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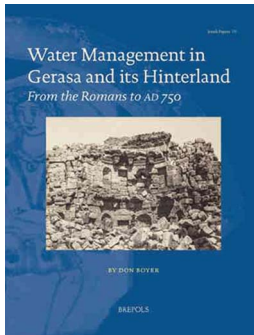
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ANTIQUITY 2023 Vol. 97 (396): 1634–1636
<https://doi.org/10.15184/aqy.2023.151>

DAVID DONALD BOYER. 2022. *Water management in Gerasa and its hinterland: from the Romans to AD 750* (Jerash Papers 10). Turnhout: Brepols; 978-2-503-59862-8 paperback €125.



This hefty and amply illustrated volume provides the reader with a fresh and in-depth examination of the water supply and management of the Decapolis city of Gerasa (also known as Jerash or Jarash) in modern-day Jordan. The book is an impressively detailed exploration with a commanding control of complex evidence and a large, yet patchy, dataset comprising nineteenth-century records of European visitors, early excavations and new survey data. The study has a wide scope both geographically and temporally, taking in an area of 180km² and spanning the Hellenistic period through to the tenth century AD, and was completed as a PhD project by trained geologist Don Boyer.

The book opens with an Introduction (Chapter 1) and is then divided into four parts: methodology and context; the hydraulic system; the urban network; and a set of technical appendices. Part 1 provides the reader with a wealth of background information about the city and its hinterland. Chapter 2 lays out the existing data and previous studies. Boyer supplements these limited data with extensive new survey work to record water-related installations and infrastructure. This includes an excellent programme of high-quality and well-considered archaeometry to refine our understanding of the dating of elements of the water supply network. Chapter 3 delivers a comprehensive discussion of the changing physical landscape in which the water-management systems are situated. This particularly

detailed study of the hydrological setting, especially the springs, surpasses most studies in the wider region. Chapter 4 summarises settlements and human activity in the study area, with a focus on water management, from the Neolithic period onwards based on published surveys and excavations.

Part 2 encompasses a thorough examination of the hydraulic system of the city and its hinterland. Chapter 5 not only describes the water sources in the area, in particular the all-important springs, but also highlights the relationship between water availability and settlement location. Chapter 6 continues this level of detail in its review of water-transport elements, most notably the numerous aqueducts that operated in the area. At times this chapter feels like the author has become overly absorbed in the details. Instead of starting by breaking down the system into its component parts, which then become difficult to keep track of, it might have been more useful to start with a general description about the nature of the overall system and how each sector operates, which is set at the end of the chapter. In addition to making it rather difficult for the reader to follow, opportunities to discuss issues of wider significance are missed. We are told, for example, that many of the aqueducts are not roofed, so water could potentially be easily accessed by anyone; that there are numerous branch-lines off the aqueducts, including some with offtake basins; that “the greater part of the overall aqueduct network supplied rural users” (p.274); and that these “local networks ... were probably constructed and maintained by local communities” (p.167). Together, these elements are extremely significant for challenging prevailing views that aqueducts were parasitic upon their hinterlands and served only urban needs and users. This will hopefully direct future discussions towards a change in perception.

Chapter 7 delivers a comprehensive account of the various types of water storage used in the system, including reservoirs, storage basins and cisterns. Again, the author does not fully explore the subtleties in the Gerasene system. The combined distribution and storage basins, for example, are an interesting addition to the roster of Roman-period water-management facilities, where these features are usually either for distribution or for storage, rather than meeting both needs. This adds to current arguments about water management in the Roman Middle East that suggest these systems were developed to be more responsive to challenging and unpredictable climate conditions. On the other hand, a brief discussion is made of the constant-offtake principle in Chapter 10—the idea that water is not stored in significant quantities in any part of a Roman water management system and therefore is inherently wasteful. Regrettably this is only compared with the North African context, which operates in rather different ways from the Middle East.

Water use is examined in Chapter 8, which starts with public uses (bath houses, fountains, ornamental pools and latrines). The ecclesiastical and cultic uses get rather short shrift, which seems to occur throughout the book, suggesting that the author does not want to engage with wider social issues. The numerous industrial uses of water—for agriculture, quarrying, mining, textile and leather production, water-milling, pottery production and glass- and metal-working—are discussed in more depth. These data have the potential to make a substantial contribution to wider debates, particularly relating to the nature of the urban economy and the idea of producer versus consumer cities.

Part 3 weaves together a picture of the urban network, starting in Chapter 9 with the urban water infrastructure. It establishes a coherent narrative about the main components of the system: supply from spring-fed aqueducts to reservoirs; then distribution to regulation basins and *castella*; distribution via pipelines to end users; and finally, the system for waste water and sewage disposal. Boyer is over-modest about how significant this dataset is; thanks to the author's diligent work, Gerasa is now one of the best understood cities in the region for water supply and management, in particular how water was distributed around the city. Chapter 10 complements this narrative by helpfully tracking diachronic changes in water management across the city. The first main investment in the city's water management occurred in the second half of the second century AD with the building of aqueducts to meet a "vastly increased water demand" (p.323) with a peak in numbers of fountains along the *Cardo* (main street) and the construction of the large East Baths. The third and fourth centuries see a further expansion of the fountain network and more bathing facilities. In the fifth to mid-seventh centuries, the city's water-management system witnessed significant changes, due to the rise of Christianity which saw additional water needs in the city, for example the prestigious Baths of Placcus. From the mid-seventh century to AD 750 there was a gradual decline in the system with some parts of the city being cut off from piped clean-water supplies. This disintegration of the system was exacerbated by earthquakes in the seventh and particularly eighth centuries and a change in climate that saw "high-intensity rainfall and flash flooding" (p.329). This is where Boyer is at his strongest, marshalling disparate datasets into a convincing picture of Gerasa and its water supply. The book concludes with Chapter 11's overview and a set of recommendations for future studies.

Overall, this research is remarkably detailed and especially useful for those who want to engage at a deep level with the intricacies of Jerash's water-supply system and who have a strong grasp of hydraulics and water engineering. For readers with less expertise in these areas, I suggest starting with Chapter 11 for a general outline, then read Chapters 9 and 10 for the urban network and Chapter 8 for the rural network; this will help to situate the greater level of detail available in the earlier chapters. The data are presented in such detail and with such care that this opens a rich vein for further study and wider debates within the Roman economy and Roman water-management studies in these areas.

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