Water Culture in Roman Society

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Abstract

Water played an important part of ancient Roman life, from providing necessary drinking water, supplying bath complexes, to flowing in large-scale public fountains. The Roman culture of water was seen throughout the Roman Empire, although it was certainly not monolithic and it could come in a variety of scales and forms, based on climatic and social conditions of different areas. This discussion seeks to define ‘water culture’ in Roman society by examining literary, epigraphic, and archaeological evidence, while understanding modern trends in scholarship related to the study of Roman water. The culture of water can be demonstrated through expressions of power, aesthetics, and spectacle. Further there was a shared experience of water in the empire that could be expressed through religion, landscape, and water’s role in cultures of consumption and pleasure.

Keywords


1 Introduction

Water is transmutable and transformative. Human fascination with water often derives from the fact that water, governed by the laws of physics and other natural forces, changes form and state,¹ as well as transforms other entities by

¹ Strang 2005, 98; Oestigaard 2011, 38.
providing life and inflicting death, as a natural force in its own right. Water is also part of an inherently shared, cross-cultural experience, as all humans must use it. Given the endless variety of ways in which humans interact with water on a daily basis, all waterforms (whether natural or artificially created) have the ability to link “social groups physically and topographically.” One needs to find clear and clean water for drinking and bathing. A person can experience a waterscape, or all of the natural water features of the environment, including rivers, lakes, springs, and seas, along with the various forms of precipitation, such as rain and snow—making water an integral part of one’s interaction with the world. Or one can find oneself in front of an artificial fountain, which displays water and demonstrates the power and grandeur of water that has been harnessed, even in the case of the smallest of water-displays. Regardless of an individual’s encounter with water, there is always an associated lived experience with this vital and versatile element.

The Romans were fascinated and obsessed with water on a variety of levels. The term ‘water culture’ is used here in an attempt to bring together the various aspects and nuances of the relationship between water and Roman society. The idea behind water culture is not a novel one, and appears widely across modern scholarship. One of the first major studies on water culture in the ancient Greco-Roman world was Renate Tölle-Kastenbein’s 1990, Antike Wasserkultur. Her monograph offers a general overview of water collection, distribution, and disposal, in addition to a discussion of water’s use in notions of power and as an aesthetic element. Alain Malissard’s 1994 monograph, Les romains et l’eau, explored water usage of the Romans, including utilitarian- and pleasure-related uses, engineering issues, and the notions of power associated with the control of water (specifically through aqueducts and the formal administration of water). In 1996, Maria Ricciardi and Valnea Santa Maria Scrinari published a volume documenting all of the elements of the hydraulic systems of Ostia, under the title, La civiltà dell’acqua in Ostia Antica. The authors, however, do not attempt to define the notion of a water civilization implied in the title. Betsey Robinson, in her 2001 PhD dissertation exploring the culture of water at Corinth, uses the term ‘culture’ over ‘cult,’ in order to widen her discussion of not only religious elements of water, but also social implications of water usage. In Hennig Fahlbusch’s 2008 edited volume on the water features of Hadrian’s Villa, Wasserkultur is used as a broad term in

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3 Strang 2005, 108.
4 Rogers 2013, 2, 6.
5 Robinson 2001, 14.
order to illustrate the impact of water on the villa itself, but the volume is only limited to the practical aspects of the water collection and distribution network there. Brian Campbell’s 2012 monograph on rivers of the Roman world demonstrates how water impacted Roman culture at large, albeit he does not specifically discuss Roman water culture per se.6 Wolfram Martini explores the Wasserkultur of Perge’s fountain and gate system; yet again, this term is used to suggest the importance of water at the site, without offering much in terms of definitions.7 This failing is also true of the recent conference volume Fountains and Water Culture in Byzantium (2016), the contents of which thoroughly investigate the role of water in Byzantium, but without formulating an explicit definition of water culture.

Recent scholarship in Roman studies has attempted to define elements of Roman culture. Scholars advocate reexamining modes of cultural influence, especially in the Roman period, moving away from charged terms, such as Hellenization and Romanization.8 ‘Culture’ simply put is how a society’s practices and beliefs differentiate it from another society.9 The so-called ‘cultural revolution’ of the Romans, a phenomenon tied to their imperial project, is seen in “the conversion of wealth into social prestige that [allows for] new forms of culture [to] emerge.”10 Indeed, as will be demonstrated below, there was a fluid cultural exchange when it came to water in the Roman world. While Rome early on invested in water-related building projects, such as the construction of the Aqua Appia in 312 BCE, over time these projects became more refined and grew in scale and complexity. But even though elements of Roman water culture were adopted and implemented throughout the empire, there were still variations based on region and local social practices. Water culture, and perhaps Roman culture at large, should not be considered monolithic.

Water culture is a broad concept. First and foremost, because water is a naturally-occurring element employed by humans in innumerable artificial forms, water culture comprises the intersection of natural and artificial elements in society, the exchange between human and natural realms. Secondly, water culture is composed of the specific, and sometimes idiosyncratic, forms of water manipulation through which a society achieves seemingly limitless

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6 For example, see his section on the appearance of rivers in Roman literature, religion, and art (2012, 118–59).
7 Martini 2016.
8 See Wallace-Hadrill (2008, 17–28) for a full discussion of these issues.
goals: hydration, agricultural irrigation, decoration, public and personal hygiene, hydraulic power, and so on. Finally, any given water culture will bear different social implications throughout all levels of a society. Water is omnipresent, and therefore, whether visible or invisible, impacts all aspects of culture writ large. Thus, water culture, defined simply yet succinctly, is the set of water-related practices that both express and shape a society’s perception of its place within the natural order, in relation to foreign societies, and concerning its own constituent participants.

Romans had an expansive and diverse water culture, which stretched throughout the empire, linking all of the various inhabitants over time. In order to understand better the water culture of the Romans, the following discussion employs a wide body of evidence. First, ancient literary sources are presented to demonstrate Roman attitudes on water, especially in terms of the inherent positive and negative qualities of water. Second, ancient water administration and legal policies associated with water are presented to illustrate the ways in which Romans themselves distributed water in public and private contexts throughout the empire. Third, a variety of archaeological evidence is presented to show the ubiquity of water in the Roman world, including aqueducts, baths, sanitation, water-displays, and hydraulic power. Fourth, regional trends of water usage will be offered, in order to demonstrate that, while water was employed in all parts of the empire, it could be used in different ways, according to social and climatic reasons. Finally, Roman water culture will be explored more holistically, in efforts to understand the ways in which water permeated different aspects of Roman society. The modern scholarship on Roman water is extensive, yet the ensuing discussion is meant to illustrate the wide body of evidence (archaeological, literary, epigraphic, etc.) that is constantly changing and impacting conceptions of water in the Roman world. The approaches of different scholars, trained in different schools of thought across the world, come together here—demonstrating the complicated nature of Roman water culture.

2 Ancient Roman Sources on Water

Stemming from a long Greek tradition of observing the properties of water, such as that of the Presocratics, the Romans knew much about water and were able to tap into its resources in a variety of ways.\textsuperscript{11} The Romans classified

\textsuperscript{11} For more on the Presocratics and their thoughts on water, first see Vitruvius (\textit{De arch. 8.praef.}) and Seneca (\textit{QNat. 3.22}). See also the most recent edited volumes of Curd and
waters based on their inherent qualities, based on an understanding of what made ‘good’ and ‘bad’ waters. ‘Good’ water was in constant motion, had a good taste, and was healthy, while ‘bad’ water was usually construed as the opposite. Water was also transformative, whether its composition was changed because of its own environment, or it was able to transform its consumers in some way.

Four prose authors, Vitruvius, Seneca the Younger, Pliny the Elder, and Frontinus, provide useful Roman views on water, especially as these works are scientific or administrative in nature. Each of these authors explains the properties of water and offers insights on the element. Their thoughts seem to reflect a commonality of Roman attitudes towards water, demonstrating the extent to which Romans understood the properties of this vital resource and how to harness its power for utilitarian and restorative purposes. Other literary sources, especially poetry, are mentioned here only where relevant.  

Vitruvius is widely known for his treatise on architecture (*De architectura*), probably written between 30–20 BCE. The ten books of the work explore a variety of topics that would have been crucial for the Roman architect or engineer to understand, including the layout of cities (Book 1), building materials (Book 2), temples (Books 3 and 4), public buildings (Book 5), private buildings (Book 6), decorative details of structures (Book 7), water (Book 8), sundials and clocks (Book 9), and machines (Book 10). Within Book 8, Vitruvius discusses the four elements (preface), finding water (chapter 1), rainwater (chapter 2), the nature of different waters (chapter 3), testing water (chapter 4), methods for leveling earth for water infrastructures (chapter 5), and aqueducts and piping (chapter 6). Chapter 3’s discussion of waters presents hot waters (1–5), poisonous waters (15–18), intoxicating waters (20), and springs that can harm (21–23). By demonstrating the properties of these different waters, Vitruvius ensures that subsequent architects and engineers know which types of waters are the best to collect. Scholars have shown that Vitruvius was relying on Greek sources for Book 8, especially from Hellenistic Pergamon. If this is indeed the case, that means Vitruvius’ discussion, while based in truth, might

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Graham (2008). All translations of ancient texts are taken from the Loeb Classical Library, unless otherwise noted.

12 See Rogers (2015, 80–129) for a longer discussion of literary sources related to Romans’ perceptions of water.

13 Rowland and Howe (1999, 1–18) provide a succinct introduction to Vitruvius and his treatise. For more on the notion of the Roman ‘architect,’ see Anderson (2014), who discusses all known Roman architects.

not actually reflect the state of Roman aqueduct technologies at the end of the first century BCE.

Seneca the Younger composed one of the first Roman treatises on scientific matters, the *Naturales Quaestiones*, in the early 60s CE. The seven books of the work deal with a variety of issues related to meteorology, including celestial phenomena (e.g., meteors, comets, thunder, lightning), terrestrial waters, precipitation, winds, earthquakes, and the sources of the Nile. Seneca, a Stoic, presents in the *Natural Questions* an in-depth physical description of the various meteorological phenomena, in order to understand the nature of the benevolent, caring god, who sends signs through phenomena. Book 3 discusses terrestrial waters, including how water impacts health (3.2.1–2), movement of water and its relation to topography (3.3.1), rivers (3.4–19), varieties of water (3.20), deadly waters (3.21) and deadly waters without bad tastes or smells (3.25), stoicism and eternal waters (3.22), and hot waters (3.24).16

In Seneca’s discussion of the nature of water, there is a passage of particular importance for understanding water in Roman thought:

All waters are still, or running, or collected, or occupy various subterranean channels. Some are sweet, others have flavors that are disagreeable in different ways; among them are the salty, the bitter, and the medicinal. In the last category I mean sulphur, iron, and alum waters. The taste indicates the properties. They have many other distinctive qualities in addition. First, there is touch: they are hot or cold. Then weight: they are light or heavy. Then color: they are clear, muddy, blue, yellowish. Then their

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15 For more on the *Natural Questions*, see: Gross (1989), Gauly (2004), Hine (2010), and Williams (2012). Hine (2010) and Williams (2012) have reorganized the order of the books, placing Book 3, on terrestrial waters, at the beginning of the sequence.

16 For more on Book 3, see Gross (1989, 103–47), Gauly (2004, 96–104), and Berno (2012).
effect on health: for some are wholesome, others are deadly. There are
certain waters which thicken into rock, others are thin or fat. Some give
nourishment, some pass through without any benefit to the drinker; and
some waters, when drunk stimulate fecundity.

Trans. T. H. Corcoran

This succinct passage encapsulates the Roman psyche regarding waters’ inher-
ent qualities, which framed how the Romans interacted with water in their
daily lives. Of special note is the way in which Seneca discusses the transforma-
tive properties of water, giving life or bringing death, based on its composition.17
Thus, water has the ability to nourish humans, but it also has the ability to
transform and alter in a negative direction.

Pliny the Elder, in Book 31 of his Historia Naturalis, explores natural phe-
omena, in a similar vein to Seneca.18 Pliny describes a great deal about water:
medicinal properties of water (31.1), waters and their qualities (31.2), classes of
water, including healing and curative (31.3–17), marvels associated with water
(31.18), deadly waters (31.19), beneficial waters (31.21), water finding techniques
(31.26–28), varieties of water (31.29), phenomena of waters (31.30), water
pipes (31.31), hot and medicinal springs (31.32), medicinal uses of sea water
(31.33–37), salt (31.39–45), soda (31.46), and sponges (31.47).

Finally, the commentary, De aquaeductu urbis Romae, of the year 98 CE
by Sextus Iulius Frontinus, provides important insight into the construction
and management of the city of Rome’s water infrastructure.19 Frontinus was
installed the curator of the cura aquarum under Nerva in 97 and then flour-
ished under Trajan, so he had an intimate knowledge of the water supply of
the city of Rome.20 While much of the work is technical or legal (e.g., distribu-
tion capacity of aqueducts or the legal rights of water servitudes), Frontinus
provides glimpses into the nature of water, through his descriptions of certain
aqueducts. The water of the Aqua Marcia was known for having a greenish

17 For more on the taste of water and its transformation of other elements, see Sen. QNat.
3.20.1–2.
18 The bibliography on Pliny the Elder is immense, but Healy (1999) offers an important
discussion on science in the Natural History, and Gibson and Morello (2011) offers a wide
array of essays on Pliny.
19 For more on Frontinus in general, see: Evans (1997); Bruun (2003); Peachin (2004). The
most recent editions of Frontinus are Del Chicca (2004, in Italian), Rodgers (2004), whose
introduction (1–20) offers a succinct understanding of the author and work, and Paniagua
(2016, in Spanish).
20 See below, 11–13, for a full discussion of the cura aquarum.
color (7.1). The Aqua Alsietina/Augusta was known for having no redeeming or consumable qualities for humans, so it was delivered to the Transtiberium for use in Augustus’ Naumachia (11.1). But Frontinus also indicates that the aqueduct supplied water to some farms and gardens in the area, in addition to acting as an emergency water source for fountains across the river (11.1–2). The Anio Novus had water that could sometimes turn a muddy color, because the banks of the river were loose (15.1–2).

These four authors share a few salient points of interest. First, the importance of the classification of water is present throughout. Seneca divides water not only into celestial or terrestrial (QNat. 3.23), but also by properties that can then give water its own specific tastes, medicinal properties, odors, and temperatures (QNat. 3.20.2). And just as there are a number of different liquids in nature, so too can there be a variety of waters to classify (Vitr. De arch. 8.3.26).

Furthermore, other literary texts mention that beneficial waters must be moving. Pliny the Elder reports that physicians know that running water is better for those who drink it, due to the agitation of the currents in the water, than stagnant waters (stagnantes). Because the water’s impurities are removed through its motion, it can be used without concern for one’s health. In fact, the importance of moving water extends well beyond its potability. The waters used in purifying rituals in Roman religious practice must also be moving. Thus, in various aspects of Roman life, the importance of moving water, over stagnant, was stressed.

These authors also emphasize the transformative nature of water, both in terms of water’s ability to alter its human consumers and water’s own changeable status. Just as wine can take on the properties of the environment in which its grapes are cultivated, so, too, can water take on the quality of the soils that it passes through (Vitr. De arch. 8.3.4, 8.3.12). Seneca explores the ways in which the taste of water can be affected by its environment:

21 Frontinus curiously does not include any discussion of the pleasant drinking nature or coolness of the waters of the Aqua Marcia, as Vitruvius (De arch. 8.3.1) or Pliny (HN 31.24) do.
22 See also Res Gestae (22.4); Taylor (2000, 169–200), who describes of the aqueduct, along with the location of the Naumachia of Augustus.
24 Plin. HN 31.21.
25 Liv. 1.45.6–7; Ov. Fast. 4.778; Ov. Met. 3.27; Columella Rust. 12.4.3; Tac. Hist. 4.53; Valerius Flaccus 4.420–423; Sil. 8.125; Festus 152.11–13 L. On the necessity for moving water for religious use, see Thesaurus cultus et rituum antiquorum [ThesCRA] 2.3a.IV.A (s.v., Purificazione, Romana, Mezzi impiegati nelle purificazioni, liquidi e unguenti; V. Saladino).
At quare aquis sapor uarius? Propter quattuor causas: ex solo prima est, per quod fertur; secunda ex eodem, si mutatione eius nascitur; tertia ex spiritu, qui in aquam transfiguratus est; quarta ex uitorio, quod saepe conscipiunt corruptae per inuiuriam. Hae causae saporem dant aquis uarium, hae medicatam potentiam, hae grauera spiritum odoremque pestiferum, hae leuitatem grauitatemque, <hae> aut calorem aut nimium rigorem. Interest utrum loca sulphure an nitro an bitumine plena transierint; hac ratione corruptae cum uitae periculo bibuntur.

\textit{Sen. QNat. 3.20.1–2}

But why the variety of taste in water? There are four causes. The first is from the soil through which the water is carried; the second also depends on the soil if the water is produced by a transmutation of earth into water; the third comes from the air which was transformed into water; the fourth from a pollution which water often receives when it has been corrupted by harmful substances. These causes give water its different taste, its medicinal power, its disagreeable exhalation and pestilential odor, as well as its unwholesomeness, heat or excessive cold. It makes a difference whether it passes through places full of sulphur, nitre, or bitumen. When water is polluted this way it is a risk of life to drink it.

\textit{Trans. T.H. Corcoran}

Seneca cites a variety of ways in which water is malleable. For example, water might be transformed by interacting with earth and air (an idea possibly rooted in the conceptualization of the canonical four elements). Contact with different elements can change water itself, such as in taste, odor, and wholesomeness. When water’s healthful qualities are jeopardized, then it has the power to harm those who drink it. Therefore, these ancient sources also report that water can adversely affect people, potentially causing death, intoxication, forgetfulness, dullness, or tooth loss. In order to choose the healthiest and best tasting water, one must always be aware of water sources.

\footnote{For deadly waters, see: Vitruvius \textit{De arch.} 8.3.21–23; Sen. \textit{QNat.} 3.2.1–2, 3.21, 3.25; Pliny \textit{HN} 31.19. Poisonous waters can be found in Vitruvius (\textit{De arch.} 8.3.15–20), with intoxicating waters in the same section (8.3.20). There are two polar opposite springs near the river Hercynmus in Boeotia: one induces forgetfulness and the other causes rememberance (Plin. \textit{HN} 31.11). Men becoming dull from water is found in Vitruvius (\textit{De arch.} 8.22) and Pliny (\textit{HN} 31.12). For tooth loss, see Vitruvius (\textit{De arch.} 8.3.23). Pliny, however, reminds the reader that there are plenty of healing qualities from a variety of waters (\textit{HN} 31.3–12).}
Roman authors also stress the necessity of water. On a superficial level, Pliny the Younger mentions that water is necessary for the upkeep of a villa (Ep. 2.17.25). Of course, water is crucial not only for drinking, but also for a variety of other utilitarian uses, as Vitruvius reminds his readers (De arch. 8.praef.3). Water is used for raising animals and various foodstuffs (Vitr. De arch. 8.3.28). Columella warns his reader to water plants thoroughly, lest they die (Rust. 10.143–44). Thus, the harnessing of water by the Romans is the catalyst for the flourishing of all forms of life, not only of humans, but also of flora and fauna necessary for survival.

3 Roman Water Management: Administration, Distribution and Legal Regulations

Roman communities tended to ensure that inhabitants of the empire had access to water, whether through public or private means. Although Roman water management remains a complicated and ever-changing subject to modern scholars, given the wide array of available evidence spanning the entire empire and several centuries, the administration, distribution, and legal regulations of water provide insight into the types of access Romans may have had to this necessary life-giving element. This section discusses the ways that Romans made water accessible to a variety of constituencies, while highlighting modern debates in Roman water management. There were a number of administrative and legal mechanisms for the control of water on a variety of levels, which evidences the importance of water in their culture at large. That being said, vast differences in water management programs (e.g., public, private, planned, or ad hoc) found across the Roman world demonstrate the overall locally autonomous nature of water systems throughout the empire.

Before turning to the actual administration, distribution, and legal regulation of water, a brief note should be made about types of water and some flood management strategies. The Romans distinguished between public and private water sources. Private water sources might include wells, springs, and streams, while public water typically comprised rivers, seas, and aqueducts.27 These notions of public and private water sources will guide the ensuing discussion of how a Roman could access water.

Of these various public water sources, rivers especially required close administrative attention. Rivers had to be controlled (to prevent potential

destruction) and monitored (particularly in terms of economic interests). The Tiber River was (and still is) prone to flooding. For example, the flooding Tiber ruined the 13 BCE inauguration of Lucius Cornelius Balbus’ theater in the Campus Martius when its overflowing waters submerged part of the theater itself. In order to facilitate the control of rivers, then, flood management strategies were put into place, and aediles might have originally maintained the Tiber River and its banks. By the Julio-Claudian period, however, an office had been established, perhaps with five officers, the curatores riparum et alvei Tiberis (curators of the banks and the channel of the Tiber), which was probably reduced to a one-man office by the Flavian period; oversight of the drains that fed the river was extended to the office by 100 CE, making the officer in charge the curator alvei et riparum Tiberis et cloacarum urbis. The exact tasks of the curator are not entirely clear, but he probably marked the boundaries of the river, maintained the quays and cargo embankments (crucial for the importation of foodstuffs to the city), and organized efforts to prevent floods. Romans thought it best to monitor and regulate rivers, not only in the vicinity of Rome but across the empire, given that rivers are not only great sources of public water, but also destructive agents.

The administration and legal regulation of water in the city of Rome has been a subject of great interest since the beginning of the empire itself (particularly issues concerning the supply of water to the city). One of the best sources for reconstructing the cura aquarum, or the office in charge of water distribution, is Frontinus—a curator himself of the office. Reflecting on the past history of the office, Frontinus in De aquaeductu urbis Romae states that he wanted to provide a manual for his successor, and in the work, he covers

28 The Nile River’s floods, for example, were famous for their life-giving and destructive properties. For more see Bonneau (1964, 29–131; 1993) and Campbell (2012, 136–37).
29 For an extensive discussion of the physical, social, and historical implications of Tiber River floods, see Aldrete (2007).
30 Aldrete 2007, 4–5.
31 Aldrete 2007, 199.
32 For an overview of the office, see Aldrete (2007, 198–203), Masi Doria and Cascione (2010), and Campbell (2012, 98–117). One can also refer to the Lex de imperio Vespasiani and its connection to river management; see Bruun (2012a). Campbell explores rivers in general throughout the Roman world, from practical matters, to wider cultural phenomena associated with these water sources (e.g., rivers in literature, religion, and art). See also the contributions in Franconi’s 2017 volume on fluvial landscapes of the Roman world, including discussions of the impact of climate on rivers.
33 See the edited volume of Hermon (2010) that explores empire-wide issues of river control and other riparian issues.
numerous topics, such as the history of the aqueducts of Rome (including the actual capacities of each of the aqueducts), the distribution of private water rights from the emperor (addressing such details as the sizes of pipes, the *quinariae*), and various pieces of legislation (such as earlier *senatus consulta*) regarding water, amongst other smaller matters.

In addition to the inner workings of various aqueducts up to the early second century CE, Frontinus documents the imperial overhaul of the *cura aquarum*. The water administration office was probably set up after the aedileship of Agrippa in 33 BCE, who helped monumentalize Rome’s water infrastructure on a scale far grander than anything seen in the Republic. After Agrippa’s death in 12 BCE, the administration was transferred to Augustus, who made it an office for those of senatorial rank through a *senatus consultum* of 11 BCE, as recorded and reported by Frontinus. By the time of Frontinus, however, the office had apparently fallen into corruption and bad business practices. Frontinus, under the prerogative of the emperor, then continued to improve Rome’s water supply, cracking down on illegal water tapping by private individuals. Using Frontinus’ treatise, we know that the *curator’s* duties included:

1) The upkeep of the physical constructions necessary for the city’s water supply, and, in doing so, to manage the work force at the disposition of the administration. 2) The registration of the private water grants. 3) Jurisdiction in a number of questions which concerned the aqueducts, such as infractions of private parties on the land reserved for the aqueducts.

After Frontinus’ time, the office of water administration continued to grow and transform, as exemplified by the creation of the office of the *cura aquarum et Minuciae*, or the office of water administration and grain distribution, two agencies that were merged in the early Severan period. Frontinus also mentions that the organization of the *cura aquarum* included an architect (*architectus*), scribes (*scribae* and *librarii*), attendants (*accensi*), and heralds (*praecones*). Oftentimes in modern literature, there is still some confusion

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37 On this new office, see Taylor (2010).
38 Frontin. *Aq.* 100.1. There has been discussion on the exact location of the physical offices of the *cura aquarum* in the city of Rome. For the most recent evaluation, see Bruun (2007).
regarding the *aquarii*, which Frontinus uses a collective noun to denote the staff of the office (who were sometimes associated with selling water rights illegally), since the term can also refer to a class of professional water sellers, who would deliver water to Roman homes.\(^{39}\) Further insight into the workings of the *cura aquarum* can be gained by comparing Frontinus’ account with literary descriptions of other Roman administrative offices. For example, Jean-Jacques Aubert has compared the *cura aquarum* to the *vilicus* system (i.e., the management of an agricultural estate). Here, the estate owner (*dominus*) employed a *vilicus* (typically a slave or freedman) to organize farmwork and oversee his agricultural slaves. Likewise, the *curator aquarum* might hire someone (such as a *libertus* with procuratorial power) to manage the workforce of imperial slaves who performed regular maintenance on the water distribution network. Just as the *dominus*’ slaves were legally considered part of his *familia*, so too could these imperial slaves be considered part of the *familia Caesaris*, as these properties were connected to the imperial family.\(^{40}\)

Modern scholarship offers varying interpretive lenses for understanding Frontinus’ *De aquaeductu*: as a literary work (Saastamoinen 2003, with both technical and rhetorical flourishes); as an incomplete treatise (Bruun 2003); as a speech perhaps read to the Senate (DeLaine 1996); as a panegyric for the emperor or Frontinus himself (Evans 1997).\(^{41}\) Building on previous scholarship, Michael Peachin (2004) suggests that Frontinus was actually producing this work (and all of its details) to assert his power as *cura* and thereby persuade the incumbent aristocracy that the emperor’s overhaul of Rome’s water infrastructure would bring valuable benefits to the city. Whatever Frontinus’ intentions may have been, his work is an important piece of evidence for understanding Roman water systems, especially aqueducts and related legislation until the early second century CE.

For reasons outlined above, Frontinus’ *De aquaeductu* does not provide a complete or unbiased portrayal of Roman water systems; thankfully, however, archaeological evidence offers a different, complementary picture of Roman water administration. For example, some scholars have examined the engineering details mentioned in Frontinus (e.g., *calices*, the delivery necks of pipes, and the *quinaria*), which can provide insight into the amounts of water

\(^{39}\) Bruun 1991, 108–109, 190–94. See also Kehoe (2008), who discusses the impact related to the illegal selling of water on the Roman economy.


\(^{41}\) See also, Blackman and Hodge’s reappraisal of Frontinus (2001, 137–50).
flowing through the city and give some indications of population size. More importantly, the stamps on lead pipes (*fistulae*) have helped modern scholars reconstruct the building programs and usage policies managed by the *cura aquarum*. Christer Bruun (1991) used the *fistulae* found in Rome to illustrate who was installing water and who might have been using the water, given the names stamped on the pipes. Bruun demonstrates that, of the water coming into the city of Rome, 17% went to the emperor, 38% to private individuals, and 45% to the public at large.

Bruun has also challenged prior understandings of *fistulae* in relation to water rights. In the past, *fistula* stamps have been used to reconstruct ownership of Rome’s vast water network. Inscriptions on *fistulae* can be wide ranging: names of emperors; names of officials; names of individuals in the genitive case; names of individuals in the nominative case; consular dates; institution names; place of the conduit’s manufacture; numbers; images; miscellanea.

It had been thought previously that a name in the genitive case appearing on a *fistula* stamp signified ownership of the water flowing through the pipes. Bruun has rightly shown, however, that the genitive does not always indicate ownership, especially in the case of imperial names. For example, a pipe labeled with an imperial name could mean that the water was supplying an imperial property (e.g., a bath complex) or a business related to the imperial *fiscus*, not simply supplying the emperor directly. Further, names on *fistulae* can indicate benefactions of the emperor, not necessarily ownership. *Fistulae* could also indicate the name of the pipe’s manufacturer (or *plumbarius*, a person who specialized in metal product production). Moreover, Gerda De Kleijn has argued that the available evidence for *fistula* stamps does not conclusively identify their meaning or role within the water infrastructure system,
aside from conveying a general sense of control over the pipes and the water flowing through them.49

Much of the work to-date on Roman water administration (especially using archaeological evidence in conjunction with other literary sources) concerns the city of Rome itself, due in part to the prevalence of these pipes within the imperial capital. In fact, early in the study of fistulae, it was thought that only Rome had these types of inscriptions, but archaeological discoveries in the last few decades have shown that they were present throughout the empire, even though they might not appear with the same frequency.50 For instance, while fistula stamps have been found concentrated in the city of Rome, they are also found in Ostia, Portus, the Bay of Naples, and some other sites on the Italian Peninsula.51 Moreover, because of the excellent state of Pompeii’s preserved water infrastructure, this site has the potential to reveal logistics of Roman urban water management at a new level of detail.52

There has been a growing trend to examine, where possible, evidence of fistulae and other vestiges of the water distribution network outside of Rome, in order to obtain a fuller picture of Roman water administration at large. A 2006 conference at the Université Laval, “Vers une gestion intégrée de l’eau dans l’empire romain,” drew a number of international scholars who presented archaeological, economic, and juridical evidence of water administration and usage across the empire.53 This conference illustrates the need for cross-empire collaboration among scholars in order to create a diachronic, far-reaching geographic study of Roman water management systems.

Roman law is another important form of evidence for the administration, distribution, and regulation of water, both at Rome and throughout the

50 Bruun 2016b, 11–2.
51 The standard publication for the fistulae of Rome is still Heinrich Dressel's entries in the CIL (15.2.1, nos. 7235–7913). On Dressel and other early scholars of fistulae, see Bruun (2015a; 2016b, 11–3). For more on the find spots of the examples from the city of Rome, see Bruun (1991, 20–24; 2001, 55–8), Eck (1998), and De Kleijn (2001, 147–223). On Ostia, see Geremia Nucci (2001). Bruun in various publications covers the examples outside of Rome (1991, 272–303; 2001, 52–5; 2016b), including those of Campania (2010) and Pompeii (2012d); see also his cautionary note about what information can be used from the examples of Rome (2016b, 10). It should be noted that there was a diversity of materials used for water conduits throughout the empire: lead pipes in Rome and the Italian Peninsula; tubuli, which could be made in terracotta; other pipes could be constructed from wood or stone. For more, see De Kleijn (2001, 136), along with Jansen (2000c, especially 111–24).
52 On Pompeii’s water private infrastructure, see Jansen (2001).
53 Hermon 2008.
empire. In the last two decades, scholars of Roman law have begun to shed light on the legal regulation of water, providing a more nuanced understanding of water usage and access to water sources, especially in terms of private water rights. Of course, government regulation of water systems (or concerted efforts to control water by those in power) has been present since prehistory, as evidenced in Mesopotamia, the Arabian Peninsula, and Egypt.54 Whereas local laws throughout the Greek world generally construed a basic right to water for all people (e.g., the right to use a neighbor’s water if one does not have any), Roman law is explicit in differentiating between public and private water rights.55 The latter was determined in strict connection to the land on which the water rests (rather than on an individual or family basis). And while publicly-owned water assured that all people had access to water, the principles underlying these legal distinctions overcame the ‘tragedy of the commons’ (by which individuals tend to consume as much as possible of a common resource because no individual gains by saving or investing for the future).56 In a sense, at least part of the Roman water supply was privately owned, which guaranteed individual interest in maintaining sound water management policies.

Although a full examination of Roman policies associated with water cannot be offered here, some salient points will be made, in order to show how Roman law constructed principles of water access for inhabitants across the empire. Scholars draw on a wide range of evidence to demonstrate Roman legal thinking about water, from inscriptions (e.g., laws and legal contracts), juridical texts, and literary sources.57 Romans were especially concerned that water systems be protected in order to safeguard healthy water supplies, both in and outside urban centers.58 To this end, much of Roman law focuses on controlling access to water throughout its journey across rural aqueducts (which individuals might tap for private use) to its final distribution within an

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54 Bruun 2000.
55 For more on the differences between Greek and Roman conceptions of water access, see Bruun (2000, 557–604). On Greek water legal practices, especially through the works of Plato and Aristotle, see Louis (1982). See above, 10–11, on public and private waters in Roman law.
57 Again, the bibliography on this subject is vast. Some key works to consult are Shaw (1982), Bruun (2000, 575–604; 2015b), Bannon (2001; 2009; 2013), and Kehoe (2008). Difficulties arise in Roman legal documents concerning with water, as it is believed that many water-related cases were done by case law, until full codification of Roman law occurred in the sixth century CE (Wilson 2012, 4; below, 60).
urban destination. Thus, like much of Roman life, there is a clear dichotomy between rural and urban water rights, predicated on the intended use of the water (e.g., for use in crop irrigation versus bath complexes).

In rural Roman areas, there were two methods to gain access to water: through cooperative community agreements and servitudes. There is evidence, for example, in the semi-arid and arid climates of North Africa, that communities would come together to form agreements on how to share water sources, usually for the irrigation of agricultural lands. At Lamasba in Numidia (modern Algeria) around 212–218 CE, multiple communities collectively formulated a plan to distribute water on a schedule to different farmsteads. This program was overseen by a board of three that represented the settlements’ decurions and citizens. Although this example, along with many others, was inscribed, no doubt similar arrangements were also devised as simple oral agreements between various parties. Regardless, such cooperation among rural communities appears to have been commonplace throughout the Roman Empire, illustrating a relatively consistent pattern in social resolutions to the practical problems of rural water supply.

On the Italian Peninsula, in order to obtain access to another’s private water supply, an individual had to obtain a servitude. As part of the *iura praediorum*, rustic or predial (or property-related) servitudes were often permanent mechanisms through which one could access a neighbor’s property and its resources, such as water. Rustic servitudes related to water included the *servitus aquae ductus* (the ability to channel water) and the *servitus aquae haustus* (the ability to draw water). Thus, if one did not have a natural water source on their own land, he or she could make a contract with a neighbor, in order to obtain access to their water for private use, including agricultural irrigation.

59 For more on the use of water from aqueducts going through the countryside, see Wilson (1999).
61 Shaw 1982, 68.
62 Bruun 2015b; 144. Another commonly cited example is the cooperative arrangement of the inhabitants alongside the Ebro River in Spain during the reign of Hadrian, the *lex rivi Hiberiensis*. For more, see the initial publication by Beltrán Lloris (2006), along with subsequent discussions by Kehoe (2008, 244) and Bruun (2015b, 145).
63 Servitudes seem to only be operational on the Italian Peninsula. See Bruun (2015b, 147).
64 In English, servitudes are often known as ‘easements’ in modern legal terminology. On servitudes generally, with a helpful bibliography, see Bannon (2009, especially 12, note 33), along with Bruun (2000, 581–85; 2015b, 145–49).
Water servitudes in rural areas, as Cynthia Bannon argues, promoted a competitiveness and cooperation within communities that aided in their economic success.\footnote{Bannon 2009.} Bruun, however, disagrees with some of Bannon's conclusions; he argues that Bannon has conflated servitudes with other water-sharing arrangements, since only servitudes addressed individual properties and issues of private ownership.\footnote{Bruun 2015b, 146.} Indeed, instances of cooperation between communities dealing with public water sources were often temporary, not permanent like servitudes.\footnote{Bruun 2015b, 147. There could be lapses in the rights to a servitude, however, as some had to be exercised within two years of an agreement or only for a certain period of time. For more, see Bannon (2009, 18–9) and Bruun (2015b, 149). See also Bannon (2013) for a discussion of legal issues related to water piping on properties being sold to another party.}

While servitudes were used in cities, civic legal policies regulated private water access in the urban sphere more often than individual servitudes. For example, outside Rome, there is clear epigraphic evidence for private water rights that must have been granted by local town councils (rather than the emperor).\footnote{Bruun 2015b, 135.} In the city of Rome, private water access could be granted through the \textit{beneficium} of the emperor, often via the \textit{cura aquarum}. Dennis Kehoe has argued that at Rome, where demand for access to water was astronomically high, grants of private water rights often became corrupt, tapping more water than legally permitted at the expense of public supplies, creating an underground market in which water distribution did not economically benefit \textit{all} of the inhabitants of Rome.\footnote{Kehoe 2008, 244–45.}

Considering the great need for public water, an important issue for the Roman state was the acquisition of land for the construction of public aqueducts. Rabun Taylor's 2000 study of the aqueducts of Rome outlines the evidence as to how the Romans constructed aqueducts. Taylor is emphatic that the Roman state did not expropriate land for aqueducts, but instead purchased land (or in the very least servitudes), presumably at market value.\footnote{Taylor 2000, 244–45.} Among the evidence that Taylor cites, the course of the Aqua Virgo, built by Agrippa, does not follow a simple westerly path, but snakes north and south, perhaps responding to landowners not honoring agreements with Agrippa to allow the construction of the aqueduct on their land.\footnote{Taylor 2000, 93–127. Taylor reacts to de Robertis' 1936 study that argued that Roman law allowed for land expropriation.} Indeed, Taylor points out that
Roman law emphasized ownership above all else, making expropriation of lands impossible.\(^{73}\) Not all scholars, however, agree with this position. Bruun argues that the Romans expropriated not only the land on which aqueducts were constructed, but also the land surrounding these monumental waterways, in order to use its material resources for necessary aqueduct repairs.\(^{74}\)

While the primary and secondary literature on Roman water administration, distribution, and legal practices is vast and complex, this brief discussion has illustrated a few salient points about its organization and basic principles: (1) The administration of water in the city of Rome itself and throughout the empire was meant to provide all inhabitants, especially those in arid and semi-arid climates, access to potable water. (2) There are clear distinctions in types of water access, whether public or private, rural or urban. Roman legal policies concerning water are crucial to understanding the relationship between the Roman economy and law, especially for rural Roman life. (3) Further, scholars continue to expand investigations beyond the evidence from the city of Rome itself, stretching to the boundaries of the empire, in order to clarify the powerful mechanisms through which the Roman Empire achieved the goal of providing water to all of its inhabitants.

4 Categories of Water Usage: Archaeological Evidence

Archaeological evidence of Roman water structures is the foundation of any full, nuanced understanding of Roman water culture. Classical archaeologists have been fascinated with Roman water structures for the last century or so; therefore, these structures are often featured in the wider discourse of Roman culture. In the last few decades, however, numerous archaeological discoveries and investigations have not only expanded modern conceptions of Roman water usage, but have also challenged previously held opinions and altered preconceived notions. Among the archaeological evidence explored in this section are aqueducts, baths, drainage and sanitation, water-displays, and hydraulic power.

\(^{73}\) Taylor, on the one hand, demonstrates that ‘expropriation’ is not a Roman legal concept in and of itself, and the notion of ‘eminent domain’ is a Medieval legal coinage. Confiscation, on the other hand, is based on consequences of an individual’s actions, such as a criminal act. See Taylor (2000, 93–4).

\(^{74}\) Bruun 2000, 595–98. Bruun uses the example of the 11 BCE *senatus consultum* cited in Frontinus (124.4–125), which gives those workers the ability to seize materials.
A brief note must be mentioned, however, concerning an important theme that will resurface over and over throughout the ensuing discussion. One of the major issues when exploring the use of water in the Roman Empire is the dichotomy between public and private use. Andrea Schmölder-Veit, working primarily on fountains in the western empire, suggests using categories of water usage, based on Latin terminologies:75 *utilitas* (utility), *usus* (consumption), *salubritas* (cleanliness), *salus* (health), *voluptas/amoenitas* (beauty). She asserts that conceptions of water in the public sphere are related to *utilitas, usus, salubritas,* and *salus,* while private life is related to *voluptas/amoenitas.* But one could easily argue that all of these terms are crucial to both public and private use and needs. While there are differences between public and private water-related structures (e.g., scale), there are nevertheless overlapping interests between the two spheres, which must be remembered.

4.1 Prolegomena: Modern Scholarship on Roman Water

Before outlining the major categories of water usage, it is important to highlight some organizations that promote the study of Roman water systems. Many of the scholars responsible for publishing water-related archaeological evidence are also active members of the Deutsche Wasserhistorische Gesellschaft, the Frontinus Gesellschaft, and other international organizations. It is crucial first to survey their scholarly activities, which will lay a strong foundation for the ensuing discussion.

The Deutsche Wasserhistorische Gesellschaft (DWhG) is a German society that promotes the study of water in all time periods.76 The current society was founded in 2002. Originally, however, the society was formed by Martin Eckoldt in 1963 as the Bundesanstalt für Gewässerkunde, which would go on to organize the “Geschichte und Zukunft einer wasserhistorischen Kongress-Serie,” a series of international symposia held every few years. Until 1991, the symposia were organized by Günther Garbrecht and Henning Fahlbusch in cooperation of the Leichtweiß-Institut für Wasserbau of the Technischen Universität Braunschweig.77 After the 1991 symposium, the series took on the title *Cura*

75 Schmölder-Veit 2009, 23–5.
Aquarum, which is still active today. Many of the publications of the Cura Aquarum series illustrate the breadth and sweep of Roman water technology and its implementation throughout the Roman world. Readers can simply browse through the titles to find interesting articles, with new archaeological data and methodological approaches.

The Frontinus Gesellschaft, founded in 1976, is another German organization that is concerned with the history of water technology and usage, particularly in the Roman period. Named after Sextus Julius Frontinus, the organization brings together scholars from a variety of disciplines (e.g., Classics, Engineering, Archaeology) at a variety of conferences and excursions, the latter promoting on-site autopsy. In addition, the society has an annual journal (Schriftenreihe der Frontinus Gesellschaft), a series on water supply (Geschichte der Wasserversorgung), and a supplemental series, which often stems from the society’s conferences. While this organization is largely comprised of German-speaking scholars, their meetings include a growing number of international researchers.

Recently, a handful of international research networks have formed to study water in the ancient Mediterranean. The HYDRΩMED Project, based at the University of Aix-Marseille (France), has explored water management in the Mediterranean during the first millennium BCE through a series

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78 The symposia associated with the Cura Aquarum series include: Pompeii (Campania) 1994; Syracuse, Sicily 1998; Jerusalem, Israel 2001; Ephesus 2004; Jordan 2007; Toledo, Spain 2009; Jerusalem 2012; Athens 2015. To-date the following symposia have been published: Pompeii 1996; Sicily 2000; Israel 2002; Ephesus 2006; Jordan 2008; Athens 2017. See Koloski-Ostrow et al. (1997) for a review of the 1996 proceedings, along with Koloski-Ostrow (2008) on the 2006 proceedings. It must be noted that the Cura Aquarum series was a joint collaboration between the DWhG and the Frontinus Gesellschaft; however, after 2006, due to a legal dispute, the DWhG took over the series.

79 http://www.frontinus.de/index.html (Last accessed 10 September 2017). While much of the activity of the society is focused on the Roman period, the group still promotes water history in subsequent periods—all the way to the Baroque period. For example, in their publication series, Geschichte der Wasserversorgung, they have published on the Middle Ages (Band 4, 1991; Band 7, 2007), the Renaissance (Band 5, 2000), and the Baroque period (Band 6, 2004).

80 The ancient period titles of the Geschichte der Wasserversorgung series include: ancient Rome (Band 1, 1986; with a second edition, 2013) and the ancient cities (Band 2, 1987, including Pergamon, legislation, fountains, and building elements; Band 3, 1988, including baths and hygiene). Conference proceedings include one on ancient baths (Kreiner and Letzner 2012), historical water systems (Wiplinger 2013), Frontinus’ legacy in Asia Minor (Wiplinger 2016b), and water management in the time of Frontinus (Wiplinger and Letzner 2017).
of conferences. At a meeting in Athens in July 2015, the project presented “Water Cult and Culture in the Mediterranean World of the 1st Millennium BC,” providing a number of papers that explored the implications of water in cultic settings of Greece and beyond. The Idraulica Antica: Gruppo di Studio Sull’Idraulica Antica, based at the University of Padova (Italy), brings together international scholars to discuss matters not only concerning Roman hydraulic systems, but also the implications of water on Roman urban and social landscapes. The group has hosted a series of international summer schools in the nearby town of Feltre, on the following topics: Hydraulic Systems in the Roman World (2014); Water and the City: Hydraulic Systems in the Roman Age (2015); Water Management in Arid and Semiarid Climates in Roman Times (2016). In November 2017, a conference also took place at Feltre, “Water and the Roman Cities and Settlements.”

The *Aquae Urbis Romae*, or the “The Waters of the City of Rome,” project of Katherine Rinne is an important online resource for all scholars on the use of water in the city from its founding until the present day. This site houses information on the complex water infrastructure of Rome, which allows scholars to see exactly how the use of water has evolved. The project also includes a journal, *The Waters of Rome*, which publishes online refereed papers that explore issues related to water in Rome from antiquity to the present.

The journal *Water History* explores all time periods of humans’ use of water—attempting to understand how water has influenced human communities. With the proliferation of modern water-related problems across the globe, studying water systems of the past has become all the more relevant. Today, the world is faced with issues of water access, the commodification of water, and the destructive properties of water. A number of organizations study water management, safeguards for water, and hydro-environmental sciences in general, such as the programs of UNESCO.

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81 Sophie Bouffier, a professor at University of Aix-Marseille, coordinates the project. The network’s website is: http://hydromed.hypotheses.org/ (Last accessed 10 September 2017).
82 The group’s coordinator is Prof. Paola Zanovello at the University of Padova. For more, see the group’s website: https://idraulicantica.wordpress.com/ (Last accessed 10 September 2017).
83 Rinne 2016.
84 Of special interest here, however, are two special issues: “Roman and Byzantine Empires” (Vol. 4.1, 2012) and “Roman Canals” (Vol. 6.1, 2014).
85 Bibliography on modern issues associated with water is immense. One can easily consult the studies of Strang (2004; 2006; 2008; 2012), whose research investigates not only humans’ experience with water, but also the cultural significance of water in modern life. The water-related programs of UNESCO, such as the International Hydrological Program,
our interpretation of present water crises, so too can these modern cases help us think about how the Romans used and manipulated water.

4.2 Aqueducts and Water Supply Systems

One of the most enduring examples of Roman engineering ingenuity was its ability to move and store water on a massive scale. Before the Roman aqueduct, there were many ways in which water collection was facilitated (and even continued after the advent of the canonical Roman aqueduct building form): wells, cisterns, tunnels, qanats, etc. While the Romans certainly did not invent the aqueduct by any means, they were able to incorporate new technologies and scales of building, such as:

the use of arcades to carry channels over valleys and low-lying terrain;
the availability of concrete as a cheap and adaptable building material;
the adoption of waterproof cement linings from the Punic world or Hellenistic Sicily;
the expanded use of lead piping and of bronze stopcocks on distribution systems; and
the introduction of settling tanks and storage and reservoirs on the network.

Aqueducts in particular were great feats of engineering that funneled water from natural sources (e.g., springs or rivers) into large conduits, which simply relied on gravity to move water.
A majority of Roman aqueducts were simple channels often constructed with masonry blocks. These channels followed the natural contours of the land, and they were installed 50 cm to 1 m below the surface of the earth, making them easy to install and maintain over time. The masonry channels themselves were generally tall and oblong (to allow for easy cleaning and maintenance by work crews), lined with waterproof cement, and were probably half to two-thirds full of water when operational. Other forms of channels included open channels (taking advantage of rock formations) and piping systems (using terracotta, lead, stone, and wood). When Roman engineers could not use subterranean aqueduct systems, they relied on various engineering works, including grander tunnel systems, embankments, bridges/viaducts, siphons, and continuous arcades. Inverted siphons, which are often found in Gaul, allowed water to cross valleys, in which an aqueduct entered a header tank at one side of the valley, and then continued down the slope in pipes, where the resulting pressure would push the water to the receiving tank on the opposite side of the valley. Arcades provided raised surfaces for aqueduct channels to travel (especially across plains), allowing for the necessary changes in gradient to provide sufficient water pressure at the terminus. Although arcades associated with aqueducts are not nearly as numerous as subterranean channels, the aesthetic rhythm of their arches stretching across the landscape has become an iconic representation of Romans’ ability to harness natural forces.

Not all aqueducts lead to Rome, however. Aqueduct systems had various destinations. Aqueducts supplied mining operations throughout the Roman world, as well as hundreds of military camps. Moreover, Harry Evans has demonstrated how the aqueducts running through the Tiburtine region toward Rome also included extensions that served various rural communities. These communities included villas and farms, which needed a great deal of water to sustain the agricultural and industrial activities. In addition to

88 Hodge 2002, 93.
91 Hodge 2002, 126–70.
93 Hodge 2002, 161–70.
94 For more on the symbolic character of the architecture of Roman aqueducts, see Kek (1996, especially 265–316).
95 See Wilson 2002.
96 See, for example, Fevrier (1983).
97 Evans 1993.
aqueducts, these people relied on other water systems, such as ground water, rainwater runoff, and irrigation systems.98

Aqueducts also supplied urban centers, but they did not act alone. They were part of a larger urban supply network.99 When water entered a city, it would generally pass first through the *castellum aquae/divisorium*, which, in turn, would supply the water to specific areas of urban space. Two well-preserved examples are found at Nîmes and Pompeii, both of which are tripartite, allowed the water to be distributed in three different ways; exactly which parts of the city were supplied by these divisions has been a matter of debate since antiquity.100 Water then travelled throughout the Roman town and supplied a number of consumers: public baths, public fountains, industrial complexes, private dwellings, etc. Private water connections are well understood, thanks in part to the evidence from Pompeii, with nearly 124 private connections found.101 Water inside the home, according to the evidence from Pompeii, could be controlled easily, as it entered the home through lead pipes, travelled through a distribution box, which could be shut off using taps and stopcocks.102 The use of lead pipes in water distribution has led some scholars to attribute the decline of the Roman Empire to lead poisoning, a conclusion that has been repeatedly refuted in the last few decades.103

98 For more on these systems, especially in Latium and south Etruria, see Thomas and Wilson (1994). See Wilson (2008, 309–10) on irrigation systems. For more on the role of aqueducts in the countryside, see Wilson (1999), along with his work on the impact of both climate change and drought on North African agricultural irrigation systems (2017).


100 Vitruvius, on the one hand, states that the *castellum* would provide water for the baths, public fountains, and private water connections in the city (*De arch. 8.6.2*). Frontinus, on the other hand, states that the water would be for public, private, and imperial use (*Aq. 3.2*). Ohlig has shown through the *castellum* example at Pompeii that Vitruvius is incorrect in his assertion, as the conduits from the *castellum* do not supply just baths, fountains, and domestic spaces (Ohlig 1995, 135–40; Ohlig 2001). Hodge reminds the reader that Vitruvius is not an encyclopedia or a strict how-to-guide, but a recommendation for the reader (2002, 282). For more on the *castellum aquae*, see Hodge (2002, 291–303).

101 Jansen (2001) presents one of the first systematic studies of domestic water supply. See now Dessales (2013, 179–224), who offers an even fuller discussion of the elements of domestic water systems there.

102 For more on Roman water taps, see Kretzschmer (1960), Balty (1962), Lebel (1965), and Jansen (2001, 29–31).

103 Among the proponents of lead poisoning in the Roman Empire are Gilfillan (1965) and Nriagu (1983). In addition to lead being found in piping for water, lead was also present in a number of other products that Romans consumed, including some cosmetics.
The topic of Roman water supply has been studied in earnest for the past century to varying degrees of detail, with different emphases. The city of Rome itself had 11 different aqueducts, with its first in 312 BCE, the Aqua Appia, and the last in 226 CE, the Aqua Alexandrina. The first modern treatises on these 11 aqueducts were by Esther Van Deman (1934) and Thomas Ashby (1935), who both examined the standing remains of the structures, providing important observations and photographic evidence from the early twentieth century of structures that have not all survived to present day. Until Van Deman and Ashby, the aqueducts of Rome had not been systematically studied, a point that Ashby bemoans in his preface.

Since the pioneering work of Ashby and Van Deman, scholars have worked tirelessly to study specific aqueduct systems. Klaus Grewe in 1986 published the aqueduct of Köln in a monograph that explored not only the aqueduct itself, but also the engineering issues of the structure. The aqueduct of Nîmes and the associated Pont du Gard were first published extensively in 1991 by a French team, who then published a second edition in 2000. The importance of this work lies in the breadth of expertise that the contributing scholars collectively used to examine the aqueduct, in terms of its actual structure, its placement in the landscape, and its impact on the urban settlement of Nîmes. Other studies of note include the aqueducts of Spain (especially Segovia), and sweeteners. Vitruvius (De arch. 8.6.10–11) and Pliny the Elder (HN 34.50.167) knew of the potential dangers to humans of lead usage. For a pointed critique of Nriagu, see Scarborough (1984). Current archaeological and osteological research demonstrates that there certainly was lead consumption by the Romans (and could be dangerous in and of itself), but not on the level that would cause the decline of a whole empire. For more, see Keenan-Jones, Hellstrom, and Drysdale (2011) and Delile et al. (2014). For an overview of lead poisoning throughout history, see Lessler (1988). Waters contaminated with lead are still a problem today. The World Health Organization’s International Program on Chemical Safety still monitors lead usage and actively promotes the discontinuation of lead in products that are consumed.

The 11 aqueducts are: Appia (312 BCE); Vetus (272–269 BCE); Marcia (144–140 BCE); Tepula (126–125 BCE); Julia (33 BCE); Virgo (22–19 BCE); Alesietina (2 BCE); Claudia and Anio Novus (finished in 52 CE); Traiana (109); Alexandrina (226). For more on the chronology and construction of the aqueducts of Rome, see: Aicher 1995, 31–45; Taylor 2000; Koloski-Ostrow 2001, 5–6; Bianco 2007, 19–67; Wilson 2008, 296–97.

Ashby 1935, ix.


An early overview of the Roman aqueducts of Spain can be found in Fernández Casado (1972); on the Segovia aqueduct, see Mas-Guindal Lafarga (1992).
Pergamon, Ephesus, and Athens. Many of the scholars who publish on aqueducts are French and German, probably due to the fact that they were the first to examine these ancient structures in their native countries. But more recently, studies of aqueducts located in other countries, produced by a more international group of scholars, have been cropping up, notably in Israel and Greece. Furthermore, new research is being conducted on previously excavated aqueduct systems (such as at Ostia), as well as recently discovered sources and their conduits (such as the head of the Aqua Traiana near Lake Bracciano, north of Rome). One can easily find individual reports on aqueducts and their water systems throughout the Roman world in the various publications of the *Cura Aquarum* series.

While scholars have continued to document individual aqueduct systems, it is important to note that, by the 1980s, a shift in interpretive approach had occurred: a move away from traditional, detailed analyses of individual aqueducts toward more comparative, diachronic studies of aqueducts across the empire. In 1977, a conference in Lyon brought French and German scholars together to discuss not only aqueducts in France, but also Pompeii, Carthage, Attica, Pergamon, Trier, and Algeria, among a few others. While individual sites are singled out within this volume, bringing them together in one place allowed for a new comparative approach across a wide swath of geography. Then, in the late 1980s, the Frontinus Gesellschaft produced two volumes (as

109 Wiplinger 2016a. Wiplinger has spent much of his career investigating the aqueducts of Ephesus.
110 Leigh 1998. See also Leigh (2001) about early Roman hydraulic systems in Athens, along with her study of the reservoir of Hadrian in Athens (1997). For more on the development of Athenian water infrastructure systems from the Hellenistic period until the nineteenth century, see Christaki et al. (2017a), and from the nineteenth century until the present, see Christaki et al. (2017b).
111 On aqueducts in Israel, see Amit, Patrich, and Hirschfeld (2002). New research is coming out of Greece through the 2015 *Cura Aquarum* symposium in Athens (Wellbrock 2017), Giorgi’s 2016 study of the Byzantine aqueduct of Gortyn (Crete), Vitti’s 2016 study of vaulting construction in the Peloponnese that also discusses vaulted the aqueduct channels of Argos and Corinth, and an edited volume on *Great Waterworks in Roman Greece* (Aristodemou and Tassios 2018). See also Kamash (2010, 99–112) for more on water supply of the Roman Near East.
112 See Bukowiecki, Dessales, and Dublouloz (2008) for their work on the water systems of Ostia. Taylor et al. (2016) have been working over the last few years documenting the unknown parts of the Aqua Traiana located near its source.
113 Boucher 1983. Of interest, see Fevrier’s chapter on the role of the Roman military and the construction of aqueducts.
part of its *Geschichte der Wasserversorgung* series) that examine aqueducts more holistically, whether by investigating water systems and distribution networks in general, or by studying the social implications of aqueducts. In both volumes, close attention was paid to the structures associated with water distribution systems at a number of sites throughout the Roman world, from the northern provinces to the eastern provinces—in a way not seen until that point. In the second volume, Werner Eck provides one of the first systematic and prolonged discussions of the social implications of water distribution in the Roman city, suggesting the elevated status of a settlement that boasted its own water distribution network.

In 1987, a colloquium was held in New York aptly titled, “Future Currents in Aqueduct Studies.” The published proceedings contained important contributions for the study of Roman aqueducts. Philippe Leveau provides a synthesis of the preceding ten years of research on aqueducts, particularly in examining how architecture (i.e., water systems) impacts socio-economic systems. Brent Shaw, using evidence from North Africa, also presents new ideas: interpreting water systems as status symbols and aqueducts as both objects of utility and luxury; demonstrating how members of the local élite maintained aqueduct systems; and further investigating the dichotomy of rural and urban water collection and distribution. A. Trevor Hodge, the editor of the volume, asserts that there needs to be more emphasis on the engineering and technological aspects of Roman water supply, since, more often than not, classicists and archaeologists do not have the relevant engineering background to sufficiently evaluate this aspect of the water supply.

After this colloquium was published, Hodge’s seminal work was released in 1992, *Roman Aqueducts and Water Supply*. Immediately it became a standard text regarding aqueducts, made even more accessible for the first time in English, unlike previous scholarship which tended to primarily be in German. Picking up from his own suggestion in 1991, here Hodge includes lengthy discussions of the more technological aspects of the Roman water supply—giving

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115 Eck 1987.
116 Leveau 1991. He divided his discussion into the following sections: the archaeology of aqueducts (their architecture; how they function); social and economic conditions (cost; duration and organization of work); aqueducts and civilization (aqueducts as public monuments; their role in urban water supply).
118 Hodge 1991.
his reader a more complete understanding of how a Roman aqueduct actually functioned. A second edition was released in 2002 without substantial changes, but with a supplemental bibliography, making the work still an invaluable resource.

During the 1990s, work continued on aqueducts in general. In *Utilitas necessaria: Sistemi idraulici nell’Italia romana* (1994), Giulio Bodon, Italo Riera, and Paola Zanovello thoroughly present the evidence for aqueducts and water systems in Italy, making their volume a cornerstone of research on regional trends within the empire.119 Peter Aicher’s 1995 guide to the aqueducts of Rome was an important update to the work of Ashby and Van Deman, helping the modern visitor to Rome understand the aqueducts (especially when the previous guides had been rendered obsolete with subsequent destruction of those structures). Another French conference in 1996, following in the footsteps of Boucher, presented new information on aqueducts in Gaul and further afield.120 Roger Wilson, in a state of the field essay of 1996, points out the important work done on Roman water supply systems, including the monographs on specific aqueducts. Wilson, however, also stressed the work being done on private aqueducts that are present throughout the Roman world—illustrating archaeological evidence that is not always on the forefront of scholarship.

In the late 1990s, the debate on the actual purpose of aqueducts grew, especially through the work of Andrew Wilson. Although most scholars simply stressed the luxurious aspects of aqueducts (as they were objects of benefaction, either from the emperor or members of the local élite),121 taking note of Brent Shaw’s study of North Africa, Wilson instead stresses the utilitarian nature of aqueducts. In a sense, he wants others to consider the aqueducts in the wider water supply system—particularly systems that are outside of urban centers, which would have served large populations and supplied agricultural estates.122 In the same vein as Wilson, Ann Koloski-Ostrow, in her 2001 edited volume, *Water Use and Hydraulics in the Roman City*, which started with a panel at the 1996 annual meeting of the Archaeological Institute of America, also stresses the need to investigate aqueducts as one part of a wider water supply and distribution network, in which all of the requisite parts work together to supply the ancient Roman town with sufficient water. This collected volume paid special attention to Pompeii, an important site for understanding water supply systems, particularly given the available archaeological evidence

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120 Bedon 1997.
121 See especially Wilson 1998.
of the *castellum aquae*, the water towers, along with street fountains and private water connections throughout the city.

The last decade also has seen an increase of scholars investigating water supply with an emphasis on technology and engineering principles. Örjan Wikander’s *Handbook of Ancient Water Technology* (2000) is an important collection of essays from leading scholars that illustrate the various principles of water supply in the Mediterranean basin (from the Bronze Age to the Greco-Roman period). John Peter Oleson in 2008 presented an edited volume on various themes of engineering principles in the Greco-Roman world, which included water supply among other diverse topics, such as agriculture and warfare. Thus, water supply in the modern scholarship has been approached from various angles, including studies of aqueducts themselves, the wider water distribution networks, the social implications of aqueducts and water supply, and the technological aspects of these structures.

Conferences, of course, still continue to promote the study of individual aqueducts and larger water supply systems. In 2009, a French conference, *Les réseaux d'eau courante dans l'antiquité*, explored both aqueducts in France and some other locations, in addition to other hydraulic networks outside of France. The Frontinus Gesellschaft’s 2011 international symposium examined historical water systems, including sites in Germany, Turkey, Spain, and even South America (Brazil). A particularly interesting discovery presented at these proceedings is the use of sinter (the calcium carbonate sediment that builds up in aqueduct channels) in determining the date of an aqueduct with a relatively high degree of accuracy. Such research illustrates the continued need for interdisciplinary approaches to the study of aqueducts.

In the last decade, studies have continued the endeavor to place aqueducts and other water-related structures more meaningfully within the broader contexts of landscape and water supply networks. For example, Julian Richard makes the case for connecting specific fountains to the respective aqueducts that once supplied them. Monuments, as Richard argues, should not be seen in isolation, but as a part of a larger network of water, particularly as flowing water gave these structures vitality and meaning. In the same vein, Elisabetta Giorgi traces the impact of the aqueduct of Gortyn (Crete) throughout the city’s history, highlighting the numerous aspects of urban life that depended

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123 Abadie-Reynal, Provost, and Vipard 2011.
124 Wiplinger 2011.
125 Sürmelihindi and Passchier 2011.
126 Richard 2012, 47–92.
on water resources supplied by this aqueduct. Giorgi also investigates the relationship of Gortyn’s aqueduct with its surrounding landscape, which is often missing in modern scholarship.

There are plenty of salient points to glean from past studies of Roman aqueducts—and also many future avenues of inquiry. The publication of individual aqueduct systems (whether initial or subsequent studies) is still vital. These, in turn, can be pulled together to form regional studies of aqueduct and water system usage throughout the Roman world. Next, the call for interdisciplinary studies of water systems is being fulfilled—with scholars incorporating engineering and scientific analyses to obtain the full picture of the nuanced intricacies of Roman aqueducts. Finally, there has been a rise of scholars placing aqueducts into wider water supply networks, focusing on their final destinations (whether urban or extra-urban), as well as their impact on such communities. In the future, it would be a desideratum to have an updated synthetic and diachronic analysis of aqueducts and water supply systems throughout the Roman Empire (perhaps as an updated version of Hodge’s study), which not only pulls together new evidence from various parts of the Roman world, but also places aqueducts in a wider social network, stressing the socio-economic implications of Roman water usage practices.

4.3 **Baths**

One of the most enduring aspects of Roman water culture is perhaps the phenomenon of the Roman bath. Romans are often credited with creating a more hygienic lifestyle; however, as modern scholarship has begun to demonstrate, bathing in a similar manner to the Romans was already popular in Greek culture and bathing was not as ‘clean’ as modern hygienic standards would demand. Regardless, bathing was omnipresent throughout the Roman world, using similar technologies to allow for heated water for relaxing bathing experiences. This section explores precursors to Roman baths, technical aspects

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127 Giorgi 2016. Giorgi’s main focus is the Byzantine aqueduct system, but she still focuses on the important Roman aqueduct there. Her assertion that the study of an aqueduct is crucial for understanding the daily life of a city is still valid for the discussion of Roman period water systems.

128 Grewe (2016) does offer a substantial synthesis of aqueducts in German, which is handsomely illustrated; however, it is crucial to produce an even greater study in English, using all available evidence. It should be noted that Camp (1991) already made the case for understanding the historical contexts of water supplies through diachronic and regional approaches.
of Roman bathing complexes, terminology, public and private baths, healing bathing complexes, and the cultural phenomena surrounding baths.\textsuperscript{129}

Over the last few decades, the Greek precursors to Roman baths have become better understood by scholars, largely due to a number of archaeological discoveries that expanded the corpus of pre-Roman bathing complexes, definitely demonstrating that baths were built throughout the Greek world (including Egypt) well before Roman conquest.\textsuperscript{130} Building upon the seminal work of Réné Ginouvès (1962), scholars have demonstrated how Greek bath structures started in the second half of the fifth century BCE and flourished in the Hellenistic period, with at least 75 known public baths, 17 baths connected to sports facilities (\textit{gymnasia/palaestrae}), domestic baths, and others—more than half of which were unknown to Ginouvès.\textsuperscript{131} The main purpose of the Greek bath structure was to provide a space for users to cleanse themselves. Public baths (\textit{balaneia}) contained hip-bathtubs (made out of masonry or terracotta) that allowed individuals to wash themselves while seated, in addition to \textit{louteria} (pedestal basins) that allowed for cleansing while standing; baths are characterized by at least one or two rooms, one of which is often circular to allow for a maximum number of hip-bathtubs that would have flanked the walls of the room.\textsuperscript{132}

While Greek-style baths probably started in Athens in the late fifth century, they spread throughout the Greek world, including Magna Graecia in the late

\begin{thebibliography}{9}
\bibitem{129} Unlike other sections in the present discussion, the goal here is to highlight the recent developments in scholarship—understanding how the study of Roman baths has changed over the last three decades. See Manderscheid (2004) for a synthesis of bath bibliography up to the year 2001.
\bibitem{130} On Egypt, for example, see Boussac, Fournet, and Redon (2009), Fournet and Redon (2013), and Lucore (2016, 335–37), along with the French Balnéorient Project (http://balneorient.hypotheses.org, Last accessed 10 September 2017), which strives to publicize bath discoveries in Egypt.
\bibitem{131} Ginouvès’ 1962 monograph was the first catalogue and synthesis of the available evidence of Greek bathing. There have been a few other studies since, but the most comprehensive (with bibliography) can be found in the conference proceedings, \textit{Greek Baths and Bathing Culture: New Discoveries and Approaches}, by Sandra Lucore and Monika Trümper (2013), which brings together a variety of scholars to discuss numerous aspects of Greek bathing culture, culminating in a catalogue of 70 known Greek baths (identified by their inclusion of hip-bathtubs). Trümper’s introduction provides a succinct state-of-the-field essay about Greek baths. Not included in the volume, however, was Wassenhoven’s 2012 catalogue of baths of the Greek Peloponnesse during classical antiquity. See also Yegül’s discussion of Greek \textit{gymnasia} and baths (1992, 6–29).
\end{thebibliography}
fourth century and Egypt in the Hellenistic period. In Sicily and South Italy, experimental bathing technologies are found in bath complexes, including the earliest examples of furnaces (to allow for heated water) and hypocausts (to allow for immersion pools). Indeed, by the Hellenistic period (mid-late fourth century BCE), Greek baths contained spaces intended for relaxing bathing—the prominent feature of Roman baths, which probably originated in the use of natural thermal waters in Sicily and Italy.

The development and presence of heated baths in Sicily and South Italy has prompted much discussion about the transition from Greek-style bath complexes to their more distinct Roman counterparts. One of the earliest known examples of a Roman bath is the second building phase of a bath at Fregellae, a Latin colony in Latium, which dates to the second century BCE. In this example, there are separate spaces for men and women, rational organization of space, a large central furnace, a hypocaust system, and alvei (communal heated pools). The hypocaust system allows for heat to circulate beneath the floor, which is elevated by a series of small pillars made of square or circular bricks. The bath at Fregellae is one of the earliest known examples of this phenomenon. The organization of the space into a rational order, perhaps influenced by other examples on the Italian Peninsula, led to the tripartite division of early Roman baths: apodyterium (changing room), tepidarium (warm room), and caldarium (hot room).

Fikret Yegül has spent much of his career exploring the development of Roman baths throughout the Roman world. He has shown that Roman bath complexes were a natural progression of Greek and native Italic models. Early Italian baths were often located near kitchens in domestic spaces, in order to take advantage of the already present heat sources, while also providing a space that allowed for healthy sweating (and probably later developed into the laconicum, or room intended for a dry heat, as opposed to the sudatorium,

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133 Lucore 2016, 330–35.
134 Lucore 2016, 331–34. See especially Lucore's work on the baths of Morgantina in Sicily (e.g., Lucore 2013). For more on water management in Greek baths, see Manderscheid (2000a, 469–84).
135 Lucore 2016, 333.
137 Much has been written on gender issues in Greek and Roman baths. See Stähli (2013), who re-examines Greek vases that depict female bathers, suggesting that they may not be wholly accurate. For Roman baths, which seem to have been gender segregated early on and perhaps shifted in the Imperial period, see: Fagan (1999, 24–9) and Yegül (2010, 27–34).
138 Tsiolis 2013, 104–108.
for steamy heat).\textsuperscript{139} The early development of Roman baths is easy to discern in the Bay of Naples region, with its well-preserved bath complexes, such as the Stabian Baths at Pompeii. In the second and first centuries BCE, in conjunction with newly developed technological advances in heating, the canonical ‘single-axis row type’ of Roman bath, which prompted patrons to progress from warm to hot rooms, from the \textit{tepidarium} (warm room) to \textit{caldarium} (hot room), in addition to the sweating rooms, often culminated in a plunge in the cold water pools of the \textit{frigidarium}.\textsuperscript{140} This particular bathing arrangement quickly spread beyond the Bay of Naples, and it can be seen throughout the Roman world.\textsuperscript{141} Other spatial arrangements developed over time, including the ‘half-axial type’ (series of rooms that do not follow a strict axis of progression) and the symmetrical imperial baths of Rome (the series of rooms were replicated on a main central axis that provided bi-lateral symmetry).\textsuperscript{142} There has been much scholarship on Roman baths outside of the Italian Peninsula, demonstrating the popularity of this cultural activity for nearly all the inhabitants of the empire.\textsuperscript{143}

Roman bathing facilities naturally came in a variety of shapes and sizes, evident in the terminology the Romans themselves used for these spaces. In written sources, baths are known either as \textit{balnea} or \textit{thermae}.\textsuperscript{144} The term \textit{balnea} usually refers to smaller bathing establishments, such as a domestic bath suite or a neighborhood bath complex, the latter of which often had a nominal entrance fee;\textsuperscript{145} while \textit{thermae} was used to indicate the large-scale

\textsuperscript{139} Yegül 1992, 50–7; Yegül 2010, 45–7. Yegül (2010) is an update of his 1992 monograph, focusing primarily on Roman baths, using new scholarship and discoveries, while providing easily approachable syntheses of Roman bathing culture. See also the concise article of Fagan (2001) on the genesis of the Roman public bath.


\textsuperscript{141} Yegül 1992, 66–79; Yegül 2010, 58–65.

\textsuperscript{142} Yegül 1992, 80–91.


\textsuperscript{144} For more, see Fagan 1999, 14–9. See also Blonski 2014, 171–240.

\textsuperscript{145} Private domestic bath structures have been explored in-depth by Nathalie de Haan (2010), using evidence from the Italian Peninsula and North Africa, in order to explore not only
imperial bath complexes found both in Rome and abroad. The city of Rome at the end of the first century BCE had 200 balnea, but by the end of the fourth century CE, it is reported that balnea numbered at least 856, along with 10 or 11 thermae.146 While the balnea were probably based on the ‘single-row axis’ or ‘half-axis’ types of arrangements, the imperial thermae often followed symmetrical arrangements. For example, the Baths of Caracalla in Rome have a strong axis of the frigidarium-tepidarium-caldarium, while there are two palestrae on opposite sides of the axis.147 The thermae of Rome, provided by imperial benefaction (and thus with free entrance), were grand complexes that provided places for bathing, exercise, entertainment, and even eating and drinking. Among the most well known imperial thermae in Rome were those of Agrippa, Nero, Titus, Trajan, Caracalla, and Diocletian.148 The Baths of Diocletian were the largest, and since it was later converted into the Church of Santa Maria degli Angeli, modern visitors can still gain a sense of its original grandiose scale. Due to the grandeur of these public complexes, some have interpreted imperial baths as ‘palaces of the people,’ where all inhabitants had access to the same services, thus underlining bathing facilities as important cultural and social institutions within the fabric of everyday Roman life.149

The remains of the Baths of Caracalla are still standing and have been relatively well studied, thereby offering a good example of the scale and costs of these monumental structures.150 The complex consists of a main bathing core, which is surrounded by a precinct that provided libraries, meeting spaces (e.g., various types of performances), porticoes, water-displays, and shops (especially their archaeological contexts but also their social implications. See Uytterhoeven (2012) for further bibliography and a brief discussion of private baths in the Roman East.

146 Yegül 2010, 2–3. The fourth-century numbers are derived from the Notitia urbis regionum (ca. 334–357 CE) and the Curiosum urbis Romae (357–403 CE).
147 On the symmetry of the imperial thermae, see Yegül (2010, 104).
148 For general discussions of these baths, see Yegül (1992, 128–83) and Yegül (2010, 101–32).
149 Scholarship has debated the inclusivity of Roman baths. It is generally agreed that while social barriers were not changed through bath access, there was indeed a mixing of different classes that was unique in the Roman social landscape. For more, see Yegül (2010, 34–39). Natascha Zajac (1999) argues that the grand imperial thermae of Rome were not built to improve the public health of the city’s inhabitants, but were solely for the legitimization of the emperor.
The precinct itself measures nearly 1.3 km². While the baths themselves are not innovative in terms of technology or construction technique, it is the actual scale of construction (some walls still survive to nearly 37 m high) and richness of decoration (e.g., imported marble and statuary) that make this complex especially impressive. Through a careful architectural analysis, Janet DeLaine has posited that the baths would have cost nearly 12–14 million kastrenses modii (KM), broken down into materials (53% of the costs), decoration (29%), and amenities (17%), over the course of six or seven years for its construction.

Roman bath technologies have also figured prominently in modern scholarship. Vitruvius in Book 5 of his treatise on architecture provides a brief discussion of necessary factors in planning the construction of a bath complex, noting the features that make Roman baths unique from their predecessors, such as the hypocaust system (De arch. 5.10). The heating systems of baths included floor heating (the hypocaust), wall heating (including special tiles that allowed hot air to rise from the open cavities of the floors, the so-called nipple tiles (tegulae mammatae) and box-tiles (tubuli)), furnaces, testidines alveolorum (metal containers to keep water warm), and sweat rooms. Water supply systems in baths were also intricately planned, as Hubertus Manderscheid has pointed out: water had to be provisioned from a source, used, and then disposed of through drainage systems. Water actually had a number of functions within a bath complex: for primary facilities (namely cold water pools, hot water spaces, drinking water, and latrines, in addition to supplying thermopolia, watermills, and bakeries) and secondary uses (cleaning, watering plants, and decorative fountains).

151 For more on the activities that took place in the thermae, see Yegül (2010, 119–32).
152 Piranomonte 2012, 10.
154 DeLaine 1997, 207–24, especially 219; for more on the design, decoration, materials, and construction process of the baths, see 45–194. DeLaine used the KM, which valued 100 denarii of wheat at 1 KM, in the Price Edict of Diocletian. The annual annona for 175,000 residents of Rome was valued at 7 million KM, the army annually cost the state between 44–150 million KM, and civilian salaries in Rome were between 4–6 million KM.
155 Yegül 2010, 80–97. See also Lehar (2012).
156 Manderscheid 2000a, 484–535. See also Yegül 2010, 97–100. Manderscheid also distinguishes between normal bathing facilities that only use fresh water, and those that use thermal and fresh waters, the latter of which would have different uses for the two types of water (see 511–14).
157 Manderscheid 2000a, 492–505.
Specific technical innovations have also seen an increased interest in modern scholarship. There have been a number of different experiments by scholars to understand exactly how floor and wall heating systems actually functioned. In 1998, this type of experimentation was brought to a popular audience, when a team of scholars and specialists, led by Yegül, reconstructed a fully functioning Roman bath at Sardis, Turkey, which was sponsored by the television series NOVA. The team’s goal was to reconstruct a whole bath complex, including the thermal mechanisms of the heating system. Other interdisciplinary approaches to the archaeological evidence have employed modern engineering models to understand better how Roman baths functioned. For example, Ismini Miliaresis has studied the Terme del Foro of Ostia in terms of the fuel required for operating the baths. She has determined that 150 trees would need to be harvested, transported, and stored for the baths to run efficiently for an entire year. Future studies in this same vein will surely yield better understandings of the complexities of Roman bathing complexes.

Roman baths are also found attached to naturally occurring thermal waters, which were prized for their healing qualities. Roman authors report on the medicinal and healing properties of these special waters, which probably increased their popularity. Oftentimes known as spas (sometimes attributed to an abbreviation of sanitas per aquam, ‘health through water’), bathing sites connected to healing waters were popular throughout the Roman Empire, such as Baiae in the Bay of Naples or Bath (Aquae Sulis) in England. There were hundreds of healing spots, and many of these sites are still used today, preventing full archaeological investigation. Indeed, many of these sites were simply called Aquae with an added qualifier (to differentiate one Aquae from the others), such as the locality’s name, the site’s founder, its divine connections, and/or a cognomen. Some sites have been known for centuries,

158 For the complete bibliography, see Yegül and Couch (2003, 154, note 5).
159 Yegül and Couch 2003.
160 Miliaresis 2013. See also the earlier work of Blyth (1999).
161 Vitr. De arch. 8.3.1–5; Sen. QNat 3.2.1–2, 3.24; Pliny NH 31.1–2, 31.3.17, 31.32, 31.33–37. See Jackson (1999) for a succinct overview of ancient medical opinions regarding the healing properties of water; Fagan (1999, 85–103) offers the fullest discussion of medicinal waters in baths to-date, along with supplemental material from Köhler (2016).
163 Yegül 1992, 92.
164 For more on the phenomenon of Aquae throughout the empire, see Peréx and Rodríguez Morales (2011); Campbell (2012, 330–68). These types of healing sites are becoming
but have only recently undergone systematic excavations, such as Aquae Apollinares Novae (Vicarello, Italy) on Lake Bracciano, north of Rome. The Domitianic era complex includes a bathing facility tied to the local thermal water that could reach up to 50 degrees Celsius, as well as an adjacent hostel, offering pilgrims a convenient way of extending their stay at the facilities. Indeed, spas were often built in scenic locations, with a number of amenities, so that patrons could not only heal their bodies and minds, but also enjoy a ‘resort-like’ space. The hydrotherapeutic services of the spas could include both external and internal uses of water, such as full-body immersions or medicinal drinking water. The sheer popularity of thermal bath complexes in the Roman world is easy to understand, as these types of health treatments are still popular today throughout the world.

In addition to archaeological evidence, Roman literature offers insight into Roman attitudes towards bathing culture. Seneca satirically bemoans many aspects of the baths, including the racket of rowdy bathers, which he suffered while living above a bath complex (Ep. 56) and the frivolous luxuries of contemporary baths compared to the Spartan example of Scipio Africanus (Ep. 86). While these passages cannot be taken at face value, they are helpful in reconstructing what types of activities and behaviors may have taken place in bath complexes, which is not immediately evident in the archaeological record. Garrett Fagan’s 1999 monograph, Bathing in Public in the Roman World, is an invaluable resource, as it synthesizes literary, epigraphic, and archaeological sources to present a greater understanding of bathing in the Roman Empire, such as the popularity of the baths and the phenomenon of bath benefaction.

Another interesting avenue of inquiry that Fagan briefly explores is the notion of hygiene in the context of public baths. While Roman baths certainly improved the hygiene of the bathers, literary and epigraphic evidence suggest that baths could be dirty places, as some bathers did not take care to leave the space clean for other patrons.

better published and known, such as those of the province of Hispania; see, for example, González Soutelo (2012). For a broad discussion of these types of healing sites, including their divine connections to Apollo, Asclepius, and the nymphs, see Rogers (2015, 331–51).

On the site at Vicarello, see Von Falkenstein-Wirth (2011).


Fagan’s conclusions then inform other scholars, such as Yegül’s brief synthesis of Roman bathing rituals and customs (2010, 11–21). See also Busch (1999), which is a similar treatment of the materials Fagan analyzed in German.

Fagan 1999, 181–88. Today’s notions of hygiene, naturally stem from modern, post-Victorian conceptions of cleanliness that were not familiar to the ancients. For more on this concept, see Koloski-Ostrow (2015b, 102–104) and below, 39–46, on sanitation.
In the last few decades, a number of conferences on Roman baths have brought together new evidence from across large parts of the Roman world. The “First International Conference on Roman Baths,” held in 1992 in Bath, England, organized by DeLaine and David Johnson, was divided into two parts: “Bathing and Society” explored bathing culture throughout different parts of the empire; while “Design and Concept” illustrated the need for further architectural studies and reconstructions of baths in various contexts (including around the Bay of Naples, military installations, and urban spaces)—a trend which has continued today in scholarship. The Frontinus Gesellschaft, in addition to the relevant bath entries in its Cura Aquarum series, organized a conference in Aachen in 2009 on the technical and cultural histories of Roman baths (SPA: Sanitas per Aquam).170 The conference was able to pull together a wide variety of scholars who presented evidence from Italy, Greece, Turkey, Spain, Germany, Egypt, and elsewhere, thereby highlighting the many newly discovered and published sites (as well as some freshly re-examined cases) from throughout the Roman world.

Another significant research trend is the contextualization of Roman baths within the longue durée evolution of bathing practices extending to the present day. The beginning of this section focused on pre-Roman bathing facilities in the Greek world, demonstrating that the Roman bath was not sui generis; however, the technological advances of Roman baths, especially in terms of heating capabilities and water supply, were instrumental in providing a model for later bathing cultures. Yegül presents a succinct progression of baths from the Roman period into the Byzantine era, followed by a decline in bathing among Christians in the West and continued development under Islamic rule in the East.171 Finally, he explores the development of modern notions of cleanliness and the importance of hygienic bathing in modern European societies, perhaps arising from the renaissance of ‘oriental-style’ bathing in the eighteenth and nineteenth centuries.172

4.4 Drainage and Sanitation
In the last twenty years, Roman drainage and sanitation have received a great deal of attention in modern scholarship. This research, employing new approaches and evidence, explores the systems themselves, frequently challenging modern notions about the cultural practices of the Romans. Following

170 Kreiner and Letzner 2012.
171 Yegül 2010, 181–212.
an overview of Roman drains and sewers, this section will present the relatively recent exploration of the Roman toilet, and then conclude by discussing the social implications of Roman sanitation practices and toilet usage, and how Romans conceptualized privacy and hygiene. Scholarship shows that the Roman world was indeed not as clean as modern audiences have come to believe.

Roman sewers and drains are of integral importance in dealing with water systems. In modern English, 'drains' refer to conduits that prevent impermeable surfaces, such as streets, from flooding; while ‘sewers’ traditionally refers to conduits used for human waste. In Latin, however, it appears that no such distinction was made: cloaca (perhaps derived from cluere, to purge or to clean with running water) can signify a drain or sewer. Given the wide regional variation in water management and technology, it is no surprise that different types of drainage systems were employed throughout the Roman world: open and closed drains, integrated drains (with both human waste and rainwater), and separated drain systems (one for waste and one for rainwater). For the most part, it seems that Roman drains were ‘conflated sewers,’ in that they were intended to carry away excess waters in urban environments, but human sewage could also be present. For clarity, scholars often divide drainage systems into four categories: first order (drains in a structure or complex, which leads waste away, e.g., gutters on roofs or channels from latrines); second order (combined first order drains to form a ‘single exit channel’); third order (‘principal canalizations,’ which are generally underneath streets); fourth order (the collection of drains that discharge away from the settlement). These four categories usually build upon each other to create an extensive urban drainage network that works effectively to move surplus water and human waste away from inhabitation.

The variety of drainage systems employed by the Romans is well documented in a 2000 article by Gemma Jansen. Using the archaeological evidence from Pompeii, Herculaneum, and Ostia, Jansen shows how local topography

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174 Reimers 1989, 137–38. Reimers also points out that the terms fossa and cuniculus could be used to indicate channels or trenches, such as agricultural drainage canals. Vitruvius also mentions that architects must be acquainted with the legal regulations surrounding drains, the iura cloacarum (De arch. 1.1.10). For more see Koloski-Ostrow (2015a, 63).
175 Reimers 1991, 112. For a more systematic treatment of these drain types, see Hodge (2002, 332–45) and Riera (1994, 399–415).
176 Koloski-Ostrow 2015a, 83.
determines the type of conduit system a community could use. For example, because of Pompeii’s steep gradient, rainwater could flow through the city and wash out at the lower city gates. In addition, Pompeii’s low water table allowed for cesspits for private latrines, eliminating the need for an extensive sewer network. Cesspits are holes in the ground that are dug to allow for the disposal of human waste. They act as liquid soak-aways, in that the liquid from the waste is allowed to soak down into the soil, while solid waste is left on top (and can be compacted), and later removed by stercorarīi, the human waste collectors who would use the waste as agricultural fertilizer. Given Herculaneum’s steeper slope and harder volcanic soil, there are very few cesspits and limited sewers, as rain and wastewater could run off directly into the sea. At Ostia, given the lack of gradient and high water table (especially with the proximity of the Tiber River), a large sewer network was installed to ensure proper waste management, as cesspits were impossible to use. Thus, topography dictated exactly what type of drainage system a settlement could use.

Roman drains were built first and foremost to deal with wastewater. Frontinus even mentions that one of the main reasons for a drainage system, especially in Rome, was to deal with the water continuously running off from water fountains—and thus into the streets themselves (Aq. 111.2). Indeed, in addition to flowing through streets, wastewater was important in all aspects

179 Jansen 2000b, 43. For an updated in-depth investigation of the water supply and drainage systems of Herculaneum, see Camardo, Martelli Castaldi, and Thompson (2006), which is derived from the work of the Herculaneum Conservation Project begun in 2001.
180 Jansen 2000b, 45.
181 Jansen 2000b, 45.
182 In modern scholarship, there have been questions regarding how much fountains could wash into the streets. In the case of small street fountains in Pompeii, for example, while occasionally they could flood the street with a limited amount of water, in reality, they probably only wetted the surrounding area of the street (Richard 2012, 130–31). There is a good amount of evidence from throughout the empire that excess water from fountains (especially large-scale examples) could go to secondary structures, such as latrines, before evacuating into drains (Richard 2012, 131, 135–36). There is no available evidence that public fountains could be switched off, using a stopcock, unlike private fountains (Richard 2012, 106). Richard, however, has recently demonstrated that the Late Hadrianic Nymphaeum at Sagalassos had a stopper on the parapet of its main basin, which would have prevented water run-off (Richard 2016a, 278–80). More research, it seems, needs to be conducted to understand better the potential to close off public fountains. For more on the ability for domestic fountains to be turned off, see Jansen (2001). For more on literary sources related to water control, see Reimers (1989) and Koloski-Ostrow (2015a, 63–5).
of Roman drainage. For example, surplus water from baths could be used to supply and clean out nearby latrines, and waste from sewers could be fed into fields as fertilizer. Again, this reinforces the idea that Roman waste conduits functioned as ‘conflated sewers.’

Arguably the most famous drain in the Roman world was the Cloaca Maxima of Rome. The Great Drain was originally a small tributary of the Tiber River (with a zig-zagging course that led to the Tiber), which was reportedly canalized in the seventh century BCE by Tarquinius Priscus, as an open drain. By the fifth century, the drain was monumentalized with lined stones, and was covered over in the late Republic. In the aedileship of Agrippa in 33 BCE, a new lower stone course was added, monumentalizing it further. In past scholarship, the Great Drain has been associated with a great sanitary revolution in the city of Rome; however, recently, scholars have challenged that notion. In examining the physical remains of the Cloaca Maxima, Koloski-Ostrow believes that the structure was intended mainly as a storm drain, which could also serve other materials that entered it.

Another crucial element of sanitation is the Roman toilet. While toilets have been identified since their excavation, it is only in the last few decades that they have received systematic attention by archaeologists. The first major study of toilets was by Richard Neudecker (1994), which explores more luxurious toilets (the so-called Prachtlatrine) in the cities of the first two centuries of the Roman Empire. The studies of Barry Hobson (2009) expanded the

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183 Wilson 2000a, 177. See also Hodges (2002, 335–36). For more on the use human excrement and urine, see Jansen, Koloski-Ostrow, and Moormann (201b, 147–56) and Koloski-Ostrow (2015a, 89–92). Miko Flohr, an expert on fullonicae, or fulleries (spaces dedicated to the maintenance of wool fabrics), questions the old assumption that urine collection points were located outside fullonicae (e.g., amphorae on street corners), as this method of collection would inevitably become contaminated. Evidently there must have been some other way that the fullonicae collected urine for their industrial uses. For more see Flohr (2011, 151–53).


185 For the previous bibliography of the Cloaca Maxima, see Gowers (1995) and Koloski-Ostrow (2015a, 63, note 66; 70, note 96), along with Hopkins on the early construction (2007) and on the drain’s ‘sacred’ nature (2012). See also the collected volume of Bianchi (2015), which presents recent archaeological work done on the drain by the Sovrintendenza Capitolina ai Beni Culturali of Rome.

186 Koloski-Ostrow 2015a, 63–70, especially 70. Hopkins (2007) also makes this argument.

187 See more on the history of sanitation in Jansen, Koloski-Ostrow, Moorman (2011a, 2–3). In early excavations, toilets were not often identified as such (e.g., the machine chamber of a hydraulic lift).
discussion of toilets throughout the Roman world, offering a broader overview on the subject. In 2007, the “Ancient Roman Toilet Workshop” was convened at the Royal Dutch Institute in Rome, bringing together an array of international scholars who work on Roman toilets, along with scholars of toilets from other time periods. The resulting publication, *Roman Toilets: Their Archaeology and Cultural History*, is an important exploration of the cultural and social implications of toilets, their typology and placement in urban sanitation networks, and Roman styles of urination and defecation. One important contribution of the conference outlined regional trends in toilet usage across the Roman world, which might be based on cultural attitudes: more widespread use of toilets in the Italian Peninsula and North Africa, and less use of toilets in Britain, Syria, and Judea.

The most recent monograph on Roman toilets, by Koloski-Ostrow (2015), offers an interdisciplinary study of Roman sanitation, using archaeological, literary, and epigraphic evidence from the Italian Peninsula (second century BCE to the second century CE). While not a corpus of Roman toilets, Koloski-Ostrow’s monograph is based on research conducted over the course of decades—its thoroughness illustrates some salient points about the subject. After a brief discussion of terminology (e.g., *latrina*, *secessus*, *necessaria*, *forica*), Koloski-Ostrow delves into a wide body of evidence on the Italian Peninsula, proposes a latrine typology for the first centuries BCE and CE, and demonstrates that Roman toilet forms were influenced by earlier precursors in the Hellenistic East. In her discussion of Roman toilet use, Koloski-Ostrow engages the graffiti and paintings found in and around toilets, which

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188 Hobson (2009b) explores the toilets of Pompeii, including those on second stories; Hobson (2009a) presents toilets from throughout the Roman world, with an emphasis on those found in Pompeii.
189 For more on the structure of the workshop, see Jansen, Koloski-Ostrow, Moorman (2011a, 3–5).
191 See Rogers (2016) for a short review of the monograph, which points out some of the very few problems with the study.
192 Koloski-Ostrow 2015a, 40–41. Oftentimes in modern scholarship, a distinction is made between a private toilet and public toilets (the multi-seater toilets), the latter of which is often described as a ‘latrine.’ See Jansen, Koloski-Ostrow, and Moormann (2011a, 4–5; 2011b, 43–7).
193 Koloski-Ostrow 2015a, 26–32. See also various discussions in Jansen, Koloski-Ostrow, and Moormann (2011b, 51–55, 100–102, 113–30).
194 Koloski-Ostrow 2015a, 52–63. See also chapter 3 in Jansen, Koloski-Ostrow, and Moormann (2011b, 21–42), which explores earlier toilets in Egypt, Jerusalem, and Greece.
often made jokes about defecation, but also issued warnings to those using latrines against those around them and the things lurking inside the toilets themselves. Of particular interest in this study is the use of comparanda from other cultures regarding defecation, such as post-antique Europe, the Middle East, and Asia.

The main achievement of Koloski-Ostrow’s monograph is revisiting questions about Roman hygiene. It is often believed that the Roman world was a relatively clean place, given the presence of baths and drainage in most urban centers. This notion was first challenged by Alex Scobie in 1986, who also began engaging with the archaeological evidence of latrines and sewers, which were until then often neglected. By the late 1990s, more scholars were paying attention to this archaeological evidence, culminating in Günther Thüry’s 2001 book on dirt in the Roman world and a conference in 1996 (“Sordes Urbis”) about waste management in Roman cities. Meanwhile, Garrett Fagan questioned the salubrious nature of Roman baths, especially given that the pools were used by healthy and sick alike, the waters changed probably only once a day, and the whole complex was likely saturated with γλοιός (a mixture of oil, sweat, and dirt, the by-product of strigiling one’s body). More recently, using comparative modern scientific data, the 2007 Roman Toilets Workshop further demonstrated that Roman latrines were indeed not hygienic according to modern standards. Toilet-related diseases could easily be transmitted in latrines because of how a Roman would clean him/herself after defecation (e.g.,

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195 Koloski-Ostrow 2015a, 111–18; see also her discussion of Roman toilet use in Latin literature (104–11). See also on the images and graffiti associated with toilets, Jansen, Koloski-Ostrow, and Moormann (2011b, 165–81). Because Roman toilets and drain systems lacked traps, which close off the connection between the two, there was free movement of materials and organisms between the two. Thus, animals could appear in a toilet, having traveled from the drains themselves. For more, see Jansen, Koloski-Ostrow, and Moormann (2011b, 159) and Koloski-Ostrow (2015a, 82–83). Presumably, the fear associated with these creatures led to the worship of Fortuna in and around toilets, hoping that she would bring luck and protection, especially against the Evil Eye (Koloski-Ostrow 2015a, 113–14).

196 Koloski-Ostrow 2015a, 41–8.

197 Dupré Raventós and Remolà Vallverdú (2000) edited the “Sordes Urbis” conference proceedings, which has a wide range of essays, including some on rubbish disposal in the Roman city. Another more recent edited volume on waste management in the Iberian Peninsula can be found in Remolà Vallverdú (2011), along with the review by Koloski-Ostrow and Ostrow (2014). See also Cilliers (1993), who examines possible Roman state interest in public health through legal policies.

what was the role of washbasins?) and how domestic toilets (often connected to cesspits) were located adjacent to kitchens.\(^{199}\) Koloski-Ostrow, picking up on this previous scholarship, makes the case that modern scholars must divorce themselves from modern standards of hygiene, which did not develop until the mid-nineteenth century, and evaluate the ancient evidence appropriately.\(^{200}\)

The most recent research on Roman hygiene has focused on how toilets were actually *used* by ancient Romans. One persistent question about Roman toilet use is that of privacy. Public latrines, while usually multi-seaters, would nevertheless have offered some privacy, with offset doors (to prevent outsiders looking in) and high windows (to make the space dark). And although the seats were typically situated relatively close together, users presumably would have afforded themselves greater privacy by pulling the folds of their clothes around their genitals while seated.\(^{201}\) It has been argued that the proliferation of public toilets (from the time of Augustus throughout the first two centuries CE) was part of the élite class’ method of controlling social order, creating a confined space for behaviors that would otherwise have taken place out in the open.\(^{202}\) Another question of toilet use is how the Romans cleaned themselves afterward. The perennial favorite of the ‘sponge stick’ (i.e., a sponge attached to a stick for self-cleaning) has found traction over the years, as it is mentioned a few times in Latin literature and occasionally sponge spicules are found in toilet drains.\(^{203}\) In public latrines, conduits located in front of the seats, presumably filled with running water, have been interpreted as spaces to rinse sponge sticks. But there has been some resistance to the notion that sponge sticks were used in public latrines or that they were used communally (thereby exacerbating already questionable hygienic conditions). Lastly, scholars have recently posed questions about the sensory experience of using dark, not well-ventilated public latrines with drains that were not always


\(^{200}\) Koloski-Ostrow 2015a, especially 118–22. See also Jansen (2000a).

\(^{201}\) Koloski-Ostrow 2015a, 92–6. For more on the notions of windows and lighting in public latrines, see Koloski-Ostrow 2015a, 28–9.

\(^{202}\) Koloski-Ostrow 2015a, 96–8. See also Jansen’s 2003 study of the toilets of Hadrian’s Villa at Tivoli. In her analysis she differentiates between the various toilets found there—and who potentially was able to use them (e.g., emperor; imperial retinue; slaves).

\(^{203}\) Jansen, Koloski-Ostrow, and Moorman 2011b, 102–104; Koloski-Ostrow 2015a, 86–8. Koloski-Ostrow supports the sponge stick theory, but does not address the counter arguments in her text.
continuously flushed. While to the modern audience a Roman toilet might be unbearable, it is worth remembering that the ancients, accustomed to an environment of odors (which might be considered foul today), probably had a sensory landscape distinct from that of today.

4.5 Water-Displays

The study of Roman water-displays has a rich and vibrant history, and one that is constantly evolving. Over the course of the last century, scholarship has moved away from strict typologies and catalogues, attempting to understand fountains in their original context of Roman society and the built environment. At this point, scholars are fortunate to be able to draw evidence from across the empire, in order to put together a ‘bigger picture’ of Roman water-display. Like other aspects of Roman water culture, water-displays come in public and private contexts, which can impact their usage and meaning for an ancient audience.

Before turning to the modern scholarship, however, the terminology of Roman water-displays must be discussed briefly. Romans had a variety of at least 21 different terms for fountains, suggesting they themselves were fluid in word choice for their water-displays. Of those terms, nymphaeum has come down through modern scholarship to refer occasionally to private fountains, while more often indicating the monumental fountains of the empire, such as the large water-displays seen in the city of Rome itself (e.g., the Severan Septizodium) or in Asia Minor, a region known for its large, showy fountains. But the term ‘nymphaeum’ became popular only in the modern period—especially during the Renaissance, when it was used to describe fountains (often of a grotto-like appearance) in Italian villas. And there are a few problems with this popular usage. First, the word has religious connotations, stemming from...
from the sacred spaces of nymphs, especially in the Greek world.209 And yet, by the High Roman Empire, large-scale fountains had been divorced from this religious association, unlike natural springs, which might be the object of ritual and cult.210 Indeed, in the Roman period, fountains were man-made structures built either de novo or over a natural water source.211 Second, ‘nymphaeum’ in modern usage typically implies a certain level of monumentality. Modern scholarship often deems any large-scale fountain a ‘nymphaeum,’ even without epigraphic evidence that the ancients themselves called the structure a ‘nymphaeum.’212 Given the handful of inscriptions still remaining, it is difficult to apply ‘nymphaeum’ universally to all fountains.

Given the widespread adoption of ‘nymphaeum,’ the word also cannot simply be rejected. Other terms, however, can be employed to avoid this problem of anachronistic connotation, such as ‘fountain’ or ‘water-display.’ A water-display has two functions: to show off water and to collect the water for a secondary use, such as ritualistic washing or refreshment. A water-display, and by extension ‘fountain,’ then, is not restricted to a particular size, which means that a wider body of examples can be used in studying Roman fountains—not just the often impressive monumental façades that one associates with nymphae.

Roman fountains came in many sizes and shapes, constantly evolving and adapting over time. Greek and Hellenistic fountains were generally tied directly to springs or simple aqueduct channels, and most were covered structures that prevented water from evaporating quickly, thereby aiding water conservation.213 Under Augustus, especially with the growth of the water supply system under Agrippa, the city of Rome witnessed the advent of monumental fountains, whose architectural forms drew inspiration from Republican and early imperial domestic spaces.214 What immediately distinguished Roman public fountains from their Greek counterparts was the

210 See below, 76–8, for more on the religious nature of water in the Roman world.
211 For example, see Agusta-Boularot (2001, 167–68) and Longfellow (2011, 9–13).
212 There are a handful of inscriptions that describe fountains as ‘nymphaea’ in the Roman world, including the first-century-ce nymphaeum from Metz, France (CIL 13.4325), the 104–105 ce Trajanic fountain in Syria (Inscriptiones graecae ad res romanas pertinentes 3.1273), and the second half of the second-century νυμφαίον from the Agora of Argos (Argos Inv. E.266). For a complete discussion of the epigraphic evidence, see: Settis (1973).
213 Longfellow 2011, 9–13; Richard 2012, 34–40. Longfellow in particular traces the development of monumental Roman fountains from their Greek precursors through the third century ce.
214 Longfellow 2011, 3.
ostentatiously wasteful use of water, insofar as these displays were often uncovered, prioritizing public display over water conservation—a feat made possible due to the increase in reliable water supply. The construction of fountains continued in Rome through the Flavians, including the famed Flavian-period Meta Sudans, built on the foundations of an Augustan predecessor. When the emperor Hadrian began traveling throughout the empire, he sponsored the construction of water-displays and water supply systems, especially in Greece and Asia Minor. In Greece, the water-displays were constructed using Italian architectural models (such as the semi-circular, open air nymphaeum in the Athenian Agora), as well as Greek models (such as the basilica-form nymphaeum on the slopes of the Larissa Hill at Argos). In Turkey, Hadrian plugged into a pre-existing culture of aquatic benefactions sponsored by the local élite class, thereby producing the famous Baroque-style façade fountains found up and down the coast of Asia Minor. Back in Rome, the Severans reintroduced the monumental fountain, including the famous Septizodium near the Circus Maximus, which included both features found previously in Rome and architectural innovations from the provinces.

Naturally, not all Roman water-displays were ‘monumental.’ The streets of Roman cities throughout the empire were outfitted with fountains, providing easily accessible water for the local populations. Most often, these were simple rectangular structures, built by joining four stone blocks in the form a basin, with a pillar providing the water that flowed into the basin. The Romans called these fountains either a lacus or a saliens; the former indicates a hollow cavity, while the latter implies a structure with ‘jumping’ or ‘gushing’ water. Water-displays were also attached to other architectural elements, thereby lending a sense of vitality to a structure. There are a number of such water-displays attached to arches and gates throughout the Roman Empire. For example, the North Nymphaeum at the foot of Perge’s acropolis was designed so that water flows through both an arch and a sculpture of a personified

220 Del Chicca 1997, 234.
221 Rogers 2015, 37–41, 60–3. For more on the differences between the lacus and saliens, see Del Chicca (1997) and Ambrogi (2005, 58).
local water source (the Kestros River), before continuing through the main thoroughfare of the city in a *euripus* (water channel). Some theaters were also fitted with water-displays on the *frons pulpiti* (or front of the stage), which not only provided small displays of splashing water when theatrical productions were not taking place, but also cooled the surrounding air. Within domestic spaces, at both urban and extra-urban locations, water-displays could come in a variety of forms, including water channels, aediculae structures with spouts in their interior niches, and dining spaces with water flowing around them. Whatever the form or scale, water-displays were present throughout the Roman Empire in a variety of contexts, demonstrating the ubiquity of flowing water in the Roman world.

Modern scholarship includes general publications on fountains, typologies, catalogues based on geography, syntheses, connections with water networks, and empire-wide studies. First, there have been general archaeological publications of the various water-displays throughout the empire. Monographs such as Renate Bol’s work on the Nymphaeum of Herodes Atticus in Olympia (1984) and Robinson’s magisterial study of the Peirene fountain of Corinth (2011) have reexamined specific monuments, altering previous conceptions of those water-displays and their complex histories. Current and ongoing research projects by groups of scholars, especially the field reports found in the publications of the *Cura Aquarum* series, provide up-to-date excavation results and interpretations. Without the diligence of these field archaeologists, proper data would not be available to be mobilized within theoretical models.

Second, there is the great tradition of Roman water-display typologies. The two most important contributions are Neuerburg (1965) and Letzner (1990; 1999). Norman Neuerburg, studying the public and private water-displays of the Italian Peninsula, suggests that there are six different types of fountains (*edicola, camera, facciata, grotta, semicircolare*, and *rotondi*) and analyzes their placement within the greater context of their location. Wolfram Letzner illustrates 458 public and private water features in the western half of the Roman Empire. His extensive catalogue allowed him to offer a *Grobtypologie*, or a broad typology, of 19 variations of water features, thereby placing these water-displays in their wider typological context. Hélène Dessales has recently built on the work of Neuerburg and Letzner, offering new typologies of

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225 Dessales 2013; Rogers 2013.
226 Letzner (1999) is a second revised edition of the 1990 original publication.
basins, fountain elevations, and fountain furniture (i.e., moveable objects associated with a water-display, including sculpture, vases, and miniature fountains), on the basis of finds from Pompeii and comparanda from other parts of the empire.\textsuperscript{227} Other briefer studies present similar typological discussions, including those by S. Meschini (1963), Ginouvès (1969), Salvatore Settis (1973), and Pierre Aupert (1974).

Third, water-displays are organized into catalogues, which are typically grouped by region. The fountains of Italy are gathered in the extensive catalogue of Neuerburg, which includes both public and private examples. Understanding the site of Ostia was supplemented in 1996 by the study of Ricciardi and Scrinari. The western half of the empire, as already mentioned, was catalogued by Letzner. Knowledge of North African water-displays was improved with Francesco Tomasello’s study of the minor fountains and nymphaea of Leptis Magna (2005) and Nicolas Lamare’s recent dissertation (2014), which catalogues the monumental fountains of Northern Africa. The eastern half of the empire has likewise been covered by a series of regionally-based catalogues: Greece by Susan Walker (1979), Franz Glaser (1983), and Sandrine Agusta-Boularot (2001); Asia Minor by Claudia Dorl-Klingenschmid (2001); Asia Minor and the Middle East by Richard (2012; 2016b); the Middle East by Arthur Segal (1997).

Recently, the fountains of Roman Gaul have also received attention in secondary scholarship. Henri Lavagne, over the course of his career, has illustrated a number of Gallic water-displays (1990; 1992; 2012). Claude Bourgeois (1991; 1992a) has presented the evidence for both indigenous and Roman water cults, as well as their associated monuments, in the area of modern France. Agusta-Boularot, in her 1997 dissertation, outlines the development of water-displays throughout the empire, incorporating examples from France. In a 2004 issue of \textit{Dossiers d’Archeologie}, edited by Agusta-Boularot, a number of French archaeologists present examples of fountains, including new reconstructions, from throughout Roman Gaul, making them accessible to a wider audience. Unfortunately, these Gallic examples are often left out of the ‘canon’ of Roman water-displays, perhaps due to issues in terminology and misunderstandings of local trends in fountains in France.\textsuperscript{228}


\textsuperscript{228} Scholars note the difficulty in the appellation ‘nymphaeum’ to any water-display in France, which might have religious or monumental connotations (Bourgeois 1992a, 21; 1992b, 107–12; Lavagne 2012, 422). Lavagne himself wonders why more ‘nymphaea’ (i.e., what might be considered a ‘monumental’ fountain) in France are not given over to local trends.
Work on domestic fountains has also become a vibrant field of study. Again, Neuerburg is the earliest collection of examples in Italy, which has since been supplemented by Ricciardi and Scrinari (1996) for Ostia, Marianna Bressan (2003) for examples throughout Italy (especially subterranean ones), and Dylan Rogers for Pompeii (2013). Mantha Zarmakoupi (2014), in her study of luxury villas on the Bay of Naples, provides an in-depth discussion of water in those structures, focusing on their meaning and architectural importance for those spaces. Zarmakoupi illustrates different types of water-displays, including nymphaea and euripi, and the spaces designated for swimming and sunbathing in a villa. She concludes that beyond the symbolic and mythological associations of flowing water, the water-displays were a fashionable demonstration of wealth and available luxury. Imperial villas have also received attention for their water-displays, especially Hadrian’s Villa near Tibur (modern Tivoli).\(^{229}\) The villa’s abundance of water (nearly 300 discharge points for water!) vitalized the surrounding architecture and highlighted not only the power of the emperor (who had access to this water), but also his physical presence in the villa, as many of these water-displays directed one’s view to the emperor himself. While the scale and complexity of water-displays might be different in an imperial villa versus a private villa or domus, in both contexts there was the desire and ability to show water off in a variety of ways.

Dessales’ 2013 monograph most fully explores domestic fountains of Roman Italy, using examples from around the empire to supplement her arguments. In addition to offering a catalogue and typologies of fountain elements, Dessales places the fountains of Pompeii into their urban water network, demonstrating that private fountains at Pompeii (and probably elsewhere) were not used for drinking water, but rather for display and other secondary uses, such as for baths.\(^{230}\) Because a Roman house probably had access to various types of water (rain, ground, and piped waters), drinking water evidently came from a

\(^{229}\) The bibliography on Hadrian’s villa is vast, but see the following for succinct discussions of the water-displays there: Ehrlich 1989; MacDonald and Pinto 1995; Salza Prina Ricotti 1998; Manderscheid 2000b, 2002, 2010. The recent collected volume of Fahlbusch (2008) examines the use of water of the villa, with emphasis on the water sources themselves.

mixture of those sources, and the water flowing through fountains, although it could drain into a cistern for secondary use, was not intended for drinking.231

Dessales’ work is particularly notable for its exploration of the placement of water-displays within the domestic sphere. Most attention to-date has been paid to the role of water in spaces associated with gardens in domestic structures.232 For example, Wilhelmina Jashemski, the pioneering archaeologist who developed archaeological methods to uncover Roman gardens, vividly illustrates the use of water in Pompeian gardens: pools, fountains, sculpture, and mosaic fountains.233 Studies of water-displays demonstrate the importance of the visibility of fountains through the entrances of Pompeian homes, reflecting the luxury and power of the owner as someone who could afford to display flowing water.234 Dessales, however, shows that over time water infiltrated nearly every part of the Roman house (especially after the rise in available water from imperially-sponsored aqueducts), not just the peristyle where it traditionally appeared in houses throughout the Italian Peninsula.235

The proper discussion of the historical development of water-displays throughout the empire has been greatly facilitated by field reports, typologies, and catalogues. Pierre Gros (1996) offers one of the most succinct and well-informed discussions of how fountains transformed over time, with attention to different contexts throughout the whole empire. Dorl-Klingenschmid (2001) provides a diachronic narrative of how fountains changed in their urban contexts. Brenda Longfellow (2011) has recently examined the development of monumental fountains in Rome, Greece, and Asia Minor, attempting to place

231 See also Keenan-Jones 2016, 785.
233 Jashemski 1979, 32–49. The study of Roman gardens (and others in the ancient world) has been growing over the last decade, whether spurred on by Jashemski’s archaeological work or in studies of the garden in Roman literature. For example, see Kathryn Gleason’s edited volume, A Cultural History of Gardens in Antiquity (2013), Kathleen Coleman’s edited volume, Le jardin dans l’antiquité (2014), Farrar (1998; 2016), and, most recently, the long awaited volume by Jashemski et al. (2017). See Wescoat (2013) for an overview of waterworks in the study of garden archaeology worldwide.
234 Rogers 2013, 157–58.
235 Dessales 2013, 333–80. Dessales also discusses the development of the private water-display, stemming from Egypt, Magna Graecia, palaces in the East, and then Republican-era villas on the Italian Peninsula (2013, 13–51).
them in an empire-wide progression. Lamare also provides a succinct overview of how water-displays throughout the empire developed.

Next, public water-displays have recently been studied in terms of their placement in water infrastructure systems. De Kleijn, in her 2001 study of the water supply of Rome, illustrates how the larger water system of Rome impacted the numerous ways that water was used in the capital, and offers a series of water usage categories (recreational, personal, domestic, operational, and aesthetic). Richard (2007; 2012) stresses that water-displays must be studied in terms of their wider water systems, arguing that displays cannot be properly understood without knowing how water reached them or how much water might have been available. In a similar vein, Cecelia Weiss (2011) has recently highlighted the impact of geology on Roman water-displays, building upon Dora Crouch’s work on Greek water supply and usage (1993; 2003).

Finally, the study of water-displays now seeks to place ancient Roman fountains into wider-reaching contexts throughout the empire, including aesthetic trends, urban contexts, social considerations, and little explored public contexts. In terms of aesthetics, the decoration of water features has been considered in different respects. Deena Berg (1994) explores the artistic development of fountains, from 700 to 30 BCE, providing a foundation for subsequent studies of Roman structures. The seminal work on Greek and Roman fountain sculpture is still that of Balázs Kapossy (1969). The sculptural programs of water-displays in the eastern half of the empire have also received greater attention in later studies, such as the monograph of Georgia Aristodemou (2012) and a few recent dissertations (e.g., Chi 2002; Ng 2007; and Taback 2002). Dorl-Klingschmid, in her 2001 study, classifies water-displays as Prunkbrunnen (decorative fountains), and gathers examples based on form, decoration, and placement within the cityscape.

Analyses of the urban contexts in which water-displays appear have provided fruitful results in the last two decades. Moving past simple typologies, scholars have studied fountains in their original contexts, understanding better how they function in urban spaces. The dissertation of Agusta-Boularot (1997) illustrates the importance that water-displays could have in Roman cities, particularly in the western half of the empire. S. Ellis (1997) argues for the use of water infrastructure (including aqueducts and fountains) as a means of social

236 Criticism of Longfellow’s work has focused in particular on her data set, which examines only examples dedicated to the emperor (either by the emperor himself, imperial officials, or members of the local élite class). See Campagna (2011), Burrell (2012), and Lavagne (2012).

237 Lamare 2014, 1.93–127.
control in Rome and the provinces. Schmölder-Veit (2009) examines urban sites in Italy, North Africa, Spain, and Switzerland, investigating the relationship between fountains and the urban water supply. Nur Banu Uğurlu (2009) examines the placement of Roman fountains supply. Longfellow (2011) explores expressions of patronage and identity through water-displays, primarily using examples from this region. Finally, Richard (2012) has been at the forefront of interpreting water-displays in terms of identity and placing these structures in their original socio-economic, socio-cultural, and socio-political contexts.

Water-displays have been studied by scholars for their implications about Roman society and landscape, including their role as status symbols, products of patronage and munificence, and as indicators of identity. Walker (1979) is an early example of placing large-scale fountains in their wider cultural milieu to illustrate how Greeks in the Roman period employed water-displays as markers of their social standing within their communities. Shaw (1991), focusing on North Africa, demonstrates the need for approaching water usage at the regional level. Here, Shaw shows the luxurious and utilitarian nature of water, along with the increasing desire of the local élite to use water in new fashionable ways. Wilson (1995) also explores the use of water in North Africa and shows that water throughout this large region was generally a marker of luxury and status, as some sites were not as well watered as those in the more northernly parts of the Mediterranean basin. Susanna Piras (2000) likewise demonstrates that water-displays could act as a powerful status symbols, especially those that featured water without any functional purpose or secondary use (although this was probably not the case with most fountains throughout the empire). Robinson (2013) suggests that the fountains of Corinth, many of which are tied to old Greek myths (e.g., Peirene was the site where Bellerophon tamed Pegasus), helped the new Roman inhabitants of the colonia forge a new identity, one uniquely Roman and Greek at the same time.

Another trend in recent studies has been to approach water-displays from the standpoint of religion and entertainment. New discoveries, naturally, continue to change the narrative of water-displays in these contexts, making the already rich corpus of fountains even more so. For example, a large three-terraced nymphaeum (perhaps dedicated to Egeria) from the Caligulan period was recently discovered at the Sanctuary of Diana at Nemus Aricinum (Nemi, Italy). Constructed within a liminal space outside of the sanctuary proper,
the large nymphaeum lavishly illustrated the flowing water of the natural source located there. Longfellow (2012) also demonstrates the power of Romans adding fountains to preexisting Greek religious sanctuaries in Greece in Asia Minor, showing that the Romans were able to make bold statements regarding their presence in the East, while at the same time expressing religious reverence in sites such as Eleusis, Olympia, and Xanthos. Rogers explores the use of water-displays in religious sanctuaries throughout the empire: source and healing sanctuaries in the west; fountains at sanctuary entrances in the East; and fountains connected to imperial cult buildings throughout the empire. Further, more attention is being paid to water in Roman theaters, from the use of water on the frons pulpitii, its presence in the porticus postscenium, the phenomenon of aquatic spectacles in and around orchestras, to the exchange of architectural vocabulary between theaters and fountain structures. Thus, there are new ways that scholars can use new and already existing pieces of evidence to explore water-displays more fully.

Finally, phenomenological studies are beginning to explore how Romans themselves would have experienced their fountains. It is difficult, of course, to repopulate ancient spaces with bodies. Yet one can draw on comparative studies of more modern fountains and consider how interactions with water today may reflect the experiences of ancient Romans. Popular fascination with the Baroque Trevi Fountain in Rome has been explored by John Pinto (1986), tracing its meaning and power from its construction to the present day. Katherine Rinne in various publications has made the case for the visceral power of water and its special place in the fountains of Rome (1999; 2010). A 1998 exhibition at the Cooper-Hewitt National Design Museum in New York explored the spectacle and pleasure of fountains from the Renaissance to the modern period. The work of Rogers examines Roman water-displays in terms of how the canonical five senses can effect and affect an ancient Roman’s experience with a structure, regardless of context or location throughout the empire. In his 2015 dissertation, public fountains are explored in various contexts (civic, religious, and entertainment-related), illustrating that fountain placement, design, and water usage were similar throughout the empire, given humans’ common and

240 Rogers 2015, 266–354.
241 See Rogers (2015, 355–406) for an in-depth discussion of these issues, see also Rogers (2018, 183–88), along with Day (2017). On the aquatic spectacles of the Roman theater, see: Traversari (1960); Berlan-Bajard (2006), which is reviewed by Coleman (2008). On the relationship between theater and fountain architecture, see Aristodemou (2011) and Lamare (2011). See also below, 70–5, for more on aquatic spectacles.
innate sensory response to water. Further work by Rogers focuses on public and private examples in Roman Greece, with particular attention to sensory experiences.243

4.6 Hydraulic Power
Given the ubiquity of water in the Roman world, there were many uses that fit outside what one may consider the canonical uses of water—particularly in hydraulic-powered systems, which powered the Roman economy, both literally and figuratively. Throughout the ancient world were many different water-lifting devices in various forms.244 They often served a variety of purposes: aiding agricultural irrigation;245 facilitating work in mines; obtaining water from wells; assisting fire prevention. Some of the most prominent and efficient devices in the Roman world were the compartmental wheel and the water-screw, the chain pump, and force pumps. Devices in wheel forms are the most efficient lifting devices, as the force of the moving water actually moves the devices themselves.246 The Roman force pump, which could be made from a variety of materials including wood, was based on Greek models, but simplified for ease of use.247 Force pumps were probably also used in the Roman theater for liquid spartiones, which would have run down the cavea, spraying the surrounding air with scented and colored water.248 While the Roman world was probably filled with a number of different water-lifting devices and technologies, only scant examples have survived since antiquity, making a complete study of them difficult.

Water was also used to power mills throughout the Roman world. Mills have been in continuous use since antiquity, and modern scholarship over time

243 Rogers 2018; Rogers forthcoming. Sensory studies are growing in modern studies on Greco-Roman culture. For the most recent collected volume of Betts on multisensory experiences in Roman culture (2017).

244 See Oleson (1984; 2000b) for a complete overview of Greek and Roman water-lifting devices, for which there were many. There is a great Hellenistic tradition of literature on water-lifting devices and other similar apparatuses that relied on hydraulics. For more see Lewis (2000).

245 For more on agricultural irrigation practices, see Oleson (2000a) and Wilson (2008, 309–10).

246 Oleson 2000b, 229.

247 The force pump sits in the water or liquid that it is moving, and thus is not a modern siphon pump. For more on the force pump itself, see: Oleson 2000b, 272–85; Fleury 2005; Brun and Fiches 2007; Fleury 2008a; Stein 2014.

has debated their importance for various cultures in different time periods.\textsuperscript{249} Currently, over 60 Roman mills are known.\textsuperscript{250} There were different arrangements of wheels in mills: wheels could be vertical or horizontal; placed in a source of moving water, either natural bodies of waters (e.g., streams or rivers) or manmade open aqueduct channels.\textsuperscript{251} On the Janiculum hill, a watermill, with five millraces, connected to the Aqua Traiana was partially excavated in the 1990s, perhaps illustrating the importance of these structures in the reorganization of the \textit{annona} in the third century CE.\textsuperscript{252} A large-scale example of a compound watermill is that of the complex found at Barbegal (7 km west of Arles, France), which lies on a steep gradient descending nearly 30 m.\textsuperscript{253} The large building (61 × 20 m) was separated into a series of rooms; water flowed in through two main channels, powering seven wheels on either side, which ran the mill. The structure itself, because of its size and preservation, marks it as one of the most important flourmills in the Roman world, active from the first to third centuries CE.

Mills were not limited to simply grinding grain. There is evidence that watermills were used to power saws, such as the examples found at Hierapolis (Turkey) from the second half of the third-century and at Jerash (Jordan) from the late fifth-century.\textsuperscript{254} Further, mills were used to power industrial mining activities, from prospecting and extracting, to primary ore-processing.\textsuperscript{255} Scholars have noted that the mechanized technologies associated with watermills played a significant role in the growth of the Roman economy, from the first century CE on.\textsuperscript{256} Wilson has argued that the cessation of water-related mining techniques in the third century CE adversely impacted the Roman economy, because easily mined gold and other metals could no longer contribute to the precious metal market economy.\textsuperscript{257} Due to the paucity of evidence for mills, however, the field is still nascent.

\textsuperscript{249} Despite archaeological discoveries of ancient mills in the twentieth century, economic historians in the middle of the century attempted to deny the importance of these structures in antiquity. For more on this debate, see Greene (1994) and Wikander (2000, 371).
\textsuperscript{250} Wikander 2000, 372. See the relevant chapters in Brun and Fiches (2007) on mills.
\textsuperscript{252} Bell 1994; Wilson 2000c. See Taylor (2010) for more on the third-century reorganization of the \textit{annona}.
\textsuperscript{253} Leveau 1996; 2007.
\textsuperscript{255} Wilson 2002, 17–23.
\textsuperscript{256} Wilson 2002; Bruun 2007; Sabri, Merkel, Tichomirowa 2016.
4.7  Post-Roman Water Culture

In Late Antiquity, water culture naturally continued throughout the lands of the former Roman Empire, but perhaps not built in the same degree or intensity as before. For example, in North Africa, the existing water technologies and infrastructure lasted through the Vandal invasions and the Byzantine period; however, new aqueduct systems were extremely rare.\(^\text{258}\) In the city of Rome, during the Gothic siege of 537–538, all the aqueducts were cut, in order to force the city to surrender.\(^\text{259}\) After the siege, only four of the 11 aqueducts were repaired, and it was not until the Baroque period that the popes were able to begin restoring some of the aqueducts in earnest.\(^\text{260}\)

Recently, more research has been conducted on Late Antique water systems. The aqueducts of the site of Gortyn (Crete) have been published by Elisabetta Giorgi.\(^\text{261}\) In addition to documenting the aqueducts of the Imperial period, Giorgi has extensively explored the final phase of the aqueduct there, which is dated to the sixth and seventh centuries. As Gortyn was the prominent provincial capital of Crete and Cyrenaica in the Imperial period, her work has shown how the city changed in the Late Antique period. By the sixth and seventh centuries, the monumental city center, which was once full of civic and religious structures, was turned into an industrial zone that needed more water.\(^\text{262}\) Thus, aqueduct studies can demonstrate ways in which urban centers evolve, as water systems were adapted to shifts in the use of space. Furthermore, Jordan Pickett has studied water infrastructure systems of the eastern Mediterranean (300–800 CE), in a similar manner to Giorgi.\(^\text{263}\)

Further, modern scholarship has increasingly focused on fountains of the Late Antique period. Ine Jacobs and Richard have surveyed the Late Antique fountains of Asia Minor.\(^\text{264}\) They have been able to demonstrate in this period that, while already existing fountains were maintained where possible, new structures were also constructed, albeit more modest and cost-effective

\(^{258}\) Wilson 2012, 5.
\(^{259}\) For more on the geological aspects of the waters of Rome from antiquity until the present day, see Pandolfi (2008).
\(^{260}\) Wilson 2008, 298. For more on the water of the city of Rome in the Baroque period, see the monograph of Rinne (2010), which not only gives a social history of the aqueducts, fountains, and Tiber River in that period, but also highlights the importance of the engineering aspects of the water infrastructure of the city—thus drastically transforming modern Rome.
\(^{261}\) Giorgi 2016.
\(^{262}\) Giorgi 2007, 314.
\(^{263}\) Pickett 2015.
\(^{264}\) Jacobs and Richard 2012.
than their predecessors, prioritizing the need to conserve water in an uncertain period, when unknown political or social changes could impact the distribution of water. Other scholars are continuing to reexamine previously studied fountains throughout the eastern Mediterranean, from Gortyn to Constantinople, demonstrating that fountains were still an important part of life in the Late Antique period.265

The water of Constantinople has also recently received a great deal of attention in scholarship. Constantinople as a city lacks a natural source of potable drinking water.266 With its position as the ‘New Rome,’ it is believed that Constantinople copied elements of the water system of Rome, although probably not of the same sophistication.267 Constantinople was first supplied with water under Hadrian, and later its main aqueduct was completed by the emperor Valens in 373 CE, bringing water from Thrace, at a length of nearly 268 km.268 Over the next few centuries, the aqueduct continued to grow in length to accommodate the fifth-century growth of the city—making it one of the longest aqueducts in the ancient world, reaching nearly 971 m long.269 This aqueduct remained in continuous use until at least the time of Justinian, with later disruptions in the seventh century (due to neglect), and a restoration by Constantine V in 767 that provided water until at least the First Crusade (1095–1099).270 Water supplied a number of structures throughout the capital, including baths, monumental fountains, etc., many of which are mentioned in the fifth-century Notitia urbis Constantinopolitanae.271 Water was also stored in a network of 150 cisterns throughout the city, constructed with freestanding columns (and not the pier system used in Rome); the surplus of water stored in Constantinople provided an element of security in increasingly volatile times.272

265 For example, see Stephenson and Hedlund (2016) and Longfellow (2016) on the monumental fountains of Constantinople, and Longfellow (2018) on the second phase of the nymphaeum of the so-called Praetorium of Gortyn. See also Sodini, Kozelj, and Wurch-Koželj (2016) on the nymphaeum in a Late Antique house on the island of Thasos.

266 Crow 2012a, 53.

267 Ward-Perkins 2012, 65. See also Grig and Kelly (2012) for an overview on examining the cities of Rome and Constantinople together.

268 Crow 2012a, 37–38. The aqueduct system of Constantinople was extensively surveyed, mapped, and studied by Crow, Bardill, and Bayliss (2008), bringing to light unknown elements of the system itself.

269 Crow 2012a, 37.

270 Crow 2012b, 135.


272 Crow 2012a, 41.
Over the course of the fifth and sixth centuries, water administration and legislation became more codified. The Theodosian and Justinianic Law Codes provided for: “(1) maintenance of the system outside of the city and regulation of water for agricultural uses; (2) distribution and allocation within the city; (3) maintaining and financing the system.” Of primary importance for the whole system was that it had provisions for public water. Over the course of the Late Antique period and into the Byzantine period, there were a number of offices tied to water maintenance, including the *hydrophylacæ*, the *logothetes ton hydaton*, and the ninth century *komites hydaton*, the ‘counts of the waters,’ a branch of the state’s revenue and tax office. Despite the similarities with Rome, some scholars still debate whether the Constantinople system was actually modeled after the one in Rome. For example, only one lead *fistula* has been discovered in Constantinople, unlike the hundreds of Rome. Regardless, the water infrastructure system of Constantinople was tied to the emperor and his court, as “water was a key resource for displaying power, expressed through the provision of free-flowing fountains for the population of the city and for urban baths and *nymphaea*: traditional components of classical euergetism.”

The Romans laid the foundations for the use and enjoyment of water through the Late Antique and Byzantine periods. It has been noted that in these later periods, engineers relied on earlier Roman technological advances, thus there was no great need for further innovations in aqueduct or bath technologies, for example. Still, water played an important role in the Byzantine period, especially as the city of Constantinople flourished, while other urban centers of the West began to fail. A recent conference (the proceedings of which were published in the collected volume, *Fountains and Water Culture in Byzantium*) discussed, among other things: the role of water in the Byzantine Empire; the use of water and sound in fountains; the decline of *thermae* by the ninth century (as many were converted into churches); and the use of water in Christian doctrine and theology, such as the cult of the Virgin Mary as the *Zoodochos Pege*, the ‘Life-Giving Source.’ Scholars are also revisiting previously accepted

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273 Crow 2012a, 42.
274 Crow 2012a, 36, 43, 50.
275 This of course may be ascribed to the regional trend of using terracotta conduits in the region. For more on the *fistula*, see De Kleijn (2016, 55, 58–59). For more on the find spot of this one *fistula*, which was part of the fountain of the famous Serpent Column, see Stephenson (2016, 109–11).
276 Crow 2012b, 134.
277 Lewis 2007, 375.
278 On the sound of fountains, see Dauterman Maguire (2016); on baths, see Magdalino (2016, 142) and Kullberg (2016); on the *Zoodochos Pege*, see Bodin (2016) and Kimmelfield (2016).
notions, such as the connection of baths with baptism. While Roman bathing culture was habitual and daily, baptism was a singular and spiritually transformative experience.\textsuperscript{279} This research demonstrates the multivalent nature of water in cultures after the Romans, showing its importance beyond the need for mere survival. In a new Christian context, water took on a more eternally nourishing, spiritual aspect.

\section*{5 Empire-Wide Trends and Phenomena}

There are a number of features that are considered to be characteristic of the ancient Roman city. By the time of the High Empire, it is clear that there was a set of ‘requirements’ that one expected from a city to provide comfort, order, and security. In an often quoted passage, Pausanias, describing Panopeus of Phocia (Greece), is shocked that the site has the status of a \textit{polis}, as the inhabitants have “no government offices, no gymnasium, no theater, no market-place, no water descending to a fountain, but live in bare shelters just like mountain cabins, right on a ravine.”\textsuperscript{280} Similarly, in his oration on Rome, Aelius Aristides described the cities of the provinces as “full of gymnasia, fountains, gateways, temples, handicrafts, and schools.”\textsuperscript{281}

The passages of Pausanias and Aristides both cite water-displays within a litany of necessary structures for a Roman city.\textsuperscript{282} This raises questions about empire-wide trends in water consumption. Currently, there is no complete modern discussion of such trends. Thus, one must piece together patterns of water usage from disparate studies across the empire in order to begin to understand differences that can be discerned from the available evidence. The most salient differences can be attributed to climatic conditions and indigenous social practices. Regardless, even if modes or rates of consumption varied across the different climatic and geographic regions of the empire, Roman water culture was ubiquitous and far-reaching.

\begin{itemize}
\item \textsuperscript{279} Kullberg 2016, 155–57.
\item \textsuperscript{280} Paus. 10.4.1. (Trans. W.H.S. Jones). γε οὐκ ἀρχεῖα οὐ γυμνάσιόν ἐστιν, οὐ θέατρον οὐκ ἄγοράν ἔχουσιν, οὐχ ὅπως κατέχομεν ὡς κρήνην, ὅλα ἐν στέγαις καλώσας κατά τὰς καλύβας κάλλος τὰς ἐν τοῖς δρεπτοῖς, ἐνταῦθα οἰκώσαν ἐπὶ χαράδρα. See Alcock (1995) and Rubinstein (1995) for a discussion of the nature of the \textit{polis} by the time of Pausanias, with special emphasis on this passage.
\item \textsuperscript{281} Aristid. Or. 26.97 (Trans. Behr 1981). πάντα δὲ μεστὰ γυμνασίων, κρήνων, προπολικῶν, νεών, δημιουργιῶν, διδασκάλων. See also Thomas (2007, 121) and Pont (2010, 170).
\item \textsuperscript{282} Aristides is known to have written in other instances on water, such as in the extant fragments of a panegyric he gave on the waters of Pergamon (Jones 1991).
\end{itemize}
Most of modern Europe is part of the former empire, which has a temperate climate, with healthy rainfalls. There are, however, many other drier climates in the empire, including those characterized as hyper-arid, arid, and semi-arid. ‘Hyper-arid’ regions are those associated with the deserts of Africa and the Middle East.283 ‘Semi-arid’ denotes climatic conditions in which occasional, severe droughts jeopardize the successful cultivation of crops and livestock, such as in parts of the Iberian Peninsula, Turkey, and North Africa. The Roman Empire also included regions with true ‘arid’ climates, characterized by a desert-like, harsh and regular lack of rainfall, such as the modern countries located on the so-called ‘Arid Belt,’ including Libya, Egypt, Sudan, Jordan, Yemen, Oman, United Arab Emirates, Iran, Turkmenistan, etc.284

Roman water infrastructure was present in practically the whole of the empire but was used in various ways depending on the needs prescribed by these drastically different climates. For example, the semi-arid areas of North Africa, hosted an extensive network of aqueducts and cisterns, as Wilson has documented.285 Wilson’s work demonstrates how inhabitants of this region ensured sufficient water supplies throughout all seasons: systems for regulating reservoir usage (especially for heavy water users such as baths), as well as taps and stopcocks at points of use (not simply at reservoirs), which allowed for greater control of the water. Further, Richard’s study of fountains in the Roman East has shown that, while the fountains were monumental in scale, they operated on relatively small amounts of water.286 In a similar vein, Christoph Ohlig has outlined the differences in domestic water usage practices between Pompeii and Colonia Ulpia Traiana (Xanten, Germany), two sites that have very different climatic conditions.287

Societal practices are also of great importance in considering differences in water consumption across the empire. Zena Kamash has demonstrated that

283 For more on drylands and the archaeology that can be undertook there, see the collected volume of Barker and Gilbertson (2000).
284 For more on the ‘Arid Belt,’ especially in the context of the ancient world, see the collected volume of Liverani (2003), which explores life at arid sites in the Roman Empire. The volume was the product of a conference hosted by the Centro Interuniversario di Ricerca sulla civiltà e l’ambiente del Sahara antico (CIRSA) of the Università di Roma ‘La Sapienza.’ The group strives to study life diachronically in arid lands. See also various contributions in Francochi’s 2017 volume on fluvial landscapes, which investigate climate change’s impact on ancient river landscapes.
287 Ohlig 2012.
although water-related technologies were successfully implemented across the Roman Near East, some were not as popular as others. As lead pipes were not universally adopted across the region, cisterns were popular in domestic contexts, which explains the limited popularity of water-displays in the home. Another reason is that homes in the East were not meant to be as publicly accessible as their counterparts in the West, which often featured views through the atrium to beautiful water-displays. Bathing complexes achieved noticeable success in the third century CE, while latrines achieved a limited popularity only in the fourth century. Kamash attributes the success of baths to the daily necessity of bathing (and the social interactions that happened at the baths), while latrines might have only received limited success due to local religious concerns against the exposure of the nude human body. Surely there are other such regional socially-constructed distinctions in water use to discover still.

Much remains to be done in terms of regional trends of water usage across the Roman Empire, but a foundation has been laid in the modern scholarship. In order to ensure stable and reliable water sources, local populations readily adopted Roman water infrastructure systems, which could be implemented to varying degrees based on local needs. Again, water culture is not monolithic, and it can easily adapt to local concerns, while still allowing local populations to enjoy the myriad of benefits water provides.

6 Water Culture and Its Implications

The previous discussion of the various aspects of water usage by the Romans has touched on many aspects of Roman society at large. It will be helpful, then, to examine the employment and manipulation of water by the Romans more holistically, outlining trends in how water impacted the wider conceptions of Roman culture. Given the ubiquity of water in the Roman world, many aspects of water culture in Roman society overlap. This fact, however, helps to

288 Kamash 2010; 2012.
290 The site of Dura-Europos has no evidence of private water-displays, which Kamash attributes to the use of cisterns (2012, 86–7).
291 Kamash 2012, 87. On western examples and their sight lines, see Rogers (2013, 158).
illustrate the importance and dominance water had on how an ancient Roman lived, regardless of where he or she resided in the empire.

6.1 **Power**

There is a natural power behind being able to harness water and use it for other purposes. Previous studies of the political and social power of water have been general, and they have not sufficiently expressed the complexities of the different aspects of the Romans' use of water. In the Greek world various tyrants, who were known for completing water-related projects to curry favor with their people, were able to create ‘spaces of power,’ translating political power into the surrounding artificial built environment. These types of spaces continued into the Roman Empire, when symbolic forms of architecture (e.g., the arch, specific types of public buildings) signified the domination of the Romans. Indeed, by employing expected architectural forms, a benefactor or a community could show their ties to Rome, despite their diverse backgrounds and social statuses.

There is an innate power that one witnesses in flowing water, no matter the context. A trip to the Baroque-era Trevi Fountain in Rome, with its resplendent decorative program and impressive water flow, never ceases to amaze even the modern veteran visitor of the city. The same feeling can certainly be expected to have been felt by ancient Romans, especially those in semi-arid climates, where the display of water would be a stark juxtaposition with the surrounding dry landscape. The water-related structures of the Romans can be considered symbols of conspicuous consumption, visual statements and reminders to all of the ability and resources of the Romans. Indeed, as it will be seen in the ensuing discussion, flowing water in fountains and baths, and its associated built structures (e.g., aqueducts), can invoke the power of the Romans. More monumental architectural forms of water, as opposed to more utilitarian forms (e.g., watermills), demonstrate the political and social power of their builders. In this context, this section explores imperial and private benefactions of water, private and civic status, Roman dominance over nature, and rhetoric.

Benefactions of water were omnipresent throughout the Roman world. The emperor himself could dedicate aqueducts, fountains, and bath complexes,

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294 Arvanitis 2008, 1.
295 Thomas 2007, 150.
296 Thomas 2007, 7.
297 Piras 2006.
in his name and for the people. These types of structures visually signaled to users political power, and thus a political ideology, behind their construction. Unlike drains underneath the streets, for example, aqueducts, fountains, and bath complexes were tangible. Further, structures like these could be enjoyed on a personal level within an urban environment. And, naturally, the same structures were also funded by private individuals wishing to emulate the emperor and support their local communities.受益行为可以轻松提升一个地方的地位，正如雅典和其他希腊城市的情况，哈德良在他的统治期间，为希腊许多地方捐赠了多座水渠和喷泉。雅典，尤其是当它不像古典时期那样处于高位时，从皇帝的希腊主义倾向中受益匪浅。确实，这些结构的政治和文化利益通常超过了明显元素的奢侈消费。这些问题也涉及了如何资助，一个特定类型的与水相关的建筑项目是否起源于罗马然后扩展到省区，或者相反？不管怎样，有一个有组织的努力试图提供公众资助，使水在全国各地都变得可用。

与水相关的建筑有关的地位问题在现代学术界已经被广泛讨论。特别是在水物理上稀缺的地区，如北非和小亚细亚，市民水项目可以立即提升一个社区的地位。这些社区正在利用罗马获得水的更大欲望，罗马帝国的框架允许和支持。水渠，例如，可以为城市提供一种公民自豪感。这些城市的公民自豪感反过来又导致了城市之间更大的竞争，争夺更好的水相关结构。例如，提洛斯的尼米法纽姆和

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298 The benefactions of public fountains by the emperor and members of the local élite are explored most fully by Longfellow (2011).
300 For example, Longfellow (2011, 164–82) argues that the form of the monumental Septizodium fountain of Rome can be derived from the provinces, especially given that Septimius Severus, its benefactor, was from Africa.
303 Dorl-Klingenschmid 2006; Thomas 2007, 127. For more on competition between cities in Asia Minor, see: Robert 1977; Heller 2006; Kuhn 2013. See also the recent article of Lendon (2015), who argues that the influx of large-scale fountains in Asia Minor could be attributed to the élite education of local young men, as the monumental fountain type and its
the nymphaeum of Laodicea-on-the-Lycus, both of Severan date, were built in competition with each other, particularly as they are both of monumental in scale (well over 40 m long each).

Status was also evidently elevated for those who had water in their private dwellings. Throughout the Roman Empire, the ability to obtain a private water right meant that an owner had to petition the emperor in Rome or the local civic authorities. Thus, private water concessions would then allow an owner to use and display water, automatically elevating his or her status. Some examples, such as in the House of the Vestals in Pompeii, demonstrate how owners, once they had access to water, could complete renovations to their homes that could incorporate new ways of displaying water, keeping up with the fashions of time. While most water in the Roman house could be used for utilitarian and practical purposes, there is some evidence that not all of the water was saved for secondary use, again, demonstrating the status of the owner, who could have a surplus of water. In relation to status, flowing water inside a domestic space also illustrated the wealth of the owner. Edmund Thomas, in a recent reanalysis of the Augustan-era Villa Claudia at Anguillara Sabazia (northwest of Rome), has shown that the impressive water-displays there mimic the architecture of Augustus’ Naumachia in Rome, illustrating the wealth of the villa’s owner and the resources that he or she was able to muster to construct the water-displays there. Thus, particularly in the visible display of water in domestic spaces, owners were able to declare their elevated status to all.

Both the benefaction of, and the status afforded to, individuals and communities by water-related projects share an underlying theme: dominance over nature. Given the destructive nature of water, Romans were able to construct structures and enact safeguards against water’s forces, such as river flooding. Nicholas Purcell has demonstrated in a series of articles the strong nature of connection to the water supply offered a new ways to teach the art of rhetoric in the High Imperial period.

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304 Longfellow 2011, 189–90; Rogers 2015, 252, 259–60.
305 Bruun 2012c. See also above, 18.
306 Schmölder-Veit 2009, 161. See Rogers (2013, 158) on the lines of sight from the streets of Pompeii into the interiors of homes, so that passers-by could see water-displays therein.
307 Jones and Robinson 2005.
308 Zarmakoupi 2014, 146.
310 Thomas 2012.
311 See above, 10–11, especially with Bruun 1992.
the Romans’ relationship with water—an element that comes from elsewhere, flows elsewhere, and with which an individual’s experience is usually fleeting.\textsuperscript{312} The concerted effort of Romans to control water, especially over the course of the empire, became an integral part of the administrative apparatus of the empire, improving its survival.\textsuperscript{313} Purcell states that water “had a vital contribution to make: directly through the basic problem of conceptualizing a mobile element in a wide environment, and indirectly through the complex cultural and legal associations connected with each watery landscape.”\textsuperscript{314} Romans then, in their ‘rhetoric of control,’ to borrow a phrase of Purcell, were successfully able to demonstrate their power over nature, while still supplying a vital and pleasurable element necessary for their subjects.\textsuperscript{315}

Perhaps one of the greatest benefits of the Romans’ relationship with water was making it publicly available, while still maintaining a certain air of exclusivity. While even the Greeks had legal regulations that provided for the public water supply, the Romans continued this tradition, but on a much grander scale—and at a time when private water rights were legally controlled, imbuing such imperial projects with all the more prestige value. Even the 11 aqueducts of the city of Rome can illustrate this point, given the sheer population of the city, which would require vast amounts of water. While there was public access to water throughout the empire, often at local public fountains or in the public baths, there was still an exclusivity of water usage, usually by the emperor and those who had private water rights. Longfellow, discussing water-displays, says that “aquatic displays, ranging from the small jets ringing Pompeian impluvia to the Augustan Meta Sudans in the heart of Rome, celebrated water in a manner that symbolized the bounty of the empire, as well as the political power, social status, and wealth that were wished for by many but possessed by few.”\textsuperscript{316} Thus, the divide between those who had access to different types of water use, whether publicly or privately, helped to delineate levels notions of power in the Roman Empire—thereby reinforcing the hierarchies that structured the empire’s social organization.

\begin{thebibliography}{99}
\bibitem{312}Purcell 1996, 200. See Purcell (1996 and 2012). In a similar vein, see Kleiner (1991) on the Roman triumph over nature, particularly water, through bridge-building.
\bibitem{313}Purcell 1996, 193, 207.
\bibitem{314}Purcell 1996, 203–204.
\bibitem{315}See Purcell 1996, 206.
\bibitem{316}Longfellow 2011, 28.
\end{thebibliography}
6.2  **Aesthetics**

Haec utilitas haec amoenitas deficitur aqua salienti, sed puteos ac potius fontes habet; sunt enim in summo.

**Pliny, Ep. 2.17.25**

Only one thing is needed to complete the amenities and beauty of the house—running water; but there are wells, or rather springs, for they are very near the surface.

**Trans. B. Radice**

The aesthetics of water are infinite. Pliny the Younger in his *Letter* about his Laurentine Villa expresses the idea that a house is made better through the use of *running* water, not just water that can be found in a well. He goes on in the *Letter* to describe the space’s numerous decorative water features, which clearly gave him and his guests delight and pleasure. The luxury and sensual nature of the flowing water evidently enhanced the various spaces throughout the villa, vitalizing them. While a Roman villa certainly did not need to have water-displays and running water, these features were certainly desirable, making the complex even more enjoyable.

While water can be aesthetically pleasing on its own in nature, when it is controlled and subjected to architectural forms, it can take on new meanings. For example, when an ancient Roman saw an aqueduct arcade, he or she could think first of the running water inside (*utilitas*), while still admiring its external beauty of superimposed arcades (*amoenitas*). Moreover, given that many aqueducts terminated in urban water-displays, an aqueduct out in the country could also be viewed metonymically: an extraurban signifier of the powerful public building projects taking place in the city.317 Further, the forms of architecture that water-related structures in the Roman world adopted would take on empire-wide symbolic meanings of a shared identity.318 Thus, aqueducts employed iconic arcaded forms, which, of course, while aesthetically pleasing, were also highly functional. Bath complexes by the start of the empire took on canonical architectural forms that allowed bathers to progress through the various cold to hot rooms. The imperial baths of the city of Rome, with their sheer size, not only spoke of the monumental architectural forms, but also the power behind the imperial commission. Fountains came in different sizes

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318  Thomas 2007, 127.
and shapes, but the large-scale façade fountains found throughout the empire demonstrate a shared architectural vocabulary that, with the addition of flowing water and decoration, created splashy spaces of luxury.

Part of the aesthetic experience behind many water-related structures, such as fountains and baths, were their decorative programs. Precious materials, such as imported marbles in the imperial baths of Rome, illustrated the stretches of the empire—and the ability that the Romans had to obtain these exotic materials. Sculptural decoration of both baths and fountains illustrated programs that stressed subjects related to abundance, mythology, history, and patronage/imperial ideology. For example, the Baths of Caracalla in Rome, resplendent in imported marble on its floors and walls, was full of sculpture. Images of Hercules not only invoked a mythical figure, especially as a protector of hot springs, but also Caracalla’s own connections to Hercules.319 Thus, the decoration of structures associated with water could add to the aesthetic beauty of the complex itself, while also hinting at other connections to water, myth, and history.

In the same vein, the symbolism behind water and its use in water-related structures is multivalent. First and foremost, water symbolizes purity.320 Water’s ability to cleanse is crucial for its role in Greco-Roman religion, in particular, as an ancient had to wash his or her hands upon entering a religious space.321 Mythology is also full of water-related subjects. For example, river gods and nymphs can serve as symbols for water, especially in a decorative program of a fountain or private house. Depictions of the Tiber River, which could be found throughout the empire, were symbols for not only water, but also a wider sense of identity tied to the capital.322 As was discussed in the previous section, water, especially in private spaces, invokes luxury and status.323 As villas have been described as places of self-promotion and social difference, the addition of running water can only have elevated the status of a villa, especially in combination with other decorative programs.324

321 ThesCRA 2.3a.IV.A (s.v., Purificazione, Romana, Mezzi impiegati nelle purificazioni, liquidi e uguenti; V. Saladino).
322 Meyers 2009; Tayor 2009.
323 Zarmakoupi 2014, 141, 147.
324 On this conception of the Roman villa, see Zarmakoupi (2014, 213).
6.3 Water as Spectacle

Roman entertainments, especially in the empire, included aquatic spectacles. Among the various water-related spectacles in the Roman world were: *naumachiae* (mock sea battles); aquatic *venationes*; and hydromimes (shows in pools that included choreographed swimming).\(^{325}\) These spectacles were different than the other shows put on in the arenas of the Roman world. And because of that fact, either new structures had to be constructed (e.g., *naumachiae*) or pre-existing buildings had to be altered to accommodate large amounts of water. For example, in the latter part of the empire, theater orchestras were walled up and waterproofed to allow for pools, the *kolymbethra*.\(^{326}\) A number of these aquatic spectacles appear to illustrate historical battles, especially of the distant past, such as the battle between Corcyra and Corinth of 434 BCE, which Dio reports was staged in 80 CE in the Flavian Amphitheater of Rome.\(^{327}\) Kathleen Coleman demonstrates that these aquatic spectacles were lavish, which added to the perceived authenticity of the events by spectators.\(^{328}\) Further, the Romans did not restrict themselves to mock naval battles, but transformed Roman pantomime into hydromimes, or tableaus set in marine contexts.\(^{329}\) Water, in a sense, helped to create indelible experiences for Romans throughout the empire. Thus, the concept and performance of aquatic ‘spectacle’ can inform new discussions about the nature of the Roman tastes.

The Roman spectacle has received a great deal of scholarly attention in the last decade or so. The English word derives from the Latin *spectaculum*, which, for the Romans had a variety of meanings, including a sight or manifestation, entertainment in the form of a performance, or the structures associated with entertainment.\(^{330}\) The last definition is the most interesting for the present discussion. In Classical Latin, when *spectaculum* is used in the plural, *spectacula*, it is understood to mean “the places occupied by spectators in a theater, etc.”\(^{331}\)

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325 The most exhaustive resource on these aquatic spectacles of the Romans is Berlan-Bajard (2006), along with Coleman (1993). For more on *naumachiae*, see Cariou (2009). See also Traversari (1960) for a discussion of aquatic spectacles of Late Antiquity, with reconstruction drawings of entertainment complexes complete with hydromimes (by Italo Gismondi).
327 Dio 67.25.3. See Coleman’s discussion of this spectacle (1993, especially 60–2).
328 Coleman 1993, 73.
329 Coleman 1993, 49.
330 D’Arms 1999, 301.
331 *OLD* s.v., Spectaculum, 3. The associated literature for this definition is as follows: Pl. *Cur.* 647; Cic. *Har.* 22, Sest. 124; Vitr. 5.6.2; Liv. 1.35.9, 45.1.2; Ov. *Met.* 10.668; Calp. *Ecl.* 7.23; Tac. *Ann.* 14.13; Juv. 8.205; Fest. p. 84M; Suet. *Cal.* 31.
time of Pompey, it is known that in the Forum Romanum, there were spectacula made of wood.\footnote{Welch 2007, 32–3, 43–58. Welch describes the development of the spectacula in the Forum Romanum over the course of the middle to the end of the Republic (43–58).} The dedicatory inscription of the amphitheater of Pompeii, dated to about 70 BCE, describes the structure as a spectacula, not an amphitheater (CIL 10.852). This naturally raises the question of whether the spectacula were in fact the buildings themselves, or the entertainments taking place in those spaces.\footnote{Indeed, spectacula is used until Vitruvius first uses the neologism, amphitheatrum (Rawson 1987, 86–7). Davies (1997, 121, no. 83) argues that spectacula here would have only alluded to the entertainments taking place in the amphitheater, not the physical space, namely because of the attestation of amphitheatrum was by Vitruvius (1.7.1).} Such early use of spectacula is important here. Entertainment-related spaces could in fact be public spaces at large, an idea which at first glance might be jarring to a modern audience that is used to entertainments taking place in specially constructed spaces. Spectacle, then, in the Roman world can encompass a variety of different places and cannot be limited to just one type of space.

Spectacle can be defined in a number of ways. Cultural performances, as defined by sociologist John MacAloon, include spectacles, rituals, and festivals.\footnote{MacAloon 1966.} Diane Favro, building upon this idea, argues that “spectacles are expansive, open-ended events that evoke an array of emotions.”\footnote{Favro 1999, 205. See also Wiles (2003) for more on the performativity of space, including sacred, processional, and public spaces, among others. His discussion is tied intimately to conceptions of performativity and theatrical space throughout history.} In a similar manner, spectacles should amaze “by virtue of [their] nature, scale, or novelty.”\footnote{Edmondson 1999, 77. Edmondson explores the relationship with literary works and spectacles, especially how they both tend to follow certain patterns to be intelligible to viewers.} It follows easily that spectacles are often first associated with entertainment, such as the famous munera of the Romans.\footnote{See the work of Beacham (1991 and 1999) for more on the development of spectacle and entertainment in the empire, including how the emperor asserted his dominance through entertainments and how public life becomes more of a theatrical performance in the empire.} The munera provided performative events for the Roman public, and the populace would deem imperial munera successful based on their lavishness—for example, by the incorporation of exotic animals in the arena. The use of flowing water could potentially then be considered an entertainment, intended to delight the public with its ability to control and display water in innovative ways.
Entertainments in the Roman world were sponsored by one party, the benefactor, and viewed by other parties, the audience. The benefactors, given their economic ability to fund a spectacle, asserted their power and prestige through this benefaction, often gaining support, whether political or otherwise, from those in the audience, many of whom might be their own clients.338 In a sense, entertainments were a way in which Romans of the élite classes could define their relationship with their subordinates, using these spectacles as “vehicles of self-representation,” by showing their audience the way they wished to be viewed.339 Often, the entertainments put on during the empire would have pushed the boundaries of known and accepted spectacle, as Coleman demonstrates in her discussion of the aquatic displays of the Early Empire (e.g., the naumachiae, or ship battles, of Augustus).340 Such displays used entertainment in novel ways that would have been enjoyable to its audience, causing them to remember the event and the benefactor.

An important Roman office connected with spectacle is that of aedile. Because the duties of the aediles originally included those of the cura urbis (office of the city, connected with the urban prefect), cura annonae (office of grain allotments), and cura ludorum solemnnum (office of the games and religious ceremonies), this meant that the aediles supervised public building, such as the upkeep of temples and water supply, and put on spectacles for the populace. In the city of Rome, the aedileship was mainly relevant in the time before Augustus’ internal government reorganization, including the institution of the cura aquarum, which managed water; in Italian and provincial cities, however, the aedile’s functions did not diminish.341 It is the fact that aediles were intimately tied to public works and spectacle is interesting here because both often featured impressive water-related projects. Agrippa in 33 BCE, when he was installing the Aqua Virgo and the accompanying castella, lacus, and salientes, held the office of aedile. In addition, extant inscriptions occasionally reveal that aediles sponsored the building or restoration of water-displays. For example, two aediles, perhaps in the Early Empire, in Urbium Mataurense (modern Urbino, Italy), restored a saliens there after four years of disrepair (CIL 8.2631). One can imagine that the saliens provided not only necessary drinking water for the people of Urbumno, but also a display of flowing

341 For an overview of the aediles in the Republic, see Drogula (2000).
water in the street, which—especially after a four year hiatus—would have noticeably revitalized the street itself. The connection between the office of the aedile and water projects is, in the very least, suggestive of the nature of Roman public water works, and thus a link can also be drawn between the entertainment-related ventures of the aedile and his support of water features that had the potential to act as spectacles.

It is also important to consider the ephemerality of spectacle. Spectacles are part of cultural performance, which includes rituals and festivals, all of which often occur over the course of a day or series of days, relegating them to the memories of the audience following completion. While the audience certainly enjoyed and craved these public spectacles and entertainments, after they were done there was no physical reminder of them, with the exception of structures specifically built to house them or souvenirs purchased at the event. The water flowing through a fountain, for example, is ephemeral. But because the structure is permanent, the ephemeral nature of flowing water is superceded by the fountain. Despite the fact that the water drains away, the memory of the flowing water in a permanent structure continues on in the minds of viewers. In a sense, given the lasting nature of the permanent water-display, investment in that spectacle will last much longer for the patron, longer than the single day the traditional spectacle took. Water-displays then effectively combine ephemerality and permanency to create a unique style of spectacle in the Roman world.

Finally, spectacle is intimately tied to the space that it occupies. The place in which spectacle occurs would surely evoke for its audience different associations:

including historic activities that have occurred in the same place; the way it may have been specially fashioned or altered to take on unaccustomed symbolic meaning; and its location relative to other areas of urban space and their significance.

Favro expands this idea by asserting that “ancient urban locales played a part in the creation, presentation, and interpretation of public performances” and that “Roman urban sites augmented self-awareness likewise by serving as

342 For more on souvenirs in the Roman period, especially for tourists, see essays in the edited volume of Schmitz and Sieler (2013). An ephemeral spectacle, such as a triumph, could be captured in durable forms, such as on the Gemma Augustea. For more, see Kuttner (1999, 97 and 118).
repositories of human memory.” The locations where spectacles took place, then, would not only have been vital in the creation of the actual entertainment, but also would have created a long-lasting memory for the audience, associated with that particular location. For example, one can imagine approaching the Severan Septizodium in Rome, with its imposing three-storied façade, sumptuous statuary program, and cascading water. Coming from the south, one would enter the city at the Porta Capena, with the monumental backdrop of the fountain, adjacent to the Circus Maximus and the Palatine Hill. Passers-by, not only thirsty for the water, also made memories of approaching the fountain when they entered the city—illustrating the wealth and grandeur of the imperial capital.

Further, the Roman street offers another example of spectacle. Barbara Kellum asserts that the “the street was the pivotal performative arena in a visual culture where viewership was active and confrontational.” Here, however, the line between the spectacle and the spectator begins to break down, as the spectator becomes an active participant in the spectacle of the street. Unlike the entertainments that might occur in the arena, the street, with its walls covered with paintings and graffiti, would have been a spectacle in and of itself, and a place intimately familiar to the inhabitants of that space. Thus, place is integral to the spectacle, not only providing the space for the performance to occur, but also creating associated memories and new performance spaces for its audiences.

The use of water has not been included in the modern scholarship on spectacle, and yet, as has been demonstrated here, there are numerous reasons to draw this connection. There is an audience for water-related structures, especially fountains—those who enjoy the aesthetic and utilitarian aspects of the structure. With the audience, then, naturally comes the benefactor, who paid for the structure, helping to define the relationships between those with power and money and those dependent on them. Unlike other Roman spectacles, a fountain, for example, is not ephemeral, just as the amphitheater in Pompeii, known as a spectacula in an inscription, is not ephemeral, either. Water-displays are more than just a monumentum, a built structure that can

344 Favro 1999, 205.
345 Kellum 1999, 283.
346 Malissard (1994, 88–102) does use the term ‘spectacle’ to describe naumachiae, clepsydras (water clocks), hydraulic organs, and decorative fountains, but fails to offer a theoretical discussion of the term. For a discussion of theatricality and spectacle associated with Roman water, see Rogers (2015, 359–68).
aid in the preservation of memories.\textsuperscript{347} It might be suggested, then, that the water-display, like other permanent physical structures devoted to entertainment, could certainly be considered a \textit{spectaculum}, too. Indeed, as mentioned previously, many fountains, especially those grand façades found in the Roman East, suggest architectural forms also found in theaters.\textsuperscript{348} Further, the fountain is tied to place, given that it is a ‘living’ part of the urban landscape, especially in that water constantly flows through it, making it a dynamic structure of the city. As memory is tied to place, the audience would have created memories of the water-display by interacting with the structure over time. Indeed, in the Roman city, because the fountain is located in the streets, an inherently performative place, the lines between the audience and the spectacle are blurred, allowing for the audience to become active participants in the spectacle that is the water-display, whether enjoying the fountain itself or collecting water from its basins. While not a traditional Roman spectacle, such as the \textit{ludi gladiatori} in the arena, the actual water-display of the fountain would have nevertheless created a spectacle. And by extension, other water-related structures, such as aqueducts and baths, can be incorporated into a discussion of spectacle.

\subsection*{6.4 Shared Cultural Experience of Water}
Charles Moore, the modern architect who designed a number of water-related installations in his career, captured the essence of water that transcends time and different societies: “[The] \textit{architecture of water} [can be defined as] what physical laws govern its behavior, how the liquid acts and reacts with our senses, and, most of all, how its symbolism relates to us as human beings.”\textsuperscript{349} Indeed, such an assertion can also be associated with Romans and their interactions with water. Further, this experience translates easily into shared experiences that the Romans had with water, regardless of their time or location within the empire. The aim of this section is not to generalize about a large swath of geography over centuries with countless inhabitants, but to highlight salient points regarding the shared Roman cultural experience of water that

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\footnotesize\textsuperscript{347} Feldherr (1998, especially 21–5, 31–5) explores how Livy’s \textit{History} is like a \textit{monumentum}, a way to preserve history, which can be extended also to the built environment. See also Spencer (2007, 65).
\footnotesize\textsuperscript{349} Moore 1994, 15. One of Moore’s more interesting water-related projects was the Piazza d’Italia in New Orleans (completed in 1978). He was also noted for collaborating with the landscape architect Laurence Halprin.
\end{flushright}
can be linked to religious practices, issues of landscape, notions of consumption, and the idea of pleasure.

6.4.1 Religion
In Book Seven of the *Aeneid*, Latinus receives a prophecy concerning the impending arrival of the Trojans and how that would affect his daughter, Lavinia (*Aen. 7.81–84*). Latinus, then, goes to the shrine of his own father, Faunus. At the shrine, which is also surrounded by a grove, the landscape resounds with the sound of a sacred spring, the *fons sacer*. Servius, writing a commentary in the fourth century CE on the *Aeneid*, felt the need to gloss this particular phrase, stating that *nullus enim fons non sacer*, that is “for there is no spring that is not sacred” (*Ad Aen. 7.84*). Whether or not water was always sacred to the Romans has been discussed since the time of the modern German scholar, Georg Wissowa.\(^{350}\) It is proposed here that water was considered sacred by Romans in all contexts, given its own origins as a naturally occurring element associated with the gods.\(^{351}\)

The inherent qualities of water made it a special substance vital to the religious practice of the Romans, who were by no means the only ancient peoples who revered water.\(^{352}\) The purity of water was prized by the Romans, a fact that many Latin authors mention when explaining the qualities of good water. For example, Pliny the Younger describes the water associated with the shrine of the Clitumnus River as *purus et vitreus*, sparkling and clear like glass.\(^{353}\) The actual or symbolic purity of water seems to be an underlying factor in the

\(^{350}\) Wissowa 1902, 219–25.

\(^{351}\) For a full discussion of these issues, see Rogers (2015, 266–354), including an overview of the cult of the Roman nymphs.

\(^{352}\) While there is not space in the present work for a full discussion of the religious practice of the Romans regarding water, there are a number of recent publications that can guide the reader: Seppilli 1977, 53–65; Fabre 2004; Dall’Aglio 2009; Di Giuseppe and Serlorenzi 2010; Costa, Palahi, and Vivó 2011; Calderone 2012; Giontella 2012; Rogers 2015, 266–354. De Cazanove (2015) compactly problematizes the issues of water in religious practices of the Greek and Romans. For the Greeks, see: Cole (1988) and Fenet (2016), along with Osanna (2015) for Lucanian examples. For the Etruscans and the areas that they inhabited, see: Prayon 1990; Chellini 2002, 235; Dall’Aglio 2009, 72–94. For outside of Italy, see: Alcock 1965; Krug 1985, 172–185; Green 1986, 138–62; Alarcão 1988, 102; Bourgeois 1991; Bourgeois 1992a; Burgers 2001, 5–6; Bel Faïda 2002; Arnaldi 2004; Pérez and Miró 2011; Andreu Pintado 2012; Maier 2012.

reverence of the element. In fact, Servius mentions that the priestesses of Vesta must collect water from the running stream outside the Porta Capena, and they must not set the vessels holding the water on the ground, lest they be contaminated (and thus made impure by the earth). And thus, the pure quality of water made it an integral element in purification rites performed by the Romans, avoiding the taint of pollution. In the same vein, water was used in marriage rites, purifying the bride, usually in the form of a bath. The power of water, particularly in its life-giving and life-taking abilities, resonated with the Roman psyche, and, thus, played a significant role in Roman religious practice.

Archaeologically speaking, water was present in a number of different religious contexts in the Roman world. Most sacred spaces had some sort of small basin, a delabrum, for washing hands before entering the sanctuary. Large-scale water-displays are often found at sites in the eastern half of the empire, such as the Hadrianic fountain in the Forecourt at Eleusis. Source sanctuaries were popular religious sites, which allowed monumentalized veneration of water at its origins, such as at Zaghoan (Tunisia) and the recently discovered shrine at the start of the Aqua Traiana near Lake Bracciano, north of Rome. While source sanctuaries are found throughout the Roman world, they are most popular in the western half of the empire (especially the northern provinces), which is also true of sites associated with healing waters.

355 Ser. Ad Aen. 7.150. See also: Wissowa 1902, 180; Fantham 2012, 63. See Edlund-Berry (2006, 169) for the full bibliography of the ritual of the Vestal Virgins collecting water from the source of the Porta Capena.
356 ThesCRA 2.3a.IV.A (s.v., Purificazione, Romana, Mezzi impiegati nelle purificazioni, liquidi e unguenti; V. Saladino); De Cazanove 2015, 183–85. See Lennon (2012; 2014, 44–54) on the definition of pollution and the polluted, along with Fantham (2012).
358 Facchinetti 2008, 47.
359 Longfellow 2012, 135–41; Rogers 2015, 300–302; Rogers forthcoming. For more on the phenomenon of water-displays at sanctuary entrances, see Rogers (2015, 296–308).
360 On Zaghoan, see Longfellow (2011, 146–47), with earlier bibliography. On the shrine associated with the Aqua Traiana, see Taylor et al. (2010).
361 Source sanctuaries typically highlight the water of the source, providing a focus for the pilgrims. This is not to be confused with a water sanctuary, which is a more general term for a sanctuary associated with water, such as thermal water. For more on this difference, see: Scheid 1991; Gros 1996, 440; Ben Abed and Scheid 2003; de Cazanove and Scheid 2003, 6. See also Bourgeois (1992b), Aupert (2012, 294–96), and De Cazanove (2015, 186–90).
there is evidence for the display of water in structures associated with the imperial cult throughout the Roman world, such as at the sanctuary at Nîmes.\footnote{Rogers (2015, 308–20, 331–50) on source sanctuaries and healing sites. Of related interest is the research project \textit{VBI AQUAE IBI SALVS}, funded by the Universidad Nacional de Educación a Distancia (UNED), under the direction of María J. Peréx, is an online atlas of medicinal water sites, healing baths, and water cult throughout the Iberian Peninsula, still under construction.}

The available ancient evidence supports the notion that water was always sacred throughout the Roman world, perhaps with some gradations in the perceived sacredness of the water. While all water was considered sacred, presumably some waters were ‘more sacred’ than others. For example, the waters collected by the Vestal Virgins at the Porta Capena stream were more obviously sacred than the waters of the Clitumnus River downstream from the shrine mentioned by Pliny where people could go swimming. But when considering the built environments that displayed water in religious spaces, the veneration of water in various forms was present everywhere in some form. Regional differences might be associated with climatic differences based on geography. For example, the prevalence of source sanctuaries in France and Germany could be attributed to the abundant number of naturally occurring springs there (in addition to the presence of older indigenous cults related to water).\footnote{For more on the sanctuary at Nîmes, see: Anderson (2013, 186–90), with earlier bibliography, along with Rogers (2015, 327–30).} Water played an important role in Roman religion, and the fact must be an underlying point of discussion in studies on the water culture of Roman society. Indeed, the sacred nature of water was evidently a major factor in the prominence of water usage by the Romans. Water was a life-giving element that was a gift of the gods for the benefit of humans.

6.4.2 Landscape
Landscape is crucial to understanding the water culture of any society. The notion of landscape has a myriad of definitions and implications, but simply put, it can be thought of as “the symbolic perception of [the] natural environment, [...] the way in which people read that environment for meaning.”\footnote{Rogers 2015, 353. On the indigenous cults of water of Roman Gaul, see the works of Bourgeois (1991; 1992a).} While landscape is intimately tied to the environment and the idea of space or place, it is something more. Indeed, landscape “foregrounds cultural context and emphasizes the relationship between humankind, nature, and the inhabited...
Landscape gives meaning to the natural world, which must take into account the human transformation of the existing environment.

Landscape studies have risen to prominence in the field of Classics in the last few decades. Archaeology and anthropology have been instrumental in laying a strong foundation for the relationship between humans and the environments that surround them, such as cultural and natural landscapes. In Classical Archaeology landscape has been integral in breaking away from the confines of the traditional text-based approaches; archaeologists are letting the material remains tell the story of past Mediterranean societies.

A publication of 1996, *Human Landscapes in Classical Antiquity: Environment and Culture*, was an important starting point for the discussion of landscape in antiquity, in which scholars employed a variety of evidence to understand better ancient ecology. The integration of archaeological sciences with more traditional modes of historical research has helped push recent discussions about landscape in more productive directions. For example, Antonia Arnoldus-Huyzendveld, in her exploration of the landscape of the city of Rome, employs, among various approaches, climate archaeology, which has aided modern scholars in reconstructing the physicality of past landscapes.

In a recent Oxford University conference on fluvial landscapes new geo-archaeological methods were presented with respect to uncovering more details about the ancient climates of different rivers in the Roman world. A number of scholars have explored sacred landscapes, taking the built environment and the human activities that take place there as their starting point (in lieu of explorations of the relationships between humans and nature). A recent edited volume, *Valuing Landscape in Classical Antiquity: Natural Environment and Cultural Imagination*, explores landscape in the Mediterranean more fully, using a variety of philological and archaeological evidence, providing a better

365 Spencer 2010, 1.
368 See especially Athanassopoulos and Wandsnider (2004a) for a full discussion of these issues.
369 Shipley and Salmon 1996.
372 For example, see Cole (2004) and Käppel and Pothou (2015).
understanding of how ancient landscape was a cultural product of ancient Greeks and Romans.373

Diana Spencer has recently explored notions of Roman landscape. She demonstrates in her 2010 monograph, *Roman Landscape: Culture and Identity*, how the elements of the natural world, especially farms, gardens, and the countryside, were integral parts of what constituted being a Roman. Spencer uses theoretical models that have been prominent in a number of other disciplines (but not always in Classics), including aesthetics, hermeneutics, phenomenology, etc. While the work is short, Spencer’s provocative discussions leave the reader with the desire to explore those issues more fully—hopefully inspiring further integration of new archaeological evidence to illustrate Roman landscape better.

Robinson’s 2011 monograph on the Peirene spring at Corinth is an important development not only in landscape studies in the classical world, but also for water’s placement in landscape. Robinson successfully demonstrates the history of the spring, from its mythological, Greek, Roman, and subsequent pasts, while stressing the importance of the water itself. The historied spring of Peirene was intimately tied to the naturally flowing waters that started high on the adjacent hill of Acrocorinth and then showed up in the city center of ancient Corinth.374 The cultural identity that was associated with the spring, perhaps stemming from the natural hydrological landscape, was integral to Peirene’s fame throughout the Greek and Roman world.375

Finally, Adam Rogers in his 2013 monograph, *Water and Roman Urbanism: Towns, Waterscapes, Land Transformation, and Experience in Roman Britain*, argues that water is often taken for granted in studies of ancient Roman communities. Rogers demonstrates the need for a term such as ’waterscape’ that allows for the inclusion of naturally occurring water sources (for example, the economic importance of seafronts), which were integral to the culture of Roman urbanism.376 While the research questions of Rogers are ambitious—which is to say that they are not all answered—his conception of ‘waterscapes’

373 McInerney and Sluiter 2016b.

374 For more on the waters themselves, see Robinson (2011, 4–26), along with Landon (2003).

375 Robinson (2013) further explores the notions of culture and identity of Peirene and the other fountains of Corinth, especially their connections to mythological episodes, such as Bellerophon taming Pegasus at Peirene.

376 In addition to water found in terrestrial contexts, Anderson and Peters (2014) argue for exploring the human landscapes associated with the oceans of the world.
in the Roman world is crucial for better understanding Roman water culture. Simply put, water was everywhere, naturally occurring, and harnessed by people. Thus, scholars must integrate this element in all of its forms as much as possible.

The notion of landscape is crucial for scholars of Roman water. While many are concerned with its final appearance and use in the built environment of the Romans, its origins in the surrounding landscape were just as important. Further, scholars can continue to explore how artificially built structures in the countryside, such as aqueducts, not only change the landscape there, but also how those structures become part of the landscape itself. Scholarship on Roman landscape has explored how Roman structures and centuriation disrupted the existing landscapes, forever altering those spaces. For example, Purcell discusses how the Roman villa, which was part of centuriation (i.e., the division and allotment of lands), began to dot the countryside, thus shaping and changing it. And of the numerous activities that occurred in a rural villa or farmstead, the need of water was tantamount, meaning that with the Roman villa came water systems to supply those structures. Further, Robert Witcher argues that the act of centuriation by Romans in conquered territories was an act of “physical and symbolic violence,” in that “pre-existing people, places, and memories swept aside, and a new set of social relations and power asymmetries imposed on the landscape.” Thus, with the imposition of Roman aqueducts in the landscapes of the empire, the lives of rural residents were changed, which had positive and negative implications, ranging from the ability to have water to physical reminders of conquest.

Landscape studies concerning water in the Roman world have much to accomplish, but, with the current trends in the scholarship of Classics, perhaps more scholars will begin to integrate evidence to understand the Romans’ relationship with nature. Finally, just as Robinson placed the Peirene spring in its cultural and natural landscape, scholars of Roman water must continue examining these two notions of landscape, vital to the study of Roman water usage.

6.4.3 Water’s Role in Cultures of Consumption and Pleasure

Roman culture has always been noted for its embrace of pleasure. Images of hedonistic orgies and activities still remain in the popular imagination, often

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377 See the review of Rippon (2014), which explores some of the problems with the monograph.
378 Purcell 1995.
379 Purcell 1995, 171.
380 Witcher 2006, 57.
in the association with the decline of Roman morals. Some still believe that the vomitorium was a place where Romans could purge themselves of food to continue in their revelries; in reality vomitoria simply are the exits of Roman entertainment complexes. Indeed, Roman pleasure is a nuanced subject of study. The Early empire saw a rise in pleasurable practices, and this rise has prompted scholars to analyze the so-called ‘culture of consumption’ popular in the Roman Empire.

Ray Laurence’s 2009 monograph, *Roman Passions: A History of Pleasure in Imperial Rome*, explores the various facets of pleasure in the Roman Empire. Using different types of evidence, including literary, epigraphic, and archaeological, Laurence is able to demonstrate the nature of Roman pleasure, from private forms (e.g., food and wine consumption at a convivium), to more public (e.g., baths, violence in the arena), and more general forms (e.g., urban aesthetics). Laurence effectively shows that over the course of the first century CE a culture of consumption developed in Roman society, with its desire to produce new types of luxury goods and to build new environments to experience pleasure.

Part of the increase in the ‘pleasure culture’ of Roman society was the growth of a global economy that provided more goods and technologies. As other scholars have demonstrated, new building construction technologies impacted the Roman economy, with new types of building materials available through the open frontiers of the empire. Thus, the new construction abilities allowed for grander architectural forms that could cater to tastes that craved newer forms of pleasure. Andrew Wallace-Hadrill has also shown the role luxuries played in the Roman world, which caused a consumer revolution, but also brought the ire of Roman orators and writers in the first century BCE.

The growth of the Roman economy in the first two centuries CE was driven by “a desire within Roman society to buy into a culture of pleasure, in which those who could build, consumed and magnanimously gave money to enable

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382 The vomitorium as a vaulted passageway in the Roman theater and amphitheater is found in Macrobius (Sat. 6.4); see also Sear (2006, 6).
384 The notion of globalization has become popular in Roman studies in the last decade, such as with Hingley (2005) and De Angelis (2013). See also the collection of essays by Pitts and Versluys (2015) that offers new perspectives on the subject, along with a response by Van Oyen (2015).
the masses to experience pleasure.”387 Roman pleasure reached its apex in the second century CE, but declined by the fourth century.388 By the height of the empire, a multi-directional web of influence between pleasure, materials and technology, and economy had developed in the Roman world—all of which allowed for the experience of pleasure in various forms.

Roman uses of water fit well into a culture of pleasure. As has been alluded to throughout this discussion, Romans relished the pleasure of water. First and foremost to consider is the response to water by the five senses.389 As already mentioned, Vitruvius reminds his reader that water was essential not only for daily survival, but also pleasure (De arch. 8.1.1). Pliny the Younger’s letter to Domitius Apollinaris, which documents the amenities of Pliny’s Tuscan villa, catalogues the water features therein (Ep. 5.6). He even describes an ornamental pool inside the villa as strepitu visuque iucunda, “a pleasure to hear and to see” (5.6.23).390 Water, from its inherent physical properties, has the ability to delight and provide pleasure.

Pleasure of water also has the power to create sensory responses when added to man-made constructions, such as in baths or water-displays. In the case of the imperial thermae of Rome, resplendent with flowing water, grand architecture, and exotic decorations, the sensory experience of the bathing ritual was a tour de force.391 The water in the baths was also transformative physically and psychologically. The water itself in the rooms in and around the caldarium would have turned to steam. And the heat of the steam not only caused bathers to relax, but also dulled the senses, as vision in particular is hindered in a room full of steam. Moreover, the pleasure associated with water in the baths could also be extended to the activities that took place in those spaces, from relaxation to sexual adventures.392 Thus, while water can be a pleasure in and of itself, it is water’s ability to alter physical spaces—and one’s own sensory perceptions—that contributed to the ‘pleasure culture’ of Roman society.

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387 Laurence 2009, 162.
388 Laurence 2009, 162.
389 For an overview of ancient Roman responses to water using the five senses, see Rogers (2015, 105–28). On sensory experiences in Roman culture, see Toner (2014) and Betts (2017), which builds upon a growing trend in sensory studies related to the ancient world, such as the work of Hamilakis (2014). For more on the connections between Roman water-displays and sensory responses, see Rogers (2015; forthcoming).
390 Rogers 2013, 155; Rogers 2015, 94–105.
391 Yegül 2010, 6, 126–32.
392 On the same-sex sexual activities that took place in the Roman bath-house, see the article of Eger (2007), who compares the Roman baths with modern gay bath houses with great success. See also Laurence’s discussion (2009, 63–74), based on Eger’s arguments.
Romans’ ‘culture of pleasure’ prompted changes in the architecture of water-related structures. Seneca the Younger in *Letter* 56 laments how bathing complexes have changed from the austere structures of the time of Scipio Africanus to Seneca’s own day in the first century CE. With some panache, Seneca describes the new baths:

Pauper sibi videtur ac sordidus nisi parietes magnis et pretiosis orbibus refulserunt, nisi Alexandrina marmora Numidicis crustis distincta sunt, nisi illis undique operosa et in picturae modum variata circumlitio pretexitur, nisi vitro absconditur camera, nisi Thasius lapis, quondam rarum in aliquo spectaculum templo, piscinas nostras circumdedit, in quas multa sudatione corpora exsaniata demittimus, nisi aquam argentea epitonia fuderunt. Et adhuc plebeias fistulas loquor: quid cum ad balnea libertinorum pervenero? Quantum statuarum, quantum columnarum est nihil sustinentium sed in ornamentum positarum impensae causa! quantum aquarum per gradus cum fragore labentium! Eo deliciarum pervenimus ut nisi gemmas calcare nolimus.

*Ep. 86.6–7*

But who in these days could bear to bathe in such a fashion [as Scipio]? We think ourselves poor and mean if our walls are not resplendent with large and costly mirrors; if our marbles from Alexandria are not set off by mosaics of Numidian stone, if their borders are not faced over on all sides with difficult patterns, arranged in many colors like paintings; if our vaulted ceilings are not buried in glass; if our swimming-pools are not lined with Thasian marble, once a rare and wonderful sight in any temple—pools into which we let down our bodies after they have been drained weak by abundant perspiration; and finally, if the water has not poured from silver spigots. I have so far been speaking of the ordinary bathing-establishments; what shall I say when I come to those of the freedmen? What a vast number of statues, of columns that support nothing, but are built for decoration, merely in order to spend money! And what masses of water that fall crashing from level to level! We have become so luxurious that we will have nothing but precious stones to walk upon.

*Trans. R.M. Gummere*

In addition to the presence of exotic marbles and statues, Seneca states that the vaulted ceilings can accommodate windows, which allow sunlight to penetrate
the baths. Further, there is an abundance of water flowing in the baths, ‘crashing from level to level,’ which certainly changed its physical appearance as it flowed down each level, while at the same time the sound of its movement filled the space with noise. Again, the insatiable culture of consumption in the first and second centuries CE of the empire fueled the popularity of water structures and the many pleasures that they afforded, like bath-houses. Bruun has recently argued that the display of water in public baths was the only time that ancient writers could attack the luxurious use of water, especially because it could lead to other unsavory behaviors in the baths. The growth of the empire, from its frontiers, to its economy, to advances in building technology, only allowed for a greater exploitation by Romans of the pleasurable qualities of water, despite continued moral attacks.

While water has important life-giving qualities that Romans depended on for survival, because of the vast resources available to the state, the more pleasurable, luxurious aspects of water were also showcased throughout the empire. Indeed, pleasure transcends utility. With new ways to construct physical environments, Romans created novel and spectacular methods for using and displaying water. Although these constructions often served utilitarian purposes, the collective desire to experience the pleasures of water in a variety of contexts prompted the proliferation of water structures across the Mediterranean during the High Roman Empire. Thus, Roman pleasure culture played a significant role in the development of empire-wide trends in building and using water structures; this phenomenon is integral to understanding the complex nature of Roman water culture.

7 Conclusions

The culture of water in Roman society was pervasive, but malleable. The dissemination of water technologies allowed for the growth of cities throughout the empire, no matter their location, since large urban centers are

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393 For more on windows, especially at the Baths of Carcalla, see Yegül (2010, 113). On the practice of Roman sunbathing, see Zarmakoupi (2014, 163–74).
394 Laurence 2009, 66.
395 Bruun 2016a. In his article, Bruun argues that while Latin writers were castigating private luxuries, private water use in the city of Rome was not attacked, as private water rights were tied to an imperial benefaction (and thus to the emperor himself). It was only the public baths of the era that led to moralistic admonitions.
unsustainable without a sufficient and reliable water source. Again, Roman water culture was not monolithic, meaning that, while there was a common, inherent need to have water and a desire to use and to display it in some way, different communities throughout the empire used water-related structures of varying degrees of scale and complexity.

A notion of adaptive water culture strongly parallels current arguments regarding the conception of Roman identity. Over the last two decades, scholars have begun to demonstrate the nuances of Roman identity throughout the empire—namely that it was “dynamic, continually evolving, and changing.” For example, Amanda Kelly has shown how Roman bathhouses on Crete are a mixture of Roman and indigenous elements, demonstrating how a population can still craft their own identity, while also exhibiting identifiable Roman traits. Paolo Vitti has shown how vaulting techniques in the Peloponnese incorporated not only technology from Rome and Northern Italy, but also local techniques, creating a unique type of vaulting (using more bricks and less concrete mortar) that was employed in structures like aqueducts and fountains. Roman identity is not straightforward, and it is unfair to prescribe a blanket culture of water for all of the inhabitants of the vast empire. But throughout the Roman world, elements of Roman water culture were employed to varying degrees, which helped to tie the various peoples of the empire together. Water, regardless of its context, helps to establish, foster, and reinforce communal senses of identity. Thus, water culture is an important avenue of investigation for understanding better the other cultural, social, political, and economic aspects of Roman life.

The work of many of the scholars presented here has helped to discern avenues of further inquiry into Roman water culture. As Hodge prescribed in 1991, the future currents of the field should include the better integration of technology and engineering studies with historical explorations of Roman water structures. To a certain extent, this is being achieved by meetings of the Frontinus Gesellschaft and other scholars, such as Richard (2012). In the same

396 Wilson 2012, 3.
397 Mattingly 2004, 10. The scholarship related to Roman identity is ever-growing and naturally complex. For more, see the discussions in Revell (2009; 2016) and in the edited volume of Gardner, Herring, and Lomas (2013). Revell also explores the notions of ‘ethnic identities’ in the Roman Empire (2016, 19–39).
398 Kelly 2013.
399 Vitti 2016.
400 Ceccarelli 2012, 1.
vein, scholars are beginning to study water systems more holistically, highlighting where water comes from, how it arrives in an urban setting, and how it is consumed. New evidence, especially when approached with new methodologies and archaeological technologies, has allowed scholars to rethink canonical elements of Roman water culture. Lead poisoning and ancient issues of hygiene are at the forefront of this discussion.

There is still more to be done, however. The field would benefit from larger diachronic and regional studies to provide a more complete understanding of just how water was sourced, collected, and used. But this is, naturally, a difficult task, not only due to the extent of the empire and its centuries of water usage, but also the available evidence, which is so expansive that it is almost impossible to synthesize fully. The goal of this contribution was to illustrate some of the most important issues facing scholars concerning the perception, use, and enjoyment of water during the Roman period. Water had an enormous impact on the growth and success of the empire; even after its collapse, Roman methods of exploiting water were continued by subsequent peoples—demonstrating the social and cultural importance of water in all time periods. By studying water in the Roman world, scholars can better understand other related elements of Roman culture, allowing for more nuanced discussions of the Romans themselves, and their relationships with other groups of people, let alone nature itself.

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