupation (possibly squatter occupation), and final abandonment as documented in Field B, dated to the end 14<sup>th</sup> century by the “jar burial” in B8.

In Square 10, along the western wall of the same house (Wall O10.5 – old grid), a probe was excavated at the end of the season in an attempt to reach wall foundations, and to explore earlier and prior use of the Mamluk-era complex. The foundation trench was identified, and the founding deposit (L. O10.55) dated to the Abbasid period by the pottery. Wall O10.5 abuts and its courses interlock with the three other walls of this farmhouse, dating the original construction of the structure as a whole to the Early Islamic period. The clean reading of pottery from this locus, then, confirmed a pattern of occupation common for many site throughout Transjordan and Palestine: Mamluk reuse of Early Islamic ruins and revitalization of structures from the Umayyad and Abbasid periods in rural sites.

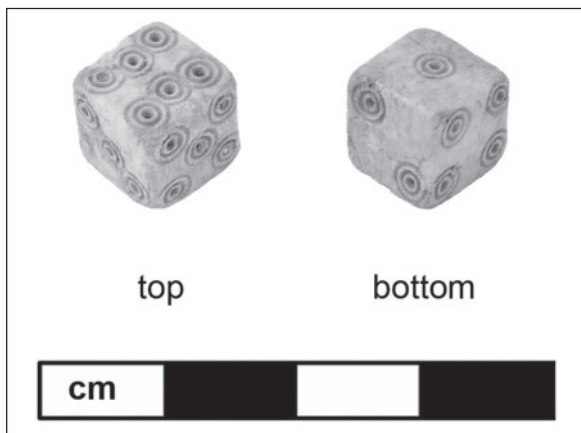
Square 13 (5 x 2.5 meters) was placed outside the west wall of the northernmost house, in order to explore the exterior spaces of the farmhouse complex opposite the courtyard. This square produced the heaviest concentration of pottery sherds (and many partially mendable forms), small finds, and palaeobotanical remains, suggesting its use as the primary midden of the complex. The ceramic assemblage was dominated by cooking vessels, tabun fragments, and storage jars (see ceramic discussion below). The midden was rich in fragments of metal tools related to agriculture, animal husbandry and household goods (for example, a hook, a horse-shoe, nails, and a kohl applicator), as well as lithics (worked and debitage). The midden also produced a rich deposit of charcoal, ash (in Locus 8.11. and



17), small bones, and teeth, which are now under study by the project phytolith specialist, palaeobotanist, and zooarchaeologist. Among the small finds in the deep fill of Loci 2-14 were an inscribed lamp, glass bangles, beads, coins, a glass-lamp fragment, and a ceramic chess piece (**Fig. 5a**). The chess piece was not the first gambling or game-related artifact found at the site, as a single die was recovered from Field B in 2011 (**Fig. 5b**). The chess piece appears to be a rook, although the form is irregular (Murray 1913: 767). On both surfaces



5a. Chess piece (rook) from Field O farmhouse in 2016.



5b. Single die from Field B room in 2011.

are incised what appear to be gaming boards, but their function and meaning are not entirely clear at this point. Gaming pieces such as these are also known from Middle Islamic contexts at Khirbat Nuqayb al-Asaymir in the Wādī Feinan, where they have been attributed to the way miners spent their free time, that is, by gambling (Jones, n.d.).

To explore the space between the northernmost and southernmost houses in the farmhouse complex, an extension probe (Square 15, 5 x 2.5 meters) was opened south of Square 13, and the walls brushed clean of debris. During wall cleaning, a complete Mamluk-era slipper lamp was recovered from the wall, having fallen between the courses (**Fig. 6**). The east balk of Square 14 (the southern half of the northernmost house, excavated in 2014), was also partially excavated to understand the relationship of wall architecture between Squares 14 and 12. In the process, a wall (eastern half of O9.26) was uncovered that is shared between Squares 12 and 14, thus between the northernmost and southernmost houses. Wall O9.26, in its entirety, follows the same pattern of construction as all Mamluk-era constructions at the site: two faces with a rubble-filled core.

In order to further explore the changing



6. Pinched lamp (Slip-Painted Ware, Mamluk period) from Field O farmhouse.

patterns of use and disposal in exterior spaces, and to investigate the pathways that may have connected different neighborhoods of the medieval village, Square 12 (5 x 5 meters) was opened this season to the east of Square 14; in the courtyard outside and to the east of the northernmost house. Unexpectedly, excavations here revealed three new walls, one that extends from Square 10 and runs east (Wall O12.5), and two others (Walls O12.6 and O12.8), abutting one another and forming an additional room to the east of the northernmost house. Finds included include two coins (see below), glass bracelet fragments, and a concentration of lithic debitage; worked stone, and a core, as well as an entire camel scapula and a rather typical domestic assemblage of cooking and tableware of the Middle Islamic period. A series of beaten earth surfaces and thin plastered floors were uncovered at the end of the season. The function of what appears to have been an auxiliary room attached to the house in the courtyard has yet to be determined; however, in its latest phase (late Mamluk/Middle Islamic II) it appears to have been used for household garbage disposal.

After this season, the structure of the farmhouse complex in Field O is becoming clearer. Two one-room farmhouses are partially built against one another, with a narrow vaulted storage space in between them on the western side. They face a common open-air courtyard, sharing both the two cisterns there and the work space devoted to food preparation. The two houses have no direct access to one another. At some later time another structure, of yet unknown function, was built on the northern end of the courtyard. Domestic garbage was thrown into both the courtyard and the space outside the houses on their west side. All middens and surfaces have been sampled for faunal and archaeobotanical analysis, and this analysis is ongoing.

*Field P: Stratigraphic Report (based on field report by Reem al-Shqour)*

Excavations in Field P, located on the flatlands to the southwest of the base of the tell, recommenced this year, to further explore the large (9.6 x 6.2 m), one-room, single-floor, vaulted building with walled courtyard first uncovered in 2004 and 2007, and originally



7. Field P farmhouse at end of season, view northeast.

excavated as Field O (**Fig. 7**). This structure was dated to the Middle Islamic (Mamluk) period, with extensive renovations, rebuildings, and additions in the Late Islamic (Late Ottoman, 19<sup>th</sup>-century, “Tanzimat”) era. Excavations continued this season in Squares 102 and 103 (the latter ending early in the season), with cleaning of Square 104 (located on the west side of the courtyard).

**Square 102**

This 5 x 5 m square is located on the northeastern side of the field. Part of it previously excavated in the 2004 and 2007 seasons, to the level of the lower fourth course of the north wall of the square. After cleaning the weeds and the collapse, we immediately reached a plaster surface (Loc.105 =Loc.112). The thick surface contains a significant amount of pottery, dated to the Late Byzantine/early Islamic periods, as well as tesserae, flints, bones, glass, a possible bronze cotter pin, and a glass bead. The north wall (P102.103) of the building was built on top of the plaster surface, suggesting that an earlier structure was demolished to build the standing structure that exists today.

Removal of this layer revealed another thick deposit (Loc. 124), comprised of compact soil with chalk and many irregular stones. The finds from this locus were ceramic, a few flint fragments, tesserae, one complete basalt pestle and an incomplete sandstone pestle. Below this (Loc. 125) was a soft fill of soil, with tesserae, glass, and pottery dating to the Late Byzantine and Early Islamic periods. We then opened a probe trench (Loc. 130) in front of the interior face of the south wall (Loc. 100) of the building, to locate the foundation trench. The

pottery was a mix of Late Byzantine and Early Islamic periods.

A preliminary assessment of the life cycle of this farmhouse, based on the archaeological stratigraphy and architectural phasing, is that a Late Byzantine structure stood on this site, which was replaced by another structure in the Early Islamic period (plaster floor Loc. 105, 112, and 115; bottom course of south Wall 100; Loc. 125). Most of the occupation dates to the Mamluk era (top courses of Wall 100, Wall 103). The building was abandoned for a lengthy period, and was then rehabilitated, reoccupied, and expanded in the Late Ottoman period, as dated by Palestinian gray chibouk fragments of the 19<sup>th</sup> century (upper three courses of Wall 100).

#### Squares 104 and 105 (Farm House Courtyard; Fig. 8)

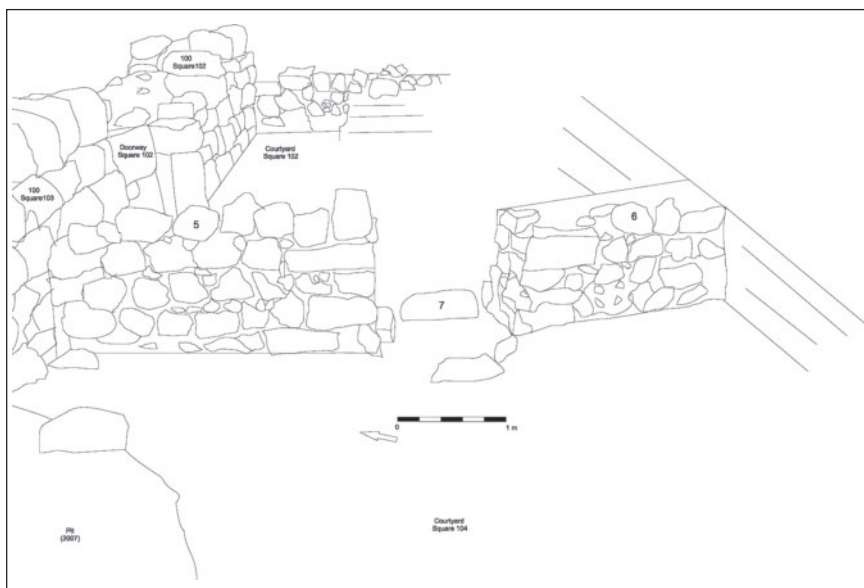
These two 5 x 5 m squares are located to the south of Squares 102 and 103 (the farmhouse) and constitute the exterior, walled courtyard of the complex. This season they were only cleared of architectural collapse and interseasonal debris, and subjected to a study of architectural phasing; relating those phases to the stratified contexts revealed through excavation in the farmhouse interior. In Square 104 a wall (Loc. 5 north half, Loc. 6 southern half) divides the courtyard into two parts (possibly to create separate spaces for sheep/goats and chickens, as today). It contains a doorway and threshold (Loc.7). The east face

of L. 5 continues under the south wall of the Mamluk-era farmhouse (Loc.100), while its west face was built against the same wall. Another small wall (Wall 8) was added at the same time to the south wall of the farmhouse (Loc. 103), connecting it to the western wall of the courtyard (Loc. 9). These walls were added at some point in the early Ottoman period.

Thus, the courtyard went through several phases of construction and development over the course of the Mamluk (Middle Islamic) and Ottoman (Late Islamic) periods. In its earliest phase, Wall 103 (the south wall of the farmhouse on the west side) was constructed; this building phase is represented today by the bottom three courses of the wall. At some point in the Early Ottoman era (c. 16<sup>th</sup> century AD) Wall 5/6 was built, with a doorway and threshold, dividing the courtyard into two halves. A small wall (Loc. 8) was also constructed, to connect the south wall of the farmhouse (Loc. 103) to the west wall of the courtyard (Loc. 9). In the late 19<sup>th</sup> century, three courses were added to Wall 100, as well as the well-cut facing of the doorway in the farmhouse's south wall and its threshold. It is likely that the west and east walls of the farmhouse were also rebuilt then.

*Field M: Stratigraphic Report (based on field report by Aren LaBianca)*

In 2016, the primary goal for excavation in Field M was to reach pre-Mamluk levels, and better understand the nature of the usage for the



8. Wall phasing in Field P farmhouse, view from courtyard to northeast (courtesy Adriana Gaspar, Institute of Archaeology, University of Bucharest).



parallel barrel-vaulted chambers which lined the slope during the 13<sup>th</sup> and 14<sup>th</sup> centuries AD. In order to do this, M8 was again reopened, and the midden exposed in 2014 (M8.9 and M8.13) was removed completely to expose earlier levels. As the season progressed, a new square, M10, was opened directly north and downslope of M8. This was done to allow for a probe that could verify if the “terrace” wall between M4 and M5 continued to run east into the north balk of M8 and the south part of M10. Finally, M4 was reopened, to allow for a balk trim of the north and east balks of the square, as well as the M4 balk stub. This was done in order to expose the south face of the “terrace” wall between M4 and M5, the west face of wall M8.3 which runs between M4 and M8, and the junction between the two walls, to determine the width of the vaulted rooms (after removal of collapse).

Square M8 (5m x 5m) is located downslope and northeast of the NE tower. Due to architecture and rubble in the balk, excavation was limited to a probe in the middle of the square. Excavation started by removing the remaining sections of plaster floor M8.8/15, which had been left between and on the north and south sides of the two parallel probes excavated in plaster floor M8.8/15 in 2014.

While removing the plastered floor, a pit (M8.17) of oval shape, with a length of 0.75 m N-S and a width of 0.42 m E-W was uncovered. The pit was filled with earth locus M8.16, and the soft, loose fill was completely sampled for archaeobotanical analysis. Based on the pottery found in the fill of M8.16, the pit appears to be contemporary with M.8.15. After removing plaster floor M8.8/15, M8.19 was excavated using a triangle-shaped probe in the southeast portion of the square, with a length of 3.27 m N-S and a width of 1.21 m E-W. M8.19 was a loose, soft earth locus, with large pockets of terra rossa and ash. At its thickest, the locus was 0.30 m deep, and was found to lie directly on bedrock. This layer clearly dates to the Mamluk period, although there is a dominance of late Byzantine and early Islamic pottery. This seems to indicate that the area around M8 was occupied in an earlier phase. Nine coins from the total of nineteen found at Tall Hisban in 2016 were found in M8, during both clean up

and excavation.

The bedrock under M8.19 slopes slightly to the north. Wall M8.3 was built on bedrock in the south, but to the north M8.19 fills a space between the wall and the bedrock (**Fig. 9**). It seems most likely that the wall was built on bedrock all the way across the square, but that the upper courses of the wall shifted to the east during an earthquake, leaving the lower courses slightly recessed to the west. This has confirmed that the Mamluk-era vaulted chambers on the north slope were constructed directly on bedrock, likely removing earlier structures, as was the case with the possible terrace walls uncovered on the east slope in 2013.

The function of the vaulted building in this square is becoming clearer, with sampling of ashy pits and surfaces for archaeobotanical and faunal analysis (Walker *et al.* 2017b; Hansen *et al.* 2017). The many thin layers of plaster and ash, cut by middens and tabuns, have revealed repeated domestic activity (areas of cooking and replastering of floors). Noteworthy in this respect is the condition of the handmade pottery (Handmade Geometrically Painted Ware), which is distinguished from sherds of the same ware from contemporary deposits in other fields of excavation by its lightweight, extreme porosity, “cloudy” white film on surface, and pale green hue. Several conditions could account for this; absorption of salts by the vessel’s fabric (salinity), long-term submersion in water, and repeated heating (Skibo and Schiffer 1987; Tschegg 2009; Tschegg *et al.* 2009)<sup>3</sup>. Salinity was eliminated as a factor in



9. Detail of Field M architectural stratigraphy – Mamluk wall on bedrock, M8 (on left) and wall shared by two vaulted rooms in M8 and M4.

3. A collaboratively written article on this phenomenon is

forthcoming.



the erosion of the pottery in the M8 building through a conductivity test<sup>4</sup> It does appear that submersion in water played some role in the physical deterioration of the handmade jars in this building (see also faunal report below for evidence of standing water on the north slope). The north slope of the tall appears to have been hit hardest by earthquake damage, and the collapse of the heavy barrel vaults of the buildings here may have blocked the water channels which carried water away from the slope into the cisterns at the base of the hill. It is, however, a phenomenon that warrants further investigation.

During the last week of excavation, M4 (to the west of M8 and sharing a wall with its vaulted building) was reopened, to allow for cleaning and removal of parts of the north and east balks of the square, as well as the balk stub, to expose the west face of the east wall of the chamber found in M4, as well as the south face of the “terrace” wall found between M4 and M5. Balk removal revealed the NE corner of the barrel-vaulted room in M4, and that wall M8.3 was also the west wall for the chamber in M.4, and used to support barrel-vaulting. This, along with clearance of vault and wall collapse, clarified that the width of the vaulted chamber was approximately five meters, similar to the Middle Islamic vaulted farmhouses in Fields O and C. The vaulted chambers across the northern slope appear to have the same dimensions (5 x 7 m) as the farmhouses elsewhere at the site. They thus appear to be a series of vaulted structures, built one against another in a line across the slope, and all facing downslope to shared cisterns; in other words. the same clustering of structures noted in the other fields of excavation for the Mamluk period.

The excavation of Square M10 (5m x 5m), immediately north and downslope of Square M8, was essentially an extension of M8, and meant to investigate the space outside the doorway of this vaulted building. During excavation, an opening shaft into a chamber was found beneath fill rocks. The chamber

was a rectangular barrel-vaulted room 5.03 m in length and 2.94 m in width. The orientation of the room was 338° NW, meaning that the chamber runs under squares M8 and M9. The three-pointed arch construction of the vaulting seems to indicate that the chamber may have been built in the Early Islamic period; however, based on stratigraphy and pottery findings elsewhere in the field, construction during the Byzantine period seems also plausible. A cave and cistern were linked to the barrel-vaulted chamber through a hole in the east wall of the chamber. A collection of surface pottery in the cave and cistern indicate that they were last in use during the Mamluk period. Due to the presence of a number of 20<sup>th</sup> century adult and infant burials in the barrel-vaulted chamber, after briefly mapping and photographing the space, the opening shaft was blocked off and covered with stones, and excavation of M.10 ceased.

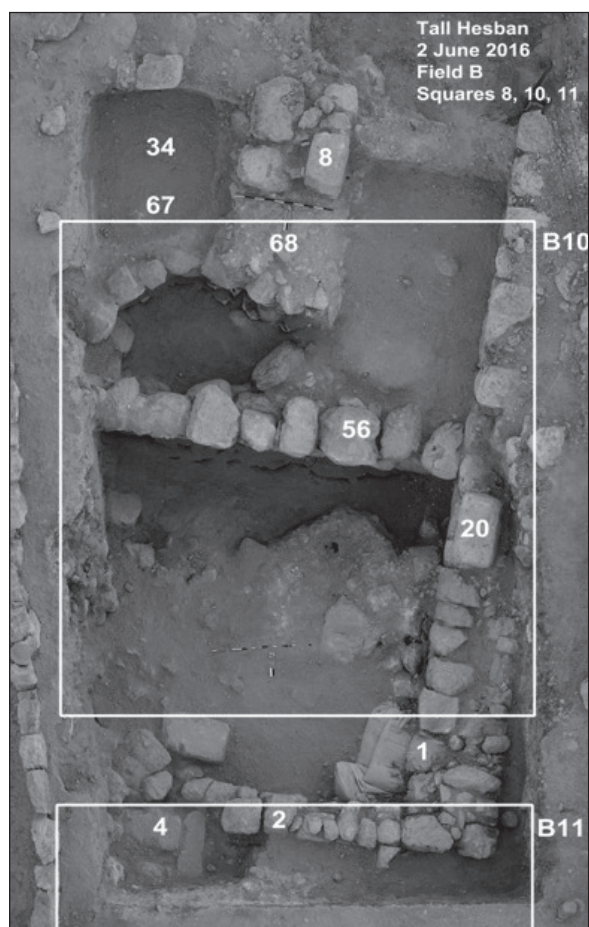
*Field B: Stratigraphic Report (by Robert Bates; Fig. 10)*

The Tall Ḥisban excavation returned to Field B in the 2016 season to explore the Byzantine and Mamluk architecture, and determine the nature and function of the Mamluk building. Some unanswered stratigraphic questions still remained from previous seasons; namely, the relationship between the Mid-Late Islamic pit (B8.44) on the south side of Square B8/10 and the Late Byzantine wall (B8.8) on the north side of the square. In addition, a Mamluk wall (B10.56) had been found in 2014, which may form the north side of a Mamluk building.

The field was initially opened in the 1970's, and then more recently during the 2011 and 2013-14 seasons. Several interesting discoveries have been made during these previous seasons in Squares B8/10. Two Late Byzantine walls and two Late Byzantine pits were found on the north side of the square, as well as a Mamuk wall and pit, which cut into the Late Byzantine structure on the south side of the square. A four-horned altar with a triangular shaped tenon joint

4. A conductivity meter is used to measure the salinity of liquids. A fragment of the sherd is soaked in de-ionized water for 24 hours, and afterwards the salinity is measured. The level of salinity was quite low. We gratefully acknowledge Yazan Abu Alhassan (Department of Engineering Geology and

Hydrogeology, RWTH Aachen University, Germany), who generously conducted this test. We are also thankful to Hussein al-Sababha (PhD student, Islamic Archaeology Research Unit, University of Bonn) for making the arrangements for us.



10. Overview of Squares B8-11: final top plan juxtaposed on end-of-season photo.

was found reused in the Late Byzantine wall (Walker *et al.* 2015; **Fig. 10**) while a globular-shaped jar and two late 14<sup>th</sup> century underglaze-painted jars, preserved in complete form, were found in the Mid-Late Islamic pit (“Pit #3”) (**Fig. 13 below**). All three jars were sampled for residue analysis, and the results of that analysis are briefly discussed below.

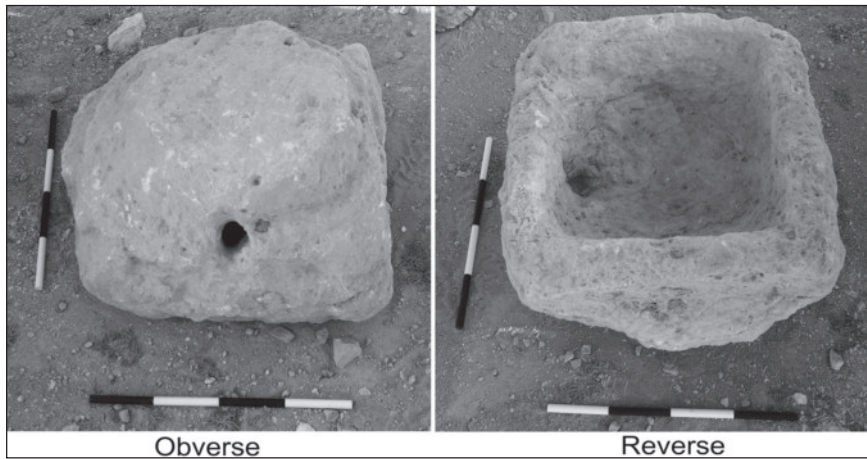
Two squares were opened in Field B; Squares B8/10 and B11. A 2 x 5 m probe was opened on the south side of Square B8/10, to follow Wall 20 (B8.20) and expose the east wall of the possible Mamluk building. A 2 x 5 m probe was also opened in Square B11 to expose the east wall (B11.1=B8.20) and south walls (B11.02) of the Mamluk building as well. In addition, a 0.7 x 1.0 m section of Wall 8 (B8.08) was removed and the plaster foundation (B10.67) was excavated to clearly date the wall. The excavation and stratigraphic sequence for the Mamluk building (B10.56, B11.1=B8.20,

B11.2) was complicated by recent restoration and preservation efforts on the site, and modern fill from previous seasons. Much of the soil that was removed contained large boulders, mixed soil and modern trash. Only two Field phases could be clearly determined through excavation; Field Phase 5b (Late Byzantine) and Field Phase 2b (Middle Islamic II/Late Mamluk).

A Late Byzantine period building phase was found in Square B8/10 during the 2013-14 seasons (Field Phase 5a). Wall 8 (B8.8) was made of double faced, medium-sized boulders and reused ashlar. It also contained a small four-horned altar and a fragment of a small pillar base. The wall was cut into by the Mid-Late Islamic pit (Loc. 42 – “Pit #3”). It was initially thought that during the construction of the pit the south side of Wall 8 was rebuilt, since it appeared that the stones lining the pit continued under the wall (see discussion in Walker *et al.* 2015). However, when Wall 8 was excavated this season, only Late Byzantine sherds were found in the wall and in the plaster foundation (B10.68) that supported it. It appears, now, that one stone of Wall 8 had shifted out of place (perhaps the result of an earthquake), and that it was incorporated during the Middle Islamic II/Mamluk period in the lining of the pit that held the two glazed jars.

On the northwest side of Square B8/10 between Wall 8 (B8.8), a 1.1 m semi-circular pit, which cut into the *terra rossa* plaster floor (Locus 47), continued into the west balk and under Loci 6-7. The pit (B8.34 – “Pit #1”) was excavated approximately 0.15-20 m in 2014 and approximately 0.08-0.12 m in 2016. The pottery in the pit consisted of Late Byzantine bowls, jars and cook pot sherds. A “*terra rossa*” colored, 10-12 cm plaster floor (B8:47=B10:67), which was cut by a later phase of Wall 8 (Loc. 8) and the two pits on the east side of Square B8/10, was removed and phytolith and floatation samples were also taken.

On the south side of Wall 56 (B10.56) in Square B10, a stone pillar base was found in the rubble during the cleanup (**Fig. 11**). The pillar base is made of hard limestone and is approximately 0.45 x 0.45 m in size. The base was reused, probably during the Byzantine period, as a baptismal font or for a similar

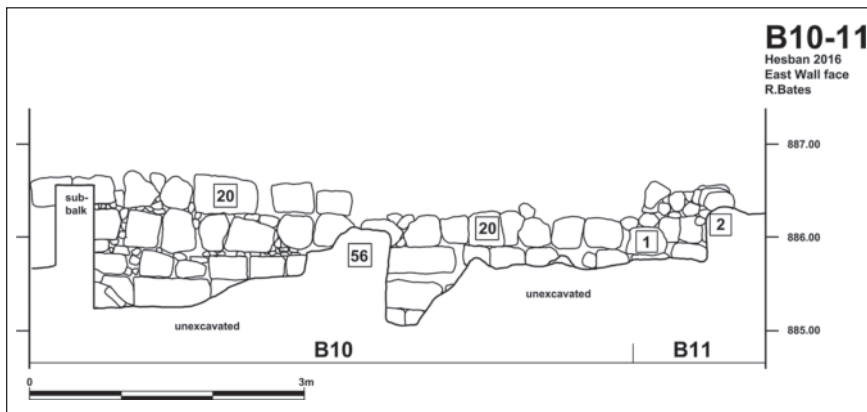


11. Pillar base reused in Wall B8.8.

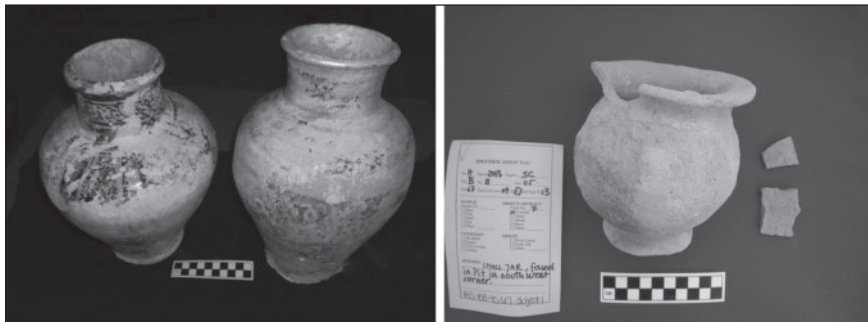
purpose. The underside of the base was carved into a square shape, approximately 12-14 cm deep, with a hole all the way through on one side, which drained the water that was poured over the initiate. A similar reused pillar was found at the Mt. Nebo church, with a square hollowed-out pillar base and a similar hole on one side. This object may have been associated with the Byzantine church on the acropolis, and perhaps related to the four-horned altar found in the Late Byzantine wall (B8.8) on the north side of the square.

Three walls of a possible Mamluk building were found in Squares B8/10 and B11 (B10.56

north, B8.8=B11.1 east, B11.1 south; **Fig. 12**). In 2014, two wall phases were found in the north wall (B10.56) that transects Square B8/10 and abuts Wall 20 (B8.20). The south side of the wall appears to be faced, while the north side was left uneven and irregular. Two to three courses of 0.30-50 m x 0.20-25 m boulders and semi-hewn rough ashlar stones were exposed. The pottery that was sealed against this wall was a mix of Late Byzantine and Middle Islamic sherds. The east wall (B8.8) was founded on a soil layer above the Byzantine wall phase, and slightly overlapping its stones. This construction forms a north east corner of the possible Mamluk



12. Wall phasing of Wall 20, Field B.



13. Three jars in "Pit #3" in B8.



building and continues south along the east balk into Square B11 (B11.1). The south wall of the Mamluk building abuts Wall 1 (B11.1=B8.20) and is also made of medium sized, 0.20-0.45 m x 0.20-25 m boulders and some reused ashlar. Two courses are preserved, and the wall is doubled faced with a rubble fill. Wall 2 (B11.2) abuts Wall 1 (B11.1), and forms the south wall of the Mamluk building. It is made of a single row of dry stacked 0.15 x 0.20 x 0.25-0.40, medium sized boulders, and semi hewn or reused small ashlar. At least 1.5 m of the wall with four courses has been preserved; the east side leans 25 degrees toward the north. The top of another wall (B11.4) was discovered in the north east corner of Square B11 behind Wall 2, but further excavation is needed to understand its purpose.

### Preliminary Conclusions

Following the results of the botanical reports (see below) there are a few preliminary conclusions that can be made to suggest the purpose and function of the rooms found in Squares B8, 10, and 11. Stratigraphically, the earliest structure in these squares is Wall 20 (B8.20=B10.20); it likely dates to the Byzantine period. Based upon the ashlar exposed on the west side of the east balk of Squares B8/10, it consisted of at least ten courses and stood approximately 2.5 m tall. How far the Byzantine section of Wall 20 extended beyond the later addition of Wall 56 (B10.56) remains uncertain until further excavation is completed. However, this early structure most likely collapsed or was abandoned until a Late Byzantine structure was built on top of its remains.

The upper part of Wall 20 was repaired in the Late Byzantine period and a new wall (B8.8) was added, dividing the space into two rooms. A later doorway was created when Wall 7 (B8.7) was also added on the west side of Wall 8. Several plaster surfaces were found. A terra rossa floor (B8.47=B10.67) on the west-side of Square B8/10 was cut into by a Late Byzantine pit (Pit #1, B8.34). This pit was subsequently plastered over several times, before the room was eventually abandoned. Between Walls 8 and 20 another plaster floor (B8.31) was cut into by a second pit (Pit #2, B8.27), that sealed against the west face of Wall 20. Unlike Pit #1,

Pit #2 was not completely plastered, but may have remained active until the entire space was abandoned.

These Late Byzantine structures were abandoned sometime before 1350 BC (see ceramic report below), when the foundations for a Late Islamic/Mamluk north/south wall (B10.56) cut into the older building. Using the existing Wall 20 as its east wall, the Mamluk construction removed the south side of Wall 8, and dug into the preexisting Byzantine collapse or abandonment. As reported earlier, two phases of Wall 56 were discovered abutting Wall 20. A later construction phase extended Wall 20 (=B11.1) southward into Square B11 and added an additional north/south wall (B11.2) to enclose the space.

On the northwest side of Wall 56, an area was cleared out of the Late Byzantine abandonment to form a pit (Pit #3). Although not used as a cooking area (as was initially suggested), according to the environmental reports the earliest layers of this pit were likely devoted to kitchen waste or similar deposits. When the second and final phase of Wall 56 was built, the pit was likely reused as a temporary storage area that contained at least three whole vessels including two imported, handle-less, stonepaste jars and a small, handmade, globular jar, that was probably added slightly later but in the same period. The larger jars contained olive oil and the smaller a dairy product (see residue analysis in ceramics section below). It is unclear as to why the three jars were abandoned and additional refuse filled in over them, but the pit continued to be used as a midden. Four stones were later added to Pit #3, cutting into the abandoned Late Byzantine plaster floors in line with two stones from the base of Wall 8. The stone lining may have been built in conjunction with the small jar providing both a protected storage space and a later waste disposal area. The refuse pit continued in use until the Mamluk building was abandoned.

Additional excavation is needed to explore the extent of the Mamluk room formed by Walls 56 and 20 on the north and east sides, and Walls 1 and 2 (B11.1, 2) on the south side. Opening a square on the west side could possibly locate the entrance to the room and its west wall. Further excavation on the north side of Wall 56



in the area of Pit #2 might clarify the earlier Byzantine strata as well.

**Reservoir Clearance** (based on a report by Jeff Hudon)

Clearance of balk collapse and debris accumulation continued in the Iron Age reservoir this season, to expose the reservoir for visitors. Based upon safety concerns, work soon concentrated in a large rectangular probe, in order to expose a more modest, yet significant section of the plastered floor. Subsequently, clearance work began on the adjacent section of the reservoir to the north that abuts the Iron Age II header and stretcher ashlar eastern wall previously exposed during the 1970's, but later covered, assumedly with excavated fill from the reservoir.

However, because of the towering height and relative instability of the old western balk of Field B, we limited exposure of the reservoir floor to a large rectangular 2 m x 2.1 m x 2 m x 1.3 m probe. The plastered floor was reached and cleaned five meters below the lowest point in the eastern bedrock wall. To our surprise, the southern (1.3 m) balk revealed continuing stratigraphy from the western balk (Squares B10 and B11, see report above) and had not been previously excavated. Therefore, the probe apparently dissected the edge of the unexcavated portion of the reservoir from that part cleared during the 1970's. Balk trimming also revealed several layers of ash in the stratigraphy, providing an ideal opportunity to date the process of in-filling of the reservoir and relate it to larger site development. Consequently, samples were taken from the lower four of these for Carbon 14 dating, using the reservoir floor (879.107 meters) as a benchmark for measuring respective elevations<sup>5</sup>. Work then transferred to the north eastern edge of the reservoir, where a trench was opened across the previously excavated part of the reservoir that abuts against the Iron Age II header and stretcher wall. The wall itself has badly deteriorated, due to its soft Senonian

chalk composition and partial exposure over the last forty years.

Plans for future excavation of the reservoir fill abutting the header and stretcher wall will serve to expose more of this monumental wall. There are also plans for a raised "parapet" wall, comprised of stones from the reservoir, to be constructed around the edge of the site.

**Material Culture**

*Ceramics (preliminary remarks by Bethany Walker)*

One of the most important ceramic discoveries is from the 2013 and 2014 excavation seasons, with the recovery of three complete vessels from stone-lined Pit #3 (Walker et al. 2015); (**Fig. 13**). The excellent stratigraphic association of a handmade jar (which would otherwise have been dated generically to the Middle Islamic or Late Islamic periods), together with two complete underglazed-painted stonepaste jars that are very well known Syrian imports of the late 14<sup>th</sup> century (Atil 1981: 171-174), secured an independent dating for the first time, based on stratigraphy rather than style, for the handmade ware. The pit also appears to be the key to understanding the function of the structure in B8/10 during the Mamluk (Middle Islamic II) period. As the purpose of the "jar burial" (if this was indeed what it was), was not obvious, care was taken to sample soils in such a way as to reveal the purpose of deposition. The contents of the two underglazed-painted jars were sampled by the zooarchaeologist, phytolith specialist, and macrobotanist, who all concurred that the contents were typical fill, the jars having remained open (without lids) for some period of time, and "buried" with soil. All three jars were sampled, as well, for residue analysis. The results of that analysis document that the small, handmade jar held goat milk, with evidence of fermentation and heating, and that the larger glazed jars held olive oil<sup>6</sup>. Handle-less jars of this form, usually attributed to Damascene production, were generally exported either as apothecary jars (and also found in Europe),

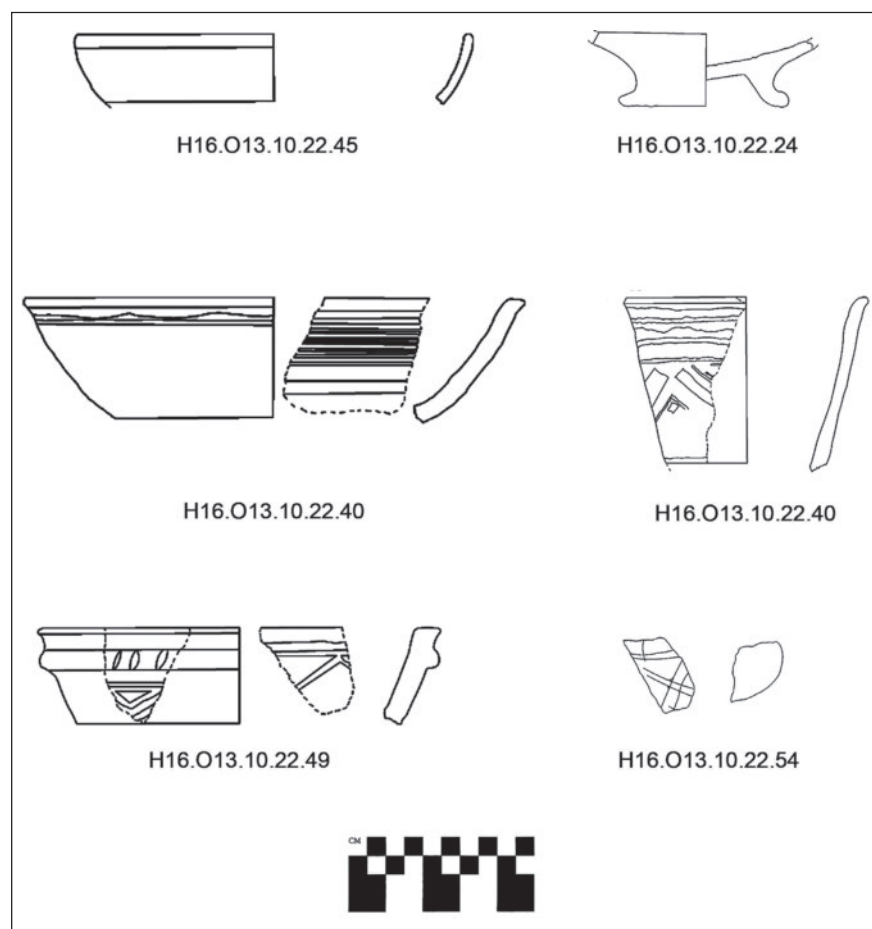
5. The C14 analysis underway at the Institut für Geologie und Mineralogie, Universität Köln. We are grateful to the efforts of Svetlana John for processing our many samples. The results are due in June 2017, which is not in time to be included in this article.

6. The residue analysis was done by Prof. Dr. Silvia Polla, A. Springer, and S. Weihe, Institut für Klassische Archäologie, Freie Universität Berlin. A full discussion of the residue analysis and its relevance for understanding building function will appear in Walker et al 2017a.

or used for the storage of grain or olive oil in household pantries (Atil 1981: 172). Although such jars were mass-produced, they were, nonetheless, rather pricey commodities, and their recovery from a rural site such as Ḥisbān raises many questions about the local economy and the nature of the settlement itself in the 14<sup>th</sup> century. The goat milk could be related to the production of cheese (as the jar exhibited signs of burning/cooking, and there was residue evidence for heating and fermentation) or *samneh*, which is a kind of very fatty butter made of milk and herbs, and which requires long hours of cooking<sup>7</sup>.

While a comprehensive ceramic report is underway for publication elsewhere, a few comments should be made here about the nature of the Middle Islamic corpus recovered this season. The fortuitous identification of domestic middens throughout the site, together

with their full excavation, makes it possible to describe in some detail the character of cooking ware, tableware, and storage ware used by a rural household in central Jordan in the Middle Islamic period (Fig. 14). The pottery recovered from the middens was dominated by cook pots, large handmade jars (both with and without painted design), and tabun fragments, suggesting a diet heavy in stews and bread. The decorative designs for the HMGP (Handmade Geometrically-Painted) vessels are remarkably diverse, while preliminary study suggests some degree of standardization of jar dimensions, for both small and large vessels. Dating handmade coarse wares with any confidence has been a nagging problem in the archaeology of Bilād al-Shām in the medieval Islamic periods. While traditionally based on surface decoration and a rough typology of forms (which reveal considerable regional diversity) stratigraphically



14. Representative pottery of midden outside farmhouse in Field O, Loc. O10.22.24 (profile drawings and plate courtesy of Robert Peitsch, University of Bonn).

7. Personal communication of 19 May 2017, with Maria Elena Ronza (based on interviews with residents of Wadi Musa). An alternative interpretation is that the goat milk represents a

coating or sealant, as milk or milk fats have also been used in this way in the past (personal communication, Annette Hansen).

secure contexts are not that common. The series of plastered floors and beaten earth surfaces of the farmhouses at Tall Ḥisbān, as well as pits sealed by wall and vault collapse, many associated with charcoal, are very promising contexts for the stratigraphic separation of coarse wares, and dating by means independent of the pottery (through stylistic analysis) itself. This work is well underway, and the results will appear in the forthcoming ceramic report.

#### *Numismatics (by Warren Schultz)*

Twelve copper coins were found during the 2014 season. Five of these are at least partially identifiable in terms of issuing authority, four are poorly preserved but by fabric and trace inscriptions are likely to be from the Middle Islamic period; and three are illegible. Of the identifiable coins, one is a Byzantine *folles* of Justinian (r. 527-565), probably from the mint of Antioch, although the mint mark is effaced. One is Umayyad, with mint and date unknown. The final three date from the mid eighth/fourteenth century and are clearly Mamluk, with two from the reigns of al-Nasir Muhammad (693-694/1293-1294, 698-708/1299-1309, 709-741/1310-1341) and one from the second reign of al-Nasir Hasan (755-762/1354-1361). The Mamluk copper coins are types number 220, 257 variant, and 374 respectively, according

to the system established by Paul Balog in his *Coinage of the Mamluk Sultans of Egypt and Syria* (New York: 1964).

An additional 22 copper coins were excavated during the 2016 season. Seven of these are at least partially identifiable in terms of issuing authority, two are from the Middle Islamic period, while eleven are poorly preserved but have traces of Arabic and are thus Islamic coins, although their condition is so poor it is not possible to determine whether they are Early or Middle Islamic in origin. Two are broken and illegible, while one is a machine-struck, base metal token, and obviously a modern contamination. Of the partially identifiable coins, one is likely to be Roman, although its poor condition makes a more detailed identification difficult. Two are Umayyad, lacking mints or dates; one appears to be a mule, featuring two different reverse-type dies. The remaining four coins are Mamluk *fulūs*. The first of these possibly dates from the reign of al-Mansur Qalawun (678-689/1279-1290), and the remaining three from the reigns of his son, al-Nasir Muhammad. These last three appear to be of the same design (Balog *CMSES* 222-226) from Damascus, but their respective dates are either off-flan or illegible. The dates of the Mamluk coins found in these two seasons are in line with the Mamluk-era coins found in the Phase I excavations of Tall Ḥisban.

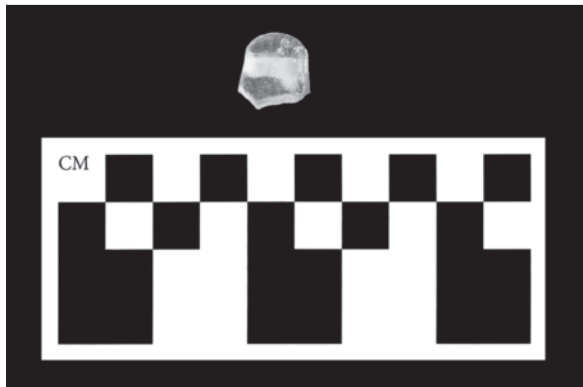
2014:			
Item Number	D(mm)	W(g)	Comments
H-14-O-11-4/L-10N	30	13.74	Byzantine <i>folles</i> , pierced, Justinian, probably Antioch (mint mark is effaced).
H-14-O-9-14/E-41	15	4.27	Umayyad, but poorly preserved. No mint, no date. Reverse central inscription: <i>Muhammad / rasul / [Allah]</i> . Obverse: <i>La ilah / illa Allah / wahdahu</i> . There are trace circular inscriptions surrounding the central field on both sides.
H-14-8-5/6-40	20	2.93	Mamluk. Al-Nasir Muhammad, Balog <i>CMSES</i> type 220, Cairo, undated.
H-14-M-1-Cleanup/B-51	20	2.44	Mamluk. Al-Nasir Muhammad, Balog <i>CMSES</i> type 257 variant, no mint, no date.
H-14-O-11-5/E-11	21	2.85	Mamluk, al-Nasir Hasan, Balog <i>CMSES</i> type 374, Damascus, date missing but has to be 762 H.
H-14-B-2/4-B/T-33	16	1.10	Unidentified. Trace Arabic inscription. By fabric probably middle Islamic.
H-14-M-1-Cleanup/B-59 1	3	0.57	Unidentified. Trace Arabic inscription. By fabric probably middle Islamic.
H-14-M-1-13-64	15	1.74	Unidentified. Trace Arabic inscription. By fabric probably middle Islamic.

H-14-M-1-clean up/B-51	16	2.34	Unidentified. Trace Arabic inscription. By fabric probably middle Islamic.
H-14-B-2-4-Balk/-46	12	1.73	Illegible, with flue or jewelry loop?
H-14-M-1-C-72	10	0.99	Illegible.
H-14-B-2/4-B/T-31	13	0.62	Illegible.
<b>2016:</b>			
Item#	D (mm)	W(g)	Comments
B2/4, pail 62	22	10.42	Possibly Roman. Corroded, but outline of a male bust facing left is visible on obverse. Traces of a design are visible on the reverse.
P102-109	19	2.39	Umayyad, unknown mint. See Illisch 1993: number 572, Plate 18.
007	14	1.76	Umayyad, unknown mint. This coin is a mule struck with two reverse dies. One side has reverse legend I and the other has reverse legend II as described in Illisch 1993: 8.
013	17	0.88	Early Mamluk, possibly Qalawun by combination of trace design, script, and light-weight fabric.
002	21	1.80	Mamluk, epigraphic, al-Nasir Muhammad, [Damascus], date missing, Balog <i>CMSES</i> type 222-226.
009	20	2.86	Mamluk, epigraphic, al-Nāṣir Muḥammad, [Damascus], date missing, Balog <i>CMSES</i> type 222-226.
014	20	2.97	Mamluk, epigraphic, likely al-Nāṣir Muḥammad, [Damascus], date missing, Balog <i>CMSES</i> type 222-226.
005	1.85	17x14	Middle Islamic. Reverse has two-line inscription in a thick script: <i>al-Malik</i> / ....., with remains of a thick, linear, and scalloped border closely surrounding the inscription.
H07.0524	16x13	1.55	Middle Islamic, <i>al-sulṭān</i> clearly visible in <i>naskhī</i> script.
004	22	3.71	Unidentified. Trace Arabic, corroded, illegible.
001	18x15	0.76	Unidentified. Trace Arabic, corroded, illegible.
010	13	1.33	Unidentified. Trace Arabic, corroded, illegible.
012	19x20	2.71	Unidentified. Trace Arabic, illegible.
011	12x10	0.64	Unidentified. Trace Arabic, illegible.
013B	14	0.70	Unidentified. Trace Arabic, corroded, illegible.
015	18	1.19	Unidentified. Trace Arabic, corroded, illegible.
016	18	1.29	Unidentified. Trace Arabic, corroded, illegible.
017	23	3.43	Unidentified. Trace Arabic, corroded, illegible.
H-16-O-10-12	16	1.75	Unidentified. Trace Arabic, illegible. Corroded with some copper sickness.
006	13	1.13	Unidentified. Possible trace Arabic, corroded, illegible.
027	x	x	Unidentified. Broken, corroded, illegible.
008	x	x	Unidentified. Broken, corroded, illegible.
003	21	3.38	Unidentified. Modern, machine-struck token, base metal, illegible, with 5 mm hole pierced near the edge.

Finally, there is one additional numismatic-related object of interest. The artifact is a fragment of small a glass disk first identified by Julian Henderson (Fig. 15). The object was

found in a late 14<sup>th</sup>-century locus, placing it in a firm Mamluk context. It was weathered with a thin, iridescent pellicle which, when removed, revealed it was made of translucent green glass.





15. Glass weight from Field O farmhouse.

It has a slight rim on the exterior edge, likely produced when the molten glass was pressed with a stamp in its center, but the impression is not deep, nor is any inscription or design legible in what remains of the central impression. The reverse side is flat and unadorned, as is typical for these objects. As for stratigraphic context, the object was recovered in 2014 from a soil deposit (Locus O9.22.54) on a beaten earth floor, right under vault collapse, inside the Field O farmhouse described in this report. This represents, then, either the last period of occupation of the house (so a domestic context) or the immediate years of abandonment (as refuse), and before the roof collapsed. Therefore, it dates to the late Mamluk period (the late 14<sup>th</sup> c.). This object is likely a coin weight. While glass weights of a similar size have been found previously in Ḥisbān, they were from earlier Islamic contexts (Kritzeck 1976). As such, this object, along with one recently excavated in Aqaba, represent the first glass coin weights found in a clear Mamluk context from excavations in Jordan.

It must be stated, however, that these objects, commonly called jetons in earlier scholarship, do not have any specific legends or marks which identify them as weights. Rather, they have been assigned the function of coin weights by modern scholars due to a series of observations; chief among them that these jetons were produced to clearly identifiable weight units (such as the dirham or the *mithqāl*, or fractions and multiples of these units), while the coins from the same period were clearly not produced to any consistent weight standard. Mamluk silver dirhams from the first 150 years of the sultanate (1250-1400), for example, were minted at such irregular weights

(individual coins can vary from less than a gram to more than seven and all points in between) that they must have required the presence of weights and balances to determine their value in any but the smallest of transactions (Schultz 2003a). The same holds for Mamluk gold dinars of the same period (Schultz 2000). Given that the vast majority of Mamluk coins found at Ḥisbān during the three phases of its excavation date from this same period (including the 1971 hoard of 66 dirhams of irregular weight) it is thus not surprising that we have found this fragment of a probable coin weight at the site.

When it comes to metrological evidence of the Middle Islamic period in the eastern Mediterranean, the general pattern is one of bronze weights being found in Bilād al-Shām, and glass weights in Egypt (Schultz 2003b)<sup>8</sup>. This observation seems to hold, whether we are talking about archaeologically-derived weights or those which entered institutional collections from the market. There is, however, one site where both glass and bronze weights have been excavated, and that is Aqaba. The glass weights found by Whitcomb at Aqaba were from Fatimid-era contexts (Whitcomb 1995: 36-37). Recently, however, al-Shqour identified a glass jeton from a 14<sup>th</sup>-century context during her excavations of the Aqaba castle environs (al-Shqour 2015: 409. Fig. 318). This object joins the one discussed above as the first two archaeologically-found glass coin weights from the Mamluk era in Jordan. The recovery of an object associated so intimately with the market structure of the time provides further archaeological evidence for the *suq* of the *madīnah* of Ḥisbān, attested to historically for the 14<sup>th</sup> century (Walker 2011: 71).

*Glass (by Julian Henderson, with notes by Bethany Walker)*

While fragments of glass vessels and bangles have been recovered from both the Citadel and the medieval village in previous seasons, this season's excavations produced an unexpected volume, not only of glass but very fine lustered and enameled glass, including those of imported beakers, from the Mamluk period. The quantity, quality, and find contexts (such as the special storage space of the farmhouse in

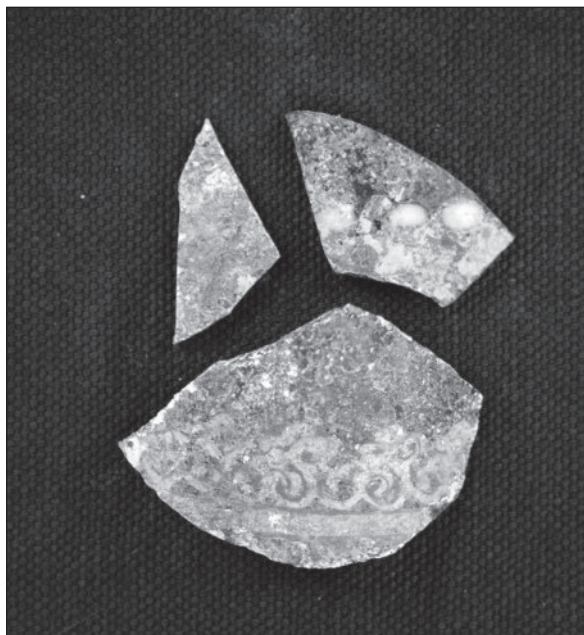
8. For more on the Middle Islamic bronze weights, not dis-

cussed here, see Holland 1986 and Goodwin 2012.

Field O, described above) justified a systematic study of this corpus, as part of the larger study of household material culture in the medieval village.

The glass was examined in March 2017 as part of a preliminary study. The bulk of the glass excavated in 2016 can be dated between the Byzantine (6<sup>th</sup> century) and Mamluk (namely 14<sup>th</sup> century) periods. Amongst the material examined are several fragments of tank furnaces, providing the first evidence at Tall Ḥisbān of glass production on the site. They are all quite small, and the glass attached to the remains of a brick is all of a pale green color and only slightly weathered. The color is more typical of Byzantine or late Roman glass; if it is all natron glass, this would suggest a date before the 9<sup>th</sup> century (Henderson 2013). If glass was worked on the site in the Byzantine period, perhaps these small fragments were discarded.

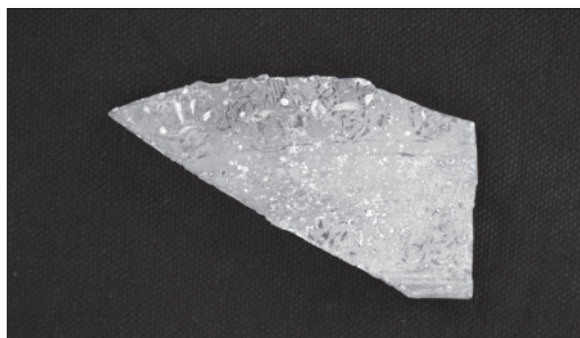
For an agricultural settlement, a surprising proportion of the glass examined is decorated; some would have a higher economic and social value than undecorated glass. It includes various fragments of marvered glass, trail decorated glass (often in contrasting colors) and unexpectedly high quality enameled and lustered glass in the form of beakers, bowls, and possibly lamps (Fig. 16). One fragment



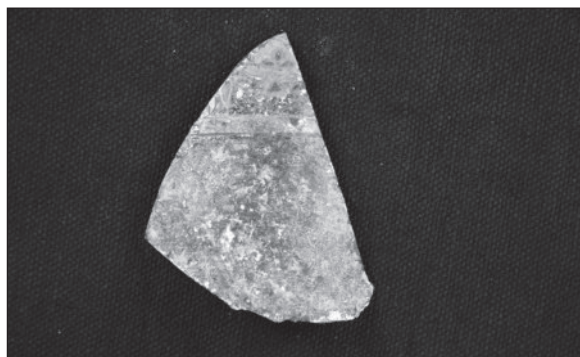
16. Misc. decorated glass fragments from 2014 and 2016 seasons.

of enameled glass is decorated with a row of human figures (Fig. 17). Another, notably, bears a heraldic design with fleur-de-lys blazon and Arabic inscription, normally associated with Mamluk military sites (Fig. 18). Enameled, lustered beakers and bowls were the product of specialist urban workshops of the 13<sup>th</sup> and 14<sup>th</sup> centuries (Atil 1981: 126-131). Their recovery from archaeological sites in Jordan is very rare (if documented at all; see Dussart 1998), but comparable beakers have been recovered from Mamluk contexts in Israel (Amitai-Preiss 2004:181, and Pl.11.2, No.19; Jackson-Tal and Tal 2013). Chemical analysis of the medieval glass fragments is planned (by Henderson) for the coming year at the University of Nottingham labs to determine provenance, although it is likely that the enameled and lustered vessels were imports from Damascus.

In addition to these, there are single examples of cut glass; the remains of a glass token (see numismatic report above); and a number of undecorated pale green or colorless bowl, bottle, and lamp fragments. Much of the glass, including decorated glass, has a thick layer of



17. Lustered and enameled glass bowl or lamp fragment from O14 storeroom, with registers of figural designs.



18. Lustered and enameled glass bowl or lamp fragment from O14 storeroom: with militarized design of fleur-de-lys blazon and Arabic inscription.

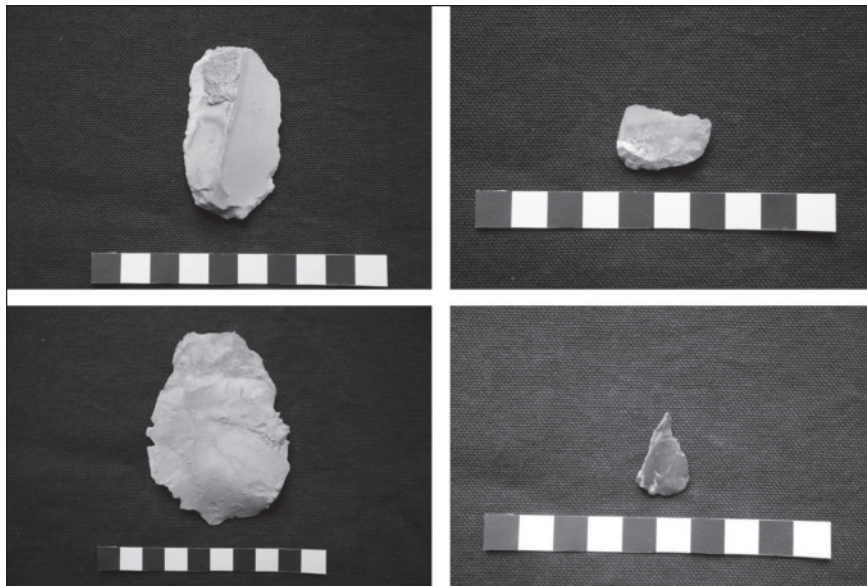
brown weathering, which is typical of plant ash glass, a type of glass which was introduced around the 9<sup>th</sup> century. This material, then, is likely to be Middle or Late Islamic in date. Such plant ash glass continued to be made until at least the 16<sup>th</sup> century in the Middle East.

*Lithics (preliminary remarks by Bethany Walker; Fig. 19)*

Equally surprising this season was the recovery of concentrations of worked flints (retouched flakes, scrapers, borers, and points) and debitage from the Middle Islamic-era middens and courtyards of the farmhouses of Field O, suggesting flint-knapping in the Mamluk period<sup>9</sup>. While there are no published parallels for this technology for the medieval Islamic periods in Jordan, there is in Africa, the Gulf, and Iraq for the same period and until

today<sup>10</sup>. The forthcoming final report on the British salvage excavations of Qara Dere and Eski Mosul in Iraq documents a simple chipped stone industry that was active in today's Iraq in the Early Islamic period, as well as the reuse of ancient flint tools to kindle fires (as “briquettes”)<sup>11</sup>.

While the study of the lithics has only begun, certain patterns are suggested. Wear patterns suggest that the tools were made in a haphazard fashion and perhaps used only once, for a domestic purpose. The cut marks on the animal bones recovered from the same contexts (analyzed by Dr. Chiara Corbino, see report below) were produced, unsurprisingly, by metal tools, though it is possible that flint scrapers, for example, were used to cut soft tissue, leaving no trace on the bones themselves<sup>12</sup>. In order to investigate whether worked stone tools were



19. Chipped stone fragments of flint (worked flakes, scraper, borer).

9. The readily available flint beds in this region of the Madaba Plains likely provided the raw material for these tools.

10. Explicit published references to flint-knapping at medieval Islamic sites are rare, though this might be more a reflection of neglect, rather than lack of material. Knapped obsidian and chert/flint have been recovered during excavations at the site of Harlaa (eastern Ethiopia) from 11th-14th C. AD contexts (personal communication of 24 May 2017, Prof. Timothy Insoll, University of Exeter, UK). For published references to chipped stone tools in Islamic contexts in Bahrain, see Insoll 2005: 333 and for Mesopotamia (modern Iraq), see Miller and Simpson (forthcoming). There is, as well, written documentation for flint-knapping among some groups in the central Sahara. Flint tools are used on occasion there even today (personal communication of 23 May 2017, Prof. Detlef Gronenborn, Römisch-Germanisches Zentralmuseum, Leibniz Research

Institute for Archaeology; University of Mainz, Germany), as well as in Iraq (flint-mapping documented by Warsaw University in the 1980s; Miller and Simpson, forthcoming).

11. We are very grateful to Dr. St John Simpson (Department of the Middle East, British Museum) for so generously providing access to the lithics chapter from the monograph's manuscript. Many Early Islamic historians and travelers also attest to this industry: al-Jahiz (d. 868/9, lived in Bosra), who described use of worked flints for briquettes, the Persian traveler Nasir-i Khusrawi, who writes of the flint markets of Basra in the 11th century (citing references in Miller and Simpson, forthcoming).

12. Chipped stone was also believed to provide a ritually pure cutting edge for knives and scrapers, appropriate for circumcisions, as well as khilāl butchery (references in Miller and Simpson, forthcoming).



used to process plants for cooking, we plan phytolith and starch analysis this coming year.

### Specialists' Reports – Environmental

In 2013 a coordinated sampling strategy was developed for zooarchaeological and archaeobotanical analysis, along with ongoing analysis of medieval Arabic texts, in order to systematically and carefully investigate changes in diet, land use, and environmental conditions at the site (both Citadel and village) over its history of occupation. The samples taken in 2016 come mostly from middens, surfaces, and hearths in the current fields of excavations (B, M, O, and P), as well as the remarkably well preserved Byzantine-Mamluk farmhouse in Field C, excavated at the base of the western slope in 2004 and 2007 (**Fig. 20**). The preliminary results of this analysis appear below.

### Zooarchaeological Report (by Chiara Corbino)

#### Introduction

In 2016-2017, faunal analyses on the material from Tall Ḥisbān focused on the animal remains from the village surrounding the citadel. These were recovered from different fields: C, M, O and B. The analyses also focused on selected periods, i.e. Byzantine, Early Islamic and Mamluk; such a diachronic approach aims to assess changes in human-animal interactions through time.

#### Materials and Methods

The archaeological investigations carried out in the village demonstrate long-term occupation of the site. Some areas (fields) were inhabited during more than one of the selected periods. In order to avoid problems related to contamination and redeposition of bones (Albarella 2016), a selection protocol for identifying the most suitable contexts was applied. Only faunal remains collected from



20. Doorway of Byzantine-Mamluk farmhouse in Field C.

loci which have been confidentially attributed to one of the chosen chronological periods (according to their physical location and/or for the unambiguous dating provided by the archaeological finds) have been included in this study. The accurate selection of well dated contexts aims to obtain reliable results for each period.

The animal remains analyzed here come from the loci listed in Table 1. Fields B and M showed some features that have been dated to the Byzantine period. A house was set in Square B8, while some walls were identified in M4. A few sealed Early Islamic contexts come from Field C. A midden related to the Early Islamic period was identified in Square C102. Faunal remains dated to the Mamluk period were recovered from contexts located in Fields C, M and O. These areas show remains of Mamluk structures probably associated with domestic activities. The animal bones from Field C were collected from Square 102. Probably, C102 was a kitchen during the Mamluk period. All the analyzed remains come from contexts related to the use of the kitchen itself. The animal remains collected from Field M come from Squares 1 and 8. Those from M1 belong to a midden located just outside the acropolis

**Table 1:** List of the Loci Selected for Zooarchaeological Analyses by Period and Square.

	List of selected loci by field/square						
	B8	M4	C102	M1	M8	O9	O10
Byzantine	34-35 and 38	23 and 27					
Early Islamic			19-21				
Mamluk			12-13 and 15	10-13	5-8	9-10	13



walls (next to the north-east corner tower). The pottery collected, together with the animal remains, indicates that this dump originated during the Middle Islamic period. M8 was a narrow vaulted chamber dated to the Mamluk period. Square 9 from Field O is probably the courtyard of a Mamluk house, while O10 is a barrel-vaulted Mamluk farmhouse.

The identification of faunal remains relied on atlases and comparisons with complete modern specimens of the LaBianca bone reference collection preserved in Madaba (Jordan), and with the skeletons of the mammal collection of the Koenig Museum in Bonn (Germany)<sup>13</sup>. The relative taxonomic and skeletal element frequencies were based on the NISP (Number of Identified Specimens). Long bone epiphyseal fusion (Reitz and Wing 1999) and tooth eruption and wear (Grant 1982) were used to assess the age at death of some species. Tooth ontogenetic ages were obtained adapting Grant's (1982) wear-scoring technique to Payne's (1973), following Greenfield and Arnod's (2008) schemes for sheep/goat.

**Table 2:** NISP Frequencies for the Byzantine Period.

<b>Byzantine period</b>	<b>B8</b>		<b>M4</b>
<b>Taxa</b>	<b>NISP</b>	<b>%NISP</b>	<b>NISP</b>
Pig/wild boar	4	24%	
Sheep/Goat	9	53%	
Chicken	1	6%	
Pigeon	1	6%	
Rodent	2	12%	
<b>TOTAL</b>	<b>17</b>		<b>0</b>

#### Results:

In total, 1962 bone and tooth fragments have been analyzed from the village. Only 22% of these, corresponding to 429 fragments, were identified to species level.

**Table 3:** NISP Frequencies for the Early Islamic Period.

<b>Early Islamic period</b>	<b>C102</b>	
<b>Taxa</b>	<b>NISP</b>	<b>NISP%</b>
Dromedary	1	2%
Cattle	5	8%
Sheep/Goat	41	69%
Chicken	9	15%
Parrotfish	3	5%
<b>TOTAL</b>	<b>59</b>	

**Tables 2, 3 and 4** show the NISP frequencies of the taxa for the considered periods. The majority of the identified remains are dated to the Mamluk period. The Byzantine (**Table 2**) and Early Islamic periods (**Table 3**) are represented by very small samples, which cannot provide statistically significant results. However, they do seem to suggest some possible trends in the exploitation of taxa through time.

Domestic species are the most abundant in all periods. Sheep/goats dominate both the Byzantine and the Early Islamic periods, although their presence increases through time. Remains of swine decrease while dromedary and cattle appear in the Early Islamic sample. However, their absence in the Byzantine period is likely to be related to the small sample size. Chickens were consumed at the site during both the Byzantine and the Early Islamic periods; although they probably began to play a major role only since the latter period.

NISP frequencies illustrate that the inhabitants of the village also relied principally on sheep/goat in the Mamluk period. Remains from this taxon have been collected from all fields. In general, it represents about 67% of the samples of each square. When it was possible to distinguish between the two species, goat occurred more frequently than sheep. This is probably due to the fact that goat is more adaptable than sheep to semi-arid environments. However, the sheep/goat proportion in the Ḥisbān assemblage appears in line with the general trend of the Mamluk period. Indeed, other Mamluk faunal assemblages located in Jordan show goat frequencies higher than those of sheep in terms of NISP (Brown 2016). Ontogenetic data about sheep/goat were provided only by the M1 sample. Adult individuals (one of 3 years and one 4-6 year old) dominate the sample, although a 2-5 month old animal indicates the consumption of meat from juvenile animals.

Low frequencies of pig/wild boar have been recorded from C102, M1 and O9. It is likely that a small Christian community was still living in the village during the Mamluk period. Indeed, Madaba, a well-known city in Jordan for the presence of a large Christian community,

13. We are grateful to Jan Descher (curator of the mammals section) and Eva Bärmann for granting access to the mammal

collection of the Koenig Museum in Bonn.

**Table 4:** NISP Frequencies for the Mamluk Period.

Mamluk period	C102		M1		M8		O9		O10	
Taxa	NISP	%NISP	NISP	%NISP	NISP	%NISP	NISP	%NISP	NISP	%NISP
Horse					2	5%				
Donkey					2	5%				
Pig/wild boar	4	4%	2	1%			1	17%		
Cattle	1	1%	8	3.5%	4	11%				
Sheep/Goat	60	67%	140	65%	26	68%	4	67%	2	100%
Sheep			2	1%						
Goat	1	1%	3	1%						
Gazelle	1	1%	2	1%						
Ibex	1	1%								
Ibex/Bezoar			1	0.5%						
Cat	1	1%								
Cape hare			2	1%						
Chicken	14	16%	51	23%	3	8%				
Chukar			1	0.5%						
Pigeon			1	0.5%						
Barn swallow					1	3%				
<i>Emberiza</i> sp.							1	17%		
Parrotfish	7	8%	1	0.5%						
Shell			1	0.5%						
Toad			1	0.5%						
Rat	1	16%	1	0.5%	4	11%				
<b>TOTAL</b>	<b>90</b>		<b>217</b>		<b>38</b>		<b>6</b>		<b>2</b>	

is located a few kilometers away from Ḥisbān. Chicken remains occur only in C102, M1 and M8. In particular, M1 shows the highest frequencies compared to the other samples of the same period (**Table 4**).

Wild species were quite rare in the village. The few remains of gazelle, ibex and hare indicate that, although hunting activities and game meat were probably a prerogative of the elite, the commoners living in the village also occasionally included this high-status meat in their diet. It is not possible to assess whether the carcasses of wild species were acquired as a luxury product, or whether the local peasants sporadically engaged in hunting activities (Brown 2016). Therefore, in this case, the scarce evidence available cannot be used to infer the consumption of high-status products in the village.

Chukar partridge and pigeon are the only wild birds identified, which probably played a minor role in the local diet. They only occur in the M1 sample, and were probably only occasionally consumed by the villagers. The presence of barn swallow and *Emberiza* sp. is

most likely not related to anthropic activities.

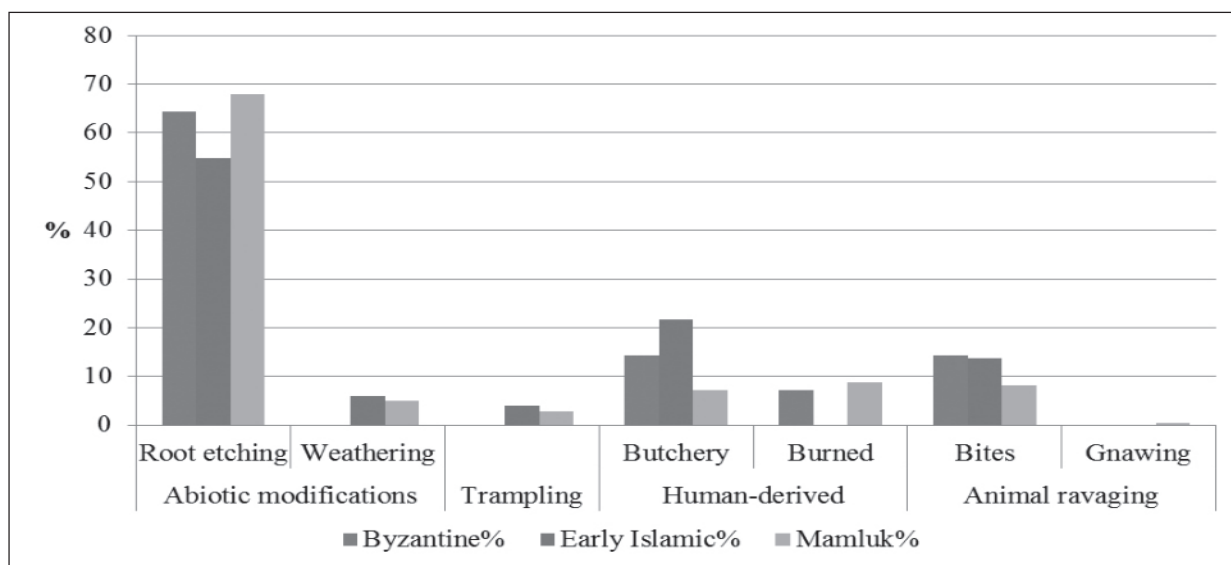
The few remains of parrotfish suggest economic links with the Red Sea region. Zooarchaeological evidence indicates that, in the Mamluk period, the presence of this taxon decreased drastically from the diet (Brown and Reilly 2016).

The presence of toad and rat remains is considered a natural occurrence. The archaeological data indicate that there was a leak in the water system nearby the M1 area in the Mamluk period (see discussion above in stratigraphic report on Field M). The presence of water would have certainly attracted toads.

The bones analyzed display a wide range of modifications, which include root etching, weathering (Behrensmeyer 1978), trampling, butchering marks, burning, bites and gnawing (**Table 5**). Overall, the material is very fragmented and heavily damaged by root etching and animal ravaging.

## Conclusions

The analysis of faunal remains recovered from the village of Ḥisbān disclosed some

**Table 5:** Relative Frequencies of Post-Mortem Modifications by Period.

general trends on animal exploitation from the Byzantine era to the Mamluk period. A considerable decrease in the occurrence of pig/wild boar remains was recorded through time. This seems to correspond with an increase in sheep/goat and chicken frequencies. The introduction of Islamic dietary rules affected in part the meat diet of the inhabitants of the village at Tall Ḥisbān. Changes in the consumption of some animal species reflect religious and socio-cultural needs that are well represented in the faunal remains recorded at the site.

Furthermore, some suggestions about the use of space in the Mamluk village could also be inferred. Interesting results were obtained from the M1 sample for the Mamluk period. A higher variety of wild species and a higher chicken frequency, compared to the samples from other contexts of the same period located in the village, likely indicate that the midden located in M1 contained also waste from the citadel.

This study aims to reconstruct differences in the villagers' diet through time. Future research will focus on investigating the connections between the elite set in the citadel and the local population at Tall Ḥisbān.

### Phytolith Report (by Sofia Laparidou)

#### Introduction to the Datasets

This preliminary dataset consists of eight samples that have been processed, counted, and

analyzed for phytoliths. The samples derived from Square B10, as it was excavated during the 2014 season. Sample B10.52.71 comes from an ashy area immediately adjacent to the underglazed-painted jars excavated from Mamluk Pit #3 in Square B10. Sample B10.53.73 is soil taken south of Pit #3, deposited through the process of deposition of garbage/kitchen refuse. The pottery in this context is mixed, but the latest sherds are Mamluk, dating the period of deposition. Sample B10.48.67 represents the contents of Pit #3. While pottery is also mixed in this context, it is heavily Late Byzantine and Mamluk. The Late Byzantine sherds represent the soil layers before the pit cut through the Late Byzantine wall (B8.8), and the dominant Mamluk sherds represent the most recent period of deposition. Sample B10.49.69 was the ashy soil at the top of Pit #3. Although the pottery is mixed, as was the case in Pit #3, the Mamluk pottery was the latest and most dominant. The deposit is likely late 14<sup>th</sup> century, dated by the underglazed-painted jars found in the pit. Sample B10.52.71 was the fill from the middle of Pit #3. Although its pottery was also mixed, most of the sherds were Mamluk as well.

For every sample, a minimum of 200 single-cell and 100 multi-cell phytoliths were identified, under a light transmitted microscope, at x50 magnification. These samples are representative of all contexts from the fill layers from Pit #3, but additional samples have yet

**Table 6:** Sample Numbers and Context.

Sample Number	Date	Context
B10_l49_p69	14 <sup>th</sup> century	Ashy context, top of Pit #3
B10_l49_p69	14 <sup>th</sup> century	Next to ashy context, top of Pit #3
B10_l48_p67	Late Byz-Mamluk	Content of Pit #3
B10_l52_p71	Late 14 <sup>th</sup> century	Fill from the middle of Pit #3
B10_l52_p71	Late 14 <sup>th</sup> century	Fill from the middle of Pit #3
B10_l53_p73	Mamluk	Soil take south of Pit #3
B10_l48_p67	Late Byz-Mamluk	Fill from Jar1, found in Pit #3
B10_l48_p67	Late Byz-Mamluk	Fill from Jar2, found in Pit #3

to be processed for a complete analysis of the Pit #3 phytoliths. As an assemblage, they could give a general reflection of the plant content of the different layers of this pit and the state of preservation of phytoliths within their contexts. However, these initial processed samples do not as yet provide a definitive interpretation of the use of Pit #3. A complete picture for direct interpretation of the results for each context will be given after more samples are processed and analyzed from the same contexts. This analysis is a preliminary result, which gives an initial reflection of the spatial trends and an initial working hypothesis.

### Identification and Quantification

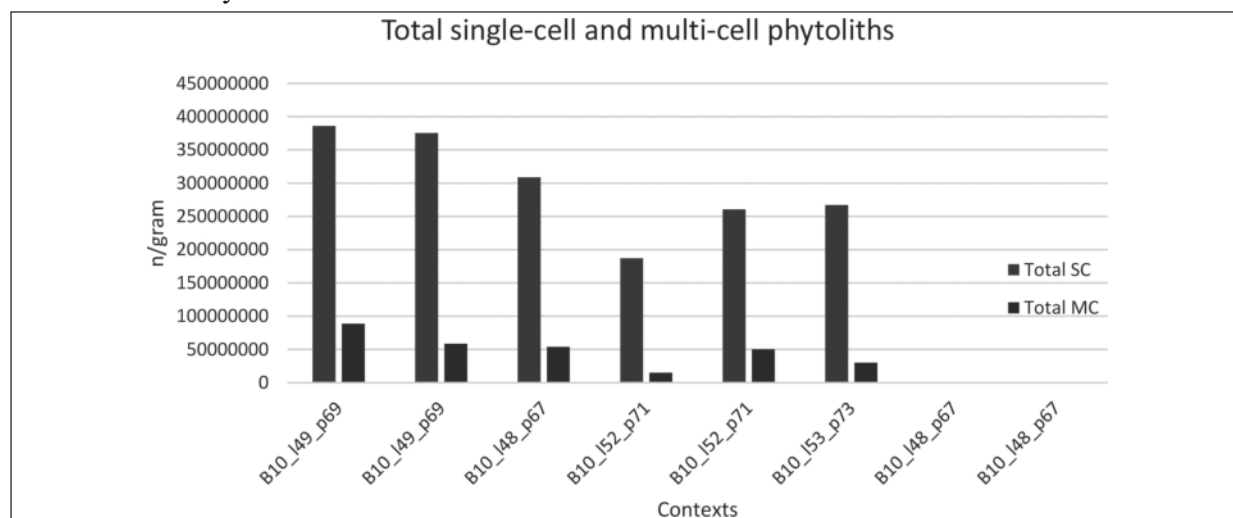
Identification was attempted at plant family and subfamily levels for single-cell and multi-cell phytoliths, while identification down to genus was made for multi-cell phytoliths of wheat and barley, when possible, based on specific morphological criteria of cereal husk

multi-cell phytoliths (Rosen, 1992). More work needs to be done for the identification of multi-cell phytoliths present in the samples, and many multi-cells await confirmation. Absolute counts of phytoliths per gram of sediment were used to make possible comparisons between samples.

### Preliminary Results

#### *Preservation and Total Morphotypes*

For graphic representation of data, the number of phytoliths per gram of sediment was used (n/per gram). The total counts of single-cell and multi-cell phytoliths in every sample are presented in **Table 7**. All samples included phytoliths common to most grasses, such as hairs, leaf/stem long cells, rondels or bilobes. Grasses, sedges and palms were the monocotyledonous plants present in the samples, while all samples were rich in dicotyledonous plant phytoliths as well (**Tables 14 and 15**). However, grasses were abundant, as well as Cyperaceae plants (**Tables 8 and 9**).

**Table 7:** Total Phytoliths Per Gram of Sediment.



In total, phytoliths were well preserved in most of the samples analyzed, and only the samples derived from the interior fill of the jars found in Pit #3 were low in phytolith counts. Pits are regarded as refuse areas and/or storage areas, thus a high recovery of phytoliths was expected for Pit #3 and confirmed after the analysis of the phytolith samples. Phytolith densities were lower in the samples from the fill in the jars. Regarding the latter, the fill may not have been an in-situ deposition, thus representing primary refuse.

Sample B10.49.69, which derived from an ashy deposit, was more likely a primary direct deposition of the plants in use at that time. Sample B10.53.73 is more likely to represent secondary refuse, as the pottery in this context was mixed, dating from the Byzantine to the Mamluk period. Samples B10.48.67 and B10.52.71 were likely a primary deposition of the plants used at that time. Sample B10.52.71, which derived from the earth directly below the pottery sherds, represents, likewise, a primary deposition.

#### Grass Subfamilies: Single-Cell Phytoliths

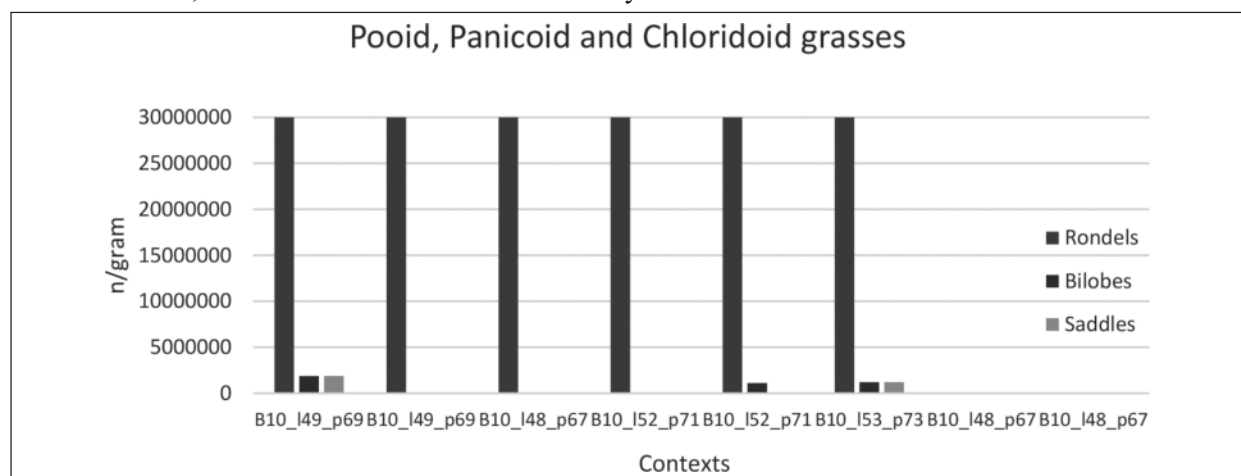
Different morphotypes of phytoliths are formed in the three different Poaceae sub-families (Pooideae, Panicoideae and Chloridoideae). In general, Pooideae grasses, which are C<sub>3</sub> plants, are indicative of cooler, more arid conditions and produce rondel-shaped short cells; they could be indicative of temperate plants like wheat and barley. However, rondel-shaped short cells could be produced by Panicoid grasses also. Panicoid grasses grow in warm, wet, humid

environments and produce bilobes and cross-shaped phytoliths. In addition, some Panicoideae live in cooler, drier habitats. Chloridoideae, which indicate dry land grasses and warm, dry habitats, create saddle-shaped short cells (Twiss, *et al.*, 1969, Twiss, 1992, Piperno, 2006). However, *Phragmites*, which is a reed grass that grows in marshy areas, also produces saddles.

The graph below documents that the dominant morphotype in all samples of this primary analysis was the rondel-shaped phytolith, indicating the predominance of Pooideae grasses in all contexts. In general, this data suggests cool temperatures and humid conditions (Twiss, 1992; see **Table 8**). However, agricultural crops could have influenced the results. Wheat and barley, according to phytolith evidence, were important cultivated crops in Tall ʿĤisbān (Laparidou and Rosen 2015) during the periods of study. Thus, the presence of cereal inside Pit #3 could have influenced the number of rondels present in the samples. This is confirmed by the presence of multi-cell silica skeletons of either wheat or barley in some of the samples from Pit #3 (see below).

At the same time, the presence of Cyperaceae plants is ubiquitous in the samples, suggesting that the environment never became extremely arid (**Table 9**). In general, the presence of sedges could indicate indirectly the choice of wheat and barley cultivation, favored by wetter conditions. A more complete picture of the wheat and barley content of the Pit will be presented in the future, after the analysis of the remaining samples has been completed.

**Table 8:** Pooideae, Panicoid and Chloridoideae Grass Phytoliths.

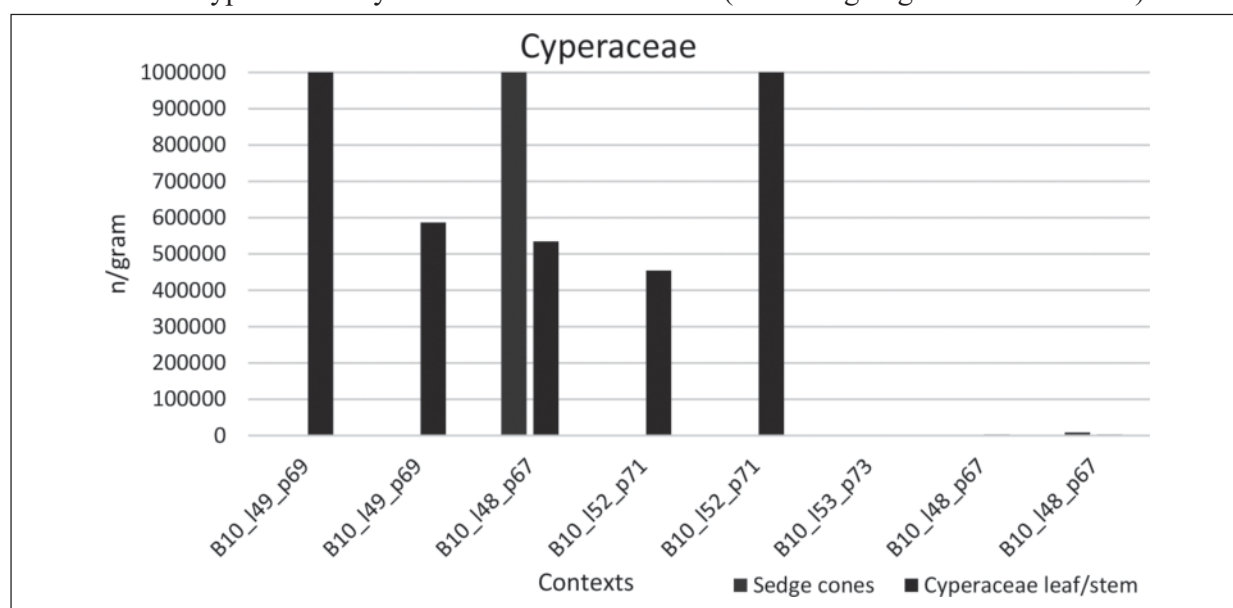


Cyperaceae phytoliths were present in six out of the eight samples analyzed. The sample derived from the ashy context at the top of the fill of Pit #3 had the highest quantities of Cyperaceae phytoliths, possibly indicating that sedges were used for fuel. Cyperaceae are forage plants, and their presence in the ashy sample could indicate the presence of dung, also. This sample had also saddle-shaped phytoliths that form in Chloridoid grasses and further suggests that dung was used for fuel. However, sedge phytoliths were present in all layers of the Pit #3.

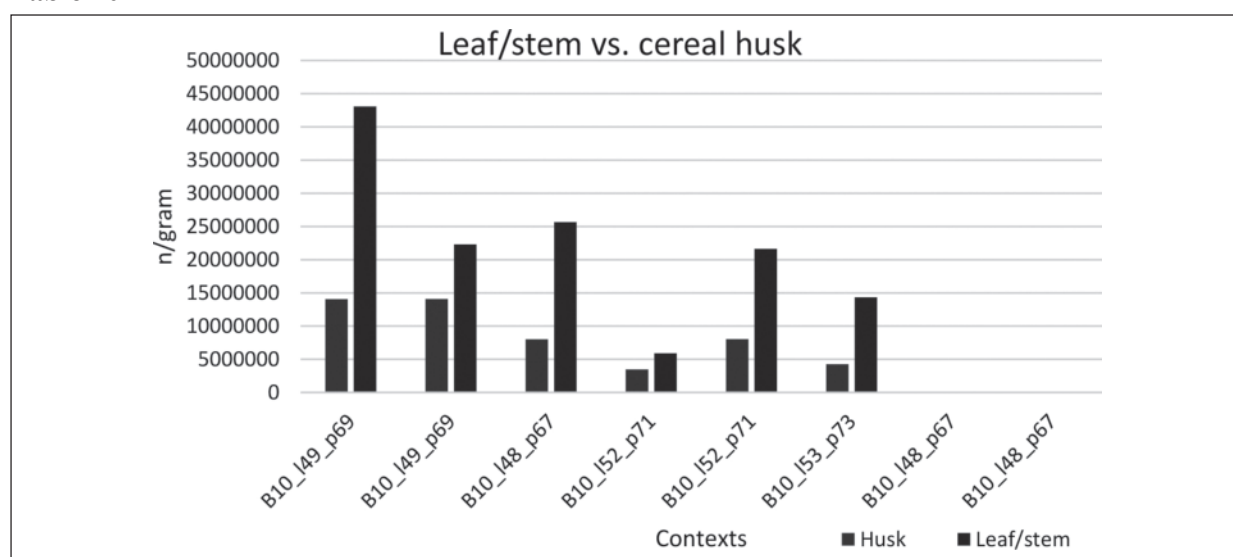
#### *Leaf/Stem Vs. Husk*

Based on these primary results, there is no major divergence between the presence of the leaf/stem and husk phytoliths across contexts, in order to draw clear conclusions of crop processing activities (see **Table 10**). Cereal husk phytoliths were present in all contexts. Cereal husk phytoliths were present in higher densities in the samples derived from the top fill of Pit #3 (ashy contexts). Cereal husks were present in the fill from the two jars excavated from Pit #3, but the data is probably not related to the content of the jars.

**Table 9:** Total Cyperaceae Phytoliths Per Gram Sediment (Excluding High Value of H-00-1).



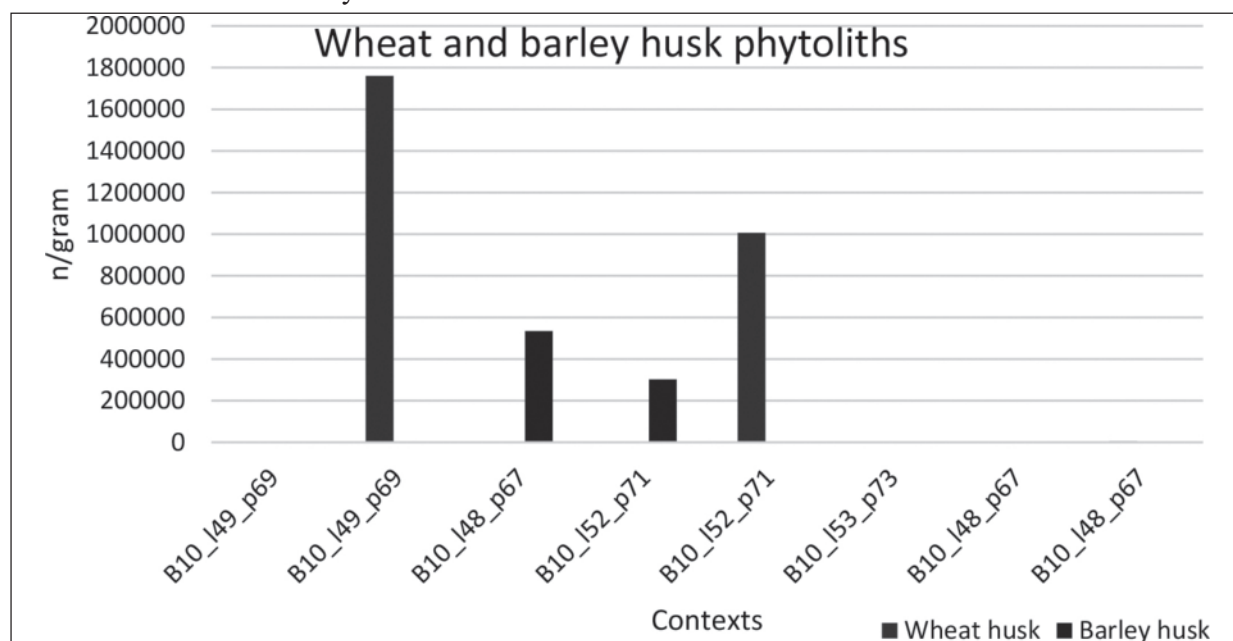
**Table 10:** Total Multi-Cells Leaf/Stem Vs. Total Cereal Husk Multi-Cells.



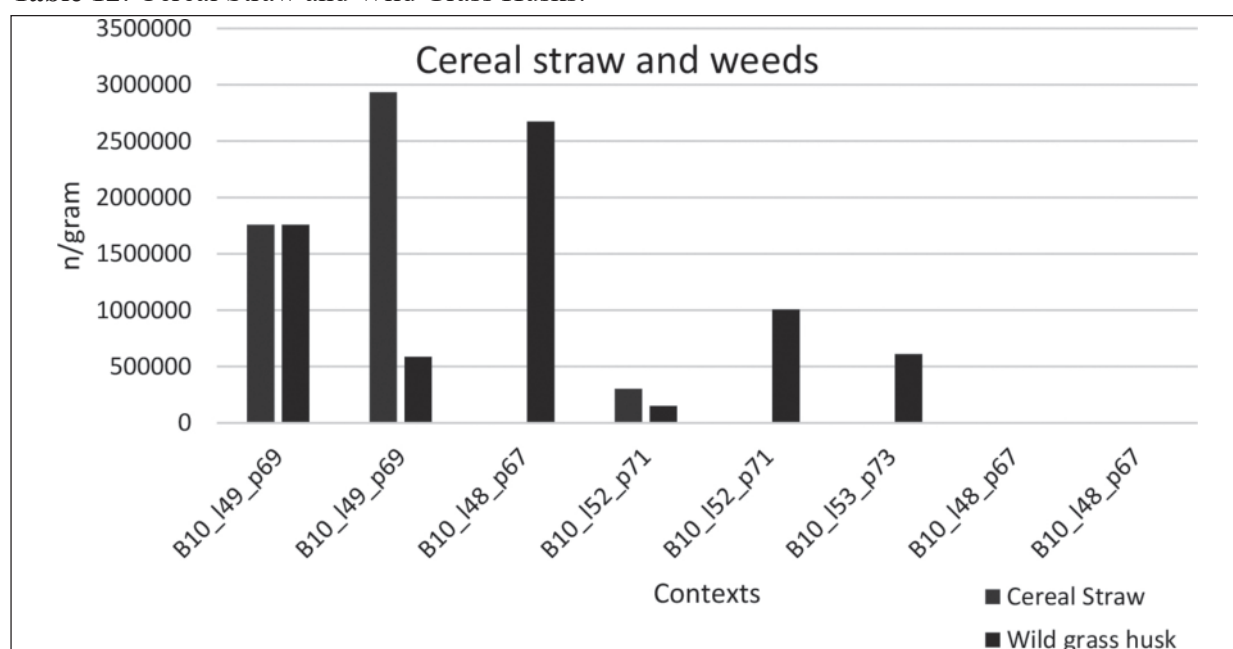
Very low densities of cereal straw were recorded, as expected, in the samples derived from the jars, while its presence in the ashy context from the top of Pit #3 is noteworthy. Cereal straw was probably used for fuel, or it represents, alternatively, the remains of animal dung burnt as fuel (**Table 12**). Wood/bark phytoliths were present in the ashy context at the top of Pit #3 (**Tables 14 and 15**).

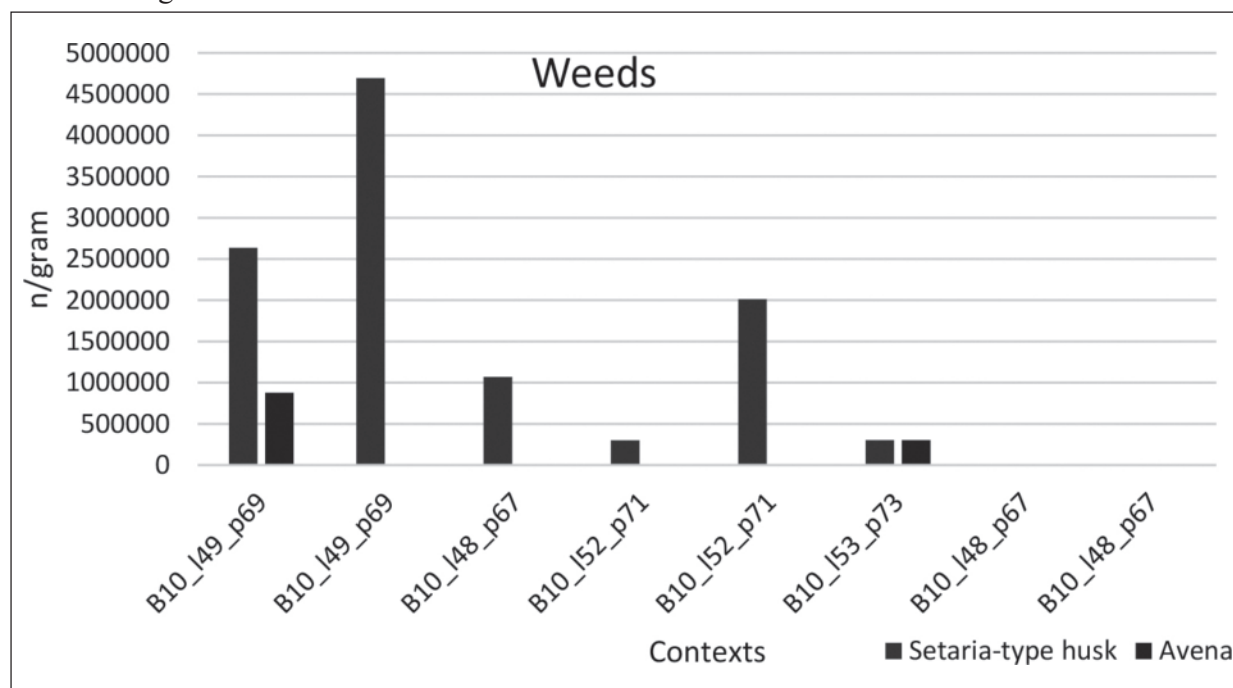
Wild taxa identifications can indicate crop husbandry practices and different crop processing stages (Bogaard, *et al* 2005, Hillman, 1981, Jones, 1992). The identification of the multi cell phytoliths of wild taxa present in the samples will take place at a later stage of analysis. However, it is interesting that high densities of *Setaria*-type husk phytoliths, as well as *cf. Avena* husk phytoliths, were present in the top ashy context.

**Table 11:** Wheat and Barley Husk Multi-Cells.



**Table 12:** Cereal Straw and Wild Grass Husks.



**Table 13:** Agricultural Weeds.

### Final Comments

The phytolith data thus analyzed from various contexts at Tall Ḥisbān suggests that wheat and barley production during the medieval Islamic periods at Ḥisbān peaked under the Mamluks. Samples derived from contexts inside the Citadel at Tall Ḥisbān, such as the Citadel's storeroom floor, suggested that grain (wheat and barley) was irrigated in the 14th century (Laparidou and Rosen 2015). Phytolith data derived from the farmsteads around the Citadel at Tall Ḥisbān, such as in Squares M8 and O9, showed evidence of irrigated wheat and barley, as well as evidence of primary crop-processing by-products, such as straw, weeds, and husks. Their recovery from hearths and middens could be traces of fodder or dung. Palm single cell phytoliths were also present in samples derived from the farmsteads at Tall Ḥisbān, possibly reflecting the importance of dates (*Phoenix dactylifera*) for consumption. Overall, phytolith data from the farmsteads at Tall Ḥisbān showed that peasants adopted a mixed agro-pastoral economy at the village-level (Laparidou and Rosen 2015).

The data from Ḥisbān shows that the environment of the site is dominated by Pooid grasses and that these grasses suggest moderate environmental conditions. However, the single cell phytoliths of Pooid grasses (rondels) could

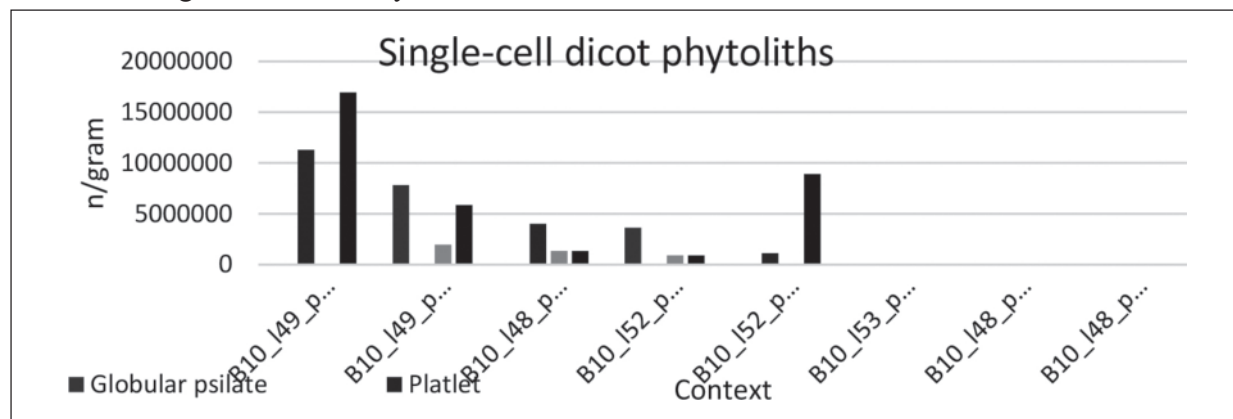
be indirectly reflecting the use and presence of wheat and barley, the two main agricultural crops in use during all periods under study. The presence of the Cyperaceae plants suggests that the environment was not extremely arid and that wet conditions and marshy micro-environments could be close to the site. The low counts of Chloridoid grasses in the samples should not allow inferences for dry land areas around the sites.

### Pit #3, Square B10, Tall Ḥisbān

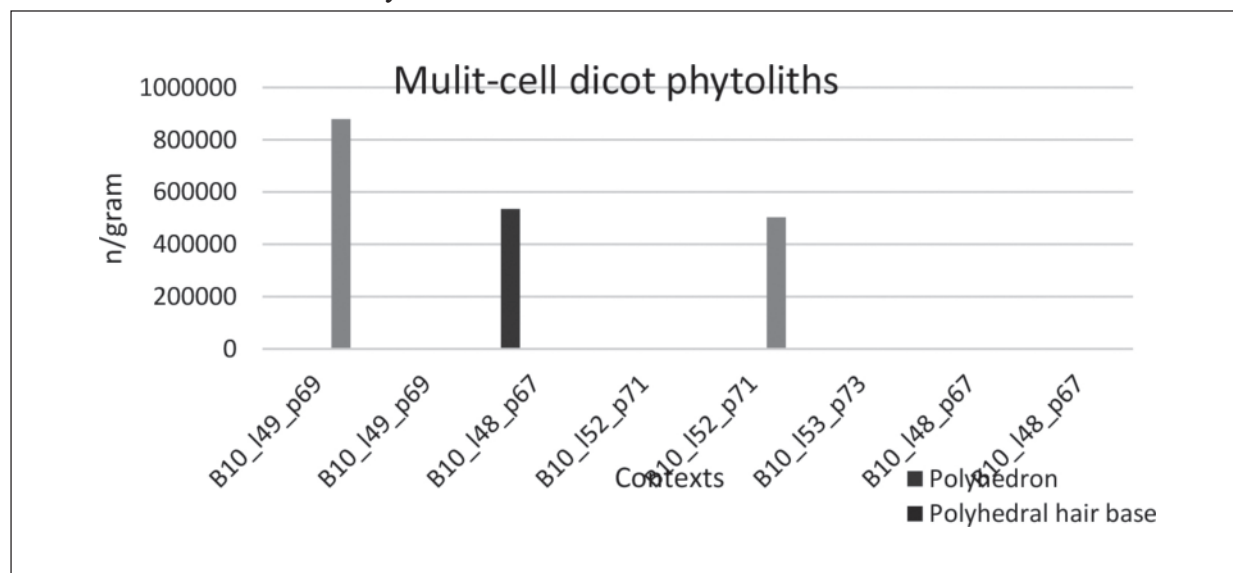
The results so far suggest that phytolith analysis and phytolith assemblage should provide a good picture of the content of Pit #3 at Tall Ḥisbān, Square B10. However, analysis of the remaining samples is needed in order to give a complete result. Pit #3 contained wheat and barley husks in several contexts, but to what degree this indicates room function will require further excavation and sampling. Palm single cell phytoliths were present in the two samples derived from the top fill of the pit, one from the ashy contexts and the other from the area around the ashy context. It is possible that at least wheat and barley were being deposited, processed, and/or thrown in this area (if not dates too). These are the two main crops represented by husk phytoliths.



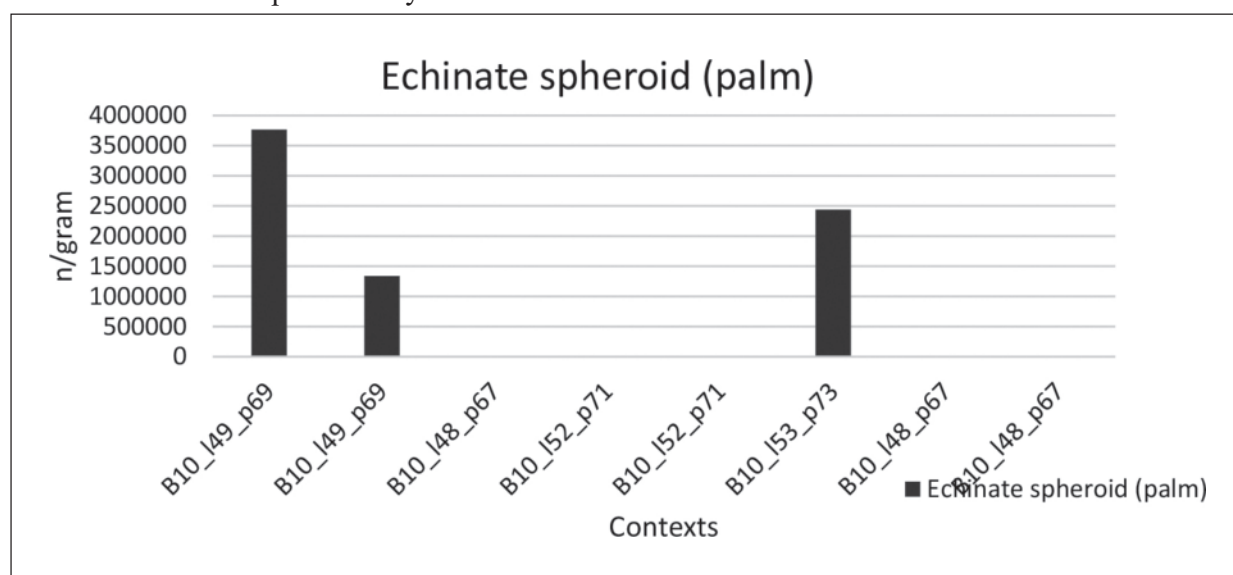
**Table 14:** Single-Cell Dicot Phytoliths.



**Table 15:** Multi-Cell Dicot Phytoliths.



**Table 16:** Echinete Spheroid Phytoliths from Palm.



## Macrobotanical Report

(by Annette Hansen)<sup>14</sup>

The following represents the preliminary results of the macro-archaeobotanical remains collected during the 2013, 2014 and 2016 field seasons at Tall Ḥisbān, as well as an overview of the contexts from which the samples originate. The remains recovered include seeds/fruits, cereal processing by-products (straw, rachis, glumes, palea/lemma), archaeological dung and wood charcoal, and reflect food preparation and consumption, crop processing, fuel use, and use of economic plants in architecture and construction of secondary products (e.g. ceramics) within their respective contexts. Samples taken for macrobotanical material originated from sealed contexts, including beaten earth surfaces, plaster surfaces, pits (including hearths), middens, and sediment within ceramic vessels.

The occupation layers sampled in this phase of the project have been relatively dated based on ceramic evidence from the early to the late Medieval periods (Byzantine-Early Islamic to Ottoman or late 5<sup>th</sup> to 16<sup>th</sup> centuries AD), though many samples originated from Mamluk contexts (13<sup>th</sup> to 15<sup>th</sup> centuries AD). Domestic contexts from both the village (Fields B, C, M, O, P) and Citadel (Field L), with varying degrees of activity and perhaps differing functions, have been sampled and compared.

While a total of 68 flotation samples were recovered during these three field seasons (**Table 17**), a number of hand-picked samples, mainly of wood charcoal that were taken in previous seasons, (1997, 2001, and 2004) were also evaluated, and selected for further analyses of wood taxa as a part of the study of the fuel economy of the site. These samples differ from the samples taken from seasons 2013, 2014 and 2016, as they were not systematically sampled (nor measured) from contexts around

the site, and therefore were quite low density and contained few quantifiable botanicals. However, the samples that did contain seeds/fruits in addition to wood charcoal mainly reflected the settlement noise of the most common cultivated cereals at Tall Ḥisbān, being hard wheat and hulled barley. A list of the economic and wild plant taxa encountered in the macrobotanical samples thus far encountered has been presented in **Table 4**.

## General Observations of Human and Animal Diet, Fuel, and Local Environment at Tall Ḥisbān through Archaeobotanical Evidence.

This study builds upon earlier archaeobotanical, vegetation survey, and ethnobotanical work which has been conducted at Tall Ḥisbān, with up to date methodologies identification and quantification allowing the more precise identification of plant remains in some cases (*cf.* cereals) down to the sub-species taxonomic level<sup>15</sup>. In regard to the consumption of plant foods at the site, there is no observable difference between the type of plant foodstuffs consumed by the inhabitants of the Citadel and in the village so far.

The botanicals from the village contexts, however, were very rich and diverse. The combination of foodstuffs reflects a diet that has been rooted in this region since the Neolithic, and is consistent with observations for other medieval agricultural villages in Bilād as-Shām. They could access a variety of foodstuffs, and forage in times of both plenty and scarcity, as the crops cultivated were primarily drought resistant and could produce sufficient yields in drier climates. The basis of the diet was cereals and pulses, supplemented by a diverse repertoire of fruits, nuts, and (likely) vegetables, and as evidenced by zoological and residue analyses, meat and dairy products and olive oil (for residue analysis, see

**Table 17:** Number of Flotation Samples Excavated Per Field Season.

Field Season	2013	2014	2016
No. Samples	23	25	20

14. For further discussion of preliminary results on macrobotanical remains for samples relatively dated to the Mamluk period, see the discussion in Walker *et al.* 2017b. The full report of all macrobotanical remains from Tall Ḥisbān appears in A.M. Hansen's PhD dissertation (University of Groningen), entitled

"The agricultural economy of Islamic Jordan, from the Arab conquest until the early Ottoman period".

15. (Crawford and LaBianca 1976 and Crawford, LaBianca, and Stewart 1976)

Walker this report). Certain foodstuffs, such as vegetables (e.g. spinach) and certain fruits (e.g. date, watermelon), will be underrepresented in the archaeobotanical record for a number of reasons related to deposition, preservation and post-depositional processes. The diet of the kept animals at the site would have consisted of cereal processing by-products (straw, rachis, glumes), as well as a combination of cereals (e.g. barley), pulses (e.g. bitter vetch), and wild taxa (e.g. alfalfa). These signals may be gleaned in archaeobotanical samples in general through remains of dung in cooking contexts or from surfaces where there is evidence where animals were kept (Walker *et al.* 2017). Dung would have been a common fuel source for cooking and firing ceramics, along with cereal chaff and wood (Hansen *et al.* 2017).

Wild plant taxa found in the archaeobotanical samples reflect a semi-arid to temperate climate, much like that of today in southern Bilād as-Shām. Many of these taxa grow commonly on or along the borders of arable fields and therefore have remains present in the archaeobotanical samples (see **Table 20** and Walker *et al.* 2017).

Certain regional foodways, such as cooking and baking practices with clay ovens (*tāwabīn*), can also be gleaned from written and ethnographic sources, and reflected in the botanical data, both in the form of macrobotanical remains and in the impressions of macrobotanicals on the fragments of those ovens (Hansen *et al.* 2017). The plant impressions from clay oven fragments (i.e. *ṭābūn*) found in 20 different contexts collected during the 2014 and 2016 field seasons from Fields M and O were analyzed. These impressions not only reconstruct the production processes of these bread ovens, but also the different kinds of dung cakes used during cooking activities (*ibid.*).

### Context Descriptions

While there were few samples from the Citadel (Square L1 and 2), the bulk of the macrobotanical samples originate from the ‘village’ or respective houses and domestic spaces located in different areas along the outside of the Tall. While Field C102 was a re-occupied Byzantine farmhouse and Field

P was an Ottoman re-occupation of an earlier house, Fields B, M, and O are mainly Mamluk domestic spaces built over earlier buildings. In the case of Fields O and P, there is a more clear demarcation between the space within the house and the courtyard outside the house<sup>16</sup>. Therefore, the descriptions below will focus on Fields B (8 and 10), C102, and P (102 and 104).

### Field B

The occupation of Field B is interesting, as it is a domestic space a fair distance from the other houses built at the base (Field P) or along the sides of the Tall (Fields O and M), and its function has been difficult to discern. This space is likely to be a Byzantine period house that was later re-occupied in different phases during the medieval period. Excavations in 2013 (B8) and 2014 (renamed B10) were focussed on understanding the late to early medieval occupation of the square, which seems to be a ‘squatter’s’ space of an earlier house in its latest phase, where trash was deposited. After the space was abandoned, the vaulting and walls collapsed and covered the square. The relatively low density of botanicals found within many of the contexts within this square would seem consistent with less ‘intensive’ use of the field as a permanent domestic space in the latter phases of occupation.

The late medieval house was constructed with Byzantine spolia (likely from the Citadel on site). The botanicals recovered from this square reflect both food consumption and fuel use during different phases of occupation. For instance, in one phase, Locus 49 Pail 69, there was a concentration of burnt material; this was originally labelled as a ‘hearth’ during a field reading and samples were taken from above, around, inside, and below this context for a full profile of the area. Since there were relatively few botanicals, this could point to the use of the area for shorter-term cooking / burning on or nearby the space, rather than a proper hearth. It contained a few highly burned *Triticeae* grain kernels (domesticated cereals). However, because of the relatively low diversity of foodstuff from this context, this was not

16. Detailed context descriptions of Fields L, M, and O and their respective macrobotanical sampling strategies are documented

in the macrobotanical section of Walker *et al.* 2017b.

determined to be an established cooking area within the domestic space, and may indicate a small collection of burnt material from earlier cooking events.

There were some curious contexts within this space, including a fairly large pit located in the south-western corner of the square (B8), which was originally uncovered during the 2013 field season and completely excavated in the 2016 field season. This pit was situated underneath plaster surface B8.31, and just below the pit, another plaster surface was exposed and excavated (B10.67.90). The pit was extensive and was excavated in several loci, which are listed below (**Table 18**). Phytolith samples were taken from each level of the soil samples taken.

Another pit was also found on the western side of Square B8/10, north of Wall 56 (B10.56). In one of the lower layers of this pit (Locus 45 Pail 67), a small jar was recovered, which contained soil. The soil from this jar (250 ml) was sampled for macro- and microbotanical materials. While the macrobotanical remains from this sample reflected settlement noise, as a result of fill within the jar after it fell out of use, the residue analysis from the bottom provided additional insight into its use for cooking a milk product, which could be likened to a type of thick butter attested in ethnographic evidence as *samneh* (for further description, see the ceramic section in this report). The soil near this jar was also sampled, and yielded a few botanicals of the most common cereal crops and wild grasses at the site. Overall, the botanicals found within this pit seem to reflect the discard of food waste over time, and seems most like a midden context.

Based on the discovery of this small jar and two underglazed-painted jars (Loci B10.50.70 and B10.50 71), it has been suggested by Walker that this space could have been used as a storage area. Soil samples were also taken from the jars for macro- and microbotanical remains. The macrobotanical remains, similar to the small jar, reflected a signal of settlement noise as a result of fill after the contents of the jar had been emptied and the jars fallen out of use. The jars, found on their sides, even became residence to some small animals (see Corbino in this report). Once again, the residue analysis points to their use in the storage of olive oil as part of their original use (see ceramic report above).

### Field C

Square C102 was excavated in prior field seasons 2004 and 2007. It is the north-western half of a domestic space, originally a Byzantine farmhouse, which was reoccupied several times, and part of a larger cluster of houses (**Fig. 21**)<sup>17</sup>. In the latter season, several surfaces were excavated down to a tumble layer (Locus 30), while the SW corner, with a complete section of the surfaces, was left in place. In exposing this corner, all of the surfaces were well articulated and all were built above an ashy layer. The concentration of ashy material in this corner is believed to be a potential cooking context. Therefore, excavation of this corner was re-opened by Annette Hansen in 2016, in order to explore this area. One fill layer was excavated (Locus 19c), followed by the packed burnt earth surface directly below it (Locus 25), followed by a plaster floor (Locus 26); for a profile of loci and their dimensions, (**Fig. 22**). The remaining loci will be excavated in the following excavation season.

**Table 18:** Stratigraphy of the Large Pit in the South-Western Corner of B8.

Square	Locus	Pail	Soil Volume
B8	32	58	5
B8	33	57	4
B8	34	60	9
B8	35	59	5
B8	41	63	4
B8	45	67	2.5
B8	34	88	41
B8	34	88 Bottom 3 cm of pit	Included in above sample

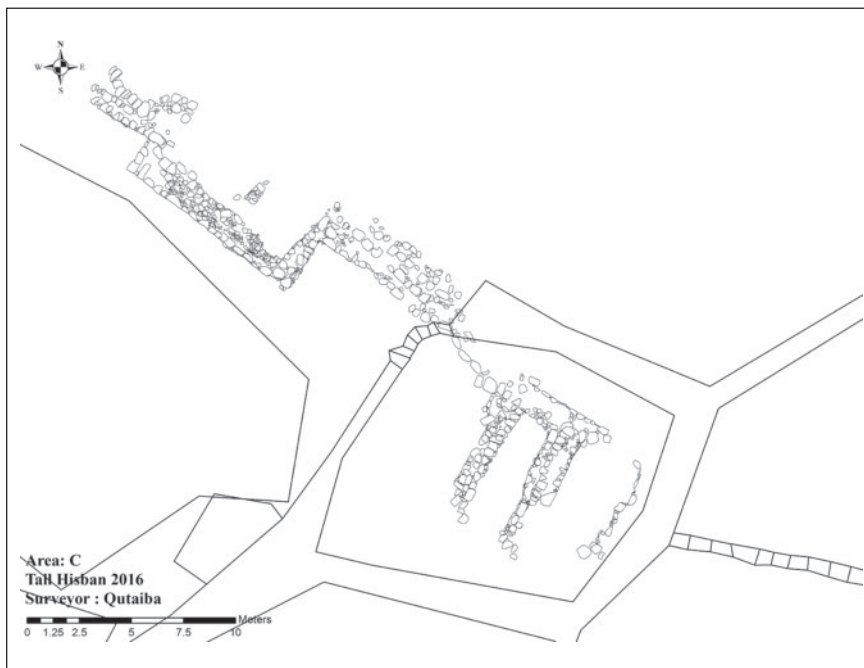
17. After this, structures on the east end of the cluster, located

upslope, were excavated in 1976 (Parker 1973).



**Table 19:** Profile of Loci for Surfaces and Potential Cooking Area in Square C102.

Square	Given Locus/ Matched Locus 2007	Given Pail/ Matched Pail 2007	Context	Loci Dimensions (cm)
C102	Cleaning/19c	1/47-50	Fill	49 x 39 x 33
C102	1/25	2/45-46	Plaster – ‘Burnt/Red-Brown compact layer’; locus sheet defines it as ‘fill plaster’	49 x 39 x 33
C102	2/26	3/51-53	Plaster floor	15 x 36 x 35
C102	3/27	4/54	Fill/Earth Surface/	10 x 35 x 20
C102	4/28+29	5/55-57	Ashy layer	3 x 40 x 5
C102	5/30	6/58	Tumble and fill below ashy layer	Not applicable



21. Plan of Field C farmhouse cluster (courtesy Qutaiba Dasouqi).

### Field P

Two squares (P102 and P104) were reopened during the 2016 field season, in order



22. Detail of cooking area inside Field C farmhouse, sampling for archaeobotanical analysis.

to explore the late to early medieval occupation layers within the house. P104, an area outside the house, did not yet reach contexts ideal for systematic sampling. P102 is the area within the house. This space is clearly demarcated by walls and a threshold, and is situated directly north of what appears to be the house's outside courtyard. This outside courtyard may have been an ideal location for keeping the resident family's beasts of burden; this will be an interesting focus for investigation in future seasons. Early Islamic occupation layers were reached, based on the pottery reading of the plaster floor in the Northeast half of the square (Locus 105.100a); a seed was selected from this context for radiocarbon dating. Two charcoal samples were taken from this square (Locus

110) and five soil samples were taken from this context. One sample originated from a burnt concentration found within an earth surface (Locus 109 Pail 102). One earth surface (Locus 111.107) in the northwest corner of the trench, runs towards the east part of the trench for about 2 meters, with a width of about 43cm. Two 'breaks' in the plaster surface (Locus 105) were

sampled separately (Locus 113.117 and Locus 114.116 respectively). Prior to the end of the season, a small beaten earth surface with a clay-like consistency was sampled. Macrobotanical remains from this field reflected signals of consumption of a variety of cereals, fruits and pulses, as well as signals of fuel from cereal processing by-products and likely dung.

Table 20

Economic Plants		
Scientific Name	Common Name	Archaeobotanical Evidence: Plant Part
<i>Hordeum vulgare</i> (hulled)	Hulled barley	Florets, rachis internodes/fragments
<i>Hordeum vulgare</i> cf. ssp. <i>distichum</i> (hulled)	2-row Hulled barley	Florets, rachis internodes/fragments
<i>Triticum turgidum</i> ssp. <i>durum</i>	Durum/Hard wheat	Grain kernels, rachis internodes/fragments
<i>Triticum turgidum</i> ssp. <i>dicoccon</i>	Emmer wheat	Grain kernels, glume base
<i>Triticum aestivum</i> ssp. <i>aestivum</i>	Bread wheat	Grain kernels, rachis internodes/fragments
<i>Triticum turgidum</i> ssp. <i>durum</i> / <i>Triticum aestivum</i> ssp. <i>aestivum</i>	Hard/Bread wheat	Chaff (Palea/Lemma), Rachis internodes/fragments
<i>Triticeae</i>	Tribe within Poaceae (Grass Family), containing many domesticated cereals, including wheats and barleys	Indeterminate grain kernels, culm nodes and bases / straw
<i>Pisum sativum</i>	Common pea	Seed
<i>Vicia faba</i>	Faba bean	Seed
<i>Vicia ervillia</i>	Bitter vetch	Seed
<i>Cicer arietinum</i>	Chick pea	Seed
<i>Lens culinaris</i>	Lentil	Seed
<i>Lathyrus sativus</i>	Grass pea	Seed
<i>Lupinus albus</i>	White lupine	Seed
<i>Olea europaea</i>	Olive	Endocarp, seed
<i>Vitis vinifera</i>	Grape	Seed
<i>Ficus carica</i>	Fig	Seed
<i>Prunus dulcis</i>	Almond	Endocarp
<i>Prunus persica</i>	Peach	Endocarp
cf. <i>Prunus domestica</i>	Plum	Endocarp
<i>Juglans regia</i>	Walnut	Endocarp
Wild Plants		
Scientific Name	Common Name	Archaeobotanical Evidence: Plant Part
<i>Bromus tectorum</i>	Drooping brome	Seed/Fruit
<i>Hordeum vulgare</i> ssp. <i>spontaneum</i>	Wild barley	Seed/Fruit
<i>Lolium temulentum</i>	Darnel	Seed/Fruit
<i>Phalaris</i> sp.	Canary grass	Seed/Fruit
<i>Alkanna</i> sp.	Dyer's alkanet / Alkanet	Seed/Fruit

<i>cf. Capparis spinosa</i>	Caper bush / Flinders rose	Seed/Fruit
<i>Celtis cf. australis</i>	Mediterranean hackberry	Seed/Fruit
<i>Centaurea</i> sp.	Centaury	Seed/Fruit
<i>Echium</i> sp.	Bugloss*	Seed/Fruit
<i>Galium</i> sp.	Bedstraw*	Seed/Fruit
<i>Medicago cf. sativa</i>	Medick / Alfalfa	Seed/Fruit
<i>Silene</i> sp.	Catchfly	Seed/Fruit
<i>Ajuga / Teucrium</i> sp.	Bugle weed / Germanders	Seed/Fruit
Brassicaceae	Crucifers / Cabbage family	Fruit and seed
<i>Chenopodium</i> sp.	Goosefoots	Seed/Fruit
<i>Calendula</i> sp.	Marigold	Seed/Fruit
<i>Malva nicaeensis</i>	Bull Mallow	Fruit
Malvaceae	Mallows	Seed/Fruit
<i>Carthamus tinctorius</i>	Safflower	Seed/Fruit
<i>Coriandrum sativa</i>	Coriander	Seed/Fruit
<i>Phragmites australis</i>	Common Reed	Culm/Straw

### C14 Samples

Several samples were selected for C14 dating. All were excavated during the 2016 field season, except for three samples from Square L, where C14 dating had not yet been conducted. Four ash samples were taken from a sealed burn layer within the reservoir. Three single seed samples were taken from Field P; from one plaster surface (L105.100a), one ashy concentration (L109.102), and one beaten earth surface (L111.107). Two single seed samples were taken from square M8; one from an ash pocket within plaster in the NW corner of the square (L15.49) and one from within a pit (L16.48) that was underneath the plaster floor (Locus 15). One single seed sample was taken from a plaster floor in the SE quadrant of Square O (L7.10). The seed samples taken for C14 were photographed and identified to their lowest taxonomic level (**Table 5**). Three wood charcoal samples, L1.L38.57, L2.L12.P68, and L2.L12.P92 were excavated during the 2001 field season; two samples originated from a burnt shelf within a room believed to have been a storage room (L2.L12.P68 and L2.L12.P92); these shelves would have held ceramics. While storage was evidenced from substantial animal bones present within the square, only small soil samples were recovered from these areas that did not indicate a signal of

storage. Macrobotanical remains, however, did give a signal of ‘settlement noise’ of some of the most common crops cultivated nearby the site, such as hard wheat (*Triticum turgidum* ssp. *durum*). Samples from each of these contexts has also been selected for analysis to determine the wood taxa<sup>18</sup>.

### Heritage Work and Community Development (by Øystein LaBianca)

Since 1998, Andrews University has been committed to heritage management, site presentation, and community engagement in developing the site for the general public as well as for the local village. This season, the interpretive path was refreshed by clearing all garbage from on and around the path, removing thistles and harmful plants. Work also included repairing and straightening the path’s border, repairing six signs from the local blacksmith, refreshing the painted interpretation on the remaining signs, and adding a new map at the entrance, outlining the path.

In past years, the team had created a welcome garden, with the intention of displaying plants that have been used locally through the ages, hoping to engage and educate the community. After discussion with members of the Ḥisbān Cultural Association and the local community, it was decided to repurpose the space, and

18. For further context descriptions for Fields L, M, and O, see

Walker et al. 2017a, and for Field B, C, and P see above.

create an area for the community to gather and celebrate culture and heritage. The center space was filled in with large stones and sand, a hedge was created between the pillars, and a smaller socio-economic garden was planted closer to the entrance. The Ḥisbān Cultural Association also organized two cultural events, which were held on the tall in the repurposed welcome garden. The first was a gathering of association members, representatives from the municipality, and local families, to share hopes that development of the site will assist to educate the public and celebrate their heritage. The second event was a celebration of the tall, which took place at the end of this excavation season. Many members of the local community told stories and recited poetry about Ḥisbān. We view this as a public commitment to the preservation of the site.

The team has completed work on an interpretive visitor map, and has nearly completed a site management plan. Throughout the season, Ivan LaBianca filmed various aspects of the fieldwork, not only to produce a film archive for the project, but also to produce educational films and short films for sharing via social media. In addition to work on the site, two rooftop gardens were installed, one at the girl's high school and one at the elementary school, in collaboration with the local community. These gardens will be used to teach how we can learn from the past about water and plant usage, caring for the earth, and that, by acting as ecological stewards, we can help to shape the future. Lastly, efforts have continued towards finalizing an agreement, which will allow the Nabulsi Heritage Buildings to become part of a new interpretive cultural heritage center for the Archaeological Park.

## Conclusions

The emerging picture of village structure and village life at Tall Ḥisbān in the Medieval era is a complex one. Entire buildings, already in ruins and abandoned for possibly a couple hundred years, as well as parts of those buildings (standing walls here and there) were rehabilitated for occupation, and houses rebuilt and barrel vaulted in the Mamluk period. The village at this time seems to have been made up of neighborhoods, which might reflect extended families, with houses in a line facing

a courtyard and cisterns.

What kind of settlement this was, however, is not entirely clear. Architecturally belonging to a common rural koine, but rather urban in terms of its material culture, the place is alternatively referred to as a “*qarya*” (village) and “*madinah*” (town) in contemporary (14<sup>th</sup>-century) Arabic sources. Its special relationship with the Citadel no doubt defined its changing status and ever-evolving relationships with larger markets and more urban social networks.

The year to come will be devoted to continuing faunal and paleobotanical work, which will now include analysis of wood charcoal and further residue analysis, as well as continued materials analysis, namely on glass and lithic. The next season of excavation is scheduled for June 2018, and represents the 50-year anniversary of American excavations at the site. Special programs are planned in Amman and in the village of Ḥisbān in celebration.

## Authors

Bethany J. Walker (corresponding author)  
Research Unit of Islamic Archaeology  
Department of Islamic Studies  
University of Bonn  
Brühler Strasse 7  
53119 Bonn, Germany  
or  
Annemarie Schimmel Kolleg of Mamluk Studies  
University of Bonn  
Heussallee 18-24  
53113 Bonn, Germany  
(email) [bwalker@uni-bonn.de](mailto:bwalker@uni-bonn.de)

Tarina Greer  
Department of History  
Missouri State University  
901 S. National Ave.  
Springfield, MO 65897, USA  
(email) [tarina.francis.greer@gmail.com](mailto:tarina.francis.greer@gmail.com)

Reem al-Shqour  
Clarissenstraat 48  
9000 Ghent, Belgium  
[reemss@hotmail.com](mailto:reemss@hotmail.com)

Aren LaBianca  
Norwegian Agency for Development Cooperation  
P.O. Box 8034 Dep  
0030 Oslo, Norway  
(email) [Aren.Sakala.LaBianca@norad.no](mailto:Aren.Sakala.LaBianca@norad.no)



Robert D. Bates  
Institute of Archaeology  
Horn Archaeological Museum  
Andrews University  
9047 US 31  
Berrien Springs, MI 49104-0990, USA  
(email) bates@andrews.edu

Jeffrey P. Hudon  
Institute of Archaeology  
Horn Archaeological Museum  
Andrews University  
9047 US 31  
Berrien Springs, MI 49104-0990, USA  
(email) hudon@andrews.edu

Warren Schultz  
Department of History  
DePaul University  
990 W. Fullerton, Suite 4000  
Chicago, IL 60614, USA  
(email) wschultz@depaul.edu

Julian Henderson  
Room B33 The Humanities Building  
University Park  
Nottingham  
NG7 2RD, UK  
(email) julian.henderson@nottingham.ac.uk

Chiara Corbino  
Annemarie Schimmel Kolleg  
University of Bonn  
Heussallee 18-24  
53113 Bonn, Germany  
(email) chiara.corbino@gmail.com

Sofia Laparidou  
School of History and Archaeology  
Aristotle University of Thessaloniki, Greece  
(email) laparids@hist.auth.gr

Annette M. Hansen  
Institute of Archaeology  
University of Groningen  
Poststraat 6  
9712 ER Groningen, The Netherlands  
(email) ahansen10@gmail.com

Øystein S. LaBianca  
Institute of Archaeology  
Horn Archaeological Museum  
Andrews University  
9047 US 31  
Berrien Springs, MI 49104-0990, USA  
(E mail) labianca@andrews.edu

(All figures are produced by the authors of this report and project photographers Felicitas Weber and Aris Legowski, unless otherwise noted)

## Bibliography

- Al-Shqour, R.S.  
2015 *Aqaba Castle: Origin, Development, and Evolution of Khans in Jordan. An Archaeological Approach*. Unpublished PhD dissertation, University of Ghent.
- Albarella, U.  
2016 Defining Bone Movement in Archaeological Stratigraphy: a Plea for Clarity. *Archaeological and Anthropological Science* 8.2: 353-358.
- Amitai-Preiss, N.  
2004 Glass and Metal Finds. Pp. 177-190 in Y. Hirschfeld (ed.), *Excavations at Tiberias, 1989-1994, Part II: The Excavations on Mount Berenice 1990-1994*. IAA Reports, Vol. 22. Jerusalem: IAA.
- Atil, E.  
1981 *Renaissance of Islam: Art of the Mamluks*. Washington, DC: Smithsonian Institution.
- Balog, P.  
1964 *The Coinage of the Mamluk Sultans of Egypt and Syria*. New York: American Numismatic Society.
- Behrensmeyer, A.K.  
1978 Tophonomic and Ecologic Information from Bone Weathering. *Paleobiology* 4: 150-162.
- Bogaard, A., Jones, G., Charles, M.  
2005 The Impact of Crop Processing on the Reconstruction of Crop Sowing Time and Cultivation Intensity from Archaeobotanical Weed Evidence. *Vegetation history and Archaeobotany* 14: 505-509.
- Brown, R.  
2016 The Faunal Distribution from the Southern Highlands of Transjordan: Regional and Historical Perspective on the Representative and Roles of Animals in the Middle Islamic Period. Pp. 71-93 in S. McPhillips and P.D. Wordsworth (eds.), *Landscape of the Islamic World. Archaeology, History and Ethnography*. Philadelphia: University of Pennsylvania.
- Brown, R. and Reilly, K.  
2016 Faunal Remains from Mamluk and Ottoman Occupations in the Middle Islamic Period Palace at Karak Castle (Qal'at al-Karak). Pp. 91-134 in K.M. McGeough (ed.), *The Archaeology of Agro-Pastoralist Economies in Jordan*. Boston: American Schools of Oriental Research.
- Crawford, P. and LaBianca, Ø.S.  
1976 The Flora of Ḥesbān. Pp. 177-184 in J.J.C. Cox and L.T. Geraty (eds.), *Heshbon 1974: The Fourth Campaign at Tell Hesbān. A Preliminary Report*. Berrien Springs: Andrews University.
- Crawford, P., LaBianca, Ø.S., and Stewart, R.B.  
1976 The Flootation Remains. A Preliminary Report. Pp. 185-187 in J.J.C. Cox and L.T. Geraty (eds.), *Heshbon 1974: The Fourth Campaign at Tell Hesbān. A Preliminary Report*. Berrien Springs: Andrews University.
- Dusart, O.  
1998 *La Verre en Jordanie et en Syrie du Sud*. Beirut: Institut Français d'Archéologie du Proche-Orient.

- Goodwin, T.  
2012 Medieval Islamic Copper-Alloy Money Weights from Bilad al-Sham. *Israel Numismatic Research* 7: 167-80.
- Grant, A.  
1982 The Use of Tooth Wear as a Guide to the Age of Domestic Ungulates. Pp. 91-108 in R. Wilson C. Grigson and S. Payne (eds.), *Ageing and sexing animal bones from archaeological sites*. British Archaeological Reports 109. Oxford: Oxford University.
- Greenfield, H.J., Arnold, E.R.  
2008 Absolute Age and Tooth Eruption and Wear Sequences in Sheep and Goat: Determining Age at Death in Zooarchaeology Using a Modern Control Sample. *Journal of Archaeological Science* 35: 836-849.
- Hansen, A. M., Walker, B.J., and Heinrich, F.  
2017 Plant Pathways: a New Methodological Approach to Using Seed Impressions in *Tabun* Fragments to Understand the Food Economy in Mamluk Tall Hisban. *Tijdschrift voor Mediteranee Archeologie (Journal of Mediterranean Archaeology)* 56: 58-69, special issue entitled *Mediterranean Food Economies*, (ed.) A.Hansen and F. Heinrich.
- Henderson, J.  
2013 *Ancient Glass, an Interdisciplinary Exploration*. New York and Cambridge. Cambridge University.
- Hillman, G.  
1981 Reconstructing Crop Husbandry Practices from Charred Remains of Crops. Pp. 123-162 in R. Mercer (ed.), *Farming Practice in British Prehistory*. Edinburg: Edinburgh University.
- Holland, L.  
1986 Islamic bronze weights from Caesarea. *American Numismatic Society Museum Notes* 31: 171-201.
- Ilisch, L.  
1993 *Sylloge Numorum Arabicorum Tübingen*, Vol. IVa, *Bilād aš-Šām I. Palästina*. Tübingen: Ernst Wasmuth Verlag.
- Insoll, T.  
2005 *The Land of Enki in the Islamic Era: Pearls, Palms, and Religious Identity in Bahrain*. Kegan Paul.
- Jackson-Tal, R.E. and Tal, O.  
2013 Crusader Glass in Context: The Destruction of Arsuf (Apollonia-Arsuf, Israel), April 1265. *Journal of Glass Studies* 55: 85-100.
- Jones, G.  
1992 Weed Phytosociology and Crop Husbandry: Identifying a Contrast between Ancient and Modern Practice. *Review of Palaeobotany and Palynology* 73: 133-143.
- Jones, I. W.  
forthcoming Miner Sins: Archaeological Evidence for Gambling at Khirbat Nuqayb al-Asaymir, a Copper Mining Village in Faynan, Southern Jordan. Paper presented at *ICHAJ*, Amman, 2016.
- Kritzeck, J.  
1976 Two Early Arabic Glass Weights. *Andrews University Seminary Studies* 14.1: 157-62.
- Laparidou, S and Rosen, AM.  
2015 Intensification of Production in Medieval Islamic Jordan and its Ecological Impact: Towns of the Anthropocene. *The Holocene* 25: 1685-1697.
- McQuitty, A.  
1986 Architectural Study of Beit Ras. *Archiv für Orientforschung* 33: 153-155.
- 2007 Khirbat Faris: Vernacular Architecture on the Kerak Plateau, Jordan. *Mamluk Studies Review* 11.1: 157-171.
- McQuitty, A. and Lenzen, C. J.  
1989 An Architectural Study of the Irbid Region with Particular Reference to a Building in Irbid. *Levant* 21: 119-128.
- Miller, R. and Simpson, St J.  
forthcoming "Flaked Stone". Ch. 4 in St J. Simpson *et al.* (eds.), *Glimpses into Life by the Tigris from Late Antiquity to the Post-Medieval Period: The Results of Rescue Excavations and Surface Collections at Qara Dere and Babneet Village (Eski Mosul) by the British Archaeological Expeditions to Iraq*. Oxford: Oxford University.
- Murray, H.J.R.  
1913 *A History of Chess*. London: Oxford University.
- Parker, S.T.  
1978 Tell Hesban 1976: Area C.4, 6, 8, 9, 10. *Andrews University Seminary Studies* 16: 71-108.
- Payne, S.  
1973 Kill-off Patterns in Sheep and Goats: The Mandibles from Aşvan Kale. *Anatolian Studies* 23: 281-305.
- Piperno, D.  
2006 *Phytoliths: A Comprehensive Guide for Archaeologists and Palaeoecologists*. Oxford, Altamira.
- Porter, B.  
2010 Locating Middle Islamic Dhiban on the Mamluk imperial frontier. *Fondation Max van Berchem Bulletin* 24: 5-7.
- Reitz E.J. and Wing, E.S.  
1999 *Zooarchaeology*. Cambridge: Cambridge University.
- Schultz, W.C.  
2000 Medieval Coins and Monies of Account: The Case of Large-Flan Mamlūk Dinars. *Al-‘Usūr al-Wustā* 12.2: 29-33.
- 2003a The Circulation of Silver Coins in *Bahrī* Period. Pp. 221-244 in A. Levanoni and M. Winter (eds.), *The Mamlūks in Egyptian and Syrian Politics and Society*. Leiden: Brill.
- 2003b Mamlūk Metrology and the Numismatic Evidence. *Al-Masāq: Journal of the Medieval Mediterranean* 15.1: 59-76.
- Skibo, J.M. and Schiffer, M.B.  
1987 The Effects of Water on Processes of Ceramic Abrasion. *Journal of Archaeological Science* 14: 83-96.
- Tschegg, C.  
2009 Post-depositional Surface Whitening of Ceramic Artifacts: Alteration Mechanisms and

- Consequences. *Journal of Archaeological Science* 36: 2155-2161.
- Tschegg, C., Ntaflos, T., and Hein, I.  
2009 Integrated Geologic, Petrolic and Geochemical Approach to Establish Source Material and Technology of Late Cypriot Bronze Age Plain White Ware Ceramics. *Journal of Archaeological Science* 36: 1103-1114.
- Twiss, P. C.  
1992 Predicted World Distribution of C3 and C4 Grass Phytoliths. Pp. 113-28 in G. Rapp Jr. and S.c. Mullholland (eds.), *Phytolith systematics: Emerging Issues*. New York: Plenum Press.
- Twiss, P. C., Suess, E., and Smith, R.M..  
1969 Morphological Classification of Grass Phytoliths. *Soil Science Society of America Proceedings* 33: 109-15.
- Walker, B.J.  
2011 *Jordan in the Late Middle Ages: Transformation of the Mamluk Frontier*. Chicago: Middle East Documentation Center, University of Chicago.
- 2014 Planned Villages and Rural Resilience on the Mamluk Frontier: A Preliminary Report on the 2013 Excavation Season at Tall Hisban. Pp. 157-192 in S.Conermann (ed.), *History and Society during the Mamluk Period (1250-1517)*. Studies of the Annemarie Schimmel Research College I, Bonn: University of Bonn.
- 2017 Early Ottoman/Late Islamic I/post-Mamluk: What are the Archaeological Traces of the 16<sup>th</sup> Century in Syria? Pp. 321-344 in *The Mamluk-Ottoman Transition: Continuity and Change in Egypt and Bilad al-Sham in the Sixteenth Century*, (ed.) S. Conermann and G. Şen. Bonn: University of Bonn.
- Walker, B. J., Bates, R. Hudon, J. and LaBianca, Ø.S.  
2014-2015 Tall Hisban 2013 and 2014 Excavation Seasons: Exploration of the Medieval Village and Long-Term Water Systems. *ADAJ* 58:483-523
- Walker, B. J., Bates, R., Polla, S., Springer, A. and Weihe, S.  
2017a Residue Analysis as Evidence of Activity Areas and Phased Abandonment in a Medieval Jordanian Village. *Journal of Islamic Archaeology* 4.2: 217-248.
- Walker, B. J., Laparidou, S., Hansen, A. and Corbino, C.  
2017b Did the Mamluks Have an Environmental Sense?: Natural Resource Management in Syrian Villages. *Mamluk Studies Review* 20: 167-245.
- Whitcomb, D.  
1995 Ayla in the Balance: Glass and Bronze Weights from the Aqaba Excavations. *Yarmouk Numismatics* 7: 34-54.

