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A Possible Military Brewery in the Trajanic Fort at Hauarra (al-Ḥumayma), Jordan

During 25 years of excavation and research at the Trajanic fort of Hauarra on the Arabian frontier, our team has highlighted the association of a revolutionary fortification design with traditional Roman planning procedures. The fort was built immediately after Trajan's conquest of the Nabataean kingdom in AD 106, adjacent to the Nabataean village of Ḥawara, halfway between Petra and Aqaba (Fig. 1). The garrison was intended to monitor the local water supply and the civilian settlement, along with traffic on the *Via Nova Traiana* and the caravan routes that converged on the site (Fig. 2; Oleson 2007; 2009; 2010: 57–60; 2019; Oleson *et al*. forthcoming). An inscribed altar from the *vicus* suggests that the fort was manned by a vexillation from the *Legio III Cyrenaica* (Oleson *et al*. 2002: 112–6). Another vexillation of that legion was stationed at Hegra, 400 km to the south, one that maintained close connections with the Hauarra garrison (Fiema and Villeneuve 2018). From the start, the Hauarra fort probably was garrisoned as well by a unit of *equites dromedarii*. At 3.1 ha, the area of the fort is appropriate for a garrison of about 500 men (Fig. 3).

The fort and its interior structures were carefully laid out in modules of the Roman foot, according to a system centuries old (Oleson 2017). The rectangular fortification, however, was provided from the start with 24 square projecting towers, apparently the earliest known Roman example of this type of military plan, previously thought to be a development of the later 3rd c. AD. Excavations at the Hauarra fort between 1993 and 2005 documented the *principia, praetorium, horreum,* barracks, water-supply system, latrine, and a craft area that most likely contained a brewery. This paper will focus on the possible brewery, which would be the first such structure identified within a Roman fort, as opposed to an adjacent civilian settlement. Sherwood directed the

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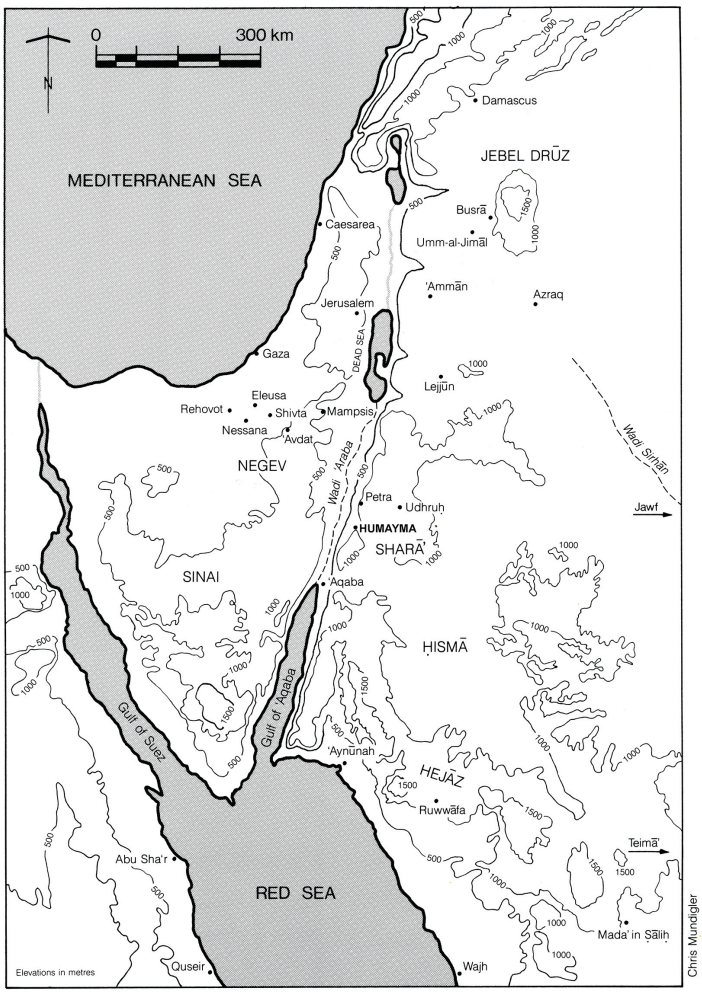
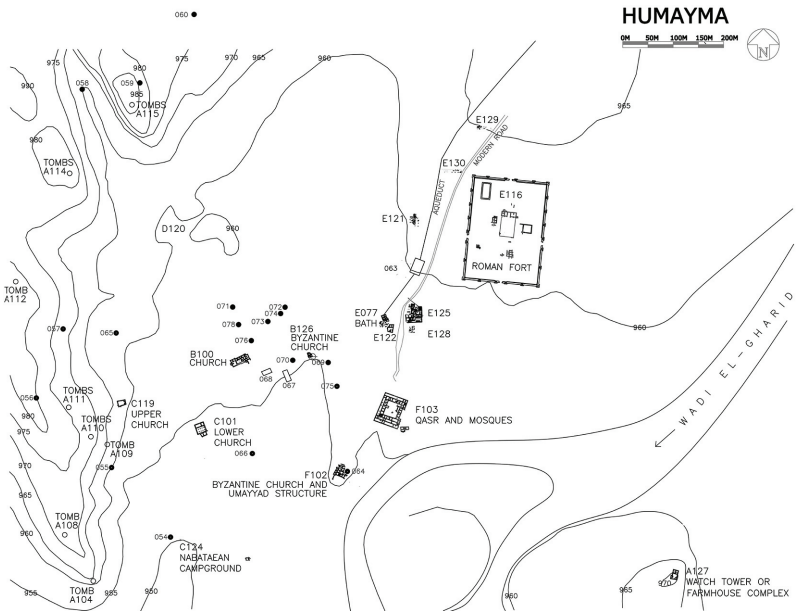
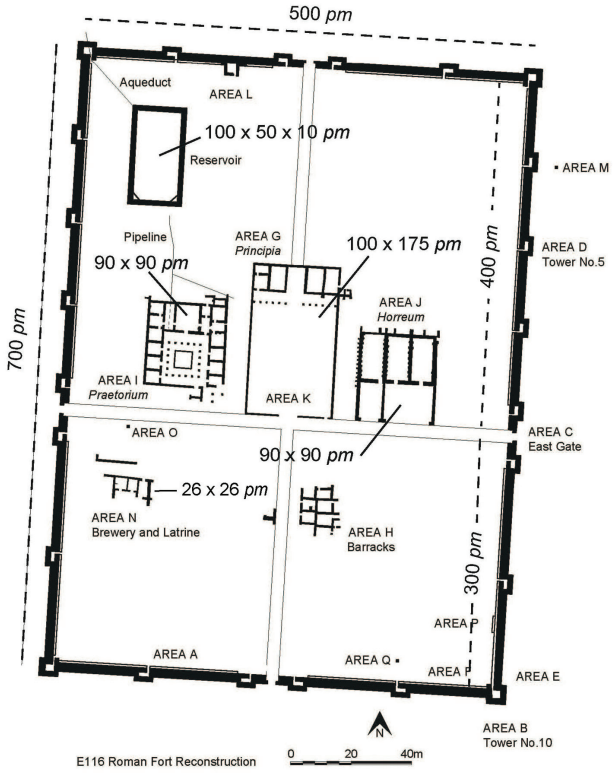


1. Location of al-Ḥumayma in the Middle East.



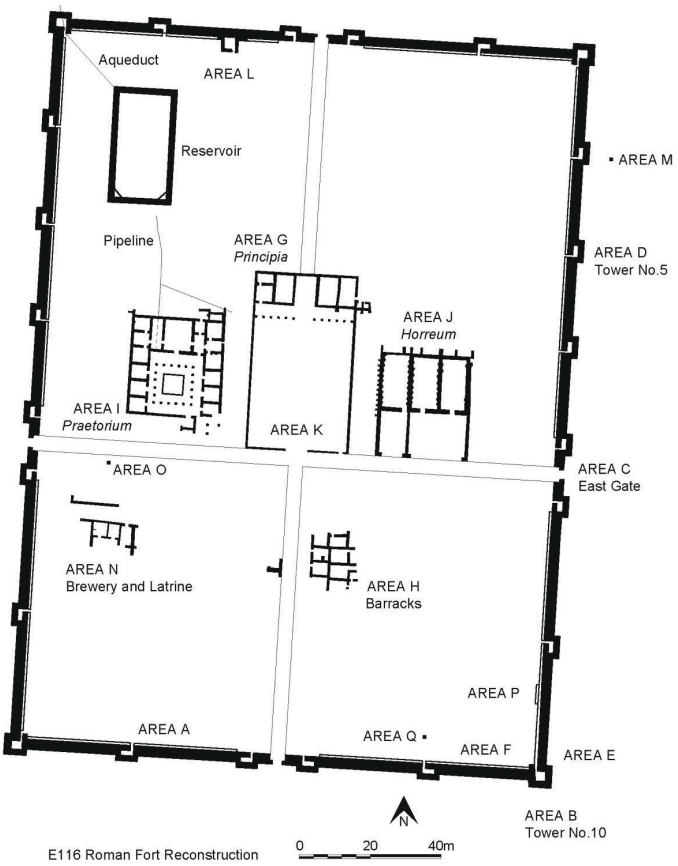
2. Plan of the site of al-Ḥumayma.

3. Reconstruction plan of the Roman fort at al-Ḥumayma, with indication of modules.



4. Aerial photograph of fort and settlement. Photo: Jane Taylor, J93-2-98.

excavation of the structure and worked with Oleson on the interpretation of its function. Some of these structures inside the walls, including the brewery, went out of use during the reign of Diocletian, after which the earlier garrison was replaced by a smaller force, probably a unit of local camel-mounted archers, the *equites*



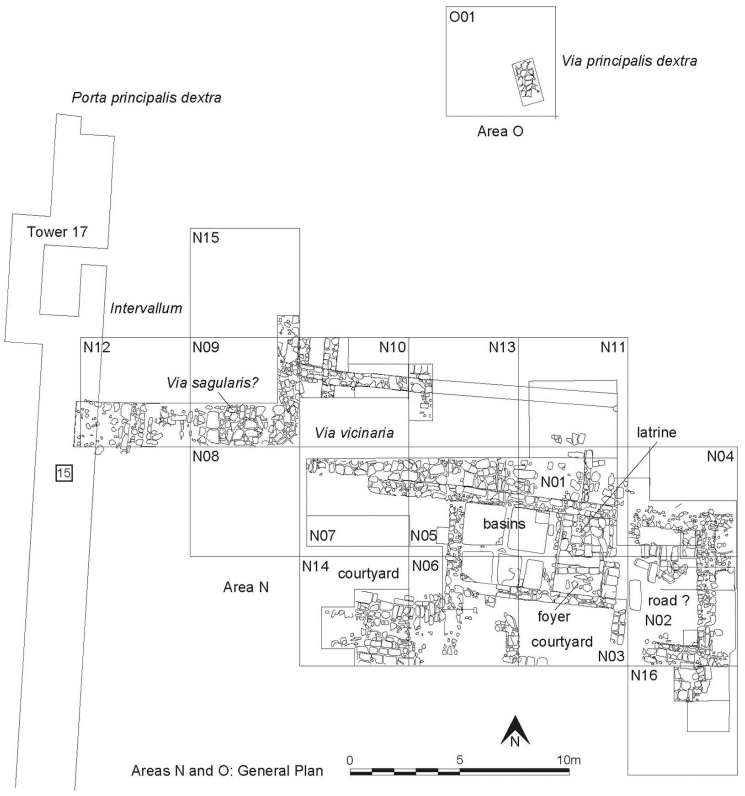
5. Reconstruction plan of Roman fort at al-Ḥumayma.

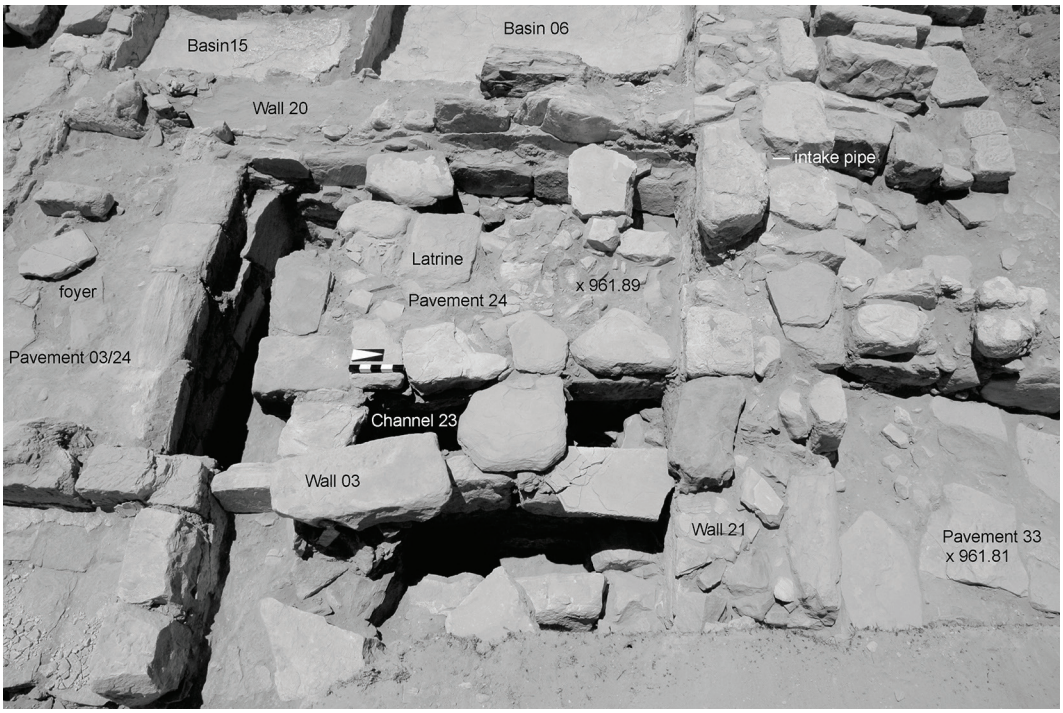
sagittarii indigenae mentioned in the *Notitia Dignitatum* (*Orientis* 34.25; Oleson 2010: 51, 54–5). The garrison was withdrawn altogether in the late 4th c. AD, most likely as a result of the earthquake of AD 363, and many of the tumbled blocks were salvaged to build the houses and churches of the thriving Byzantine community of Hauarra.

Given its isolated location in a hyper-arid environment, provisioning the fort must have been a challenge (Fig. 4). Water was obtained by diverting part of the outflow of the pre-existing Nabataean aqueduct into a reservoir inside the walls. At least some of the wheat and barley required for the military diet could have been obtained from local fields irrigated with run-off water, and poultry and pigs appear to have been supplied locally as well, to judge from the faunal remains. Fresh oysters and dried fish were brought in from Aila (Aqaba) 80 km away on the Red Sea, but cheese may have been produced locally from sheep milk. Supplying wine, however, apparently remained a problem. Sherds of wine amphorae are infrequent at the site, only one small winepress has been identified in the region (Oleson 2010: 149–50), and the hydrology and climate are not conducive to grape production. The character of a structure inside the fort, however, suggests that beer was being brewed on site for the soldiers, providing a nutritious and inexpensive beverage based on local grain. Brewing enhanced the character of the scanty water supply without wasting any of it, and beer was a customary beverage for soldiers.

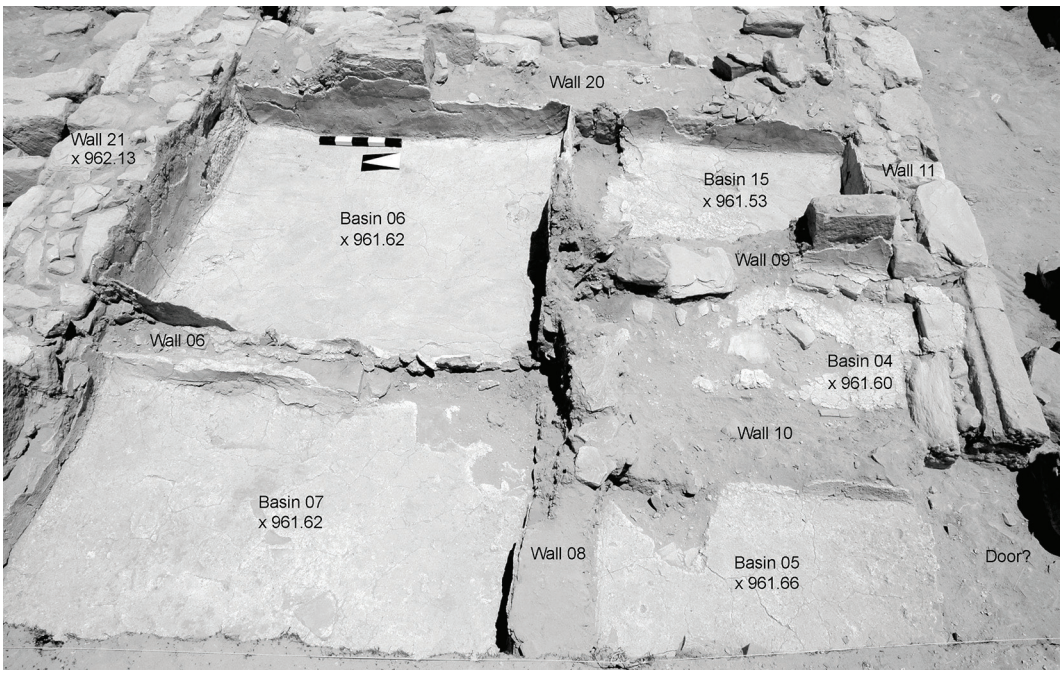
A substantial square structure (*ca.* 7.78 m, 26 pm on a side) in the southwest

6. Plan of Area N structures.

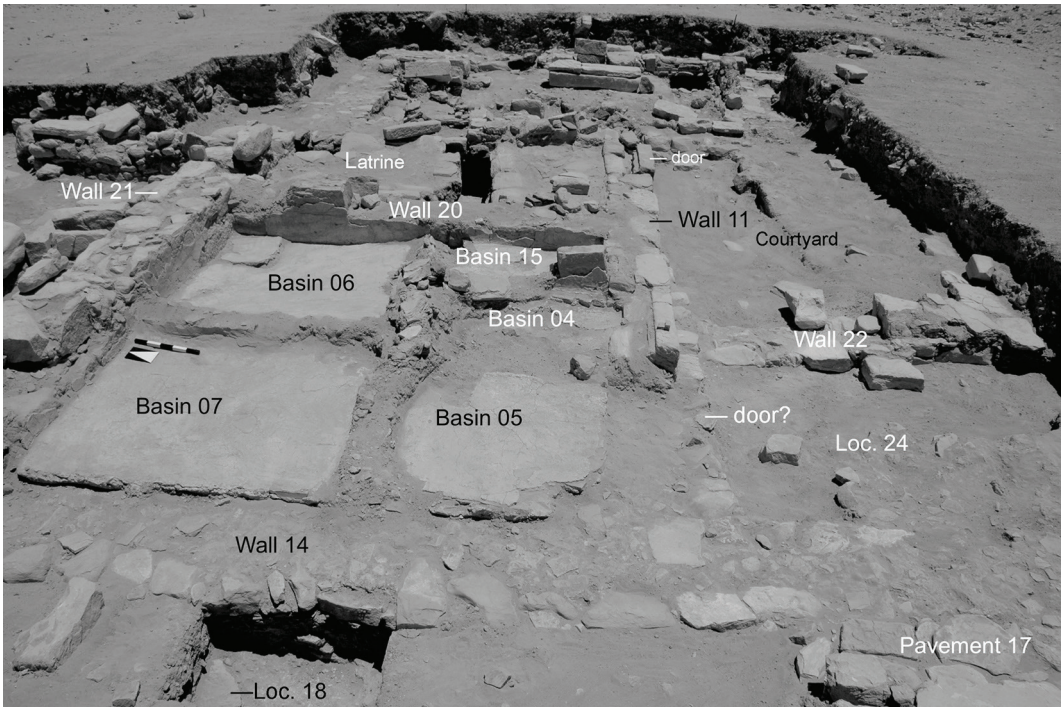




7. View of latrine from east.



8. View of brewing basins from west.



9. View of brewing basins, latrine, and south courtyard from east.

quadrant of the fort (Area N) contained the latrine and craft area along with a courtyard on the south, *ca.* 3.2 m (10.8 pm) wide N/S (Figs. 5–6). The small latrine, accessed through a shallow foyer on the south, consisted of a central paved area surrounded on three sides by a trench (Fig. 7). No seating survived, but several slabs bridging the channel may have supported wooden seats or facilitated squatting. The small room (*ca.* 2 x 2.5 m) probably could have accommodated only six or eight clients at once. Water was supplied to the trench through a terracotta pipe.

Latrines are well-documented in Roman forts (Petrikovits 1975: 106), and another small latrine was found at Hauarra in association with the 2nd c. Roman bath building outside the fort (Reeves *et al.* 2017: 106–22, esp. 113–4 fig. 7). The installation immediately west of the latrine, however, is more difficult to interpret (Fig. 8). The single large room, roughly 3.7 m square, contained five basins built of mortared rubble and plaster, each originally about 30 cm deep, with a total capacity of approximately 3,890 L. There were two large basins along the north wall and three smaller basins along the south wall. All the interior basin walls, made of thick plaster facing mudbrick and cobbles, bond with each other and abut the outer, more substantial enclosure walls. The thick plaster lining is smoothed over the joints between walls and floors. The basins belong to a single construction phase at the time the fort was built in the early 2nd c. AD and appear to have gone out of use in the late 3rd c. AD, when the fort was briefly abandoned. There was an access door in the southwest corner of the room, off the courtyard, and movement around the room was probably arranged by means of planks set on the basin walls. Both the latrine and basin room faced south on a courtyard (Fig. 9).

What was the function of these basins? Their use as grain bins is unlikely, since there was a large granary in the fort. They are also not well designed for water storage or distribution. Roman craft processes that involve shallow basins include fulling and laundering cloth, dyeing, fish-salting and *garum* production, fish breeding, olive oil or wine production, preparing or levigating clay, leather processing, and the brewing of beer (Wilson 2003: 445–6). Some of these applications can be rejected immediately. Fish-salting and *garum* production would have been impossible without a constant source of fresh fish, and the use of the tanks for fish breeding is also impossible because of problems with water supply, ambient temperature, and aeration. There is little evidence for olive or vine growing at Hauarra in the Roman period, and in any case the heavy foundation stones for pressing the fruit are absent from the site. Use of the basins for levigating clay for ceramic production can be rejected due to the absence of any evidence for pottery production at the site, undoubtedly because of the lack of good local sources of clay or fuel. Interpretation of the basins as dyeing vats should also be rejected, since that implies as well the production of textiles, a very unlikely activity in any Roman fort, much less a small, isolated frontier outpost.

Proximity to the latrine might suggest use of the basins for fulling cloth—in the sense of cleaning existing textiles rather than finishing newly woven cloth for use—since human urine was an important ingredient in the wet process used to remove oil and grease from wool (Moeller 1976: 20, 96). At Hauarra, the latrine could have been dedicated to defecation while urine was collected in amphorae or other containers propped up in the foyer, which were then carried across the common southern courtyard to the entrance to the basin room. In the initial stages of fulling or cleaning cloth, workers trod the cloth in similar basins in a mixture of urine and fuller's earth, then rinsed them with water. It would have been difficult, however, to

provide water to such a hypothetical fulling establishment in the desert environment of al-Ḥumayma. The most likely solution is the portage of water on donkey panniers from the fort reservoir to an opening in the north wall. There are several other objections to interpretation as a fullery: the basins seem too fragile for such heavy work, and the function is out of place in a fort. But most of all, the continuing supply of water to basins holding almost 4,000 L would have been a problem at Hauarra, since the industrial process rendered the water unsuitable for any further use. The same set of objections can be made to interpretation of the installation for processing leather, another polluting process.

Brewing is another craft relevant to soldiers that involves the use of basins. Like the two crafts mentioned above, it requires large amounts of water, but unlike them, nearly all the input water can later be consumed as a beverage. The means of transporting water to the basins remains unknown, but there may have been a dedicated pipeline not yet discovered, or draft animals may have brought it in with leather bags. In the standard practice used in the Eastern Mediterranean in antiquity, barley or wheat was placed in a tank and moistened so that it sprouted (malting). After a few days the malted grain was dried. Along the European frontiers this procedure generally took place in an oven. No oven was found in Area N, but in the desert climate of Hauarra drying could have easily taken place in the sun, on the pavement of the south court, or in the larger Basins 06 and 07. The dried malt could have been used immediately or stored until needed, at which point it was mixed in a tub of water for fermentation, sometimes with the addition of mash from a previous batch to speed up the process. Once the desired degree of alcohol was reached, the liquid was dipped out and strained into containers for short-term storage or for immediate consumption. Assuming a height of *ca*. 0.35 m for the walls, Basin 05 would have had a capacity of approximately 680 L, Basin 04 approximately 48 L, Basin 15 approximately 350 L. The northern Basins 06 and 07 were larger, each with a capacity of approximately 1,019 L. The total capacity was approximately 3,890 L. If the malting took place in one of the larger basins, the fermentation in the other larger basin, and the drying of the malted barley in the courtyard, the finished brew could have been moved with buckets into the three smaller basins to settle and clarify before being dipped into large jars for distribution to the troops. If each of the production stages took two days and all the basins were continually in use, such a brewery might have produced approximately 3,000 L of a soupy kind of sour beer every week. For a military unit consisting of about 500 men, this would have provided each soldier with approximately one litre of beer a day, a reasonable ration. As noted above, the unit in the Hauarra fort was a detachment from the *Legio III Cyrenaica*, and after a century of residence in Egypt, that legion had become a dedicated group of beer-drinkers. Papyri record the provision of beer in their rations.

This type of simple brew—appropriately termed *bouza* in Arabic—has been produced in rural Egypt since the Early Bronze Age (Lucas and Harris 1962: 10–6; Curtis 2001: 132–3, 370–1; Nelson 2005: 23–4). The process is similar to, but less complicated than, that used in Belgium since the 15th century to produce "lambic" beer in open tanks that collect natural yeasts from the air (Van den Steen 2011). In present-day rural Egypt, the procedure for producing *bouza* is very similar to the recipe in the 4th c. AD alchemical author Zosimus Panopolitanus. Coarsely ground wheat is made into loaves that are lightly baked, then mixed in water with a quarter proportion of malted wheat and a starter from a previous batch of *bouza*. After fermenting from one to three days,

the soupy mixture is sieved, resulting in a mildly-intoxicating drink providing both calories and vitamins (Morcos *et al.* 1973).

Sherds from wine amphorae are uncommon in the fort, so it is likely that beer, a typically Near Eastern beverage, filled the need for a comforting and nutritious drink. As long as there was adequate water from the aqueduct and sufficient stores of locally grown barley or wheat, the production of beer would have been a simple method for enhancing the quality of the food supply at an isolated post. The leftover mash would have made a welcome supplement to the diet of the camel mounts in the fort and of the pigs raised nearby for meat. Roman soldiers in both the Near East and Europe were accustomed to beer as a drink, sometimes issued as rations, as recorded for units near Oxyrhynchus in Egypt (*Oxyrhynchus Papyri* 12.1513) and at Vindolanda in Britain (Nelson 2005: 56–68). The *Legio III Cyrenaica*, of course, had come to the *Provincia Arabia* from Egypt, where beer was a standard drink for soldiers. Taking all factors into consideration, interpretation of the basin room as a brewery constructed along with the other structures within the fort walls soon after AD 106 seems the best solution for this installation.

No breweries seem as yet to have been identified inside other Roman forts, despite documentary evidence for beer as a military ration at Vindolanda and in Roman Egypt (Birley 1977; Bowman and Thomas 1994: nos. 186, 190, 482; 2003: nos. 581, 628; Nelson 2005: 65–77; Bridger 2018). In the early 2nd c. AD, Flavius Cerealis, the Prefect of the Vindolanda fort, wrote a letter requisitioning supplies, which fortunately survives: "My fellow soldiers do not have beer (*cervesam*), which I ask you to order sent" (Bowman and Thomas 2003: no. 628). A *cervesarius* (brewer) is also mentioned in the Vindolanda tablets (Bowman and Thomas 1994: no. 182.14; 2003: no. 581.6, 17). Another tablet (Bowman and Thomas 1994: no. 190) mentions the purchase of significant quantities of beer (*cervesa*) along with other rations, such as barley, vinegar, and wine. A structure in the *vicus* adjacent to the Vindolanda fort has been identified as a brewery; it contained two ovens for roasting the sprouted grain but lacked any brewing tanks (Birley 1977: 45–6). Another brewery, in the *vicus* associated with the 2nd c. AD *castellum* at Regensburg-Großprüfening contained a spring, well, oven, and a (2.4 x 2.8 m) waterproof tank (Boos 2010). A fermenting tank with "residues of black beer," is said to have been found in 1911 during the excavation of a Roman camp near Alzey, in the state of Rhineland-Palatine, but it is unclear whether or not it was found inside the fortifications (Dornbush 2006). It may well be that in northern Europe forts could rely on production of beer in the associated civilian settlements, where it was the customary drink. At Hauarra, where there is no evidence the local Nabataean population was accustomed to beer, there may have been no alternative to production within the fort itself.

In conclusion, we would like to address an obvious deduction regarding the proximity of brewery and latrine. The brewery was not a place for serving beer, an activity that brings with it the need for an adjacent lavatory. The beer would most likely have been consumed in the barracks, where the members of each *contubernia* group assembled to prepare and consume their rations. As in Roman forts elsewhere, there were most likely other, larger latrines convenient to the barracks area, perhaps along the *intervallum*, a strip of land just inside the fortification wall. This interpretation of the basins in the Hauarra fort may not be correct, but we feel it best fits the available evidence. We hope that archaeologists working on Roman military sites throughout the Roman world will keep their eyes open for similar installations.

Bibliography

Birley, A. 1977. *Vindolanda: A Roman Frontier Post on Hadrian's Wall.* London: Thames and Hudson.

Boos, A. 2010. "Eine Brauerei aus der Römischen Kaiserzeit in Regensburg-Großprüfening." *Jahrbuch der Gesellschaft für Geschichte des Brauwesens* 2010:30–51.

Bowman, A.K., and J.D. Thomas. 1994. *The Vindolanda Writing-Tablets (Tabulae Vindolandenses, II).* London: British Museum Press.

———. 2003. *The Vindolanda Writing-Tablets (Tabulae Vindolandenses, III).* London: British Museum Press.

Bridger, C. 2018. "Last [B]Orders please! The Beer Necessities of Roman Military Life on the German Limes." In *Limes XXIII: Proceedings of the 23rd International Congress of Roman Frontier Studies, Ingolstadt, 2015. Internationalen Limeskongress in Ingolstadt 2015. Beiträge zum Welterbe Limes Sonderband* 4, edited by C.S. Sommer and S. Matešić, 215–22. Mainz: Nünnerich-Asmus Verlag.

Curtis, R.I. 2001. *Ancient Food Technology.* Leiden: Brill.

Dornbush, H. 2006. "Iron Age Braumeisters of the Teutonic Forests." *Beer Advocate Magazine* 2006.

Fiema, Z.T., and F. Villeneuve. 2018. "The Roman Military Camp in Ancient *Hegra.*" In *Limes XXIII: Proceedings of the 23rd International Congress of Roman Frontier Studies, Ingolstadt, 2015. Internationalen Limeskongress in Ingolstadt 2015. Beiträge zum Welterbe Limes Sonderband* 4, edited by C.S. Sommer and S. Matešić, 702–11. Mainz: Nünnerich-Asmus Verlag.

Lucas, A., and J.R. Harris. 1962. *Ancient Egyptian Materials and Industries.* 4th ed. London: Eduard Arnold.

Moeller, W.O. 1976. *The Wool Trade of Ancient Pompeii.* Leiden: Brill.

Morcos, S.R. *et al.* 1973. "Fermented Foods of Common Use in Egypt, II: The Chemical Composition of *Bouza* and its Ingredients." *Journal of the Science of Food and Agriculture* 24:1157–61.

Nelson, M. 2005. *The Barbarian's Revenge: A History of Beer in Ancient Europe.* London: Routledge.

Oleson, J.P. 2007. "From Nabataean King to Abbasid Caliph: The Enduring Attraction of Hawara/al-Humayma, a Multi-Cultural Site in Arabia Petraea." In *Crossing Jordan: North American Contributions to the Archaeology of Jordan,* edited by T. Levi *et al.*, 447–56. London: Equinox.

———. 2009. "Trajan's Engineers and the Roman Fort at Humayma (ancient Hauarra, Jordan)." *SHAJ* 10:535–48.

———. 2010. *Humayma Excavation Project, 1: Resources, History, and the Water-Supply System.* Boston: American Schools of Oriental Research.

———. 2017. "The Modular Planning of Roman Fortifications in the Near East: Principles and Process." In *The Socio-Economic History and Material Culture of the Roman and Byzantine Near East: Essays in Honor of S. Thomas Parker*, edited by W.D. Ward, 237–72. Piscataway, NJ: Gorgias Press.

———. 2019. "The Trajanic Auxiliary Fort at Hawara (modern Humayma), Jordan." *SHAJ* 13:395–406.

Oleson, J.P., E. de Bruijn, M.B. Reeves, A.N. Sherwood, C.A. Harvey, M. Nikolic. Forthcoming. *Humayma Excavation Project, 3: The Roman Fort.* Washington DC: ASOR.

Oleson, J.P., M.B. Reeves, and B. Fisher. 2002. "New Dedicatory Inscriptions from Humayma (Ancient Hawara), Jordan." *ZPE* 140:103–21.

Petrikovits, H. von. 1975. *Die Innenbauten römischer Legionslager während der Prinzipatzeit.* Opladen: Westdeutscher.

Reeves, M.B. *et al.* 2017. "Report on the Humayma Excavation Project's 2010 and 2012 Field Seasons." *ADAJ*

58:105–44.
Van den Steen, J. 2011. *Geuze and Kriek: The Secret of Lambic Beer.* Tielt: Lannoo Publishers.
Wilson, A. 2003. "The Archaeology of the Roman *Fullonica.*" *JRA* 16:442–6.