THE 2011 SEASON OF THE LATE ANTIQUE JARASH PROJECT : RESULTS FROM THE SURVEY SOUTHWEST OF THE UMAYYAD CONGREGATIONAL MOSQUE

Louise Blanke, Hugh Barnes, Marie Broendgaard Jensen, Rune Rattenborg and Elise Thing

Introduction

The present article reports on the 2011 survey season of the Late Antique Jarash Project – a new initiative within the Islamic Jarash Project (henceforth IJP), directed by Alan Walmsley. IJP commenced in 2002 as a collaborative project between University of Copenhagen, Denmark and the Department of Antiquities of Jordan. The project began with the principal objective of establishing the presence of a congregational mosque in central Jarash, built in the Umayyad period, and examining a Late Roman bathhouse that occupied the site prior to the construction of the mosque. From this starting point, the IJP developed to include a broader investigation of central Jarash in the Late Antique transition into the Early Islamic Period by expanding east across the Cardo, south toward the Macellum and west along the line of the South Decumanus. Our excavations in these areas have brought forth a rich assemblage of archaeological data – architecture, stratigraphy and finds – and have extended our understanding of Islamic Jarash well into the Abbasid Period (Blanke *et al*. 2010).

In recent years, the IJP has expanded beyond central Jarash to include an examination of the architectural remains southwest of the Early Islamic mosque. The Late Antique Jarash Project commenced with a three week survey of surface remains in 2011, during which the area between the mosque, the South Decumanus and the city wall was examined. Particular attention was paid to a hilltop, where five areas containing distinct architectural features (A-E) were surveyed in detail (**Fig. 1**).

The aim of our investigation southwest of the mosque is to move towards an understanding of the residential urban history of Jarash during the Late Antique transition into the Early Islamic period and, thereby, cast light on a hitherto little explored part of life in the ancient town. Our principal research questions address logistics of daily life, such as the organisation of domestic spaces, rubbishdisposal and the supply, distribution and drainage of water. The non-intrusive nature of our work thus far means that these questions have been addressed within the limitations presented by the surface remains and future excavations will significantly increase our understanding of the area. This new research initiative not only supplements our results from central Jarash, but allows us to address questions relating to the broader organisation of the town in the Early Islamic Period andtie the Umayyad congregational mosque into its contemporary urban setting.

Landscape and Methodology

The southwest part of Jarash is characterised by a gradually rising landscape that slopes upwards west of the South Decumanus and the Umayyad congregational mosque towards the town wall. From the south, a series of terraces overlook the South Theatre.The hilltop is defined by a relatively flat area that measures some 100 by 80 metres at the summit of the main slope. The location of the hilltop at some distance from the major thoroughfares means that modern activity has largely been restricted to grazing goats and a partial conversion of the area to a football field. Tourists seldom make their way to the hilltop, partly owing to the steep climb and partly to the limited archaeological work conducted in this part of the town.

The occupational history of the hilltop and its immediate surroundings has been traced from the Hellenistic Period – where natural caves

1. 1928 aerial photo from Yale University archive.Showing general survey area and hilltop.

were modified to accommodate tombs – to the eighth century AD. The latter date was produced in the excavations of the Mortuary Church and the Church of St. Peter and St. Paul (built in the early 7th century (Gatier 1987: 135)) where it was defined through secondary architectural use and the discovery of two coins. When we began our survey, little was known of the periods between these two dates.

Our survey contained two main components. The first component entailed a comprehensive recording of the area between the mosque, the

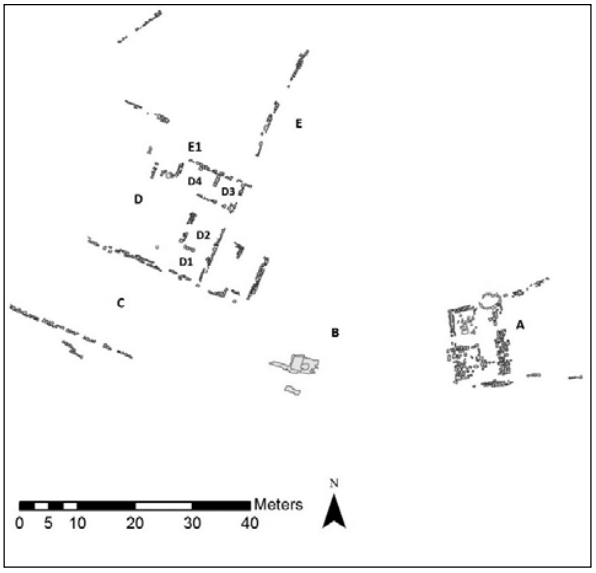
South Decumanus and the town wall where all visible wall lines, cisterns, previous excavated areas, bedrock cuts, terracing and dumps of excavated soil were recorded and mapped with a total station. These data were combined with excavation plans from the IJP using GIS (Geographical Information System) software and superimposed on a recent Google Earth image of the site. An aerial photo of Jarash from 1928 from the Yale University archive was used to trace land use and its impact on the archaeological landscape during the past 80 years.

The second component comprised a focused study of five adjoining areas, all located on the hilltop or immediately adjacent to its main features. These areas were first cleared of vegetation and, thereafter, recorded in detail, using written description combined with a full drawn and photographic record.

The five areas on the hilltop are (**Fig. 2: A-E**):

a) A building on two levels and a cistern.
b) A plateau with a series of bedrock cuts.
c) A rectangular space, defined to the south and west by long, straight cuts into the bedrock.
d) A building complex with a cistern, located on the northern edge of the hilltop.
e) A street that runs from the South Decumanus to the hilltop.

These areas are addressed thematically below and supplemented by results from the larger area survey.



2. Architectural remains on hilltop showing Areas A-E. Copyright Louise Blanke and IJP.

Thoroughfares, Streets and Alleys (E)

In Late Antiquity, one of the primary access routes to the hilltop was a street that runs south from the triple church of St. Cosmas and St. Damien, St. John and St. George across the South Decumanus and continuesat least another 175 metres.The street is aligned with the Roman Period grid system and appears to have been among the town's larger thoroughfares.It is visible on the 1928 aerial photo and has been identified in excavations where it intersects with the South Decumanus and again slightly south of the Decumanus (Barghouti1982: 219). Columns still in situ were uncovered in these two trenches, demonstrating that at least a section of the street was colonnaded (**Fig. 3**). The width of the street remains roughly the same throughout its length with only minor variations, as it was observed to be 7.30 metres in the excavation immediately south of the Decumanus and 7.60 metres at its southernmost extent on the hilltop.

During our survey, the continuation of the street south of the Decumanus was examined in detail (**Fig. 2: E**). Farming and modern dumping have obscured the majority of the east side of the street, except from the southernmost end at the hilltop, which has seen less modern activity than most other parts of the town. Three distinct areas of larger walls with associated structural collapse can be identified along the western side of the street. The southernmost of these is Area D, which will be discussed below. The three collapsed structuresare separated by alleys that run westwards from the street E. The north alley has been identified on the 1928 aerial photo, but extensive dumping has obscured its ground

3. Section of street in the excavation south of the South Decumanus. Notice walls that protrude from original façade. View south.

plan. The south alley (width 5.20 metres) is located immediately north of Area D and can be traced for 25 metres before it disappears below the spoil heaps from the excavation of the two churches (**Fig. 2: E1**).

The southernmost section of the street is partially covered by encroaching architecture, which forms a secondarybuilding façade and narrows the street to only 3.80 metres. The same situation can be observed in the excavation south of the Decumanus, where disused architectural components, such as column drums and dressed stones, were reused to expand buildings on either side of the street, thereby reducing its width to 4.10 metres(**Fig. 3**). By comparison, the width of the street adjacent to the triple church complex is 3.90 metres.

Structural Remains (A and D)

Two building complexes were recorded as part of our examination of the hilltop. The outer limits of Area D are defined by the above mentioned street and south alley, and by a large rectangular feature to the south (Area C). The eastern extent of Area D is obscured by spoil heaps from the excavation of the two churches. At first sight, Area D resembles a field of collapsed building material, but closer inspection reveals several minor walls defining an enclosed area that covers some 20x25 metres (**Fig. 4**). Three rooms span the eastern end of the building and flank the street, while a fourth room has been identified along the north wall (**Fig. 2: D1-D4**). The collapsed building material slopes towards a depression in the southwest end of the building, which could have resulted from a lack of structural collapse indicatingthe possible location of an open courtyard.

A cistern has been cut into bedrock at a break in the north wall. The northern half of the opening is delineated by limestone blocks, while the opening itself is cut into the bedrock below and extends for a metre before it expands into a pear-shaped void. The bottom of the cistern is obscured by accumulated soil, rubbish and building stones, but it was possible to estimate its depth to about 4.5 metres. A thick layer of plastering is preserved on the bottom half of the cistern as well as in patches on the sides of the opening. The opening is slightly oval and measures 90x80 centimetres, while a narrow ledge suggests that the cistern could have been closed off with a lid. The cistern was fed through a drain inlet that was cut into the south side of the opening.

The second building complex, Area A, is located on a slope between a flat plateau (Area B) and a lower terrace that opens towards the east and south. Area A measures 13x17 metres and consists of a rectangular building and a cistern that is situated immediately adjacent to the building's northwest exterior corner (**Fig. 2: A and Fig. 5**). The interior southwest and northwest corners contain platforms that could be interpreted as foundations for arches. The building's east wall stands out from the remaining structure due to the use of remarkably large stones combined with an irregular coursing. The width of the wall is 2 metres and the largest stone used is 1.5x0.32 metres. The unusual layout of the east wall could be related to adrop in the landscape, as the area further east slopes

4. Area D. View northwest.

5. Area A. Notice oval feature in foreground and capping stone to the far right. View southwest.

down to a level some 2.5 metres below the main features in Area A; the east wallacting as a retaining wall while at the same time supporting the building's superstructure.

An oval stone feature taking up 3x2.15 metres is located where the northeast corner should have been. The north and east walls stop abruptly some 20-40 centimetres before the feature and there are no signs that they were ever interlinked. Rather it seems that the northeast corner was removed to make room for a new use, meaning that the oval feature represents a later phase that postdates the collapse of the original building. The stonework on the northern side of the feature curves inwards slightly, possibly to form a low dome. The interior is filled with tumble from the collapsed superstructure and there are no visible remains of plaster that could connect the feature to the adjacent cistern and thereby to the use of water.

The cistern was found with a capping stone still halfway *in situ*. The stone has been partially lifted in recent years as indicated by wear marks on its side, allowing it to be examined in detail (**Fig. 6**). The capping stone has a diameter of 1.20 metres and is 33 centimetres thick. A round hole in the centre of the stone with a diameter of 39 centimetres gave access to the cistern when the stone was fitted in place. On the upper side of the stone, a larger square cut (44x44 centimetres) would have fitted a lid to close off the cistern when it was not in use. The capping stone has a slight angle to its sides, so that the lower half would sit inside the cistern, while the upper half would remain visible.

Examinations of the cistern with a camera on an extended string line have revealed that it consists of a narrow shaft that leads 2-3 metres into the ground after which it opens in three directions.The full depth of the cistern is 6.20 metres. Patches of plaster are preserved in the shaft and further into its interior void.

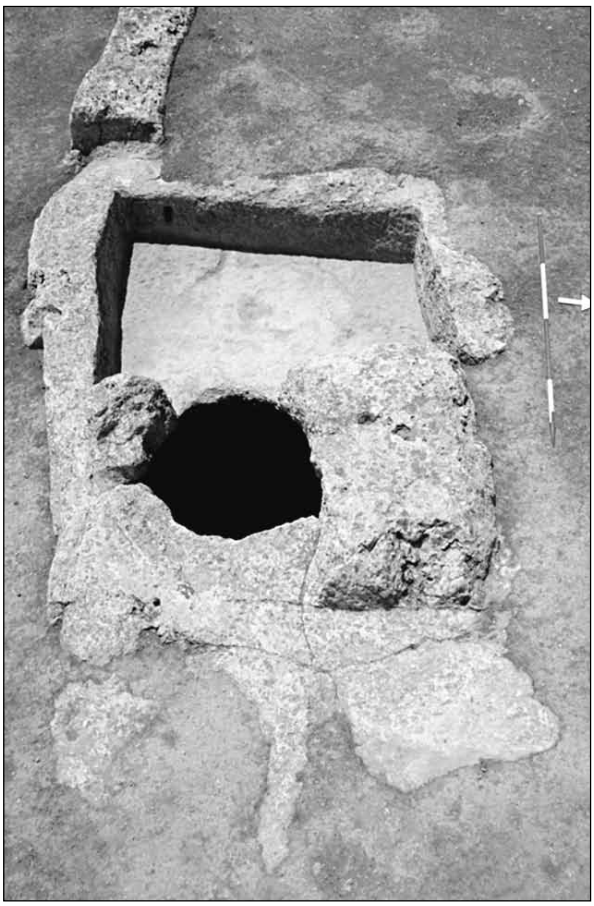
6. Capping stone from cistern in Area A. View south.

During our general survey of the area, extensive structural remains were found along the line of the street towards the South Decumanus and at least one of these structures was associated with a cistern. For now, the walls of these structures have been recorded and added to our map of the area. Future work will include detailed recording to compare the layout and architectural organisation with the structures on the hilltop.

The Water System (B and C)

Throughout the hilltop, the bedrock has been cut and actively used as an integral component in the built environment. The most elaborate use of the natural rock formation is found in Areas B and C, which constitute central elements of the water supply system for the southwest part of Jarash. Area B comprises a roughly rectangular plateau (50x40 metres) that contains a series of bedrock cuts. The most notable of these cuts isa pear-shaped cistern with an interior stone and plaster lining, an associated basin and several adjoining cuts that could be part of a system involving collection or distribution of water (**Fig. 7**). Similar to Area D, the lower half of the cistern is filled with building stones and other accumulated material; none the less the depth of the cistern can be estimated at about four metres. The opening is surrounded by a small platform with a narrow channel that either comes from or leads to the south. The western part of the cistern opens onto a basin, which was fed through a drain hole. This drain is cut into the bedrock and would have supplied water from a feature located farther to the west. Further cuts in the bedrock are found both south and north of the cistern and appear to be of a similar type as the basin, implying a series of water related and possibly interconnected features.

The plateau that surrounds the area of bedrock cuts contains no evidence of tumbled stones or other structural collapse. This situation resulted from later use of the area, as plough marks document past cultivation,while improvised football goals reveal the area's most recent



7. Cistern and adjoining basin in Area B. Notice drain hole in top left corner of basin. View west.

use. Both activities require a flat, cleared area, meaning that collapsed building material was removed for a purpose. A brief examination of the immediate vicinity explains the current lack of tumble stones. The cistern for example, contains a large number of stones, which were not a result of natural collapse, but rather, because the area provided a convenient and easily accessible dumping ground. Similarly, Area A is covered in loose tumble, which clearly does not originate from the collapse of the building.

Area C spans 45x17 metres and lies immediately west of the plateau (**Fig. 8**). Area C is defined on the western and southern sides by long straight bedrock cuts that join at a 90 degree angle. The southern cut can be traced over a distance of 19 metres,after which it disappears below an area of dumped soil.Walls of one or two courses in height and a single stone in width were constructed on top of the bedrock cuts. The landscape rises on both sides so it is

8. Area C overview. Notice bedrock cuts. View west.

possible that these walls served as retaining walls to allow use of the adjacent land and at the same time prevent collapse into Area C. The north end of Area C is defined by the south wall of Area D. A cut in this wall resembles a narrow channel that could have led water towards the north, into the building complex, most probably to feed the cistern. Modern dumping has obscured the eastern extent of Area C and the connection with Area B is, therefore, not clear. The southwestern part of Area C contains a scatter of tumble, but has otherwise been cleared of-building stones.

Combining this archaeological evidence would suggest that Area C was a reservoir intended for the collection and further distribution of water towards (at least) the north and east. The sources of water have not been identified to date, but the reservoir could likely have been fed by a combination of rainwater and water from sources that lie beyond the walls of Jarash. Water from these sources would have been led through channels in the western city wall to be collected and further distributed here.This solution resembles the water supply from nearby Birkatein that was delivered through a channel in the northern part of the town wall. There are no architectural remains to indicate that the reservoir was once spanned by a roof. The high level of evaporation in Jarash (1900 millimetres with just 400-500 millimetres rainfall (Fardous *et al*. 2004)) would suggest that Area C was not used for permanent water storage, but should rather be considered as a temporary container or as a catchment area for rainwater with further distribution to nearby subterranean cisterns.

Alternative water supply strategies can be

found in the contemporary Decapolis towns of Gadara and Abila, where water was carried through extensive systems comprising a combination of channels that were cut into bedrock and subterranean aqueducts (Al Karaimeh 2011, 2012; Kerner *et al*. 1997; Mare 1995; see also Watson 2001: 487 for a reservoir at Pella supplied with water from a nearby wadi though an aqueduct).

A total of nine cisterns have been identified in the survey area. All but two of these are located on, or in the immediate surroundings of the hilltop. They vary in shape and size from the smaller pear-shaped subterranean cisterns of Areas B and D to rectangular cisterns with roofs constructed with stone built arches. The largest cistern identified thus far is located about 50 metres south of Area C and is immediately recognisable by the barbed wire that has been piled on top of the opening to repel thrill-seeking visitors. This cistern has a large square opening with straight plastered walls that extend for about two metres before it expands in all directions. The depth of the cistern is at least 7.5 metres. It has not been possible to estimate its width.

This variety of forms may result from functional considerations – whether the specific cistern served a communal purpose or was storing water for an individual household - or from variations in the dates of construction. It is likely that it was common practice that new structures in Jarash included a cistern to supply the individual building or household and its associated activities. Unfortunately, the exclusive focus of earlier archaeology on monumental public architecture means that little is known of the water supply of non-civic buildings. The excavations of the so-called "Umayyad house" on the north side of the South Decumanus, across the street from the Early Islamic mosque, as well as the houses west of the Church of St. Theodore revealed advanced water supply systems with both drainage channels and cisterns (Fisher 1938: 282ff; Gawlikowski 1986: 109ff; See also Blanke *et al*. 2010, 324f). It seems evident that the hilltop and its surroundings were instrumental for the water supply of the southwest quadrant of Jarash, but the interconnected relationship is still to be resolved; excavation is required to achieve a better understanding of this essential aspect of life in the ancient town.

Farming and Other Later Uses of the Town

Our survey of the area southwest of the Early Islamic mosque resulted in noteworthy observations about the most recent development of the site. Comparison of our survey results with the 1928 aerial photo revealed substantial alterations to the landscape. Among the more significant changes is the complete disappearance of the line of the western half of the South Decumanus, which appears in the aerial photo leading all the way to the west gate in the town wall. In this photo, the Decumanus is flanked by a series of ruined buildings that open onto field systems (**Fig. 1**). The organisation of the buildings and associated fields appears to maintain the integrity of the town planning. The excavations on the Decumanus (Barghouti1982: 219-220) and on the slope towards the Temple of Artemis show that the field systems were created on deposits of soil lying 20-50 centimetres deep above the ruined buildings. Given the relatively clear outlines of the buildings, this soil may have been deliberately deposited rather than being a product of natural accumulation over time. This implies a conscious transition from townscape to agricultural zone, where buildings were deliberately left in ruins rather than rebuilt to maintain the urban space.Today, the western half of the Decumanus, the buildings and the field systems have been entirely obscured by deposition of spoil from excavation and restoration work in Jarash.

The hilltop and the terraces towards the South Theatre have, however, remained relatively unspoiled, and here plough marks clearly reveal the use of this area for agriculture. The field systems would have required a substantial amount of water. The most likely source for the terrace system and the hilltop fields would be the reservoir in Area C and the associated water system. It can, therefore, be suggested that the water supply system was still in use at a point in time when the majority of the area southwest of the Early Islamic mosque was in ruins and had been transformed for agricultural uses.As suggested above, rainwater was probably the main source of water for the reservoir. It should, however, be noted that if the water supply was supplemented by sources delivered through channels in the town wall, this would suggest that sections of the town wall were still standing. With the col-

lapse of the town wall, the water supply would have been cut off and cultivation of the fields would no longer have been tenable. These questions can only be solved through excavation.

Concluding Remarks

The non-intrusive nature of the survey carried out thus far means that we still lack stratified contexts with associated datable material finds. To attempt to link the hilltop structures to buildings else where on site at this early stage would be both speculative and potentially misleading. However there area few datable indicators that should be mentioned here. Ceramic sherds dating from the Abbasid period were found among the surface assemblage, documenting a presence well into the Islamic Period – a presence that has already been well established in Central Jarash in the main IJP excavation area (Blanke *et al*. 2010; Gawlikowski 1986). The architecture encroaching onto the streets on the hilltop and in Barghouti's excavation on the South Decumanus continues a trend seen on the Tetrakionion Piazza and south along the Cardo. The process of narrowing the streets had already begun in the 5th and 6th century, but certainly continued during the time of use of the Early Islamic congregational mosque – possibly resulting from a surplus of reusable building materials from derelict and abandoned parts of town. The latest pre-modern activity in the survey area is comprised by the field systems located along the line of the South Decumanus, on the terraces facing the South Theatre and on the hilltop. Based on the evidence presented above, these fields clearly represent a period of use that post-dates a general abandonment of urban life in this part of town. These different strands of archaeological observation all point towards a late occupation of the hilltop, although the specific dates of its use remain to be determined.

The two buildings described in this text (Area A and D) are very different in layout, but both contain an elaborate cistern. The smaller pear-shaped cisterns associated with Area B and D are often found in relation to single households (Wilkinson 2003: 51). Once the cisterns have been examined and measured in detail, it will be possible to calculate the maximum capacity of water held in each cistern and to estimate how large a population could be supported and for how long (Connelly and Wilson 2002). It is not yet possible to elucidate the functions of the two buildings. However, these data combined with the proximity of two churches might suggest that the hilltoparea should be perceived as a residential quarter, but further investigation would be required to confirm this designation.

With nine cisterns and one reservoir identified, it does appear that the hilltop and its surroundings played a central role in supplying water to the southwest part of Jarash. The internal relationship between the water features and the logistics of channeling water from the hilltop downhill to central Jarash require further investigation.

The area southwest of the Early Islamic mosque has proved to be a rich source of archaeological data that can shed light on significant aspects of life in the ancient town and on its development through the centuries. We hope to build on our good relations with the Department of Antiquities in the future by collaborating on a joint project that will allow us to explore the full implications of these exciting new discoveries together.

Louise Blanke (Corresponding author), University of Copenhagen, Denmark (lblanke@hum.ku.dk)
Hugh Barnes
Marie Broendgaard Jensen
Rune Rattenborg
Elise Thing

Acknowledgements

The Islamic Jarash Project is funded by University of Copenhagen, Denmark and is carried out under the direction of Dr Alan Walmsley in close collaboration with the Department of Antiquities of Jordan (DOA). We especially thank HE Dr. Ziad Al-Saad, former Director-General of the Department of Antiquities, and Mrs Samia Khouriour DOA representative in 2011. We are grateful for the invaluable help and hospitality of Mr Abdul Majid Mejali who offered logistical and technical support. We also thank Mr Ahmed Shami, former inspector at DOA, Jarash for his help and support. Also thanks to the British Institute in Amman for ongoing logistic assistance and equipment, and finally the team of the Late Antique Jarash Project (including

our Copenhagen officer Hanne Nyman and our daily fieldsupport Pernille Bangsgaard Jensen), without whose continuous hard work and enthusiasm, this work would not have been possible.

Bibliography

Al Karaimeh, S.
2011 Irrigation Systems in the Umm Qays Region: an Ethnographic Case Study. *ARAM* 23: 601-618.

Al Karaimeh, S.
2012 Roman Law and Archaeological Evidence on Water Management. Pp 41-48 in M. Zuchowska (ed.), *The Archaeology of Water Supply*. BAR International Series 2414. Oxford: Archaeopress.

Barghouti, A.N.
1982 Urbanisation of Palestine and Jordan in Hellenistic and Roman Times. *SHAJ* 1: 209-29.

Barnes, H. Blanke, L, Damgaard, K, Simpson, I, Sørensen, M.L. and Walmsley, A.
2006 From 'Guard House' to Congregational Mosque: The Danish-Jordanian Islamic Jarash Project. *ADAJ* 50: 285-314.

Blanke, L.
2007 A Newly Discovered Bathhouse in Byzantine Jarash. An Archaeological Interpretation. *Roman Archaeology Group* 2.
Forthc. The Central Baths in Gerasa. An Archaeological Interpretation of the Stratigraphic Development of a newly discovered Bathhouse in Central Gerasa in M-F Boussac and T. Fournet (eds.), *Proceedings of the Balneorient Conference held in Amman 2008*.

Blanke, L., Damgaard, K., Simpson, I. and Walmsley, A.
2007 From Bathhouse to Congregational Mosque: further discoveries on the urban history of Islamic Jarash. *ADAJ* 51: 177-97.

Blanke, L., Lorien, P.D., Rattenborg, R.
2010 Changing Cityscapes in Central Jarash – Between Late Antiquity and the Abbasid period. *ADAJ* 54: 315-327.

Connelly, J.B. and Wilson, A.I.
2002 Hellenistic and Byzantine Cisterns on Geronisos Island. *Report of the Department of Antiquities, Cyprus* 2002: 269-92.

Crawfoot, J.W.
1938 The Christian Churches. Pp 171-264 in C.H. Kraeling (ed.), *Gerasa, City of the Decapolis*. New Haven, Connecticut: American Schools of Oriental Research.

Damgaard, K.
2011 Sheltering the Faithful: Visualising the Umayyad Mosque in Jarash. *ARAM* 23: 191-210.

Damgaard, K, and Blanke, L.
2004 The Islamic Jarash Project. A Preliminary Report on the First Two Seasons of Fieldwork. *Assemblage* 8 (http://www.assemblage.group.shef.ac.uk/).

Damgaard, K., and Blanke, L.
2005 Moskéen i Jarash. *SFINX* 28, 3:134-8.

Fardous, A-N. Mudabber, M., Jitan, M. Badwan, R.
2004 Harnessing Salty Water to Enhance Sustainable Livelihoods of the Rural Poor in Four Countries in West Asia and North Africa: Egypt, Jordan, Syria and Tunisia. Jordan National Report. National CenterFor Agriculture Research and Technology Transfer. *http://www.iwmi.cgiar.org/assessment/files_new/research_projects/ICBA%20NationalReport_Jordan.pdf*

Fisher, C.S.
1938 Buildings of the Christian Period. Pp 265-296 in C.H. Kraeling (ed.), *Gerasa, City of the Decapolis*. New Haven, Connecticut: American Schools of Oriental Research.

Gatier, P-L.
1987 Unelettre du papeGrégoire le Grand à Marianusévêque de Gerasa. *Syria* 64, 1: 131-135.

Gawlikowski, M.A.
1986 Residential Area by the South Decumanus. Pp 107-136 in F. Zayadine (ed.), *Jerash Archaeological Project 1981-1983*. Amman: Department of Antiquities.

Kerner, S., Krebs, H. and Michaelis, D.
1997 Water Management in Northern Jordan: The Example of Gadara Umm Qays. *Studies in the History and Archaeology of Jordan* VI: 265-270.

Mare, W.H.
1995 The Technology of the Hydrological System at Abila of the Decapolis. *Studies in the History and Archaeology of Jordan* V: 727-736.

Walmsley, A.
2003a The Newly-Discovered Congregational Mosque of Jarash in Jordan. *al-'Usur al-Wusta. The Bulletin of Middle East Medievalists* 15: 17-24.
2003b The Friday Mosque of Early Islamic Jarash in Jordan: The 2002 Field Season of the Danish-Jordanian Jarash Project. *The Journal of The David Collection* 1:111-31.
2003c Searching for Islamic Jarash.A report on the 2002 field season of the Danish-Jordanian Islamic Jarash Project.*Unpublished report for the University of Copenhagen*.

Walmsley, A. and Damgaard, K.
2005 The Umayyad Congregational Mosque of Jarash in Jordan and its Relationship to Early Mosques. *Antiquity* 79, 305: 362-78.

Walmsley, A. Bessard, F. Blanke, L. Damgaard, K. Mellah, A. McPhillips, S. and Simpson, I.
2009 A Mosque, Shops and Bath in Central Jarash: the 2007 Season of the Islamic Jarash Project. *ADAJ* 52: 109-137.

Watson, P.M.
2001 Roman Water Installations in the Vicinity of Pella. *Studies in the History and Archaeology of Jordan* VII: 485-491.

Wilkinson, T.J.
2003 *Archaeological Landscapes of the Near East*. Tucson, Arizona: The University of Arizona Press.