LATEST FIELD STUDY OF THE JARASH HIPPODROME: BYZANTINE - UMAYYAD DYEING WORKSHOPS (E1-E7 AND W2-W18)

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During the 1st / 7th century, the town of Jarash faced challenges related to earthquakes (in 633 and 659[1]), plague (Black Death[2]) and invasion (Persians in 614 and 628; Arabs in 14 / 636). It would be normal to assume that these events shook the town, but no sudden social facture occurred. Subsequently, during the 2nd / 8th century, Jarash developed – albeit slowly – both economically and socially. Urban transformations occurred with the construction of a new mosque near the *tetrakionia* (Walmsley and Damgaard 2005) and the conversion of Antique temples and theatres into trading and artisanal establishments. The northern chambers of the Antique hippodrome racecourse at Jarash were originally warehouses; their transformation took place at that time.

The monumental study of the hippodrome conducted by A. Ostrasz and I. Kehrberg between 1984 and 1996 revised our knowledge of this site and its history. Unfortunately, the extent of the damage to the stands and the technical difficulties of the excavation made it hard for them to thoroughly explore the remains of the rooms dedicated to craft activities in that area. To resolve this issue, we conducted four excavation seasons between 2006 and 2009 with the help of the Department of Antiquities and IFPO ʻAmmān. These seasons concentrated on hippodrome rooms E1 to E7 (north-east) and W2 to W18 (north-west). The rooms excavated by A. Ostrasz and I. Kehrberg between 1984 and 1996 were re-examined to create a new plan, while as yet unexplored rooms were exposed for the first time. The only archaeological material available for study was that recovered during the four recent field seasons. This project enabled new hypotheses to be formulated regarding the nature of the north-east and north-west chambers of the hippodrome. The chronology of the remains was also established more accurately, thereby enhancing our understanding of the building. These excavations resulted in the discovery of sixteen dyeing workshops (rooms E1 - E7 and W2 - W18), dating from the 1st / 7th and 2nd / 8th centuries **(Fig. 1)**.

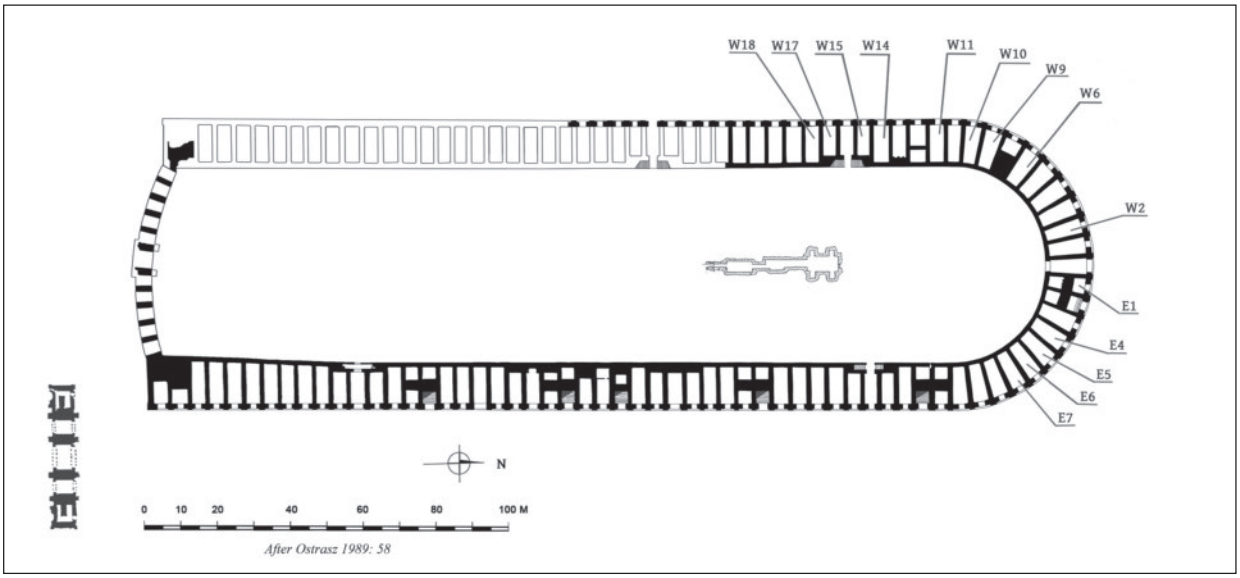
Study of the workshops highlighted three types of occupation: some were totally levelled, others were re-arranged and some were built *ex nihilo*. Although dating is not easy, these workshops are mostly associated with the Byzantine - Umayyad transition (1st / 7th and 2nd / 8th centuries). Various data lead us to believe that these Antique and Mediaeval workshops were dedicated to dyeing, rather than to tanning as suggested in the past (Kehrberg and Ostrasz 1997).

Planning: Three Types of Workshop

The workshops discovered north and north-west of the hippodrome racecourse show similarities in shape and organisation. In rooms E1 to E7 (north-east) and W2 to W18, the workshops were built after the original Roman floor had been dug out. Their shape is rectangular (9m east-west x 3.5m north-south) or trapezoidal (9.2 - 10.1m east-west x 4.15m north and 3.1m south) depending on their location within the hippodrome. In most cases, the original Roman door was narrowed with the construction of a second door. Door-steps, the lower part of door-jambs and hinges are

1. Some private homes discovered by M. Gawlikowsky were destroyed during earthquakes (Gawlikowski 1986).

2. Close to 200 people were buried in rooms W2 and W3 of the racecourse.



1. General plan of the hippodrome.

the only remains of these second doors. The workshops are fitted with basins, work benches and a main cistern. Depending on the nature of the flooring, each workshop can be divided into two distinct sections: (1) the entrance and (2) the back of the room. The former is characterised by paving, while bare soil is typical of the latter. Nevertheless, the different workshops differ in their planning and organisation. Three types of planning can be identified on the basis of architectural characteristics.

First, some workshops were abandoned following total or partial destruction (W2, E4 and E6). Workshop W2 was mostly destroyed **(Fig. 2)**. The walls of these workshops are mostly 'identified' by their absence in the different terracotta floors. Three areas of bedrock remain in basin B: two along the northern wall and one to the east. Of the southern wall of basin D, the foundations of the terracotta wall used to 'double' it are all that remains. It is clear that these facilities were abandoned and destroyed without being re-occupied later.

Elsewhere, other workshops (E7, E5 and W6) underwent partial reorganisation, indicating certain behavioural changes. E5 and W6 seem to have been abandoned first and were then refurbished. E5 **(Fig. 3)** seems to have been occupied during two stages. Modifications to basins A and B, the construction of basin C and the refurbishment of basin F help to distinguish between these two stages. Reinforcement of

2. Aerial view of chamber W2.

3. Aerial view of chambers E5, E6 and E7.

4. Aerial view of chambers W14 and W15.

the room with pillars made of shaped blocks in the north-east and south-east corners are also evidence for the second stage. Furthermore basins A and B, and their workbenches all show signs of previous use. As first constructed they formed two large basins, fitted with a drain that was subsequently blocked during the construction of the workbench for basin A. Remains of terracotta flooring visible along the edge of the western wall of the workbench (basin B) must have belonged to the original flooring, further highlighting two phases of use. Basin C is located along the southern wall. Its eastern side matches the small 'doubling' blocks of basin B; we can conclude that it was built during the second phase. Basin F and its workbench, located in the north-east corner of the room, show signs of prior use; the dimensions of the original basin remain unknown. A drain at the base of the workbench and signs of daubing in

the north-east corner of the Roman wall behind the counterfort are also visible.

Most of the workshops (W7 to W18) were established in a single episode without obvious refurbishing. W14 **(Fig. 4)** is good example of this. The workshops built *ex nihilo* consisted of a paved area with two to four shallow basins. The walls and bottom of the basin were covered with terracotta tiles sealed with mortar and fitted with a drain. A small gutter was made to empty water from each basin; these gutters usually lead to a large hole near the workshops' Roman doorway. Each basin faces a large cistern that is either built-in or consists of large terracotta jars. The paved entrance leads to an area of bare soil towards the back of the room. This area typically has between one and five basins associated with a tilted workbench (covered with a thick layer of calcite) and one to five cisterns (built-in or terracotta jars), which are often sealed with small blocks and mortar.

Although the general layout of workshops E7 to W18 is almost identical, *viz*. two separate work spaces - one paved and the other bare soil, some characteristics are worth mentioning. The eastern workshops (E1 - E7) and western workshops (W2 and W6) have more cisterns in that part of the room consisting of bare soil (up to seven in E7 and six in W6). Such workshops were mostly destroyed (E4, E6 and W2) or extensively refurbished (E5, E7 and W5). On the other hand, the western workshops built *ex nihilo* (W7 - W18) differ in organisation. There are fewer cisterns grouped in the secondary part of the workshop (just one in the case of workshop W9), whereas deep basins fitted with workbenches are more numerous.

Purpose: Dyeing or Tanning?

Since the equipment of these workshops is very similar to that of dyeing workshops, it is reasonable to conclude they were used for the processing and dyeing of fabrics. Our understanding of the set-up for dyeing is based on three very well-documented workshops: at the Isthmia sanctuary in the Peloponnesus (4th – 3rd centuries BC), Gaza (5th – 6th centuries AD) and the Jarash *macellum* (late 5th century and 1rd / 7th century).

The Isthmia dyeing workshop was established on a headland (Karadara 1961). It comprised a basin (1.25 x 0.9 m x 0.8 m deep) and cisterns (0.75 m Ø and ~0.6 m deep) with dimensions close to that of the Jarash hippodrome. Archaeologists interpreted the trapezoidal basin as having been used for cleaning wool arranged on skeins. Detergents were used to remove oils and waterproof pectins from the wool before dyeing. Two circular cisterns cut into the ground retain traces of calcite. They were probably used to soak and dye fabrics using soluble pigments (*murex* red) in an alkaline medium (soda, ash or lime). The Jarash *macellum* dyeing workshop, occupying *tabernae* 10 and 11 (Uscatescu and Martin-Bueno 1997), and that of Gaza also consist of basins and cisterns with similar dimensions and functions (Ovadiah 1969).

Archaeological discoveries such as these help us to better understand the organisation of work within the Jarash hippodrome workshops. Fabrics were cleaned at the entrance to the workshop. The paved area consisted of cisterns that were used as soap baths. The fabrics or textile fibres were soaked in order to get rid of all grit, grease and waterproof pectins. The basins were used to rinse the fibres; this explains why they were fitted with drains leading to an underground cistern under the workshop entrance. Waste-water was absorbed into the ground by capillary action. Fabric dyeing took place simultaneously, towards the back of the workshop. The underground cisterns, sealed with small blocks covered with a thick insulating coating for better thermal inertia, were probably used to prepare the dye; powdered tinctorial plants could be soaked there. The basins were used to dye the fibres and fabrics.

Even though the Jarash workshops have nothing in common with the tanning workshops discovered at Pompeii, Saepinum (1st century) and Liberchies in Belgium (2nd century), or with those still in use at Meknes in Morocco (Leguilloux 2004: 42-54), Kehrberg's initial 1984 - 1996 study of the workshops interpreted rooms E7 - W18 as workshops used for tanning rather than for dyeing (Kehrberg and Ostrasz 1997). Tanning, as opposed to dyeing, workshops would have required large quantities of water, plenty of space and heavy equipment, usually manifested in the form of large cisterns used to prepare the skins.

The Pompeii workshop consists of an internal

courtyard and indoor room (Leguilloux 2004: 46-50). The courtyard was used for the removal of hair and the soaking and heating of skins to preserve the dermis. The skins were soaked in wooden tubs of clear water and macerated in baths of organic matter (urine and faeces) to get rid of all blood, hair and muscular or adipose tissue. After being thoroughly rinsed a number of times, the skins were epilated using *peloirs* (knives without cutting edges). The indoor room was fitted with fifteen tanning cisterns to fix the leather without affecting the structure of the dermis.

This type of heavy equipment seems not to be present at the Jarash workshops. The fifteen tanning cisterns made of small blocks at the Pompeii workshop are large, on average 1.5m Ø and 1.6m deep (Leguilloux 2004: 47). The five brick-lined, shaped tanks of the Saepinum workshop are also large: 1.25m Ø and 1.4m deep (Leguilloux 2004: 50). Finally, at Liberchies, the tanning cisterns are made of small blocks or a simple lattice of branches and are around 1.3m Ø and 1.4m deep (Leguilloux 2004: 51-52). Such dimensions were necessary to manipulate the skins without changing their positioning and the layers of tan. The cisterns discovered at Jarash are much smaller (~0.65m Ø and 0.57m deep), hence the improbability of their having been used as tanning tanks.

Although there is significant archaeological evidence to suggest a dyeing function for the Jarash workshops, it is important to note that no dyeing equipment has been found at the site to date. The cisterns themselves do not show signs of dye, but we need to bear in mind that dye is a volatile substance that can disappear with time. The absence of organic dye only permits us to make suggestions regarding the use of these workshops. The absence of ovens demonstrates that the plants used did not require temperatures higher than 50 °C to dissolve and liberate their pigments. Thus, whatever dye was used could be mixed with fibres and fabrics without having to be being etched with alum at 90 °C. This suggests it was safflower from the Irbid region and / or indigo grown in the Jordan Valley during the 1st – 2nd / 7th – 8th centuries.

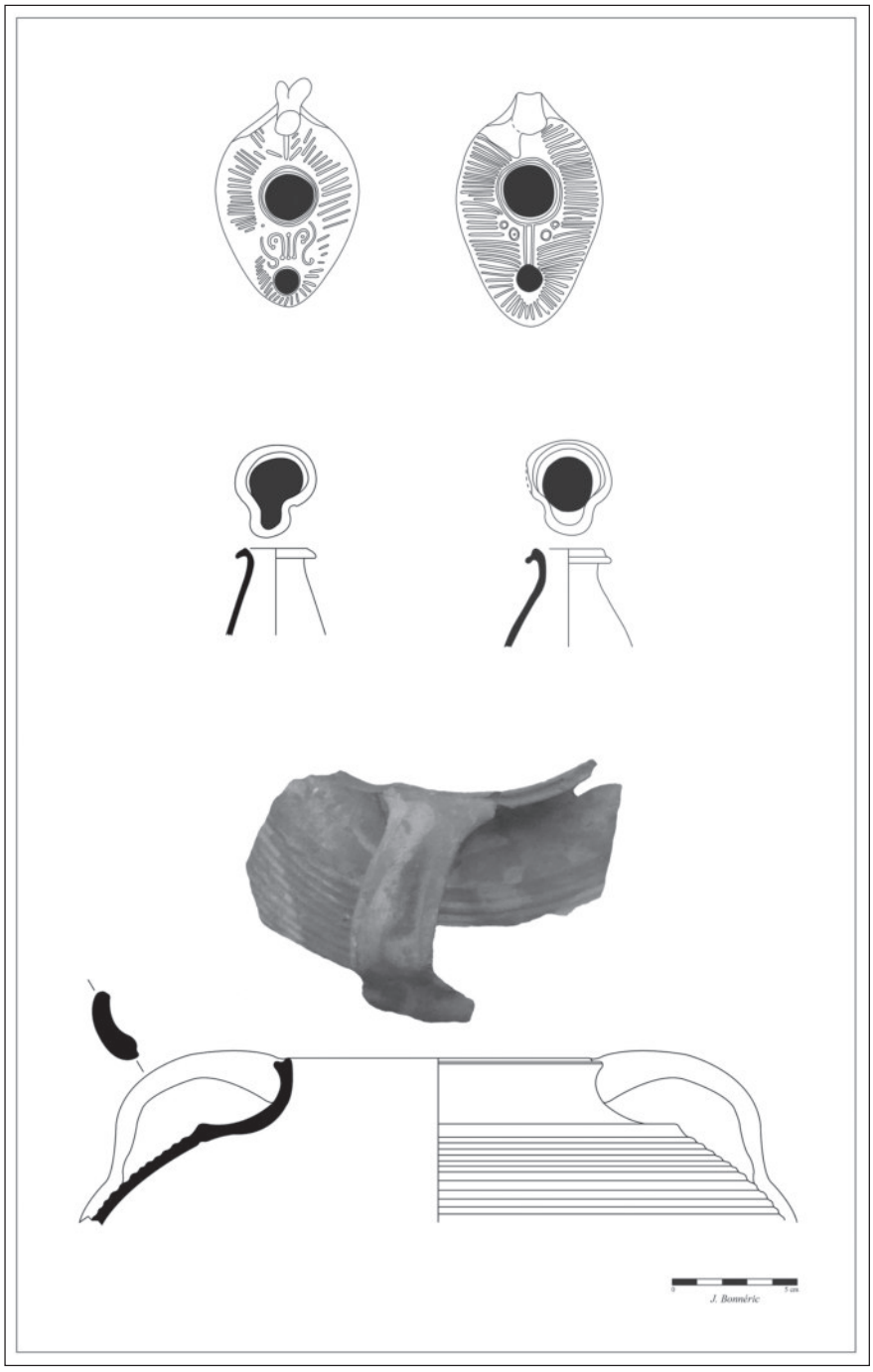
Dating the Workshops

Dating the workshops is particularly tricky. Numerous stratigraphic issues make the on-site archaeological material practically unusable in terms of precise dating. It is therefore the architecture which helps to establish the occupational chronology.

Byzantine - Umayyad Material

Ceramics do not permit precise dating of the workshops since the site was excavated previously and the context of discovery was already disturbed. Only rarely are objects found *in situ*, although the material has a relatively homogenous Byzantine - Umayyad character. Some artefacts of the Roman period were found, but most of the pottery found in the workshops themselves was made towards the end of the Byzantine and during the Umayyad periods. The discovery of some Roman artefacts can be explained by the disturbance of the Roman surface of the hippodrome at the time the workshops were established.

As mentioned above, most of the pottery is late Byzantine and Umayyad, including lamps, cooking pots, pans, bowls and water jugs. Lamps are of the moulded 'Jarash lamp' type, which were made in the town. They are characterised by a piriform shape, tenons that were sometimes animal-shaped and an elongated nozzle. They are decorated with stripes around the refilling hole, as well as with crosses, circles and lines. These lamps first appeared during the 6th century and were used until at least the end of the Umayyad period **(Fig. 5)**. Many sherds come from ceramics characterised by a ribbed and globular shape, with vertical ribbon-handles attached to the lip and shoulder, and a cambered base. Some have painted decoration in the white / off-white colours typical of the late Byzantine and Umayyad eras **(Fig. 5)**. Fragments of cooking dishes with horizontal handles were also found. These were used from the Byzantine to Abbassid periods. Jugs with a tri-lobed neck and piriform or cyclindrical paunchs were common during the 6th century and still used during the Umayyad period **(Fig. 5)**. Finally, grey-ware bowls made of thin but dense clay were produced from the Byzantine period until the 4th – 5th/ 10th – 11th centuries. The clay used for these bowls is similar to that produced in the reduction kilns discovered near the north theatre, which date to the Umayyad period. Because of



5. Byzantine - Umayyad material: lamps, jugs with tri-lobed necks and cooking pot with white-painted decoration.

the common nature of the material found and its generally lengthy period of use, we can only suggest a chronological association with the late Byzantine and Umayyad periods.

Workshop Chronology

Evolution of the workshops is suggested by the architecture. Even though the spatial organisation of workshops E7 to W18 is very similar, some differences have been noted which enable us to establish a chronology.

The workshops west of the hemicycle, *viz*. W7 to W18, were built *ex nihilo* and were occasionally modified later. In contrast, workshops E7 to W6 to the east were levelled and / or refurbished. Construction of workshops W7 to W18 in the western part of the hippodrome seems to have been sequential. The discovery of

post-reform Islamic *fulūs* in chambers W7, W11 and W14 at ground level and under the fallen stands allows two conclusions to be drawn. First, it suggests that the hippodrome was destroyed in the 132 / 749 earthquakes, giving a *terminus ante quem* for the workshops. Second, it suggests that the workshops were in use until that time. The lack of refurbishment suggests they were only occupied for a short period, probably less than a century. If they were still in use in 132 / 749, when the hippodrome collapsed, they were probably built before the mid 1st / 7th century which associates them with the Umayyad era.

In contrast, workshops E7 to W6 (east) show signs of destruction and refurbishment. Workshop W2 was even levelled and all of its facilities destroyed. The walls of these facilities can often only be traced using negative features. This destruction and refurbishment shows that the active phase of the workshops was longer in the eastern area than in the western area. Workshops E7 to W6 are therefore likely to have been built before the Umayyad workshops to the west, most likely during the Byzantine period, and were reused during the Umayyad period, although uncertainties remain. Later artisans, having changed their methods, seem to have modified the older Byzantine workshops to match their own – built *ex nihilo* – in order to better answer their technical needs.

It is hard to tell whether the eastern workshops were still active when the western ones were built. Nevertheless, signs of refurbishment and abandonment lead us to hypothesise that the Byzantine dyeing workshops must have been abandoned for a short period of time. During that brief period, chambers W2 and W3 were used as charnel-houses and cannot pre-date the mid 1st / 7th century[3]. During the subsequent Umayyad period, dyeing workshops were established in the western part of the racecourse and in some chambers of the eastern part, perhaps because it proved impossible to occupy the southern corner to the west (data from chambers W25 - 26 suggest that this part of the site had been destroyed long before). The artisans also seem to have made an attempt to adapt the extant workshops (E5 and W6) to their needs. These adaptations, perhaps too tentative and unsatisfactory, would have been covered with the gravel, pots and cooking pan fragments discovered during A. Ostrasz's study[4].

Finally, chambers E1 to E7 (north-east of the hemicycle) and W2 to W18 (north-west) do not suggest sporadic occupation of the hippodrome after the Arab invasions of 14 / 636 but, on the contrary, an intensive and dense appropriation thereof. This location seems to have prospered greatly under the Umayyad dynasty, with the development of large dyeing workshops. They were in use during the caliphate of 'Abd al-Malik (late 1st / 7th century) and, most likely, remained so until the earthquake that devastated Jarash in 132 / 749. The rehabilitation by individuals of Antique public buildings built during the 2nd century for industrial crafts (e.g. cleaning and dyeing of fabrics) seems characteristic of the general pattern of wider economic development at Jarash during the 1st / 7th and 2nd / 8th centuries.

The town of Jarash displays a degree of economic development, with an evolution from individual workshops (Byzantine period) to larger-scale manufacturing or - at the very least, large workshops (Umayyad period). The artisans seem to have been aiming for mass production of standardised goods using these impressive facilities. The importance of the Umayyad pottery workshops, e.g. at the north theatre (Schaffer 1986) and temples of Artemis and Zeus[5] (Pierobon 1986), differs from those of the Byzantine period. The workshop north of the theatre has five kilns, whereas the one located near the Church of St. Theodore has just one (Fisher 1938). In the nearby town of Baysan, individual workshops also disappear at the beginning of the 2nd / 8th century and were replaced by a whole block dedicated to industrial activities (large ceramic and dyeing workshops). This was located between the south theatre, the so-called Palladius road, the *sigma* to the west and the so-called Silvanus road to the north and

3. The charnel-house cannot be older than the mid 7th century, since gold coins depicting Constans II (641 - 668) or Constantin IV (668 - 685) were found there.
4. Caution is required regarding interpretation of this rubble. Although it includes Roman material, it doesn't belong to the time of the establishment of the workshops.
5. Three massive kilns of the Umayyad period were discovered on the lower terrace of the Zeus sanctuary in 1985 - 1996 by J. Seigne. This discovery has been the topic of a report by the Department of Antiquities.

east (Tsafrir and Foerster 1994: 97).

These sizeable facilities are associated with a concentration of workshops. During the 6th century, craft activities at Jarash seem to have been dispersed, *viz*. a dyeing workshop in *tabernae* 10 and 12 of the Roman *macellum*, a sawmill in a southern *criptoporticus* of the Artemis sanctuary (Seigne 2002a, 2002b), one pottery workshop west of the church and another under the south-east stand of the hippodrome (Kehrberg and Ostrasz 1997; Kehrberg in press). This scatter of Byzantine workshops at Jarash is characteristic of Antique urban industrial planning. However, two main industrial concentrations seem to have emerged at the end of the 1st / 7th and beginning of 2nd / 8th centuries. To the south, one concentration comprises the pottery workshops of the Zeus sanctuary and dyeing workshops of the hippodrome. To the north-west, a second concentration comprises the pottery workshops of the Artemis sanctuary and the north theatre. This phenomenon is evidence for the clustering of certain economic activities, probably from the start of the 1st / 7th century.

The development of manufacturing activities at Jarash demonstrates that the town flourished during the 1st – 2nd / 7th – 8th centuries (Bessard and Bonnéric 2010). These impressive workshops are a good example of industrial development and the clustering of craft activities. The latter may have been dictated by the coercive rules believed to have been imposed by the authorities in order to manage taxation. The appropriation and 'privatisation' of Antique public buildings with a cultural or recreational function for intensive, large-scale manufacturing activities could be indicative of the emergence of a new concept in urban planning that was associated with late Antiquity and, especially, the beginnings of Islam.

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Bibliography

Bessard, F. and Bonnéric, J.
2013 Jarash et l'essor de l'Économie Urbaine au Début de l'Islam (Considérations à partir de l'Exemple des Ateliers de Teinturiers Byzantino-Umayyades de l'Hippodrome). *SHAJ* 11: 305-318.

Da Costa, K.
2001 Byzantine and Early Islamic Lamps: Typology and Distribution. Pp.241-257 in E. Villeneuve and P.M. Watson (eds.), *La céramique byzantine et proto-islamique en Syrie-Jordanie. (IV^e^-VIII^e^ siècles apr. J.-C.)*. *BAH* 159. Beirut.

Gawlikowski, M.
1986 A Residential Area by the South Decumanus. *JAP* 1: 107-121.

Hadad, S.
2002 *Oil lamps from the Hebrew University Excavations at Bet Shean*. Jerusalem.

Kardara, C.
1961 Dyeing and Weaving Works at Isthmia. *AJA* 65: 261-266.

Kehrberg, I.
2009 Byzantine Ceramic Productions and Organisational Aspects of Sixth Century A.D. Pottery Workshops at the Hippodrome of Jarash. *SHAJ* 10: 493-512.

Kehrberg, I. and Ostrasz, A.
1997 A History of Occupational Changes at the Site of the Hippodrome of Gerasa. *SHAJ* 6: 167-173.

Leguilloux, M.
2004 *Le cuir et la pelleterie à l'époque romaine*. Paris.

Orssaud, D.
1992 Le passage de la céramique byzantine à la céramique islamique. Quelques hypothèses à partir du mobilier trouvé à Déhès. Pp. 219-228 in P. Canivet and J-P. Reycoquais (eds.), *La Syrie de Byzance à l'Islam*. VII^e^-VIII^e^ *siècles*. Damascus.

Ostrasz, A.
1989 The Hippodrome of Gerasa: a Report on Excavations and Research 1982-1987. *JAP* 2:

51-77.

Ovadiah, A.
1969 Excavations in the Area of the Ancient Synagogue at Gaza (Preliminary Report). *Israel Exploration Journal* 19/4: 193-198.

Pierobon, R.
1986 The Area of the Kilns. *JAP* 1: 184-187.

Schaffer, J.
1986 An Umayyad Potters' Complex in the North Theatre, Jerash. *JAP* 1: 411-449.

Seigne, J.
2002 a A Sixth Century Water-Powered Sawmill at Jarash. *ADAJ* 46: 205-213.
2002 b Une scierie mécanique au VIe siècle. *Archéologia* 385: 36-37.

Tsafrir, Y. and Foerster, G.
1994 From Scythopolis to Baysān, Changing Concepts of Urbanism. in G.R.D. King, and A. Cameron (eds.), *The Byzantine and Early Islamic Near East* 2: 95-115. Princeton.

Uscatescu, A.
2001 L'apport des fouilles du macellum (Jérash, Jordanie) à la connaissance des céramiques byzantines tardives de Gerasa. Pp. 59-76 in E. Villeneuve and P.M. Watson (eds.), *La céramique byzantine et proto-islamique en Syrie-Jordanie, (*IV^{e}-VIII^{e} siècles apr. J.-C.*)*. *BAH* 159, Beirut.

Uscatescu, A. and Martin-Bueno, M.
1997 The Macellum of Gerasa (Jerash, Jordan): From a Market Place to an Industrial Area. *BASOR* 307: 67-88.

Walmsley, A. and Damgaard, K.
2005 The Umayyad Congregational Mosque of Jarash and its Relationship to Early Mosques. *Antiquity* 79: 362-378.