A MILLENNIUM OF UNBROKEN HABITATION IN JARASH'S SOUTHWEST DISTRICT: THE 2017 SEASON OF THE LATE ANTIQUE JARASH PROJECT

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Introduction

This article accounts for the 2017 campaign of the Late Antique Jarash Project (henceforth LAJP). The campaign comprised the excavation of five trenches (Trench 5-9), survey of a large residential area, analysis of finds (especially ceramics and archaeobotanical samples) and conservation of copper coins retrieved through excavation in 2015 and 2017.

LAJP studies the development of Jarash's southwest district over the longue durée (**Fig. 1**). The project was initiated with an objective to investigate the infrastructure and daily life of a residential area with an emphasis on the city's development in the Late Antique and Islamic periods. The project thereby aims to cast light on a hitherto little explored aspect of Jarash's history as the focus of most past excavations has been on monumental remains of the Roman and Byzantine past. Previous seasons of the LAJP have focused on surveying the architectural surface remains (2011), on geophysics and key-hole excavation (2015) and on analysing the ceramic assemblage retrieved through these excavations (2016) (Blanke 2016; 2018a; 2018b; Blanke *et al.* 2015; 2021; Pappalardo 2019).

Following the results of our field work in 2015 and 2016, the 2017 campaign sought to address three main research questions concerning the establishment of a large reservoir in Jarash's southwest district, its design, use and eventual disuse; the residential usage of the southwest hilltop and the layout and extent of its rebuilding after the earthquake in 749AD; and the development of the district's streets with an aim to date their construction and the gradual encroachment of residential structures onto these streets. Finds' studies and conservation were carried out contemporaneously.

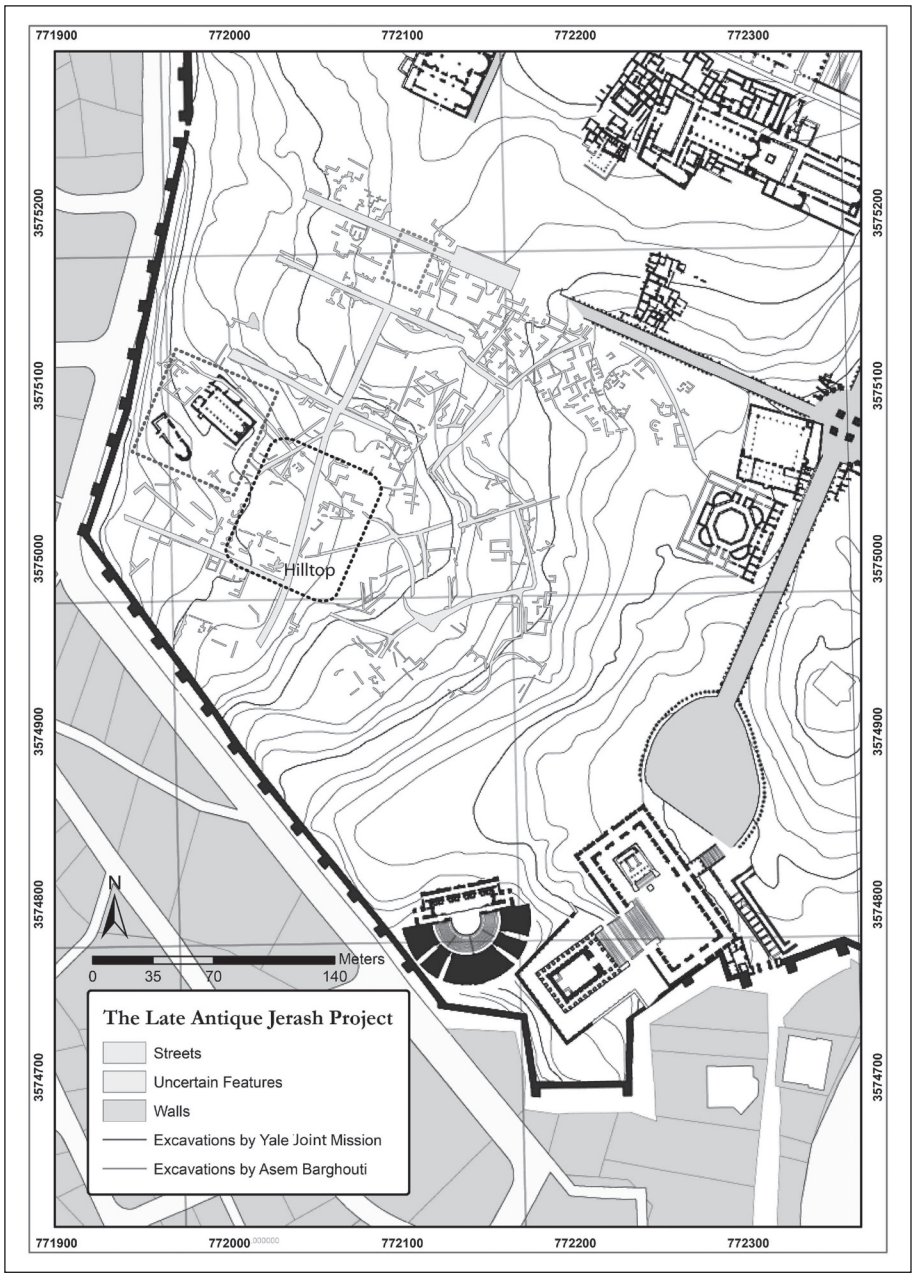
Below follows an account of the main results from these different areas of study. The presentations are followed by a summary of how these new data affect our understanding of Jarash as a whole.

A Reservoir in Jarash's Southwest District (Trench 5)

In 2011, a large (40m E-W by 15m N-S) rectangular structure was identified near the summit of the hilltop in Jarash's southwest district (See Area C in Blanke *et al.* 2015). The structure is defined to the south and west by long and straight bedrock cuts that join at a 90-degree angle. The layout of the structure, its location near the highest point in Jarash's southwest district and its proximity to several water related features led to the interpretation that it, at some point, served as a reservoir and probably also as the main water supply for the southwest part of the city. It resembles in layout and size the reservoir in Jarash's northwest quarter (Lichtenberger *et al.* 2015). In 2017, a trench was excavated at the southwest corner of the structure (Trench 5).

Trench 5

Trench 5 is the westernmost of the areas opened for excavation as part of LAJP's 2017 season (**Fig. 2**). It was originally planned as a



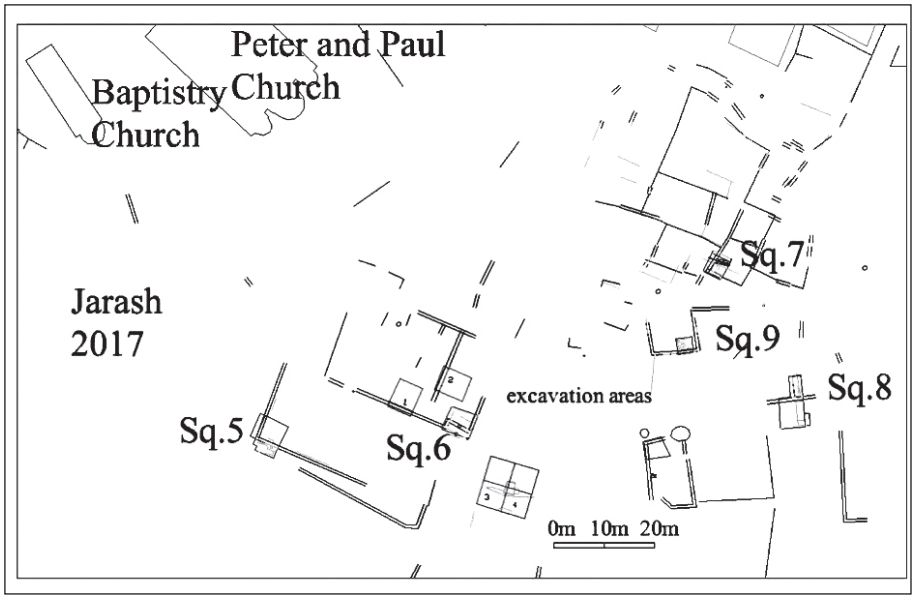
1. Map of Jarash southwest district. Note streets running perpendicular from south decumanus and diagonally from the town centre towards the hilltop © LAJP.

6×5m square, with a later extension of 4×1m to the south. The resulting rectangle, with a NNE-SSW orientation, had at least 1m of bedrock visible from the unexcavated surface. The area was positioned at the SW corner of a large visible structure, identified in 2011 as a reservoir, probably Roman in date and bound by the remains of an ashlar wall (Blanke *et al.* 2015; Pickett 2015). The main objectives of the excavation were to identify the different phases of quarrying, construction, use, and disuse of the reservoir, while secondary objectives were to identify and understand the way the reservoir functioned, how it was fed, how it was covered and, more generally, its overall functioning.

Results and Stratigraphy

The excavations have revealed a full chronologic sequence, ranging from the pre-Roman period to the 20th century, providing us not only with constructive and stratigraphic sequences, but also with a well-defined and characteristic material culture. The sequence of these phases is relative, but the dating is suggested by the results of the ceramic analysis.

The first horizon corresponds to the bedrock, an off-white pinkish limestone, which bleaches to grey after exposure to direct sunlight and erodes by crumbling into smaller lumps of



2. Survey map showing location of Trench 5-9 on the southwest hilltop © LAJP.

limestone. This stone was used for building material throughout Jarash's southwest district.

The first clearly-defined historical phase (Hellenistic I) corresponds to a water supply system, probably public in nature which consists of a rock-cut stepped entrance giving access from the street level to a cavity in the rock (**Fig. 3**). The staircase, 1.4m wide and over 2.6m long, goes down 1.8m in a mere 6 steps, each step on average 0.3m deep and while the first platform forms an uneven surface, the other steps are more regular. All steps have deep grooves running parallel to their edges, which can be linked to the evacuation of run-off or spilled water. At the bottom of the structure the steps turn to the right towards a cavity, probably the point where water was stored or from where it sprang. The structure is securely dated before the 1st century BC, a *terminus ante quem* given by the finds in the layers that seal and block the steps (*cf.* ceramic report, this article).

These well-dated steps are built in parallel to a much larger structure, which is usually identified as a Roman rock-cut reservoir. This structure forms a large rectangular area, *ca.* 40×15m, of which only the SW has been included in the excavation. The cut into the bedrock forms a 90° corner with an overall vertical face (**Fig. 4**). The faces of the vertical cut are largely smooth, with some potential quarry marks. The quarried stone from this reservoir (which goes beyond 3m deep) would have provided a large volume of construction material (several hundreds of cubic metres), perhaps related to a main building phase in this part of Jarash. As the structure remains only partially excavated, it is impossible to refine its chronology. Because it is dug perfectly in parallel (the walls of the steps and the reservoir

3. Rock-cut flight of steps leading into the cave in Trench 5. Grooves are carved at the edge of each step, facilitating water to run off if spilled © LAJP.

4. South-West view of the excavations in Trench 5, where the large cut in the bedrock and the caving are visible © LAJP.

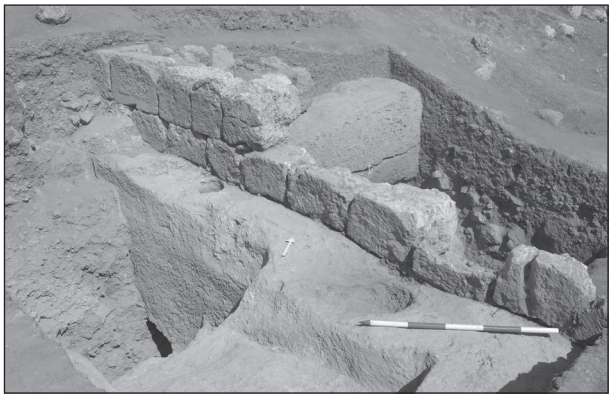
are roughly 1m apart) and not truncating the Hellenistic water steps, it is possible that the two structures are coeval. The reservoir and water steps are connected by the cavity, but the picture is too incomplete yet to determine if these are two truncating cuts or rather part of the same construction effort.

The reservoir is surrounded by a perimeter wall, built directly on top of the bedrock, which in Trench 5 was preserved as two rows of finely-cut square and rectangular ashlars, with a finished exterior and a coarse inside (**Fig. 5**). The wall has only one face of blocks of dry ashlar masonry and in its current state of preservation, it is difficult to understand what the purpose of this wall may have been.

The second historical horizon (Hellenistic II) corresponds to a moment of re-configuration of the area as the stepped access was blocked and backfilled. The material from this layer is homogeneous and has been dated to the 1st century BC. The reasons behind this blocking are not clear. Perhaps belonging to this phase was a shallow cut into the blocking level for the deposition of various burials into a single grave. This accounts for the re-burial of at least seven different individuals (minimal number of individuals, based on a preliminary assessment of the human remains). The remains were all found disarticulated, badly damaged, and largely incomplete, which may be partially a result of the pH of the soil or the lime content of the backfill. This secondary burial suggests that there might have been an inhumation necropolis in this area, disturbed when further constructions were carried out in the surroundings of the water cave. This potentially suggests a Hellenistic chronology for these inhumations.

In the Roman period, we find a series of levelling deposits (**Fig. 6**) laid on top of the blocked access to the cave and built against the wall. They consist of large layers of compacted mortar, orange in colour, with a concentration of early Roman ceramics (1st-2nd century AD), which have been preliminary interpreted as a bedding or a working surface. These *strata* were later sealed under a succession of loose sandy white mortar layers (0.2m thick) with many fragments of pottery in them, all of which were late Roman (3rd-4th century AD) in date. The purpose of these layers is not clear as they were too loose and soft to form a surface or a bedding, so they can perhaps be linked to a levelling, or else to the dismantling of a large mortared construction.

The next recognisable phase of Trench 5 consists of a homogeneously flat and compacted backfill of yellow, beaten earth found within the



5. South ashlar wall bordering the cut in the rock, separating the steps from the main quarried area in Trench 5 © LAJP.

6. Layer of orange mortar, probably 1st century AD in date, which seals the steps leading into the cave, and built against the perimeter walls of the reservoir in Trench 5 © LAJP.

reservoir. The mixed pottery retrieved from this layer suggest a 7th to mid-8th century date, and the water cave and the reservoir would have been abandoned long before then. This floor surface can probably be related to two cuts into the bedrock, with the first at a meter above the surface (which appears to be a rope hole) and one at the top edge of the bedrock (probably a beam slot; **Fig. 7**). Together, these three elements can be interpreted as a reutilization of the reservoir as a covered space - perhaps a dwelling? Such usage would correspond with the modifications of the bedrock that were found in Trench 3 and 4 during LAJP's 2015 season of excavation. Here, rope-holes, beam-slots, post-holes and door-posts were cut into the disused quarry in order to utilize the space as a dwelling (Blanke *et al.* 2021).

At a later date (Early Islamic I), two intersecting rubbish pits were cut into the beaten earth floor. The fills of these pits had remains of metal slag and other by-products of metal working, although there is no direct evidence for this activity taking place in this corner of the abandoned reservoir (no furnace, hearth, or charred/burnt spots have been identified). These pits were subsequently covered by a dark, indeterminate layer (probably reflecting disuse), before being sealed by 8th-century construction debris.

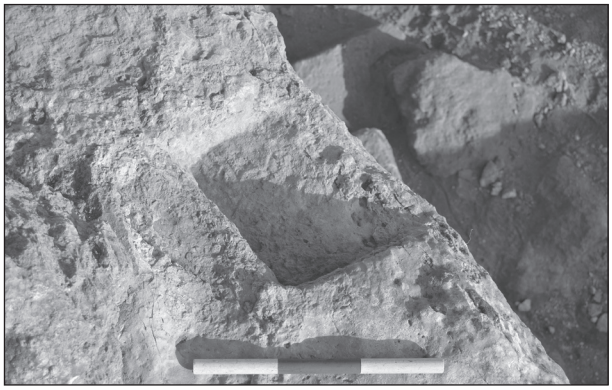
The next horizon (Early Islamic II) can be dated to the 8th century. These layers form a coherent phase, although only identifiable inside the reservoir. The chronology is securely given by the pottery, which include channel lamps that represent an early to mid-8th century date. These layers can be broadly described as the phase of final abandonment and transformation of this area into a large dump. The earliest context in this phase forms a sandy layer that may be related to demolition or construction debris linked to the dismantling of the reoccupation of the reservoir. This is then followed by a sequence of diverse dumping events, overall characterised by the banding of mixed soils alternated with large ashlar blocks. All of this suggests that by the 8th century the SW corner of the reservoir was being used as a spoil heap in some sort of clearing event, dumping in a large amount of ashlar blocks - perhaps the remains of the walls surrounding the reservoir itself or some other nearby structure. The soil slowly accumulated against the bedrock and the dumped ashlars, and together with the windblown and colluvial washing-in of material from the upper terrace began to form a slope of mixed redeposited material, that eventually reached the top of the bedrock and fully backfilled the reservoir.

After this, the sequence is followed by a series of layers of plough soil concluding with 20th-century, plastic filled layers.

Discussion

Having presented this sequence there are a series of questions that require further consideration. The first is the date of the water supply system. The large rock-cut structure identified as a reservoir is generally dated to the Roman period and seen as an example of pre-planned Roman construction effort where the construction of a water supply systems is preceded by a large quarrying event (Boyer 2016: 528; Blanke 2018a: 46, 50-52). However, as presented above, the preliminary results of 2017 raise a doubt about its Roman chronological adscription, and only further excavation will reveal if the alignment of the water steps with the rock-cut reservoir is coincidental or deliberate.

A second issue would be the nature of the water supply system. It is assumed that this reservoir would have been fed by an aqueduct system and that it would have, in turn, fed into various smaller cisterns, like the ones identified by LAJP in previous seasons (Blanke 2018a). While a water outlet from this reservoir has been identified, the inlet is still unknown. It is assumed to exist because of parallels not only from other reservoirs in Jarash, but also from Jerusalem (Wilkinson 1974) and elsewhere



7. Beam slot(?) cut into the rock in Trench 5, perhaps linked to the dwelling occupation of the reservoir in Late Antiquity © LAJP.

in the Levant (Wilkinson and Rayne 2010). Moreover, old aerial photography has revealed a linear feature leading into the city potentially identified as an aqueduct (Stott *et al.* 2018), which might feed into this reservoir. However, the presence of the water steps and the cavity into which they lead raises the issue of whether this was originally an access point to a spring (other springs are known inside Jarash - Boyer 2016; Lichtenberger and Raja 2016) rather than an aqueduct-fed reservoir. It might have been a water drawing point not that dissimilar to the water grottoes of Hellenistic Rhodes (Rice 1995) or, perhaps, the access to a karst system (Parise and Sammarco 2015) or an underground aqueduct. Such underground aqueducts are known from the Decapolis (Lucke, *et al.* 2005), 6th century BC Athens (Christaki, *et al.* 2017; Angelakis, Voudouris and Mariolakos 2016) and early Roman Tarragona (Burès, García and Macias Solé 1998).

A third point would be the purpose of the ashlar wall that surrounds the reservoir. Only two courses are preserved in the excavated corner, and a single one along most of the perimeter, which limits our interpretations. Looking at other large cisterns in Jarash, it could be put forward that the wall was the foundation for a series of sequential, self-buttressing barrel vaults, but other forms of roofing cannot be ruled out. Neither should be the possibility that it was an open-air cistern, like those found in Constantinople (Crow, Bardill and Bayliss 2008) and at nearby Birketein.

The final question that future excavation could answer relates to the nature of the south-west area in the pre-Roman period. The secondary deposition of human remains into the layers sealing the water steps (and covered by an early-Roman *stratum*) shows that an inhumation necropolis was disturbed in the Hellenistic period, probably located in the immediate surroundings of the water steps. The exact location and the chronology of this burial area is unknown. One possibility (of many) is that the blocking of the water steps was parallel to the excavation of the reservoir, an area previously used for burials[1]. In any case, the presence of burials in this area before the 1st century BC shows that in the Hellenistic period this part of the site was suburban even if not fully peripheral (as suggested by the water steps).

Additionally, we should consider the apparent chronological gap which exists in this area, with no recorded activity between the 4th and the 7th centuries AD. This suggests a potential clearing event in the early Islamic period which removed all post-Roman layers (see also Trench 6) rather than a lack of activity (which future excavation may unearth at the bottom layers of the reservoir fill).

A Cluster of Residential Buildings in Jarash's Southwest District (Trench 7, 9 and Area F)

The excavation of Trench 1 in 2015 uncovered a section of a room within a housing complex that collapsed in a sudden catastrophic event - possibly an earthquake - which sealed the room below 1.5m of wall tumble (the room forms a part of Area D, see Blanke *et al.* 2015: 232; 2021). The ceramic assemblage uncovered from the room was mainly Late Antique (including Umayyad) and Abbasid in date (Pappalardo 2019). Importantly, the architectural stratigraphy of the building revealed that it was constructed directly on bedrock, with only few architectural modifications identified. Our current interpretation of the room is that it was either built from new or massively restored after the earthquake in the middle of the 8th century AD.

A major objective in 2017 was to further investigate the residential structures on the hilltop in order to expand our understanding of the layout, size and fabric of the city in the Abbasid period, while also addressing questions of the organization of the residential structures themselves. Two trenches (Trench 7 and 9) in two different housing units were excavated and within a large (80×50m) area, known as Area F, all standing surface remains of walls were drawn (**Fig. 2**).

Trench 7

Trench 7 is located within the cluster of residential structures defined as Area F (see below). Following the results of the excavation of Trench 1 (Blanke 2016; Blanke *et al.* 2021) the aim was to further examine the extent of

1. Note that this would imply a late Hellenistic date for the reservoir (and not a Roman one).

the Abbasid period residential usage of Jarash's southwest district as well as investigate the area's development over the longue durée. The trench was laid out according to two walls that were visible on the surface and constituted the western and southern limits of a 4×4m trench. The excavation revealed several occupational sequences and displays the different construction techniques applied in this area through different periods.

Results and Stratigraphy

The earliest use of the area (defined here as Phase 1) saw remains of a Roman period occupation (**Fig. 8**). Given the small space available, the excavation was stopped in Trench 7 before reaching the bedrock. At present, a stone bench is the earliest occupation identified within the excavation, but it was probably not the first construction in the area. The top of the bench was uncovered *ca.* 2m below the current surface level. Partly obscured by the construction of later walls, the eastern face was made from stone blocks showing no regular layout, bonded with medium stones and fixed with white lime mortar. At first glance, it could be interpreted as a foundation but unfortunately, comparanda with other Roman period underground construction techniques are scarce within Jarash (but see Gawlikowski 1986, plate IIIB; Blanke 2015). The layout of the bench suggests that it served as foundation for a building of substantial size. It is associated with a collapse layer of large ashlar blocks and the same white lime mortar that is found within the bench. It is not possible to speculate on the use of the building, but a careful ceramic analysis dates its destruction to the Roman period (see ceramic analysis, this report). It is also associated with a thick sealing deposit (0.30m) on top of the collapse, which consist of light brown soil with inclusions of glass, bones, metal, *tesserae* and chunks of marble. The remains of the structure add to the list of several Roman period discoveries made by the LAJP in 2015 and 2017 (see Trench 5, 6 and 8, this report, and Blanke *et al.* 2021).

The Roman abandonment deposit was cut along the western end of Trench 7 in order to use the above-mentioned bench as a foundation for a new north-south running wall. The associated ceramic material suggests that this second phase of use should be dated to the 7th or 8th century (**Fig. 9**). Importantly, the area appears to have been untouched for centuries since the filling of the cut (*i.e.* the foundation trench) contains typical transitional period ceramics, such as Umayyad buffware and a white painted Jarash bowl. The new north-south running wall is associated with an east-west running wall in the northern part of the square; both are made of roughly cut medium-sized stones on top of which squared limestone blocks were laid. A thin but compacted red clay layer has been interpreted as the remains of a walking surface, but nothing remains on the floor to suggest the purpose of the new room. Directly on top of this surface, a structural collapse was identified across the entire trench. The collapse layer consists of a mix of lime mortar, *terra rossa* and lenses of yellow clay. The deposit is rich in organic residue (a soil sample has been collected for further analysis), which is typical for flat rooftops in the Eastern Mediterranean, which would commonly comprise wooded beams

8. Stone bench and tumble (Roman period) and south section of Trench 7 © LAJP.

9. Trench 7: top of the make-up layer dated to the Abbasid period © LAJP.

and branches with a packed surface of clay. It is important to note that in the section, the organic soil deposits appear as horizontal lines suggesting that the rooftop did not experience a long-term decay but rather a sudden collapse. Considering the period under study, it is possible that the collapse was associated with the earthquake that took place in the mid-8th century AD and is well attested throughout Jarash and nearby cities (for a detailed list on earthquakes in the region, see Ambraseys 2009).

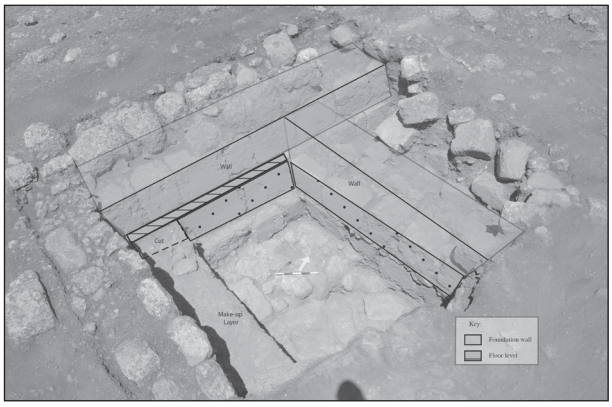
The third phase was initiated with a cut through the western end of the Phase 2 destruction in order to use the remains of the north-south running wall as a foundation for the rebuilding of this wall. Phase 3 also saw new courses added to the east-west running wall (**Fig. 10**). The rebuilding of the wall was accompanied by a make-up layer (5cm along the cut to 40cm in the western section) to level the room and serve as a foundation for a packed soil surface. The make-up layer was rich in ceramics dating to the Abbasid period comprising an abundance of *e.g.* cut ware and egg shell ware (see ceramic report).

Finally, the room was discovered filled with a packed earth deposit that was rich in finds such as jewellery, glass, disused construction material (wall tiles, *tesserae*, marble, basalt and wall plaster). As no proper abandonment layer or clear pattern of sudden destruction has been identified, one can hypothesize that the deposit was obtained from a nearby destroyed household.

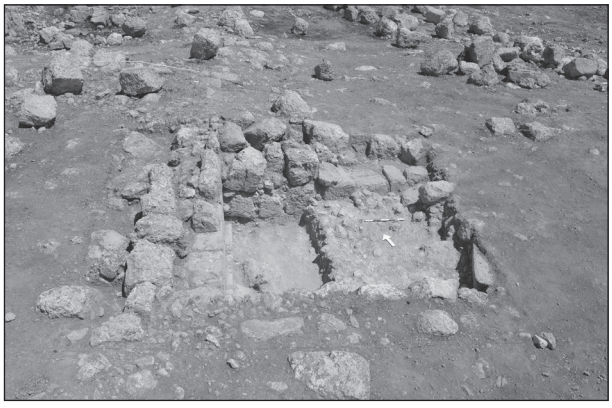
The final use of the area (Phase 4), comprise construction activity after a sudden destruction that brought an end to Phase 3 (**Fig. 11**). First, new courses of rough stones were laid along the east-west running wall in the northern end of the trench, which delineated an area to the north which remained untouched and filled with collapsed building material. Second, the southern part of the trench saw the construction of a new east-west running wall that was bonded with the rebuilt north-south wall. The medium-sized stones used for this rebuilding bear no proper cut marks, and the stones are bonded with fist-sized stones set within a thick earthen mortar. It has not been possible to date Phase 4, but in the newly constructed room, a deposit associated with the destruction of Phase 4 contains a large quantity of discarded building material (medium-sized stones, brick, tegulae, marble, *tesserae*, glass *tesserae* and plaster) as well as domestic waste (ceramics, metal fragments, bones and a soapstone fragment). Following the destruction of phase 4, the area was abandoned.

Discussion

Four phases ranging from the Roman to the Abbasid period were identified in the excavation of Trench 7. As described above, the interpretation of Phase 1 is meagre, but added to the numerous discoveries made by LAJP (Blanke 2018a and this article) one can begin to assert the extent and general use of the area in the Roman period. During Late Antiquity, this area seems to have been disused as demonstrated by the *hiatus* in occupation until the construction of the foundation trench prior to the reuse of the Roman building remains in the Umayyad period. Even if it is not currently possible to understand how the building was used, the continuous use of the north-south wall suggests that the Roman-period structure remained an



10. Trench 7: Phase 3 construction © LAJP.



11. Structural collapse over Phase 4 © LAJP.

architectural node for centuries: the inhabitants maintained the memory of the antique building, which was probably already in ruins.

The excavation shows how the area underwent major breaks during the early Islamic period. Following the Umayyad occupation, Trench 7 was used twice as a dumping area during the Abbasid period offering a large quantity of artefacts and construction material. The Abbasid-period dumps probably originated from a nearby residential area. Importantly, the material retrieved from the sealed context in Trench 9 (see below) contains the same ceramic horizon as that found in Trench 7 suggesting a wider use of the area at this time and perhaps also suggesting that nearby buildings were in use while others (such as that found in Trench 7) had been transformed to be used for the disposal of rubbish.

Trench 9

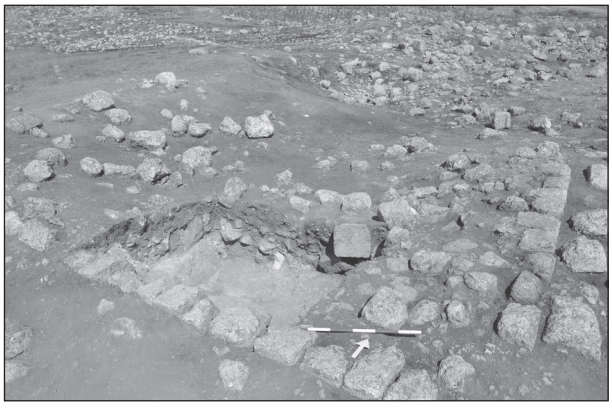
Trench 9 is located in the southernmost part of Area F (see **Figs. 2** and **12**). An east-west running wall that was visible on the surface prior to excavation marks the southern extent of the trench. The area slopes toward a depression, which was interpreted as an internal courtyard. However, the quantity of stones spread over the 3×3m trench revealed that the excavation would not expose an open area but a room. The progress of excavation revealed that the roof and walls collapsed as the result of a fire, which sealed the room and its content. We excavate a 1m wide sondage along the western edge of the trench followed by a 1m extension of this sondage toward the east in order to improve the stratigraphic documentation. The following discussion will focus on a single phase of the occupation discovered in the western part of Trench 9.

Results and Stratigraphy

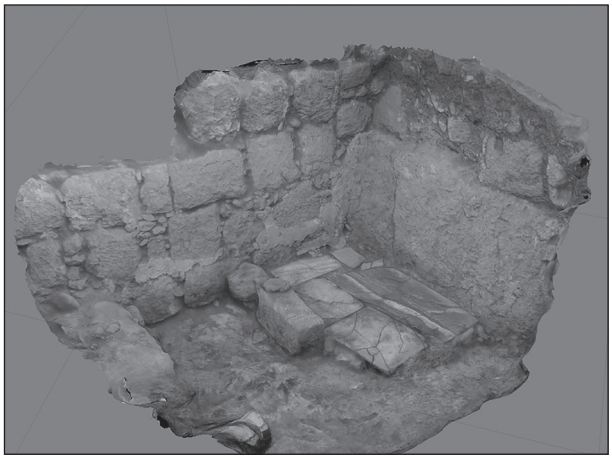
The east-west wall that was visible on the surface constitute the southern limit of the room within Trench 9. It is built with limestone ashlar blocks that were laid in regular patterns and joined with an earth mortar and medium-sized packing stones. To the west, the room is demarcated by a north-south running bedrock cut, on top of which, a couple of limestone blocks remain. The two walls form the southwest angle of a room that expands to the north and east beyond the limit of the excavation.

Abutting the bedrock wall, the excavation revealed a structure (1.50×1m) made of five marble slabs of varying sizes, the southern half is bordered to the east by two limestone blocks. The marble platform and the adjacent stones seem to be sitting on the floor (**Fig. 13**).

The marble platform is associated with a plain white plaster (only the lower part is preserved) that covers sections of the south wall. The stucco appears moulded to create two embossed pillars, which have led to an interpretation of the marble structure and the associate stucco as a prayer platform. Prayer platforms are rare but have been documented in other early Abbasid domestic contexts like the published example in Madinat al-Far (Haase 2007: 458) and Baysan (Fitzgerald 1931: plate XXIII-2; reviewed in Vernet 2016). Similar to these examples, the platform in Trench 9 is set in the corner of a room and consists of a low platform associated with a decoration on the wall facing the *qiblah* direction, which means



12. Overview of Area F with Trench 9 in foreground © LAJP.



13. Post-excavation 3D model of the prayer platform in Trench 9 © LAJP.

the structure is roughly directed toward Mecca.

In the middle of the same wall, two different plasters were applied: a preparation plaster on top of which a second layer appears to have been decorated with deep incisions making a geometrical pattern of herringbone between horizontal lines, which seems different from random patterns of hatching for preparatory purposes (see Umm al- Walīd, Genequand 2008: 140, fig. 5). It is premature to be conclusive about the decoration of this room, but it is important to note that for the early Islamic period, apart from the aristocratic palatial architecture, examples of plaster and stucco decoration are still deficient in urban residential contexts (Vernet 2018).

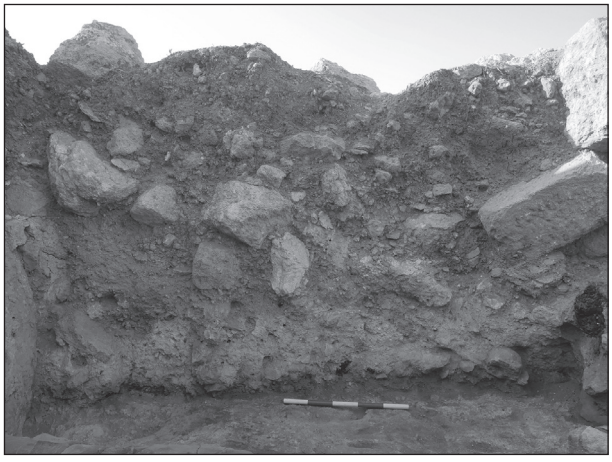
A wide range of artefacts were discovered on the floor (**Fig. 14**). These included a small reused marble capital with a smooth top surface found in the eastern part of the sondage, which could have been used to spread the dough for flat bread. Basalt is generally used for grinding purposes and limestone to spread dough (Boas 2010: 162): an example of an upturned capital had been found in the courtyard of House G in Pella dated to the Umayyad occupational phase (Walmsley 2007: 257). Several ceramic objects (jugs, a filter jug, a casserole with a lid and a pithos) were uncovered crushed on the floor below the collapsed roof (see ceramic report). The destruction deposit contained charcoal chunks and burnt botanical remains (see archaeobotanical report). The type and quantity of crops stored in the ceramic containers provide a rare insight into the diet of the residents of Abbasid-period Jarash. The material assemblage also contained a ceramic lamp of Abbasid date, which was discovered intact, as well as several types of nails, coins (unfortunately still illegible) and broken bluish glassware.

The clay floor, which is visible in the western part of the sounding shows black and reddish patches, which probably resulted from the heating process –the eastern part of the floor preserves its whitish colour–.

Several important observations have been made regarding the destruction of the building. First, the fire probably started in another part of the building since no flame burning residues were visible on the walls and no ash deposits have been uncovered. Second, the fire in the room appears to have occurred in a no-oxygen context (pyrolysis) as exposed previously with charred botanic remains and smouldered charcoal beams visible in the western section (Doroszenko 2001: 42). Third, the red patches on the floor testify that this burning process had reached high heat intensity.

Owing to the sudden collapse of the roof, it is possible to reconstruct its layout (**Fig. 15**). The burnt floor surface is covered by a thin red soil that could be interpreted as dissolved

14. Destruction deposit in the eastern part of the sondage in Trench 9 © LAJP.



15. South-facing section of Trench 9 © LAJP.

reeds and straw covered by *terra rossa*. This organization suggests that the room was covered with load-bearing beams supporting a flat roof, which was packed with yellow clay mixed with loose soil and fist-sized stones. The building collapsed inwards, which matches the ceramic spread of pots falling on to the floor from an elevated position with a scatter from south towards north. Following the collapse of the roof onto the floor, the masonry walls tumbled inwards, thereby sealing the roof and the floor deposits. The area was abandoned with no further usage until its excavation in 2017.

Discussion

The excavation of Trench 9 shows a wall construction technique that is consistent with that documented in Trench 1 and 2 in 2015, but in Trench 9, tumble stones are less numerous and there were no indications of an upper storey.

Although speculative, we currently suggest that the fire started elsewhere in the building and that the destruction ended with the collapse of the roof onto the floor, which was closely followed by the collapse of the walls onto the roof.

So far, Abbasid residential structures have been excavated in Trench 1, 7 and 9, while Trench 2, 5, 6 and 8 testify to the diversity of activities taking place on the hilltop after the mid-8th century AD earthquake. The differences between the construction techniques hosting Abbasid contexts inform that several types of buildings are standing in the same neighbourhood in that period. The substantial amount of tumble excavated in Trench 1 along with the presence of piers may suggest that the building had an upper storey above the excavated storage room, while the preliminary conclusions from Trench 7 and 9 suggest that both structures occupied a single floor.

The range of material uncovered in Trench 9 is exceptional. The assemblage of glass, ceramic and metal objects gives a rare snapshot of the utensils used in an Abbasid-period household, while the charred organic remains bring new insights about diet and consumption practices and promises to provide a radiocarbon date for the collapse (analysis in progress).

Considering the small size of the area uncovered, it is still a conundrum that the material assemblage and organic finds associated with storage are found alongside a space dedicated to prayer. It is possible that we are looking at two phases of usage in which the early phase saw the use of the room for prayer while in the second phase, the space was transformed to be used primarily for storage. Alternatively, the space served two simultaneous functions with material shifting within the room depending on its usage. Importantly, the incised plaster and the prayer platform, which was made from recycled marble slabs, underline that this room was a part of a wealthy dwelling, which was built during the Abbasid-period settlement on Jarash southwest hilltop.

Area F: A Late Antique and Early Islamic Housing Cluster

LAJP Area F is an 80×50m area with substantial structural debris, namely worn limestone blocks, extending over a gently sloping plateau to the northeast of the main LAJP excavation areas (defined in Blanke *et al.* 2015: 231). The western boundary of the area follows the dirt road that descends from the hilltop towards the southern *decumanus* (see **Fig. 2**). The southwest corner of the area and the western edge along the dirt road partially coincides with Area E defined in 2011. To the north, traces of stone architecture terminates south of the dirt road that runs below the hilltop towards the West Gate. To the east, the ruins open onto a pronounced slope towards the central part of the antiquities area along the *cardo*. To the south, Area F adjoins Areas A and B on the hilltop. In topographical terms, Area F can be divided into a northern and southern half by a steep east-west slope dropping some 4 to 5 metres towards the north. While the gradient may have become more pronounced through the accumulation of structural debris from past occupation above the slope, the latter most likely indicates a natural escarpment in the underlying bedrock, which is relatively close to the surface in this area (*cf.* worked bedrock outcrops no more than two metres below the present surface in LAJP Trench 1, 2, 6, and 9 (see details in Blanke *et al.* 2015 and this report).

Considering the insights gained from recording visible architecture in Areas A, B, C, and D during the 2011 season (Blanke *et al.* 2015: 231-235), it was deemed feasible to develop a rough plan of standing architecture

visible in Area F to complement excavation results from Trench 7 and 9. Some limitations to the retrieved information should be noted from the outset. First, it was not possible to thoroughly clean the area of spring vegetation prior to actual drawing and plotting of visible architectural features. Second, Area F is littered with a substantial amount of limestone building blocks in various states of decay, often creating topsoil matrices with a very high amount of limestone rocks and flecks. Many of the walls traced in the area appear to have collapsed from natural erosion followed by the gradual accumulation of loose, silty soils.

All wall lines recorded here were documented by laying out baselines for plan drawings and plotting said baselines with a total station. A total of 38 walls were recorded in this way, extending over anything from a couple of metres and up to more than ten metres in length. The extent and degree of preservation of these vary, but very few of the walls found protrude more than a couple of centimetres above the surrounding soil surface. Most were regular housing walls of a type also encountered in Area D, *i.e.* with an average width of 70-80 centimetres, made from worked limestone arranged in double rows. Some exceptions appear, however, *e.g.* W31 on the western slope, likely a terracing wall built to support the plateau on its higher western side, and W2 on the northeast fringe of Area B, which is a later and relatively crudely set field wall to mark out the field terrace to its west. There is no clearly observable chronological sequence in the architectural features recorded here, except from what can be deduced from their relative stratigraphy and their association with archaeological *strata* in Trench 7 and 9.

Architectural Units in Area F

The southeast quadrant of Area F holds the major part of identified wall lines, and further shows some interesting topographical variation. An enclosure marked by W1, W3, and W4 (where Trench 9 was laid out) is adjoined by a depression further north, between the former cluster of walls and W5, W7, and W8. This area presumably formed a courtyard space of an 8th or 9th century AD date (based on findings in Trench 9) and may have held a cistern in its western end, given the pronounced circular depression in this area. Roofed areas adjoining this courtyard space appear evident in the comparably higher elevation of stone debris to the north and south of this depression.

West of Trench 7 and north of W5, W7, and W8, a second depression appears to indicate another courtyard space opening onto rooms on its western, southern, and eastern side. Based on findings in Trench 7 (see ceramic report, this article), a potential 9th century occupational date of this structural unit should in all likelihood be located less than a meter below the present surface. This unit adjoins another courtyard space on its north, bounded along the escarpment by several wall lines running east-west (*e.g.* W14, W15, W17). It is not clear if the structures extending north to the escarpment from W6, W7, and W8 is a single occupational unit or several. Another structural unit is located below the escarpment and seems to open towards the slope on the eastern side of Area F. This occupies the southeast corner of a field terrace that seems otherwise free of architecture. The unit presumably held roofed spaces south of W34 and north of W35. The perimeters on the northern (W37 and W38) and eastern (W32 and W39) sides are clearly visible.

The area west of the courtyard depressions, beyond the north-south line marked by W20 and W6, is characterized by a much more modest amount of larger stones lying free on the surface, even if there does not seem to be a marked reduction in the number of walls that can be traced in this area. The walls found here, *e.g.* W21, W22, W24, and W25 are mostly in the surface rather than protruding above it, and later soil accumulation overall seems more regular and even than what is the case further west. While some structural units seem apparent in the soil surface close to W19 further south, the southwest corner of Area F is largely void of visible architecture (except W26). This may be due to soil accumulation stemming from the field terrace further south (in Area B), which also partly overlies features around Trench 9.

General Alignment of Walls

The alignment of walls within Area F is fairly regular and adheres to either of three general patterns. Terracing walls, *e.g.* W2,

W31, and perhaps W33 are irregular, and follow topographical variation rather than any particular grid. All other walls except for W1, W3, and W4 seem to adhere to the Roman orthogonal grid (on a *ca.* 20°-200° alignment) with varying degrees of accuracy. The latter three walls, situated around Trench 9, are the only walls in the general area that follow a different alignment, perhaps associated with the diagonal street running SW from the congregational mosque by the *tetrakionion* in the centre of town (*i.e.*, on a *ca.* 350°-170° alignment) (Blanke 2018a; Rattenborg and Blanke 2017).

Overall, excavation results from Trench 7 and Trench 9 would suggest the visible structures in Area F to be remains of 9th-10th century AD residential occupation, as these are the youngest *strata* associable with the visible wall lines (also discussed in Rattenborg and Blanke 2017: 326-327 and fig. 13). Findings from Trench 7 also indicate remains of earlier Roman-period structures on roughly the same alignment as later walls. Both are commensurate with the patterns of spatial alignment described above and discussed in previous reports (Blanke *et al.* 2015; Blanke 2018a), and would therefore suggest an extensive set of houses across the plateau in the southern part of Area F. The arrangement of roofed areas around presumed courtyard spaces is mirrored closely in visible surface remains from Area D (Blanke *et al.* 2015: fig. 2). Collating excavation results from these squares and the topographical variation observed on the surface, most of the eastern half of the structures recorded in Area F seem to extend from occupational layers located no more than a metre below the present soil surface, perhaps up to two metres along major wall lines. Field terracing in Area F appears to be limited to the area west of W5 and W3 and around W26, thus extending from the level plateau encompassed by Area B to the southwest. The structure below the escarpment, including W32, W34, W37, W38 and W39, is interesting because of its relation to the adjoining field that extends east from the dirt road. Excavation in this area would enable a clearer view of the relationship between domestic structures and the intramural fields, which should be dated to the Early and Middle Islamic periods or even later (see discussion in Rattenborg and Blanke 2017: 324-328).

Excavating Jarash's Thoroughfares (Trench 6 and 8)

A careful reading of aerial photos from the early 20th century supported by the geomagnetic survey that was carried out in Jarash's southwest district in 2015 have identified a series of streets leading from the town centre towards the hilltop. Two of these streets are of particular interest to the LAJP (see **Fig. 1**). A north-south running thoroughfare can be traced over the course of 300m from the triple church complex of St George, St John and Sts Cosmas and Damian across the so-called south *decumanus* to the top of the hilltop. This thoroughfare is currently perceived to have been constructed during an expansion of the city's street grid during Late Antiquity and possibly associated with the construction of the triple church complex. The second street runs diagonally from the congregational mosque in the centre of town toward the southwest hilltop.

Excavation of the Central Bathhouse carried out as a part of the Islamic Jarash Project (henceforth IJP) under Alan Walmsley's direction, revealed a street grid that matches the diagonal street and pre-dates the Roman re-orientation of the city –as seen through the construction of Jarash's main thoroughfares–. The results from the IJP suggest that the diagonal street grid dates to the Hellenistic period, remained in use throughout the city's history and became a main thoroughfare after the earthquake around 749 AD. The excavations of Trench 6 and 8 was undertaken to investigate the chronology of the development of these street systems: to examine when they were founded, how they were maintained, and when they went out of use.

Trench 6

During the first season of the LAJP in 2015, the results from Trench 2 offered an example of domestic building expansion onto the street running south from the south *decumanus*. Trench 6, a 5×5m unit, was placed adjacent to Trench 2 in order to examine that street (see **Fig. 2**), and to examine its connection to the large rock-cut reservoir identified in Area C of the

2011 field survey and 2015 geophysical survey (Blanke *et al.* 2015: 231-233; 2021). However, upon excavating Trench 6, we learned that the housing-encroachment continued further than we previously thought.

Results and Stratigraphy

The excavation of Trench 6 revealed four walls that outline two rooms (Room A and B) extending eastwards from the eastern wall of Trench 2. This structure was found to have four main phases of construction, development, and reuse (**Fig. 16**). A 1×3m sondage was made parallel to a bench-like platform in Room B that revealed the earliest phases of occupation. Based on an in-field assessment of the ceramic material, we believe that this area can be relatively dated to the Late Hellenistic period. This phase of occupation coincides with early material found in Barghouti's excavations in 1975-1976 just north of the LAJP sector, and further adds that Hellenistic occupation of Jarash existed beyond the construction of the so-called forum in the southern sector of the city (Barghouti 1982: 219-221; Kraeling 1938: 27-28). However, in Trench 6, this material was only found in the context of construction layers made of *terra rossa* and compacted yellow clay between the bedrock and the main occupational surfaces (**Fig. 17**). Thus, any insight into the nature of habitation during the Late Hellenistic period cannot be assessed from this narrow trench.

Above the Late Hellenistic layers in the sondage, we identified two main occupational surfaces. The first, again based on an in-field assessment of the ceramic material, can be dated to the Roman period due to the quantity of *terra sigillata* found. Hard-stamped yellow clay with some small stones were used to create this occupational surface. The bedrock was also incorporated into this surface at the western end of the room. Similar floor construction can be found in Trench 1 of the LAJP 2015 season, as well as in Trench A of the Danish-German Jarash Northwest Quarter Project (Kalaitzoglou *et al.* 2013: 58-63). The second occupational surface was built directly on top of the surface identified above (**Fig. 18**). Unfortunately, no artefacts were left *in situ* on this occupational surface when the building was abandoned. Thus, we have no way to precisely date when this floor was constructed. In any case, this surface covered the entirety of Room B and provided evidence for continuous habitation from the Late Roman and into the Abbasid period. However, over the course of that time, the layout and arrangement of the space changed considerably.

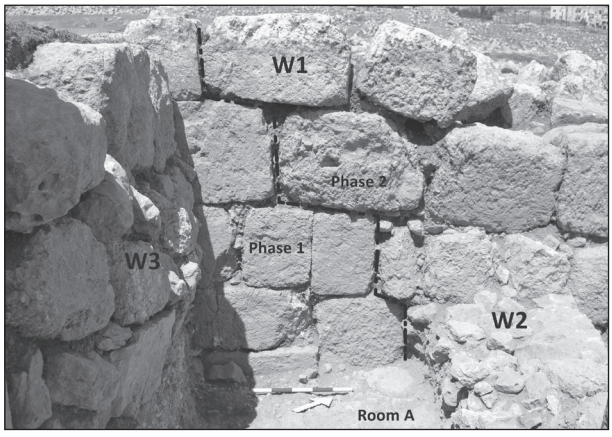
The western wall of the structure, running north-south (W1), which continues as a part of

16. Overview of Trench 6, fully excavated including sondage © LAJP.

17. Trench 6, west facing profile of the sondage exposing the stratigraphy below W4 © LAJP.

Trench 2 has three phases of construction and repair. Only parts of W1 were identified in Area D of the 2011 survey, and, based on the results from Trench 2, we believed that this wall marked the furthest extent of the street encroachment (Blanke *et al.* 2015: 231-233). The southern and northern ends of W1 are composed of finely-cut limestone blocks, which appear to be *in situ* from its original construction. Then, at some point, this wall was rebuilt, as the middle section is remarkably different in form compared to the end sections of the wall. The middle section is made of roughly-cut ashlar blocks with small packing-stones and *terra rossa* (**Fig. 19**) –a typical technique used during the Late Antique/ Early Islamic periods at Jarash–, as well as other large urban centers in *Bilad al-Sham* (al-As'ad and Stępniowski 1989: 206-210; Blanke *et al.* 2011: 320-325; Tsafrir 2009: 77-79; Walmsley *et al.* 2008: 113-118).

18. Overview of Trench 6 excavated to its main occupational surface © LAJP.



19. Eastern face of W1 in Trench 6 showing two phases of construction © LAJP.

20. Construction technique used to join W1 and W2 in Trench 6 © LAJP.

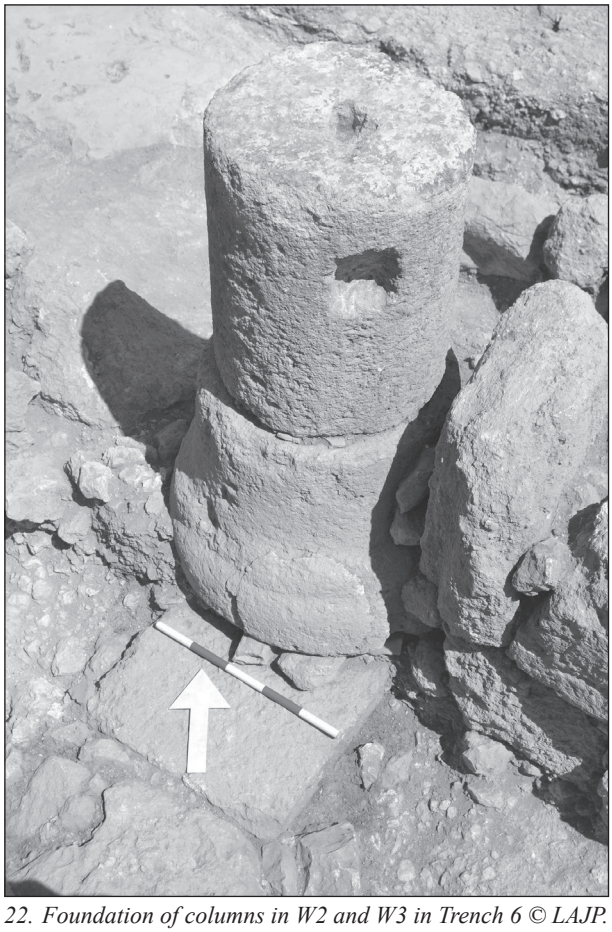
The third phase of this structure is marked by the addition of three walls, creating Room B and the addition of Room A: two parallel walls running east-west (W2 and W3), and another wall bonded to W2 running north-south (W4). The extent of Room B continues north outside of Trench 6. Both W2 and W3 applied the same construction technique and material as the mid-section of W1 as well as incorporated Roman-period limestone columns into the walls for structural support. It is clear that when W1 was rebuilt, W2 and W3 were constructed to further divide the interior space. The builders attached W2 to W1's mid-section with yellow clay and plaster (**Fig. 20**). As for W3, this wall merely abuts W1 with a small foundation trench for the wall's architectural support (**Fig. 21**). The two columns in W2 and W3 were intentionally placed and used as a part of both walls' construction. The columns sit upon two smooth limestone foundation stones with small stones wedged between the column and foundation (**Fig. 22**).

Recycled columns are commonly found in Jarash during the Early Islamic period in both the GO area around the Umayyad congregational mosque, and in the Northwest quarter

21. Foundation trench of W3 abutting W1 in Trench 6 © LAJP.

(Gawlikowski 1986; Walmsley *et al.* 2008; Blanke *et al.* 2011; Lichtenberger *et al.* 2016). However, there are no comparable examples so far in Jarash of columns being incorporated inside the walls for structural support within a domestic context. This will likely change with further excavations of private residences.

W4 was bonded to W2 to close off Room B. It has no foundation and was placed directly on top of the occupational surface. It is entirely possible that W1 initially marked the extent of street encroachment. However, it is likely that the street running south from the southern *decumanus* was no longer used and housing development overtook the newly available space. When the wall extensions were built in Room B, a small bench was also installed that ran the entire length of W2. This bench was constructed by a line of irregularly shaped stones, and the space between those stones and W2 was filled with *terra rossa*. The fill was then covered with the same yellow clay as the occupational surface. A specific function for this bench was not immediately identified.



22. Foundation of columns in W2 and W3 in Trench 6 © LAJP.

Since W2 is not completely perpendicular to W1, it creates a trapezoidal shape for Room B, which then in turn forms Room A into a smaller trapezoid. It is puzzling that W3 does not connect to any other wall in Trench 6, creating a small opening eastward. We concluded that there was no door there, because there was no recognizable threshold and no occupational surface. In the fill above W3's foundation, we came across a variety of material including glass *tesserae* covered in gold foil, glass beads, and a few unidentifiable bronze coins. We believe this space was not occupied and acted as a small dump area that accumulated over time. This theory is further supported due to there being few tumble stones from the building collapse compared to the extent found in Room B and other areas in the southwest quarter of Jarash.

We still do not know the purpose for the construction of W3 and the building that it formed, as its southern side was not excavated. This structure saw no habitation or use following the Abbasid period. Although speculative, it is likely that the building was already abandoned by the time it collapsed, since there was no material assemblage found *in situ* on the latest occupational surface (contrary to Trench 1 and 9).

This residential extension occurred when the north-south road from the south *decumanus* went out of use. We can tell from the ceramic material found inside W2 that the extension was completed in the Late Umayyad and Early Abbasid period. If we are correct that a road continued into the southwest quarter of the city –which seems evident from aerial photos and geophysical surveys (Blanke 2018a; Blanke *et al.* 2015)– a reorganization occurred with the spatial layout of the residential area where individual houses were creating internal divisions and outward expansions. The reorganization of both public and private space around the south *decumanus* began as early as the 3rd and 4th centuries AD (Kraeling 1938: 281-294; Jacobs 2009: 208). These, sometimes ad-hoc, programmes continued into the Umayyad period– in tandem with the construction of the congregational mosque under Hishām ibn ʿAbd al-Malik (r. 723-743) (Rattenborg and Blanke 2017: 319-324). Trench 6, as well as Trench 2, are examples of

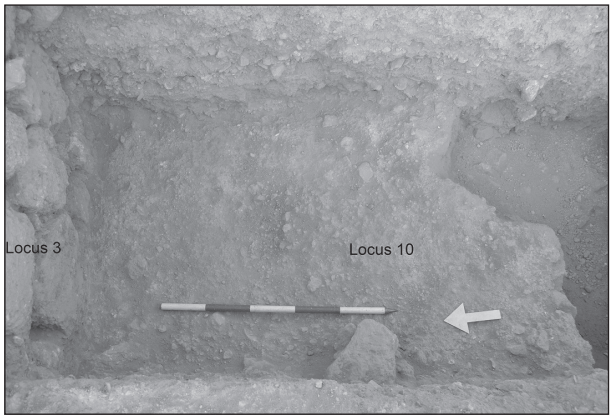
how Jarash's urban space was never static. The domestic areas of the southwest quarter moved and were reorganized to accommodate the needs of the local community members.

Trench 8

The excavation of Trench 8 was undertaken to examine the street that runs diagonally to the *cardo* and south *decumanus* from the city centre toward the hilltop (henceforth described as the east-west road) (see **Figs. 1 and 2**). Trench 8 was set up on the basis of the suspected location of the east-west road, encompassing one of the walls flanking the street from the north, and excavated in an elongated patch *ca.* 10m long (N-S). Our primary goal was to investigate the use, transformation, chronology, and disuse of this area from antiquity to the Islamic period, as well as to corroborate the hypothetical identification of the "negative linear anomalies" (identified by the geophysical survey, see Blanke *et al.* 2021) as streets. However, as described below, the excavation material has provided only partial evidence for answering this question.

Results and Stratigraphy

The excavation revealed evidence for a long sequence of activities in the area, with the pottery and coin finds pointing to dates from the Roman to the Abbasid periods. We found a large amount of ceramics, most of which were deposited intentionally either as a dump or as foundations under walking surfaces and structures. The extent of the Islamic period layers allowed only a limited insight into the use of this area in the Roman period, and the lowermost *strata* containing stone-built Roman period structures were not possible to excavate in their entirety. It was, however, clear that the southern part of the trench featured two deposits abutting a Roman period structure, both of which featured compact clay surfaces, and the lower one was established on top of Roman-period ceramic sherds forming packing beneath the surface. Conversely, the later surfaces were identified in the central part of the trench abutting the wall (**Fig. 23**, *locus* 3), whereas the southern part was subsequently filled with a *terra rossa* deposit containing many stone inclusions, probably in order to even the ground level. At the bottom of this deposit a well-preserved Roman coin was found (see coin catalogue, this article, **Fig. 39a**), which was minted in Antioch under the reign of Philip I (r. 244-249 AD) (McAlee 2007: no. 1081).



23. Clay surface (Trench 8, Locus 10) before excavation, probably used as a street surface in Late Antiquity © LAJP.

The lowest identified surface (**Fig. 23**, *locus* 10) in the central part of the trench forms a compact clay deposit on top of a 0.30m deep packing layer, which appears to have been a part of the same building sequence as the wall (*locus* 3) along its north site. The wall is *ca.* 0.75m wide, built of roughly shaped limestones with smaller stones filling the gaps between them, and with no identified bounding material. The majority of the ceramics in the deposit, *locus* 10, is dateable to the 3rd and 4th centuries AD, including African Red Slip ware and its local imitations produced in Jarash in the 4th century. This context along with the wall may thus be roughly dated to Late Antiquity.

The excavation has revealed two additional clay surfaces on top of *locus* 10, which indicate that this area was used and maintained over a long period of time. After the last of these clay surfaces had fallen out of use, the area was covered in a thick, *ca.* 0.60-0.80m, layer of yellowish deposit, forming a new surface that was used with the wall (*locus* 3). The deposit contained a large amount of Abbasid-period pottery, including cut ware and cream ware. Two installations have been identified on top of this deposit: a ceramic basin probably used, as suggested by the pinkish soil inside it, as a firing place (**Fig. 24**), and an "L"-shaped structure, probably a bin, abutting the wall and consisting of a single course of stones.

If the clay surfaces, as it might be proposed, were used as a street, that would mean that the

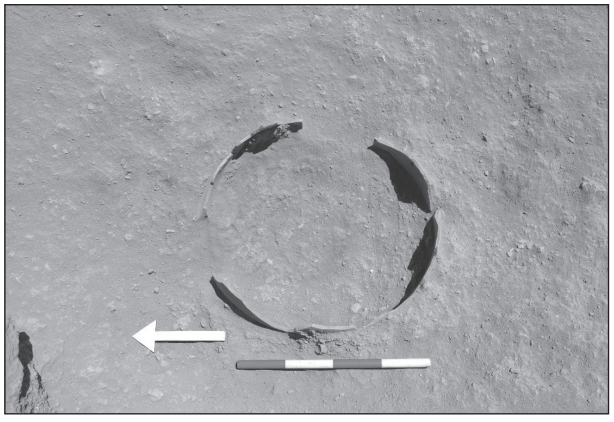
layout of the street shifted towards the north, similarly to what can be observed elsewhere on the same "negative linear anomaly" of the geophysical survey (see **Fig. 1**). It presents the "east-west road" with some of its parts running on parallel patches, suggesting that the road, at least partially, changed its layout over time.

Preliminary Study of the Ceramic Assemblage from Trench 5-9

The analysis of the ceramic assemblages was carried out alongside the excavations of the trenches. During the 2017 season, the pottery retrieved from Trench 6, 7 and 9 was fully processed and, due to a lack of time together with the considerable amount of pottery found, only 14 *loci* from Trench 5 and 4 *loci* from Trench 8 were processed. To summarize, the total number of sherds analysed is 28,774 with 1,676 sherds identified as diagnostic. Below follows an overview discussing the ceramic assemblages from each trench and the related phasing of usage (see also **Table 1**).

Trench 5

Trench 5 has revealed a great quantity of pottery. Only 14 *loci* have been processed (6,297 potsherds, revealing 598 diagnostic vessels). According to the ceramic analysis, four main phases have been identified. The assemblage of the first phase is composed mainly of carinated dishes with flared rounded rim, the body is irregularly painted in brownish or red colour, so called brown-red washed (**Fig. 25: 1-2**). These vessels seem to be a local production imitating Eastern Sigillata A shapes (Braemer 1989: 164, fig 1, A1 group; Breamer 1986: fig. 16, n. 5-8). In the fine ware assemblage, the local imitation of black gloss is attested as well, unfortunately only some body sherds were found. In the common ware assemblage, the discovery of an almost complete libation cup with high-footed base, carinated body and flared rounded rim is noteworthy (**Fig. 25: 3**). This vessel could be compared with specimens displayed in the Jarash Museum and dated to the late Hellenistic period. Another parallel for this type of libation cup is found in the rock cemetery or funerary gardens south of the upper Temple of Zeus and dated to the 1st century AD. (Kehrberg 2004: fig. 1, 3). The cooking ware is mainly comprised by carinated casseroles with a flanged rim, sometimes with a slight ridge on the top of the rim; these vessels show a shape quite close to the Greek-Hellenistic *lopades* tradition (**Fig. 25: 4**) (Parallels: Tall Mādabā, Ferguson 2014: fig. 6, n. 22; Homs area, Reynolds 2014: fig. 4, CA4, CA4A). Only one small fragment of a lamp nozzle was found (Temple of Zeus: Breamer 1986: fig. 16, n. 14; Hippodrome: Kehrberg 2011: fig. 1, n.7-8; Hippos: Mlynarczyk 2011: n. 116; Capernaum: Loffreda 2008: LUC 1.1). This assemblage is very homogeneous and can be dated as early as the 2nd or the 1st century BC.



24. Pottery basin in Trench 8 dated to the Umayyad period, and probably used as a firing place © LAJP.

The second phase of Trench 5 can be dated from the late 1st to the 2nd century AD. The discovery of a complete profile of a Pompeian

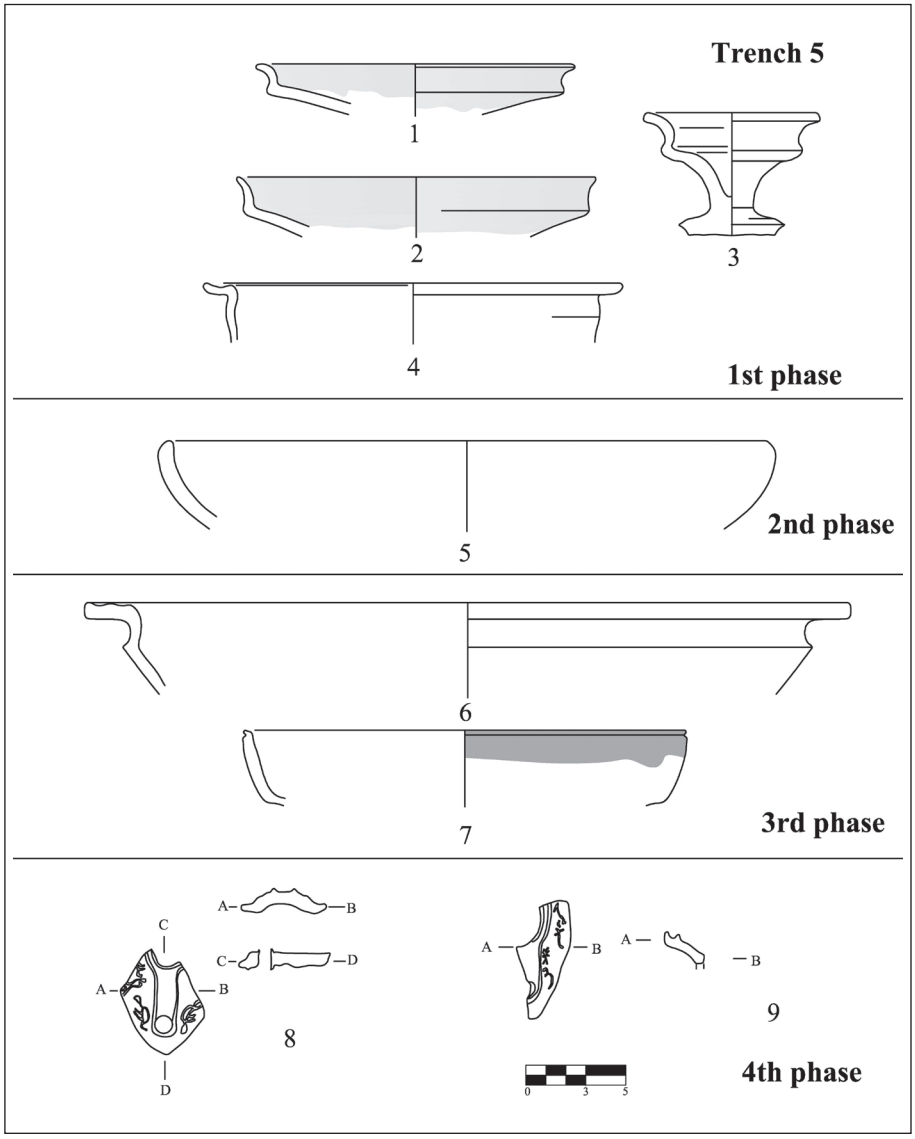
Table 1: Overview and description of the ceramic assemblage from Trench 9.

	Late Iron/ Hellenistic	Late Hellenistic	Early Roman	/Late Roman	Byzantine/ Umayyad	Late-Umayyad	Abbasid
Trench 5		Phase 1	Phase 2	Phase 3	Phase 4	Phase 4	
Trench 6	*residual sherds phase 1*		Phase 1			Phase 2	Early Abbasid?/ Phase 2 ?
Trench 7			Phase 1		Phase 2		Phase 3
Trench 9							Phase 1
Trench 8							*Locus* 2

Red Ware casserole is noteworthy. It shows the characteristic fabric of the Phlegraean Fields area (Capania region, Southern Italy) with many volcanic black sand inclusions mixed with tiny lime inclusions (**Fig. 25: 5**). The fabric and the thick inner bright red slip are a peculiarity of the Cuma area production. This production is well recorded in the ancient sources; Apicius and Martial recommend the usage of the *Cumanae testae* (*cumano rubicundam puluere*) for cooking food (Apicius, *De re coquinaria*: IV.11.138, V.2.196, V.4.198, VI.2.238, VI.5.241, VII.7.302; Martial, *Epigrams*: XIV, 114. Further information about these types can be found in Cavassa 2016; Morra *et al.* 2013).

These types of vessels are not completely uncommon in the east. Pompeian Red Ware is also documented in Umm Qays, Qasr al-Bint and in Antakia, providing further evidence of long-distance trade of the Campanian goods (Umm Qais: Daszkiewicz *et al.* 2014: fig. 5, n. 1, 149; Qasr Al Bint: Presented by F. Renel at *The International Congress for the History and Archaeology of Jordan* 14 (forthcoming in publication); Antakia: personal observation, 2015. For further information see Pappalardo forthcoming). This type of casserole dates to the late 1st century AD (Goudineau 1970, Type 15). The presence of several round lamps within this context support the 2nd century AD date (Kehberg 2015: lamp group 2; Kehberg 1989: fig. 2).

The third phase is mainly characterized by common ware showing the same composition as the late Roman assemblage found in the Temple of Zeus area as well as in Pella (Rasson



25. Ceramics assemblage from Trench 5 (1st, 2nd, 3rd and 4th phase) © LAJP.

1986: fig. 17; Smith, McNicoll, Watson 1992: 170-173, plate 108) (**Fig. 25: 6, 7**).

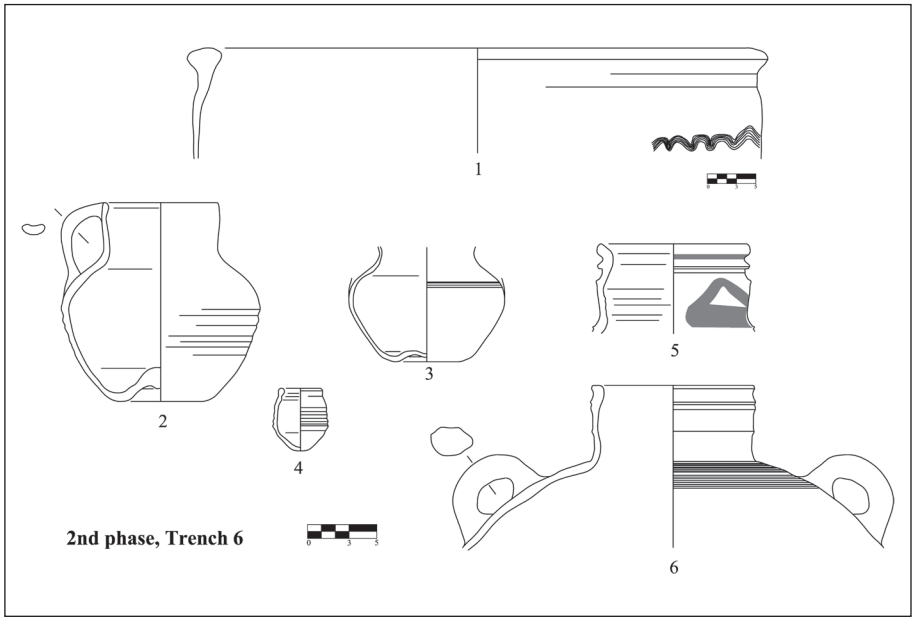
The final phase analyzed in Trench 5 correspond to a large pottery dump where the handmade basins are the most attested vessels in both the Light Brown Handmade Ware (LBHW) and the Light Grey Handmade Ware (LGHW) (Pappalardo 2019). The assemblage is fairly homogeneous, and it is important to highlight two lamps showing fragmentary Arabic inscriptions with pronounced channels between the filling-hole and the nozzle (**Fig. 25: 8, 9**) (Scholl 1986: Group V; Gawlikowski 1986: plate XIII, C-D). This type of lamp dates to the mid-8th century. Within the same horizon there seems to be different body sherds with red painted decoration both with and without buff slip, which could be dated from the late Umayyad to the early Abbasid period (Walmsley 1995: ware 8, 661, fig. 6; Vriezen 2015: 95). Due to the lack of a clear marker of the early Abbasid period (*e.g.* cut ware; channel lamps decorated with scrolls, grape clusters and birds; cream ware) it is likely that the chronology of the fourth phase is no later than mid-8th century AD. Further analysis on the unprocessed pottery is required to clarify the chronology of the latest usage of this trench.

Trench 6

6,100 sherds were retrieved from Trench 6, 453 of which are diagnostic. Two main phases have been identified.

In the lower layers, both common ware and red/brown washed ware is attested. In this *locus*, sigillata vessels have been found in a remarkable quantity compared with other assemblages (23 vessels). In particular, one sherd of *Terra Sigillata Italica* (Aretine Ware) and two complete profile bowls of Eastern Sigillata A (Atlante 58 and 28 form) should be noted. This vessel type suggests that the assemblage from the first phase should be dated to the 1st to early 2nd centuries AD. However, the discovery of 11 sherds of buff/light brown handmade coarse ware with many vegetal inclusions seems to be related to an earlier phase, probably dated to the late-Iron Age/Hellenistic period. For comparison, see vessels on display at the Jarash Museum.

The ceramics assemblage of the second phase is composed by a large amount (up to 2500 sherds) of local Orange-Red ware (O-RW), Light Grey ware (LGW) and LBH/LGH ware (Pappalardo 2019). The most recurrent type is the LGH basin with a thickened rim and rouletted as well as incised combed decorations (**Fig. 26: 1**). Different types of almost complete jars and jugs have been found; these vessels were made from a peculiar pale fabric (PW: buff-buff tending to pink) and pale painted decoration comparable to the vessels found in the 2015 season in Trench 1 (**Fig. 26: 2, 3**) (Pappalardo 2019). One of the jugs has a high neck with a straight rounded rim, carinated body, ovoid section handle and inner omphalos-shaped base. Found with



26. Trench 6 ceramics assemblage (2nd phase) © LAJP.

these vessels was an intact miniature jar with almond shaped body, rounded rim and pointed base (**Fig. 26: 4**). The Red Painted Orange Ware with buff slip (RPOW) is mostly attested with high neck jar with rounded or ridged rim (**Fig. 26: 5**). Imported wares are not common, but sherds from an amphora was found with a well-preserved upper part, with buff tending to white fabric, cylindrical neck and a straight squared rim; the body is completely covered by thin grooves (**Fig. 26: 6**). The shape and fabric of this amphora seems to match the so-called Mafjar ware (Pella: Walmsley 1995: ware 7, fig. 5, n.3; Al ʻAqabah: Whitcomb 1989: fig. 5, K; Capernaum: Loffreda 2008: ANF 49 type). These *comparanda* suggest, an 8th century AD date for the second phase, although some vessels could be dated to the early Abbasid period (*e.g.* Red Painted Orange ware with or without buff slip as well as Pale Ware).

The upper levels of Trench 6 contained one body sherd and one handle, which probably relate to the handmade medieval coarse ware (12th-14th century AD) and one fragmentary wheel-made lamp in common ware, the shape of which matches the glazed lamps with long nozzles (Avissar and Stern 2005: 126, fig. 52, n. 5-6 "12th-14th century AD"). It is not possible to define these few sherds as a proper phase of usage.

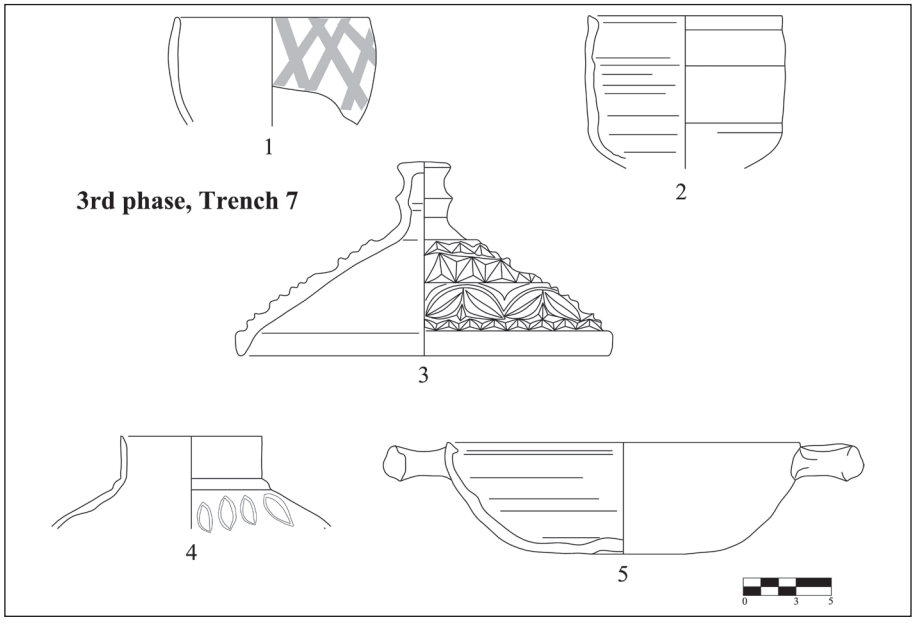
Trench 7

4.450 sherds, 217 of which are identified as diagnostic, have been retrieved from Trench 7. In this trench, three distinct phases were identified. In the first phase, the ceramic assemblage shows mainly the same composition as the phase 1 assemblage of Trench 6 with a medium quantity of "red and brown washed ware". Of note are one complete profile of a bowl in Eastern Sigillata A, Atlante 22 (2nd century BC to 10th century AD) and one sherd of thin walls ware with rouletted decoration.

In the second phase, the assemblage is composed by O-RW, LGW and LBH and LGH basins; one sherd of white painted Jarash bowl and one sherd of Jarash Red Slip ware with a stamp decoration, which is possibly residual (Uscatescu 1995: 374, stamp 1; Uscatescu 2001: 611-612). This phase dates from the 7th to the 8th century.

The third phase is the main phase of Trench 7. It represents the most common early Abbasid-period domestic assemblage and dates to the early 9th century. The Red Painted Orange Ware (RPOW) category contains one complete profile bowl with red painted cross-hatch, another bowl shows a similar fabric and shape with straight body and rim, but without any decoration. This type of vessel was most likely made in Jarash in the late Umayyad-early Abbasid period (**Fig. 27: 1-2**) (Gawlikoswski 1986: 117, plate XII.).

The most outstanding vessel retrieved from the trench is a complete Cut ware lid (**Fig. 27: 3**) (Macellum: Uscatescu 1996: fig. 108, n. 754-755; Temple of Zeus: Bessard



27. Trench 7 ceramics assemblage (3rd phase) © LAJP.

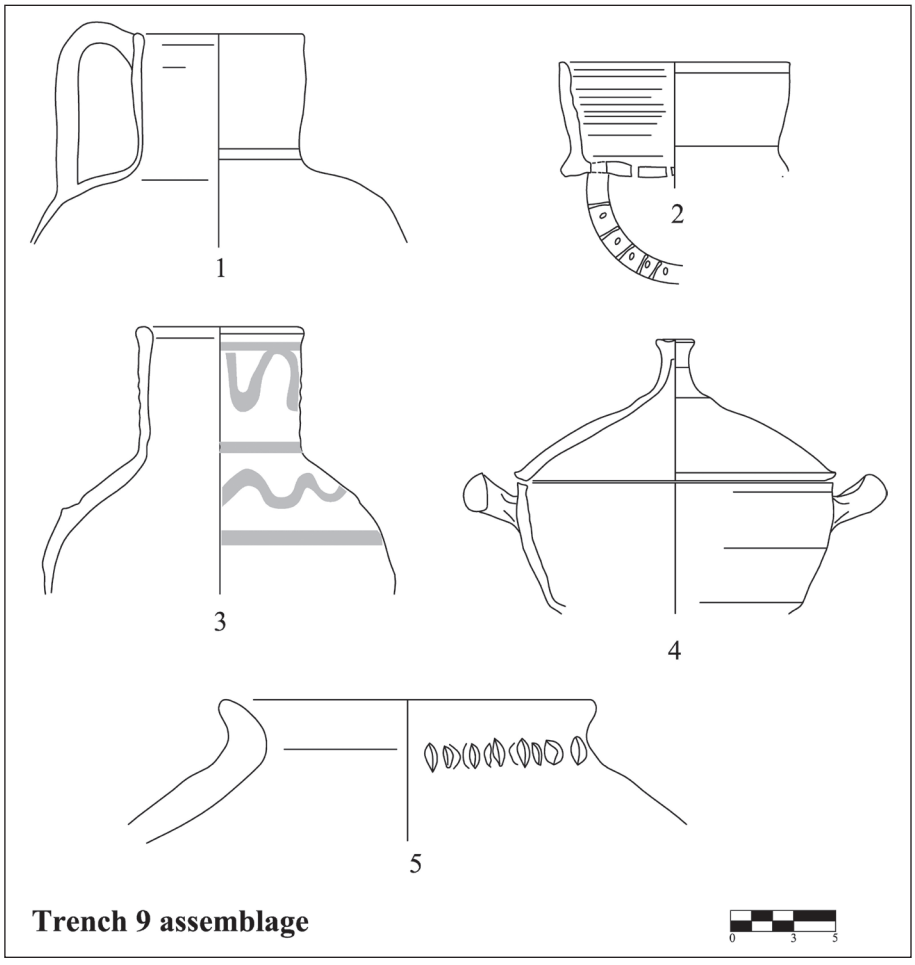
2013: fig. 14; Rujm Al Kursī: ‘Amr 1990; Pella: Walmsley 1995: fig. 9, n. 6; KHirbat Al Mafjar: Whitcomb 1988: fig. 1, period 2, fig. D; Tiberias: Stacey 2004: 94, fig. 5.8). The fabric colour is red-orange with scattered tiny inclusions of grit; the body is truncated cone shaped with a straight rounded rim. The cut decoration is the peculiar feature: it is made of cut triangles overlapping in three lines with cut petal-shaped lines in the middle. The decoration is very well made, the carving work is deep and accurate, which would probably have increased the vessel’s fragility. Two sherds of grey fabric cut ware were found in this context but they do not display the same high quality of carving.

The discovery of an eggshell ware jug with cylindrical neck and straight rim is equally remarkable; the fabric is very fine, whitish in colour, with no clear inclusions are visible (Walmsley 1995: ware 18). The shoulders are decorated with incised oval patterns (**Fig. 27: 4**). The cooking ware assemblage contains a complete casserole with an inward cut rim, hemispherical body, concave foot and ear-shaped handles. The fabric features appear quite different from the Byzantine-Umayyad cooking ware (**Fig. 27: 5**). In particular, the body walls are thicker, the fabric contains numerous large and medium-sized lime and quartz inclusions that are noticeable to the touch (Walmsley 1995: Ware 13A, fig. 8, n. 6).

From the same context it is also important to highlight the discovery of an almost complete “kiln waste” jug showing white painted decoration on the body, on the handle and on the rim.

Trench 9

The excavation of Trench 9 revealed a sealed context, corresponding to a single room. The ceramics assemblage comprise eight nearly intact vessels dated to the Abbasid period. Alongside these vessels, only 343 tiny sherds were found. The vessels are mostly in a fragmentary state and are in need of restoration (**Fig. 28**). **Table 2** summarizes the main features of each vessel.



28. Trench 9 vessels © LAJP.

Table 2: Summary of the ceramic phases for LAJP 2017.

Vessel number	Fabric description	Shape description	Chronology
1 (Fig.28,1)	Cream ware. Very fine, colour white tending to green, scattered tiny voids.	Jug, only upper and lower half preserved. Flared neck with indistinctive rounded rim, cylindrical handle running from the rim to the shoulder. Short ring foot.	Abbasid period- (9th cent.)
2	Completely burned, impossible to describe the fabric feature.	Intact lamp, channel type, almond shaped decorated with scrolls, grape clusters and birds (Scholl 1986, group VI) .	Abbasid period- (early 9th cent.)
3 (Fig.28,2)	Completely burned, probably buff tending to green.	Filter jug, only the upper part is preserved. Flared neck, indistinctive rounded rim. The filter has radial carved lines. The lower part is not preserved and the clean break on the base of the neck is probably indicating a second usage of the broken jug.	Abbasid period- (9th cent.)
4 (Fig.28,3)	Completely burned, probably red fabric white slip.	Jug with cylindrical neck and indistinctive rounded rim, ovoid section handle running from the rim to the neck. Red painted decoration: straight and wavy lines.	Late Umayyad-early Abbasid (mid 8th-early 9th cent)
5 (Fig.28,4)	Red fabric, many medium lime inclusions; scattered tiny quartz inclusions.	Casserole with inner cut rim; ear-shaped handle, curved body, convex base. White painted decoration on the handles.	Umayyad-Abbasid? (7th-early 9th cent. ?)
6 (Fig.28,4)	Red fabric, many medium lime inclusions; scattered tiny quartz inclusions.	Lid with cut rim; hemispherical body, cylindrical handle. White painted decoration on the body. The lid matches perfectly with the casserole.	Umayyad-Abbasid? (7th-early 9th cent.?)
7 (Fig.28,5)	Light-grey/brownish fabric, handmade, common medium lime inclusions; many medium voids.	Pithos, round inner-folded rim; globular body; flat base; finger print decoration on the short neck. Multiple handles. Medium size.	Umayyad-Abbasid (mid8th-9th cent.)

Trench 8

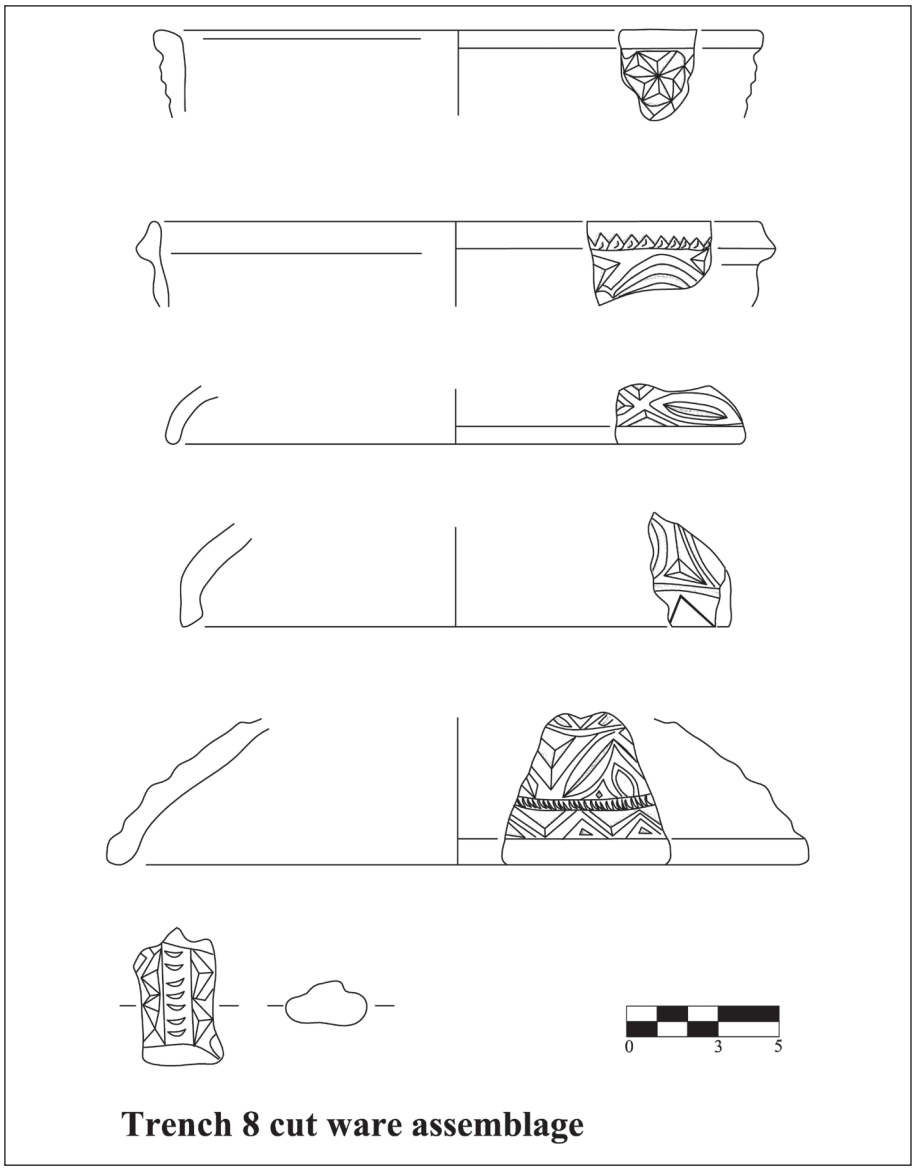
The excavation of Trench 8 revealed a considerable amount of pottery. Due to time constraints only three *loci* were processed, but combined, they contained twice the amount of the entire assemblage from any other trench (11,584 sherds; 376 diagnostic). The composition of the assemblage suggests that the area was an enormous pottery dump in the Abbasid period. From this assemblage it is worth highlighting the (at least) 15 different shapes of cut ware vessels (lids, bowls and pans) in both red and grey fabric (**Fig. 29**). It is also important to bring attention to a high percentage of kiln waste vessels (119 different shaped sherds), which may suggest the presence of nearby ceramic production. Further work needs to be undertaken in the next season in order to complete the pottery processing and analysis of the material from Trench 8.

Archaeobotanical Analysis

Archaeobotanical analysis has the potential to inform upon a range of research questions including diet, agriculture and trade. Very limited archaeobotanical analysis has taken place within previous excavations at Jarash (French unpublished on results from the Islamic Jarash Project), hence a programme of archaeobotanical analysis was instigated in the 2017 season of the LAJP. Archaeobotanical analysis at Roman, Late Antique and Islamic sites in the Middle East is generally rare (Lev-Tov 2003; Neef 1997). However, a recent archaeobotanical study at Petra and environs has indicated the potential for such research in this region (Bouchaud *et al.* 2017; Ramsay and Smith 2013). Archaeobotanical data can contribute to debates on the increase in agriculture in the Late Antique period (Ramsay and Smith 2013), and the intensification of agriculture and introduction of exotic crops in the Islamic period (Watson 1983).

Methodology

Soil samples were taken (0.5-19L) from a range of *loci* excavated in 2017. The sealed destruction deposit in Trench 9 was a focus



29. Cut ware vessels from Trench 8, locus 2 © LAJP.

of intensive sampling. Soil samples were processed by bucket flotation, using 0.25mm flot mesh and a 1mm residue sieve. Flots were assessed in the field using a low power binocular microscope (×40) and residues were sorted by eye. Preliminary identifications have been made utilizing the reference collection at the School of Archaeology, University of Oxford. Sub-samples were taken with a riffle box and then multiplied up, as presented in **Table 4**.

Results

A total of 38 samples were processed during the 2017 season, along with hand collected material from 7 *loci*. Charred plant remains were recorded in numerous samples. Traces of mineralized material was present in Trench 6 *locus* 10 –an ash deposit within Room A that also contained fish bones and an oil lamp. Given the calcareous geology at Jarash, there is strong potential for further mineralized material to be recovered. A range of charred cereals, pulses, fruits and weed seeds were identified, at generally low densities (1-5 items/L), which is reflective of other sites in the region, such as the area around Petra (Ramsay and Smith 2013). The structure in Trench 9 produced exceptional charred storage deposits of cereals, pulses and fruits. Initial assessment results are here summarized by period.

Trench 5

Seventeen samples were assessed from Trench 5. Taxa included barley (*Hordeum* sp.)

(*locus* 43), olive stones (*Olea europaea*) (*loci* 32, 42, 43, 45, 55, 56), grape (*Vitis vinifera*) (*locus* 38), fig (*Ficus carica*) (*loci* 51, 60), pulses (*loci* 38, 43, 47, 51) and weed seeds including *Silene* sp. (*loci* 32, 51). No cereal chaff was present in this or any other square.

Trench 6

Three samples were assessed from Trench 6. Olive stones were present in *locus* 8 and 10. Numerous fish bones and traces of mineralised insect eggs were present in *locus* 10, indicating a midden/faecal deposit.

Trench 7

One sample was assessed from Trench 7, which contained no charred plant remains.

Trench 8

Seven samples were assessed from Trench 8. Olive stones were present in *loci* 4, 7, 8, 15. Also present in *locus* 15 were barley grains, fig, and pulse seeds.

Trench 9

Given the presence of abundant charred plant remains in *locus* 10, *locus* 12 and 14 were split into *ca.* 50cm square areas for spatial sampling. One deposit of 100s of charred barley grains was present in *locus* 14, Area 1. Initial observations showed the grains to be hulled, and weed seeds were present. *Locus* 14, Area 2 produced a mixture of 100s of barley and wheat grains (*Triticum* sp.). *Locus* 10 produced numerous (100+) cultivated pulses, probably lentils (*cf. Lens*). Two intact dates (*Phoenix dactylifera*) were recovered from *locus* 14. This material will be the focus of detailed laboratory study and radiocarbon dating.

Results by Period

Samples from *loci* which have been assigned a preliminary chronological phase are summarized in **Table 3**. Cereal grains are present in all period –include *Hordeum vulgare* (hulled barley), *Triticum* sp., including *Triticum cf. dicoccum* (emmer) and free-threshing (*T. aestivum*/*durum*). No cereal chaff was recorded in any periods indicating that crop-processing was not taking place in this area of Jarash. *Olea europaea* (olive) was present in the Hellenistic, Early Roman, Late Antique and Late Antique/Early Islamic I periods. *Ficus carica* (fig) was present in the Early Roman, Late Antique, and Late Antique/Early Islamic I period. *Vitis vinfiera* (grape) was present in Hellenistic II. A range of pulses are recorded in all periods–usually *Vicia ervilia*, and a substantial deposit of lentils in Trench 9.

Preliminary analysis of samples from Trench 9 (**Table 4**) has shown that there are two major deposits, one containing an abundance of lentils, alongside small quantities of *Triticum* sp. grains. In Trench 9, Area 3, cereals are the main crop, mainly barley grains and wheats, with small quantities of bitter vetch. Many of the cereals are badly preserved, having been charred at high temperatures. The stored crops of lentil and barley were both clean, with very small quantities of cereal chaff and a few weed seeds (*Malva* sp., *Rumex* sp.). Two intact charred dates were also preserved.

Discussion

This preliminary study has indicated the successful retrieval of charred plant remains from Jarash. The identification of a range of cereals, fruits and pulses indicates the continuation of crop repertoire from the Roman to Islamic period, as highlighted elsewhere in the region (Farahani 2018). Fig and grape have so far not been recorded in the Abbasid period. No Islamic exotic imports have yet been recorded, and few weed seeds are present with which to evaluate the Islamic agriculture revolution (Watson 1983). The insights from the structure in Trench 9 indicate the storage of cereals and pulses within the structure. Along with wheat, barley, and dates, a store of lentils was recorded. Excavation of the rest of this structure will shed light on the range of food stored within a domestic structure in the Abbasid period.

The crop spectrum recorded at Jarash is comparable to that recorded elsewhere in Jordan. At Al Lajjūn on the Limes, barley, pea, lentil, grape and olive were recorded in the Roman period (Crawford 1987). In southern Jordan at Bīr Madhkūr in the desert hinterland of Petra a similar range of crops was recorded in Late Antiquity, including fig, olive, grape, millet, barley, free-threshing-wheat (Ramsay and Smith 2013). From Petra itself, free-threshing

Table 3: Assessment results from the LAJP 2017. Only includes samples with charred plant remains present. + = 1-5 items, ++ = 6-10 items, +++ = >10 items.

Sample	Trench	*Locus*	Period	Cereal Grain	Cereal Chaff	Olive	Fig	Grape	Pulse	Weed
29	5	38	Hellenistic II	+		++		+	++	
31	5	55	Hellenistic II	++		++				
32	5	56	Hellenistic II			+				
-	5	11	Early Roman			+				
49	5	16	Early Roman	+						
-	5	18	Early Roman	+		++	+		+	
30	5	42	Early Roman			++				
8	8	15	Early Roman?	+		++	+		+	
22	5	32	Late Antique			+				+
28	5	60	Late Antique	+		+	+			
17	5	47	Late Antique/ Early Islamic I	+					+	+
16	5	49	Late Antique/ Early Islamic I			+				
18	5	51	Late Antique/ Early Islamic I	+			+		+	+
11	5	43	Early Islamic II	+		+			+	++
2	5	22	Early Islamic II						+	
-	5	27	Early Islamic II						+	
6	8	4	Abbasid	+						+
-	8	4	Abbasid			+				
+	9	10	Abbasid	+++	+				+	
33	9	12.3	Abbasid	+++						
41	9	12.2	Abbasid	+						
20	9	14.1	Abbasid	+					+	
19	9	14.2	Abbasid	+++						
23	9	14.3	Abbasid	+++					++	
21	9	14.4	Abbasid	++						
3	6	6	Post-Abbasid?							+
7	6	8	Post-Abbasid?			+				
4	6	10	Post-Abbasid?			+			+	+
-	5	17	Medieval			++				

wheat, barley, lentil, pea, fig, olive, grape and date were the main taxa recorded from the 2nd century BC to the 5th century AD (Bouchaud *et al.* 2017). A recent detailed study from DHībān, to the east of the Dead Sea has also shown a continuity in crops from the Iron Age to the Middle Islamic period, with the main crops being free-threshing wheat, emmer, barley, lentil, grape and bitter vetch (Farahani 2018).

Other Islamic period archaeobotanical studies are rare. Limited data from Umayyad period Tabqat Fahl (Pella), to the north-west of Jarash in the Jordan Valley indicated the presence of 2-row and 6-row barley and pistachio (Willcox 1992). At Tall Hisbān, samples from the Iron Age to the Islamic period showed the continued cultivation of wheat, barley, lentil, fig, grape, olive and bitter vetch in all periods (Gilliand 1986). Given the small dataset currently available from Jarash, the picture of continuation in the main crops through time holds.

Given the presence of albeit generally low densities of charred plant remains, further sampling with increased sample size has the potential to inform upon key aims of the LAJP, and enable wider comparisons with other urban sites in the region.

Copper Coin Conservation in Jarash

Conserving coins, as opposed to other types

Table 4: Quantified data from Trench 9. Samples only analysed to 1mm.

	Sample	**20**	**21**	**23**	**41**	**19**	**26**	**14**
	Context	9.14	9.14	9.14	9.12	9.14	9.14	9.10
	Area	Area 1	Area 4	Area 3	Area 2	Area 2		
	Fraction	1 mm	1mm	1mm	1mm	1mm		1mm
	Volume/L	3.5	5.5	5.5	5	3	Hand-picked	10
Triticum sp. (grain)	Wheat			196	4	115		49
cf. Triticum sp. (grain)	Wheat	1	6	5				
Hordeum sp. (grain)	Barley			79		30		24
cf. Hordeum sp. (grain)	Barley	2	2					
Cereal indet. (grain)	cereal			300	2	66		64
Cereal indet. (culm node)	cereal							8
Lens culinaris	Lentil							899
Phoenix dactylifera	Date						2	
Malva sp.		1	3	4	1			
Rumex sp.				4				
Vicia ervilia	Bitter vetch	3						
cf. Vicia ervilia	Bitter vetch			8				
cf. Juncus clusters			6	8				
Large Poaceae indet.				12				
Seed indet.				4				24
Pulse indet.				4				

of archaeological objects, present a challenge due to the dual character of coins: coins are considered documents as well as objects with a materiality to be studied. The choice of conservation procedure depends on an array of factors: priorities set by the archaeologists, the objects' state of preservation, human resources (training and experience of the conservator), accessible technical facilities and interwoven into this: funding and time[2].

Priorities and Time: Cursory Cleaning and Selection for Conservation

The initial wish expressed by the director was, unsurprisingly, to have *all* coins conserved. As time is always scarce during a work campaign the following strategy was developed to optimize the outcome of the conservation effort: all coins were initially cleaned cursorily to establish whether further cleaning would provide readable surfaces. Based on this initial cleaning, the coins were then divided into two groups: a) the "promising" coins and/or coins from particularly significant contexts and b) the "not promising" coins.

During two weeks of conservation, 51 coins retrieved by the LAJP from 2015-2017 (of a total of 83), were lightly cleaned to evaluate their potential. Of 40 promising and/or high priority context coins, 33 coins had optimal cleaning done. 7 promising coins will be cleaned during next season and the remaining 11 coins were either too worn, fragmented or corroded to carry any legend.

State of Preservation: The Basics of Copper Corrosion and Where to Find the Surface

All coins retrieved by LAJP in 2015-2017 were struck of copper (or copper alloys). They are treated as copper coins even though they might contain small amounts of zinc, lead and tin. In Jarash, the corrosion products range from a thin and even patina to thick, bulky and porous layers of corrosion disguising and sometimes destroying the legend of the coins. The corrosion crust may –even on an individual coin– vary in thickness and state of preservation. This phenomenon, described

2. The author is greatful to Jettie van Lanschot, M. Sc. in Conservation, Ass. Professor Emerita, School of Conservation, Copenhagen for supplying relevant literature and sparring.

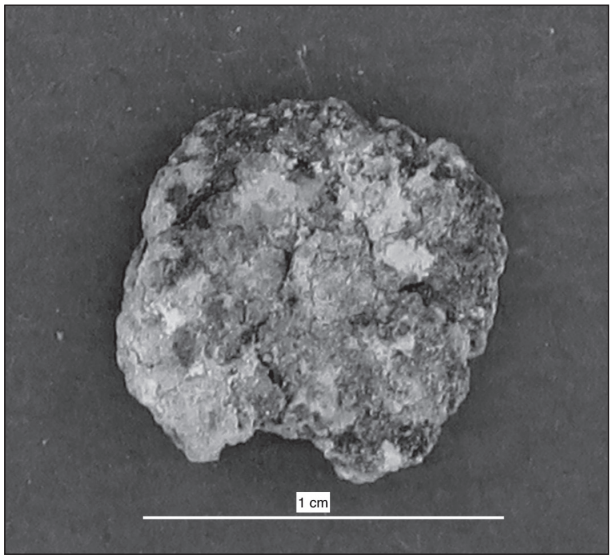
as pitting corrosion, results from the uneven distribution of highly aggressive components in the ambient soil, such as chlorides, which may derive from the dense human activity in Jarash.

Corrosion is an electrochemical process degrading metals and attacking at the surface of metallic objects. The metallic copper meets water and air (oxygen) and oxidizes. In this process it also reacts with –and incorporates– elements from its immediate surroundings *e.g.* salts and sand particles. The border of this degradation process is moving inwards from the surface of the coin towards the core of the object. Corrosion also spreads along cracks and micro fissures inside the object. When the metal reacts chemically with its surroundings it forms new combinations, which are bigger and more porous than the uncorroded metal (**Fig. 30**).

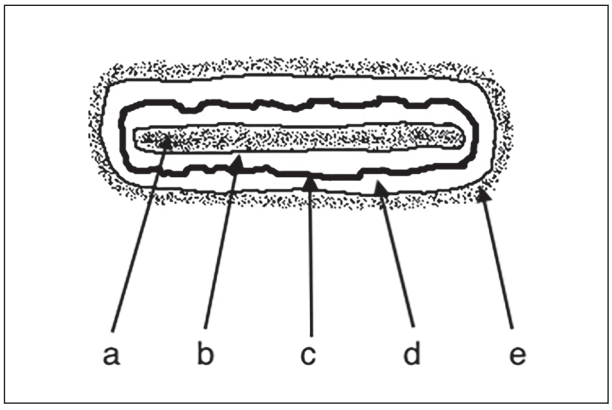
On copper alloys, as found in the Jarash coins, the corrosion layer close to the metallic surface consists of a dark brown to orange, compact cuprite, copper(I) oxide, Cu_2O. In the outer bulky, porous, green layers, the corrosion products *e.g.* copper carbonate hydroxide, malachite, $Cu_2CO_3(OH)_2$, tend to embed elements from the ambient soil, very often lime, sand and organic particles (Selwyn 2004: 64-65).

In the frequent presence of *salts* (chlorides) a bright, greyish, greasy copper(I) chloride, nantokite, CuCl, is formed directly at the metallic surface of the coins. When CuCl meets water (or a relative humidity higher than 40%) it oxidizes into the powdery, light green (par) atacamite, $Cu_2Cl(OH)_3$, known as "bronze disease" (**Fig. 31**) (de Ryck 2007: 32; Selwyn 2004: 66-68; Thickett 2016: 183).

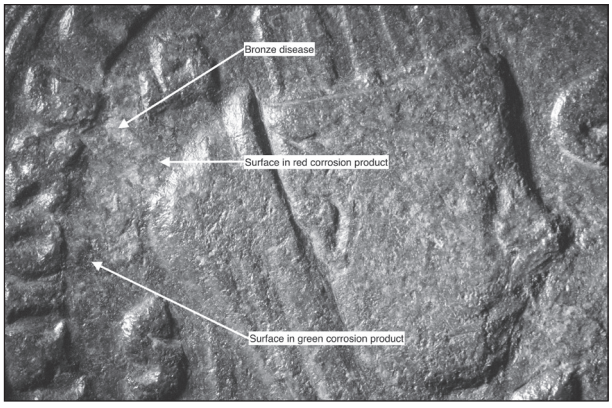
The supposed surface of the coins is therefore a corrosion feature to be found within the corrosion layers. Optimal cleaning aim to find precisely *the* spot in the corrosion layers which best resembles the original surface *i.e.* which reveals the best impression of the supposed original surface of the coin when it was in use. Sometimes the best impression is to be found in the copper oxide, sometimes in the copper carbonates, sometimes it is corroded away (**Fig. 32**) (Bassett and Chase 1994: 71). The volume change involved when copper turns into copper(I) oxide is moderate. Therefore, the corroded features stay relatively unchanged when kept in this orange-brown corrosion product (Gettens 1964: 6).



30. Bulky corrosion and corrosion in cracks. LAJP Trench 2, Locus 14, Field Object 7.



31. Corrosion layers: a) sound metal, b) cuprite, nantokite, c) best impression of original surface, d) malachite, cuprite, (par)atacamite, e) soil minerals, accretions, replaced organic material etc. © Strehle.



32. Original surface kept in specs and in different corrosion levels. LAJP Trench 8, Locus 6, Field Object 5. © LAJP_ Strehle.

Experience: Cleaning Methods and Their Effects

Thirty-one conservation campaigns since 1988 in the Middle East have given this conservator the chance to revise my earlier work. I have encountered no re-corrosion on the coins previously treated despite storage conditions that in many cases have been far from ideal.

My experience is backed by two further studies: a bibliographical survey of conservation methods applied since the time of the mandate period (1920-1946) in the Middle East (Strehle 2001: 131-135), while visits to all the Syrian museum store-rooms in 2000-2001 and to the Bahrain National Museum in 2002 and 2018 have given me the opportunity to inspect the long term effect of conservation methods. The coins kept in these museums are either untreated or have been stripped from corrosion products by the use of chemical methods such as electrochemical treatment in NaOH with zinc granulate (Damascus, Hama, Homs, Al-Maara, Aleppo and Palmyra), citric acid in the form of lemons (Palmyra) or variations of electrolysis (IFAPO Damascus and Damascus National Museum). For post cleaning, if any, the conservators have applied different varieties of paraffin or Paraloid™ as a surface treatment.

The antiquarians and conservators that I interviewed as a part of my visits have the unanimous experience that none of these treatments produce stable and secured objects. They have noted (with regret) that chemical treatment removes the surface of the copper alloys. Therefore, some museums have abandoned chemical treatments of any kind (Hadad *et al.* 2007: 164; Strehle 2001: 133) and recently, stabilization procedures have been used in the region (Hadad *et al.* 2007: 163).

These personal experiences are strongly backed by the conservation literature from the 1920s onwards. David A. Scott, a leading authority on metallurgy and metal conservation, states: "Because of the difficulties in controlling reactions during chemical treatment, which may compromise the shape of an object –including details of design, tool marks, or surface finishes retained in the corrosion– mechanical cleaning remains the preferred option…" (Scott 2002: 358).

Chemical cleaning methods do, however, have some use on museum objects with only a superficial patina on top of a sound metallic core (Hadad *et al.* 2007: 163), but it is never advisable to apply onto the corroded archaeological finds retrieved from the soil. The chemical methods have until recent years been used *on coin hoards*, where it has proven otherwise difficult to separate the individual coins imbedded in corrosion products (Selwyn 2006: 317) or, when separating the coins is thought to be too "time and labour-consuming…" (Viljus 2013: 33-39).

Research by David Thickett and Celestine Enderly at The British Museum, Department of Conservation, has verified a series of drawbacks to using chemicals for removing corrosion products: *e.g.* metal is lost to the cleaning solutions (Thicket and Enderly 1997: 185). After treatment, an increase in porosity of the metallic microstructure is observed. This presents a danger for future corrosion. The researchers also noticed, that the copper alloy loses its alloyed metals such as lead (Thickett and Enderly 1997: 187). These changes are not visible to the naked eye but are detectable with high-resolution methods such as scanning electron microscopy with energy dispersive x-ray analysis (SEM-EDX) and x-ray fluorescence spectroscopy (XRF) (Thickett and Enderly 1997: 184). Thereby, the chemical changes lead to a false picture of the composition of the copper alloys.

An alternative to chemical cleaning techniques is electro-chemical (*galvanic*) cleaning. Electro-chemical methods can involve alkaline solutions - such as NaOH - as electrolyte and a less noble metal –such as aluminium or zinc– which serves as an anode (Selwyn 2006: 318). Electro-chemical methods with sacrificial anode material have been used at museums since 1887 and were abandoned by professionals on finds retrieved in excavations since the 1970s, when more informed methods evolved (Appelgren 1896: 33-35; Scott 2002: 353-358, 368). The electro-chemical methods suffer from the same drawbacks as the chemical methods (Scott 2002: 354). Additionally, aluminium –or zinc– (according to the anode used) will precipitate at the surface of the coins (Thickett and Enderly, 1997: 187). Copper

alloys treated in the past with sodium-based solutions now present new corrosion problems, because of reactions involving the copper alloy and the residual sodium ions (Selwyn 2006: 317). Therefore, chemical –as well as electro-chemical methods– are shown to be destructive and will hamper future archaeometric studies such as investigations into alloy composition.

When dealing with hoards or coins in large quantities, excavators and numismatists with a focus on coins as documents, can be tempted to save time and turn to these destructive methods for their immediate effect on the better-preserved coins (Schultze 2018: 195-196). Chemicals cannot distinguish corrosion above the original surface from corrosion under this level. For that reason alone, no "quick fix" chemical cleaning is advisable. Only a cleaning method of a *mechanical* nature can reveal the shape and surface, which best represents the original appearance of the object without destroying the material information embedded in the coins (Bassett and Chase 1994: 64; Scott 2002: 358; Selwyn 2006: 317).

Experience: Stabilization Methods

Cleaning alone is seldom valid as the sole treatment: Coins found in soil tend, if left untreated, to suffer from bronze disease *i.e.* to re-corrode after excavation and cleaning (Selwyn 2004: 66). Therefore, it is neither sufficient, nor ethically acceptable, to stop the conservation treatment as soon as the coins are deciphered. The conservation method must address the survival of the alloy as such. Accordingly, a stabilization regime must be set up for the long-term safe keeping of the coins. This includes *chemical* as well as *physical* stability.

Since 1967 it has been possible to enhance the *chemical stability* of copper alloys by applying the corrosion inhibitor benzotriazole, BTA (Rahmouni 2009: 5215; Scott 2002: 376-377). The inhibitor neutralizes the otherwise aggressive chlorides still sitting in the corrosion crust on a coin, which has been cleaned to the best impression of the original surface. Using a 3% (weight/volume) solution BTA in ethanol is still considered the most effective inhibitor (Scott 2002: 380). Methods of application vary: from brushing at room temperature to immersion in vacuum (Hadad 2007: 163-164; Scott 2002: 379; Watkinson 2010: 3332-3334).

For *physical* strengthening and protection against oxygen- and humidity-induced corrosion, a 5-15% (weight/volume) solution Paraloid B72™ (Acryloid B72™ in the U.S.) in organic solvents is standard procedure. The coating further acts as a barrier against the poisonous BTA (Scott 2002: 380; Watkinson 2010: 3328). In the recent years, as formal training of conservators has spread, these procedures have come into use in the Middle East (Argyroupoulos 2007: 3-5; Hadad 2007: 163-164).

Methodology: How to Find the Surface and How to Preserve the Coin

To meet the dual goal of finding the best impression of the original surface and preserve the coin, I followed a three-step conservation regime at this LAJP campaign as well as in my previous involvement with University of Copenhagen's Islamic Jarash Project (IJP):

(1) mechanical cleaning, (2) stabilization of the chemical integrity of the coin in order to stop further corrosion and (3) securing the physical cohesion of the coin.

Mechanical Cleaning

A binocular magnification of 10×-40× *i.e.* using a stereo microscope and fibre lights (**Fig. 33**) is crucial to guide the mechanical removal of corrosion products (Scott 2002: 358-359). Cursory, exploratory, cleaning (see above) is done with slightly curved scalpels set in a flat angel against the coin. Working for 10 minutes on each coin is often enough to establish whether any detectable features are hidden in the corrosion and for a rough dating to Roman, Byzantine, Umayyad pre-reform or Umayyad post-reform (**Fig. 34**).

The next stage; removal of corrosion products to produce the best impression of the original surface is very time consuming and in Scott's wording: "The real problems begin when attempting to expose the object´s original surface, which may be preserved in a cuprite layer below outer, sometimes swollen, covering layers of basic copper carbonates and basic chlorides. These layers are often quite hard,

and the cuprite layer itself may be either very compact or sugary, which cannot be gauged without prior exploratory cleaning" (Scott 2002: 359). This stage of the cleaning is performed in steeper angles with pointed scalpels which are purpose-shaped by the aid of grinding paper (**Fig. 35**). Also brushes with a varying degree of stiffness and a small camera air blower (puffer) are needed to remove the loosened corrosion crust. If the surface is well defined, an ultrasonic dental chisel (still guided by stereo microscope) can be helpful. A finishing touch to enhance the aesthetic appearance of the cleaned surfaces is achieved by gentle use of a rotating stainless-steel brush.

33. Mechanical cleaning under stereo microscope. © IJP_ Tjelldén.

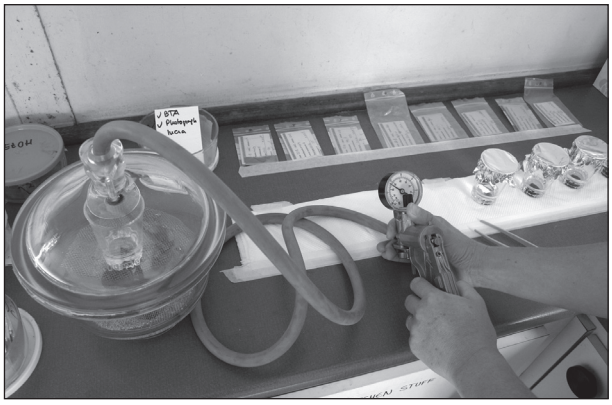
34. Cursory cleaning of coin from Trench 1, Locus 12, Field Object 9 before and after. © LAJP_Strehle.

Chemical and Physical Stabilization

Inhibiting the coins from further corrosion is achieved under vacuum, established with a hand driven pump, which can reach 65mm mercury (Hg) (**Fig. 36**). The immersion runs for a minimum of 24 hours, and is repeated if the coin, after checking in a humidity chamber, shows signs of instability or bronze disease. The coins sit in individual, labelled containers but are treated in batches (**Fig. 37**).

The final, protective treatment is applied by immersing the coins in a 15% weight/volume solution Paraloid B72™ in propanone:ethanol 3:2. This step also involves vacuum to penetrate

35. Mechanical cleaning to the best impression of the original surface. © IJP_Tjelldén.



36. Chemical and physical stabilization is performed under vacuum. © IJP_Brahe.

37. Logistics while stabilizing coins. © IJP_Tjelldén.

the micro cracks and porosities of the corrosion crust (**Fig. 36**).

Finally, the coins are stored in acid free envelopes set with tags in a polyethylene bag and handed over to the Jordanian authorities. In the housing belonging to the Jordanian Department of Antiquity at Jarash, a mobile laboratory can be set up for each season and the inventory packed up and stored between working campaigns.

Results and Future Possibilities

At this field laboratory, it is possible to conserve the coins following best practice and revealing their features without compromising the integrity and future research potential of the coins. Analysis of copper alloys, which have not been subject to chemical treatment, has thus allowed composition-based categorization according to date and function (Arafat *et al.* 2013: 264-269). Technology, provenance and trade are further areas of future research (Watkinson 2010: 3310).

The long-term effect of the conservation procedure has been monitored for three decades and proven effective. Given the possibility of treating the coins at one of the permanent conservation laboratories, the same techniques for cleaning and stabilizing would be applied.

The initial sorting of coins into promising and not-promising may be eased considerably by using digitally enhanced x-ray procedures (Walmsley 2003: 124-125). It is also tempting to experiment with stereo X-ray recordings, thus producing a double picture which separates the two sides of the same coin.

The Roman and Late Roman Coins

A total of 83 objects identified as coins were found during the 2015 and 2017 seasons (although this identification is not certain in the cases of poorly preserved objects). These were all coins of copper alloy; no higher value coins were found. Of these, 51 were selected to undergo conservation procedure. As a result of the cleaning process, detailed above by Helle Strehle, it was possible to identify a small number of the coins, which are of Roman, Late Roman, Byzantine and Islamic issue. The Roman and Late Roman coins are presented here; the Byzantine and Islamic coins will be presented separately. The coins represent single losses; no hoards were found.

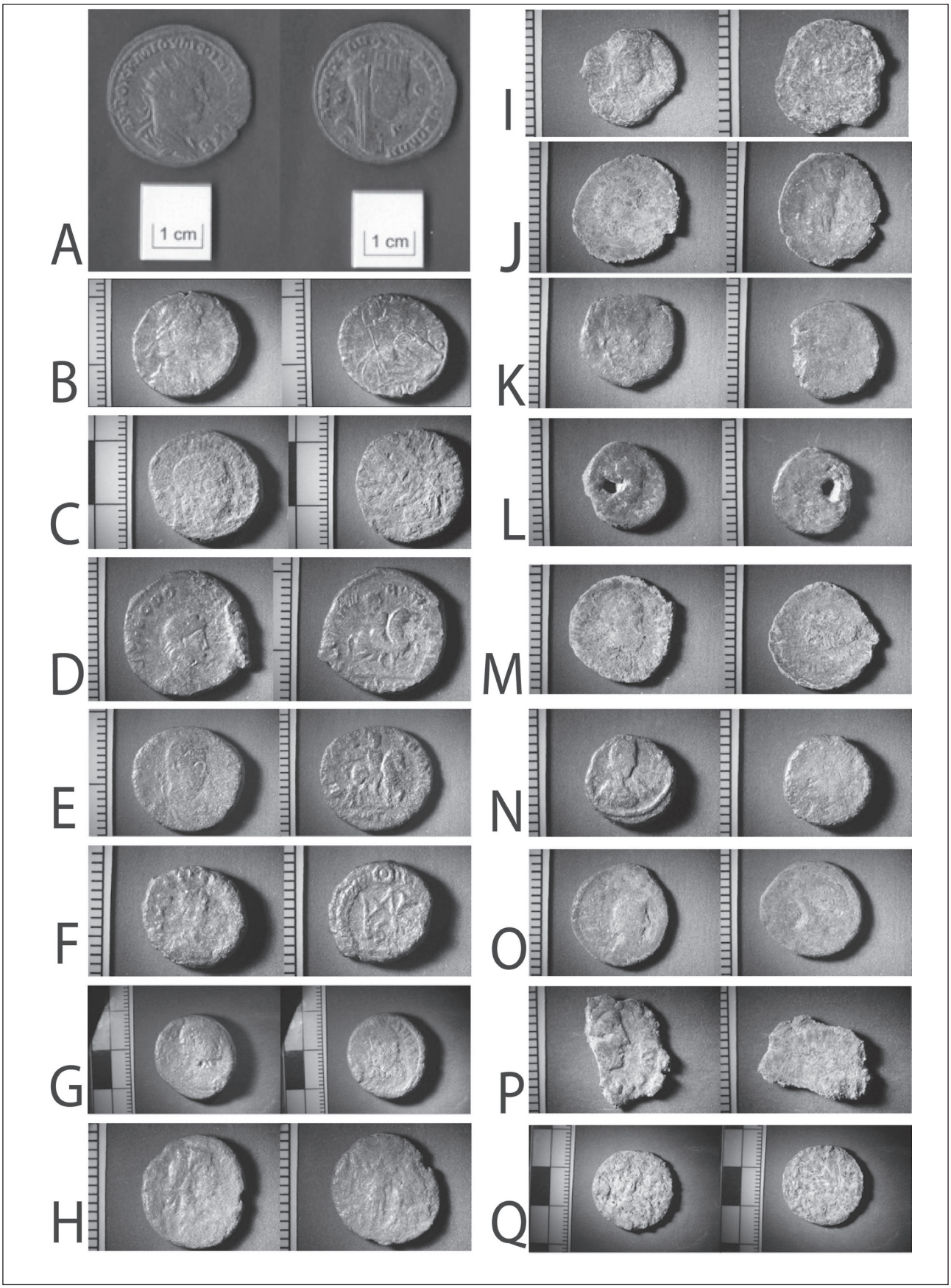
The coin catalogue is organized according to the following order:

- Field season, Trench, *Locus*, and Field Object Number.
- Denomination, ruler, mint.
- Condition.
- Description of obverse, followed by inscription.
- Description of reverse, followed by inscription.
- Diam. (in mm), weight (in grams).
- Series date.
- References (abbreviations are listed in the first section of the bibliography).

LAJP 2017 Trench 8 - *Locus* 6 - Field Object No. 5 (**Fig. 38, A**)
AE Philip I, Antioch-on-the-Orontes
Surface corrosion, worn.
Obv: radiate bust facing r. AVTOK K M IOVΛI ΦIΛIΠΠOC CEB
Rev: veiled bust with mural crown facing r. ANTIOXEΩN METPO KOLΩN; ram jumping right above, star below. In field, Δ-E S-C
Diam: 29mm, wt: 10.42g.
Series date: 244-249 AD
Ref: BMC 529-30

LAJP 2015 Trench 1 - *Locus* 12 - Field Object No. 9 (**Fig. 38, B**)
AE Constantius II, Cyzicus
Surface corrosion, very worn
Obv: Diademed draped and cuirassed bust facing r. [DN CONSTAN] TIVS [PF AVG]
Rev: Helmeted soldier facing left spearing fallen horseman to lower left. [FEL TEMP] REP[ARATI]O In Ex: SMKA
Diam: 17mm; wt: 3.03g
Series date: 351-354 AD
Refs: RIC VIII Cyzicus 92

LAJP 2017 Trench 8 - *Locus* 7 - Field Object No. 6 (**Fig. 38, C**)
AE Constantius Gallus?
Surface corrosion, extremely worn.
Obv: Bare-headed draped bust facing r. [DN FL CONST]ANT[IVS NOB CAES]. Reading uncertain.



38. Overview of Roman and Late Roman coins © LAJP.

Rev: [FEL TEMP REPARAT]IO. Falling horseman type(?)
Diam: 17-18mm, wt 3.18g
Ref: *E.g.*, RIC VII Cyzicus 94
Series date: 351-354 AD

LAJP 2015 Trench 4 - *Locus* 1 - Field Object No. 1 (**Fig. 38, D**)
AE Theodosius I, Cyzicus
Surface corrosion, very worn
Obv: Diademed, draped and cuirassed bust facing r. [DN] THEODO [SIVS PF AVG]
Rev: Mounted figure facing right raising right hand. GLO[RI]A - ROMA[N]ORVM
In ex. SMKS
Diam: 21mm; wt 2.19g
Refs: RIC IX 29
Series date: 393-395 AD

LAJP 2015 Trench 4 - *Locus* 10 - Field Object No. 42 (**Fig. 38, E**)
AE Theodosius I(?), Antioch
Surface corrosion, very worn
Obv: Diademed, draped and cuirassed bust facing r. Inscription illegible.
Mounted figure facing right, raising right hand. G[LORIA] ROMANO[RVM]
In ex. ANT[A]
Diam: 14-15mm; wt: 1.86g
Series date: 392-395 AD
Refs: RIC IX 69.

LAJP 2017 Trench 4 - *Locus* 11 - Field Object No. 15 (**Fig. 38, F**)
AE Marcian
Surface corrosion, very worn
Obv: Diademed, draped, cuirassed bust facing r. Inscription visible but not legible (DN MARCIANVS PF AVG)
Rev: Monogram (RIC 1b or 2) within wreath with S below.
Diam: 11mm; wt: 1.43g
Refs: RIC X Marcian 546
Series date: 450-457 AD

Below are coins that could not be specifically attributed but based on their few distinguishing characteristics appear to belong to the Roman/ Late Roman period. A further 23 objects identified as coins and treated by H. Strehle lacked any distinguishable surface features and were in too poor condition to merit inclusion here.

LAJP 2017 Trench 8 - *Locus* 8 - Field Object No. 8 (**Fig. 38, G)**
AE Greek Imperial
Very corroded, surface extremely worn
Obv: bust facing r.
Rev: bust facing r. Inscription in Greek letters] ANEAC[(?)
Diam: 21-22mm; wt: 10.42g

LAJP 2015 Trench 1 - *Locus* 4 - Field Object No. 6 (**Fig. 38, H**)
AE Roman/Late Roman
Very corroded, extremely worn
Obv: Laureate or diademed bust, draped, facing r.
Rev: Standing figure (possibly flanked by two other figures)
Diam: 11-12mm; wt: 0.83g

LAJP 2015 Trench 1 - *Locus* 11 - Field Object No. 8 (**Fig. 38, I**)
AE Roman/Late Roman
Very corroded, extremely worn
Obv: Laureate bust, facing r.
Rev: No discernible features
Diam: 10-11mm; wt: 0.41g

LAJP 2015 Trench 4 - *Locus* 11 - Field Object No. 18 (**Fig. 38, J**)
AE Roman/Late Roman
Very corroded, extremely worn
Obv: Bust facing r. [---]NIANVS P[F AVG]
Rev: Standing figure
Diam: 12-14mm; wt: 0.81g

LAJP 2015 Trench 4 - *Locus* 10 - Field Object No. 12 (**Fig. 38, K**)
AE Roman/Late Roman
Very corroded, extremely worn
Obv: Diademed bust, facing r.
Rev: No discernible features
Diam: 11-12mm; wt: 0.88g

LAJP 2015 Trench 4 - *Locus* 10 - Field Object No. 22 (**Fig. 38, L**)
AE Roman/Late Roman
Very corroded, extremely worn.
Perforated by a hole close to one edge, possibly

used as as pendant or decoration?
Obv: Bust facing r.?
Rev: No discernible features
Diam: 10-11mm; wt: 1.04g

LAJP 2015 Trench 4 - *Locus* 11 - Field Object No. 17 (**Fig. 38, M**)
AE Roman/Late Roman
Very corroded, extremely worn
Obv: Laureate or diademed bust, facing r.
Rev: No discernible features
Diam: 13-14mm; wt: 0.54g

LAJP 2015 Trench 4 - *Locus* 14 - Field Object No. 33 (**Fig. 38, N**)
AE Roman/Late Roman
Very corroded, extremely worn
Obv: Bust facing r.
Rev: No discernible features
Diam: 10-11mm; wt: 1.02g

LAJP 2015 Trench 4 - *Locus* 15 - Field Object No. 29 (**Fig. 38, O**)
AE Roman/Late Roman
Very corroded, extremely worn
Obv: bust facing r.?
Rev: No discernible features
Diam: 11-12mm; wt: 0.89g

LAJP 2017 Trench 7 - *Locus* 22 - Field Object No. 8 (**Fig. 38, P**)
AE Late Roman (Constans or Constanstius II or later)
Surface corrosion, worn, clipped in half
Obv: Diademed bust facing r.]PF AVG[
Rev: No distinguishable features
Max length: 14 mm (pre-cleaning); wt: 0.69g

LAJP 2017 Trench 8 - *Locus* 7 - Field Object No. 7 (**Fig. 38, Q**)
AE
Very corroded, no surface features distinguishable
Diam: 21mm; wt: 3.20g

Concluding Remarks

The results from the 2017 season of the LAJP has changed how we perceive the habitation of Jarash's southwest district. For the first time, it has been possible to document that this part of the city was in use during the Hellenistic period whereas previous studies saw mainly the Forum, the Temple of Zeus and Camp Hill as the areas of early occupation (Kraeling 1938). Although the nature of the Hellenistic period settlement in southwest Jarash requires further examination, the human remains found in Trench 5 reveals that a necropolis was found in this area prior to its reorganization in the Roman period. The ceramic evidence suggest that the water feature may already have been in use in pre-Roman times, but this remains to be examined further once the excavation of Trench 5 has been completed. Like the rock-cut dwellings uncovered in Trench 3 and 4 in 2015, the reservoir saw a prolonged use starting with extensive quarrying followed by a reorganisation for water storage. When the reservoir went out of use, the rock-cut basin was modified perhaps for dwelling purposes, as exemplified in the discovery of a beam slot and a rope hole (see also results from Trench 3 and 4 in Blanke 2018a; Blanke *et al.* 2021).

At the other end of the chronological spectrum, the discovery of an Abbasid period occupation on the southwest hilltop has vastly expanded our understanding of the size and nature of the occupation of Jarash in the 8th and 9th centuries AD. Prior to LAJP's work in 2015, the excavations of a congregational mosque in the city centre and the residential and administrative buildings in its vicinity –including the later phases of the so-called Umayyad house– have been our only evidence for an Abbasid-period occupation of the city (see, for example, Blanke *et al.* 2011; Gawlikowski 1986; Rattenborg and Blanke 2017; Walmsley 2018). The excavations of LAJP's Trench 1, 2, 6, 7, 8 and 9 in 2015 and 2017 has revealed that not only the city's centre, but perhaps the entire southwest district (and beyond) were rebuilt after the earthquake in 749 AD. The quality of building material used (*e.g.* recycled ashlar masonry, marble slabs and moulded plaster decoration) and the assemblage of finds (*e.g.* high-quality ceramic table wares) suggest a well-off population with the ability and means to construct good quality houses designed for long-term occupation. The ceramic wasters retrieved from the excavation of Trench 8 suggest that also ceramic manufacture took place nearby and continued into the Abbasid

period.

The excavation of the burned room in Trench 9 offers unique insights into diets in the 8th and 9th centuries AD as well as excellent material for radiocarbon dating (currently in progress), which will allow us to refine our understanding of the area's chronology.

Importantly, the 2017 season brought only sparse new knowledge on the area's Late Antique history. Evidence from Trench 5, 6 and perhaps also 7 suggests a major clearing event either towards the end of the Umayyad period or after the earthquake in 749 AD, which allowed for structures and areas to be repurposed for new usage. If this interpretation is correct, we should expect to find a major dumping ground of residual material in the vicinity of the southwest hilltop.

The next season of LAJP will further our excavation of the structure examined in Trench 9 in order to study the organisation of a household as well as daily life in a residential area in the Islamic period. The excavation of Trench 5 will also resume in order to reach the bottom of the reservoir and hopefully establish more firmly its date of construction and disuse as well as resolve the question of whether it was built as a reservoir to collect water brought into the city or was the expansion of a karst system as suggested by the steps and natural cave.

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