Bridges in the Ancient Mediterranean

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Anna Klara Falke, Florian Neitmann, Aleksandar Simić (Eds.)

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Introduction

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This anthology provides a comprehensive exploration of ancient bridge constructions across various cultures in the Mediterranean world, offering fresh insights into the historical context of these structures. As river courses, straits, and gorges have always formed natural obstacles, the need to cross water was a crucial aspect of ancient life. Many larger and smaller rivers traverse the Mediterranean world.[1] When simple methods – tree trunks or stones in the riverbed, wading through the water, or swimming – were no longer sufficient, other aids had to be added. Various options were developed in Antiquity, such as fords, ferries, or bridges. It can be seen that the construction of bridges, even if only with simple wooden beams, was developed at an early stage. Bridges were, therefore, built earlier than roads in some cultures. The type of crossing is related to natural conditions and technical knowledge. Moreover, it is determined by the specific demands. For example, crossings can be built for temporary or permanent purposes. Thus, bridges are an essential part of the infrastructure that is fundamental to the Mediterranean region. Lucien Febvre, one of the founders of the *Annales* school, already stated: "La Méditerranée, ce sont des routes."[2] Fernand Braudel, who coined the term of the "Mediterranean world," also emphasizes that roads were an important component that allowed movement and thus led to a sense of proximity that enabled the Mediterranean region to be understood as a single entity.[3] He sees streets and cities as the result of humans' exploitation of space.[4] Even though Braudel did not mention bridges themselves, his considerations on the significance of streets point to the fact that the construction of bridges is also relevant to opening up the area and making the roads more accessible to travel. This is particularly evident in Western European countries, such as France and Spain, where many Roman stone bridges across wide rivers have been preserved. In this volume, several bridges across the Mediterranean region are examined in detail, both with regard to their physical aspects and to their significance in ancient cultures.

Bridges have been important structures used for various purposes since ancient times and up to the present day. Due to their sheer size, they often

1 See for example Koller – Lichtenberger – Bernhardt 2019.
2 Bloch – Febvre 1940, 70.
3 Braudel 1990, 400.
4 Braudel 1990, 401.

stand out in the landscape. Remains of stone bridges bear witness to the structures of times gone by. In contrast, wooden bridges or ferries can no longer be traced archaeologically in many parts of the Mediterranean world. Regardless of their specific material, location, and function, bridges still have a special significance today. This includes not only their functional but also their symbolic significance. Accordingly, they are a widespread motif in arts and popular culture.

First, the term "bridge" needs to be defined more precisely.[5] Logically, a bridge's purpose is to connect two geographical points in a line as short and straight as possible. This applies to road structure and water supply (aqueduct bridges). However, due to natural conditions or artificial obstacles, certain aids are necessary to ensure this short connection. Accordingly, building bridges, dams, or tunnels to cross over or through obstacles when constructing a road or an aqueduct is essential.[6] Furthermore, financial and economic issues play a crucial role in deciding which types of construction should be built. In the case of a watercourse, a bridge is the only way to cross unless the water is dammed. It must be carefully weighed whether it makes more sense to build a bridge or to establish the connection via a different route that bypasses the obstacle. Based on these considerations, a bridge can be defined as *a constant architectural-technical structure that crosses a linear, moving obstacle such as a river*.[7] In accordance with this definition, Jochen Briegleb in his 1964 doctoral thesis on pre-Roman stone bridges conceives a bridge as a functional structure.[8] Following this approach, a bridge consists of a roadway to ensure the connection, be it a road or an aqueduct, and at least one opening to allow the river or stream to flow through it. Pontoon bridges are a particular type of bridge.

Bridge structures can be divided into three aspects:[9]

1. appearance: beam, causeway, or arch bridge;
2. construction technique: beams, corbels, or wedge stones;
3. construction material: wood, stone (including brick), and pontoon/ship bridges.

5 See Steinkrüger in this volume.
6 Briegleb 1971, 15.
7 Briegleb 1971, 16.
8 Briegleb 1971, 16.
9 For the following cf. Sauer 2016, 70–72.

Accordingly, the term "bridge" refers to various types of construction. In contrast to the comprehensive term "bridge," several ancient languages distinguished more fundamentally between those various types.[10]

In Ancient Greek, for example, the term γέφυρα (*géphyra*) refers to architectural or permanent bridges. In contrast, the term σχεδία (*schedía*) refers to temporary bridges, including rafts, and ζεύγμα (*zeugma*) to ship bridges. Therefore, Ancient Greek has different terms for the different types of bridges.

The Latin word *pons* only describes a crossing with a roadway. Accordingly, this word excludes aqueduct bridges, which were referred to as "aqueducts." As this type of bridge is already a well-plowed field of scholarship and raises completely different research questions, it is not included in this anthology. Instead, the focus here is solely on road bridges. Especially in Roman times, the construction of roads in newly conquered territories was the task of the military, which included the construction of bridges. It can be seen that, initially, wooden bridges were built, which were later replaced by stone bridges. Heinz Cüppers, who worked intensively on the Roman bridge in Trier (Germany), also points out that the bridge-building technique is only described in military sources from antiquity, thus confirming the embeddedness of bridge building in the military (see below).[11]

Latin sources reveal a nuanced terminology of bridges. The term *pontes longi* always refers to crossings in marshy areas, and this term only appears in the plural.[12] The word appears in a military context, so the importance of bridges for the movement of troops becomes clear. Other adjectives were used in Latin to define the material of the bridge in more detail, such as *pons sublicius* for wooden bridges, *pons lapidis* for stone bridges, and *pons navalis* for pontoon bridges. The term *pons tumultuarius* was also used for temporary bridges. Bridges could also be described as old or new (*pons novus, pons vetus*), long or short (*pons longus, pons exiguus*), wide or narrow (*pons amplus, pons angustus*). The plural *pontes* seems to have referred to bridges with several arches, not necessarily several bridges.[13] For this reason, written mentions of *pontes*, for example, on milestones, must be examined closely, as they do not mean several bridges. Thus the Latin name also differs from modern names of the structures, as bridges are not differentiated based on the number of arches.

10 For the terminology in various languages, see the contribution by Robert Kade in the present volume.

11 Cüppers 1969, 161; Goldsworthy 2003, 146–149.

12 Galliazzo 1995, 64; for example, Tac. Ann. 1.63.3; 1.49.4; Herodian 3.14.5.

13 Galliazzo 1995, 154.

This means the various buildings were already given different names in antiquity, demonstrating their importance. Therefore, different types of bridges were linguistically differentiated from one another in both Greek and Latin. While in Greek, there are different terms for the different construction methods and purposes of the bridges, in Latin, the structures are described more precisely by adjectives.

The present volume aims to better understand the significance of bridges in ancient Mediterranean cultures. Their function is not limited to the fact that they are part of roads. The aim is to show how bridges were perceived in Antiquity and why they were built. In this way, a contribution is made to the historical regional studies and road research of the respective region. Moreover, the relationships between humans and their environment are addressed in a broader context. Bridges are brought to the fore from this perspective, and road research is thus perceived differently. This anthology is not an exhaustive account of bridges, but it aims to elucidate various cultural, military, and other aspects of them.

The anthology begins with linguistic considerations about bridges. Robert Kade's article describes fundamental reflections on the linguistic development of the term "bridge" in different cultures. Kade explores the etymology of various terms for "bridge" in various Indo-European languages. Moreover, he thoroughly investigates the terms for crossings of natural obstacles in ancient Near Eastern languages, including Egyptian evidence. Through his survey of the relevant texts, he points to substantial differences between river crossings in Mesopotamia and Egypt. Even if his study partly goes beyond the Mediterranean region, it shows the development of the terminology up to the present day. In this way, the understanding and perception of river crossing in ancient cultures becomes clear. On this basis, the following contributions in this volume can be placed in a wider context.

A comprehensive approach to bridges from a philosophical perspective is presented in the following article by Michael Boch. He analyzes Martin Heidegger's thoughts on the bridge within Heidegger's phenomenological understanding of space as a hermeneutical category, focusing on the concepts of "place" and "dwelling." Taking up the adaptation of Heidegger's ideas by Julian Thomas, Boch gives an impulse to further considerations on bridges across several disciplines. In doing so, he impressively demonstrates how modern philosophical and other considerations can also influence and broaden our view of ancient bridges.

In addition to linguistic aspects, it is also interesting to take a closer look at the development of bridge-building techniques. In this respect, Roman stone arch bridges, many of which are still preserved today, stand out in particular.

It should be noted that bridge-building techniques were further developed in Roman times, not least due to new technologies such as *opus caementitium*. However, in other cultures in the Mediterranean world and beyond, a tradition of bridge-building developed long before Roman rule. A brick structure in Tello, the Sumerian Girsu, is cited as possibly the oldest bridge. The site may date back to the end of the 3rd century BCE.[14] The Büyükkaya Bridge in Hatussa (Bogazköy) from the 13th century BCE is considered the oldest confirmed bridge. It was supported by stone bridgeheads and had a wooden deck.[15]

It can be seen that the construction of bridges developed differently in different cultures. The following four articles deal with river crossing at different times and cultures in the Mediterranean region. Ulrike Steinkrüger surveys wooden bridges in the Alpine region and the German Low Mountain Range Zone from the Neolithic period through the Iron Age, demonstrating a development towards larger and more stable structures. Besides the construction techniques, she also considers the functions of pre-Roman bridges, which may have included military and cultic purposes. Therefore, she focuses geographically outside of the Mediterranean region, but her considerations on wooden bridges should be understood broadly. It is of particular importance that she emphasizes that wooden bridges were not only built for temporary purposes but were also used in the long term. Considering the military purposes of bridges is also decisive for other cultures in the Mediterranean region, as already emphasized above in connection with Roman bridge building.

Another contribution that spans across a wide temporal range is Luca Volpi's study of the various ways of crossing the Tigris River. His investigation underlines the inextricable link between the natural conditions of a river and the possibilities of crossing it. Accordingly, his study combines data from archaeological, historical, and cartographic observations with climatic and environmental aspects. This makes it clear that investigating bridges and other river-crossing options cannot be carried out comprehensively without considering the rivers. Volpi's study is limited to a large river that does not belong to the Mediterranean region. Still, the basic considerations show how important such studies are for the rivers of the Mediterranean region as well.

The following article takes us beyond Antiquity, covering bridges up to the Middle Ages. Andrew Petersen's study of pre-modern bridges in Iraq covers a wide temporal scope. Petersen traces the evolution of bridge technology from ancient structures like the Girsu bridge to the Jerwan Aqueduct and through

14 Bagg 2011, 43.

15 Bagg 2011, 43; Naumann 1963.

the Sasanian and Islamic periods. Moreover, he underlines the necessity of further research to document and understand these bridges comprehensively. This will also shed light on the technological achievements of ancient Mesopotamia and the dynamic interaction between humans and their environment in the regions along the Tigris and Euphrates rivers, as elaborated in Luca Volpi's article.[16]

Several examples from the eastern edge of the Roman empire are examined by Anna Klara Falke in her article on crossings over the Jordan River. She critically discusses the evidence that speaks for or against the existence of Roman bridges across the Jordan River, broadening the view beyond the Roman period to the manifold ways of crossing the famous river through the ages. This shows that even in the other provinces not so strongly characterized by large rivers, ways were sought to cross the smaller watercourses. The development of stone-arched bridges became widespread. However, stone bridges did not completely replace all other options for crossing rivers; on the contrary, they continued to be used. The study of the development shows the use and crossing of the Jordan River in the *longue durée*.

It turns out that permanent stone bridges were not built in all cultures. Fords, wooden bridges, or other options were often sufficient to cross a river on dry feet temporarily. However, even with the further development of bridge building in Roman times, the construction of wooden bridges and the use of other options did not end. What is interesting here is the comparative question of the specific advantages of the different types of bridges. The present anthology provides various examples from the Mediterranean region but is by no means an exhaustive treatment of the subject. It should also be noted that hardly any or no bridges were built in some regions. For example, there were no bridges over the Nile in Ancient Egypt.[17] In Greece, which was divided into small areas by the various poleis, bridges are only found in connection with processionary roads.

As mentioned above, bridges often facilitated military campaigns, which is illustrated by several Greek and Latin sources. One of the most famous examples is Xerxes' Bridge over the Hellespont, which according to Herodotus was built during the campaign of the Persian king Xerxes I against Greece in the fifth century BCE. However, as a storm destroyed the bridge shortly after its completion, Xerxes had the Hellespont flogged as punishment:

16 See also the legendary account on Semiramis' bridge across the Euphrates in Diodorus Siculus 2.8.2–3.

17 See Kade in this volume.

> The men who had been given this assignment made bridges starting from Abydos across to that headland; the Phoenicians one of flaxen cables, and the Egyptians a papyrus one. From Abydos to the opposite shore it is a distance of seven stadia. But no sooner had the strait been bridged than a great storm swept down, breaking and scattering everything. When Xerxes heard of this, he was very angry and commanded that the Hellespont be whipped with three hundred lashes, and a pair of fetters be thrown into the sea. I have even heard that he sent branders with them to brand the Hellespont. (Herodotus 7.34–35)[18]

Herodotus also provides a detailed account of the immediate rebuilding of the bridge, including the materials and building techniques employed (7.36).[19]

Another example mentioned in historical sources is Caesar's bridge over the Rhine, which was built during the Gallic War. Caesar describes in detail how the bridge was built, which illustrates interesting details about the material, logistic, and technical aspects involved:

> Caesar, for those reasons which I have mentioned, had resolved to cross the Rhine; but to cross by ships he neither deemed to be sufficiently safe, nor considered consistent with his own dignity or that of the Roman people. Therefore, although the greatest difficulty in forming a bridge was presented to him, on account of the breadth, rapidity, and depth of the river, he nevertheless considered that it ought to be attempted by him, or that his army ought not otherwise to be led over. He devised this plan of a bridge. He joined together at the distance of two feet, two piles, each a foot and a half thick, sharpened a little at the lower end, and proportioned in length, to the depth of the river. After he had, by means of engines, sunk these into the river, and fixed them at the bottom, and then driven them in with rammers, not quite perpendicularly, dike a stake, but bending forward and sloping, so as to incline in the direction of the current of the river; he also placed two [other piles] opposite to these, at the distance of forty feet lower down, fastened together in the same manner, but directed against the force and current of the river. Both these, moreover, were kept firmly apart by beams two feet thick (the space which the binding of the piles occupied), laid in at their extremities between two braces on each side, and in consequence of these being in different directions and fastened on sides the one opposite to the other, so great was the strength of the work, and such the arrangement of the

18 ἐς ταύτην ὦν τὴν ἀκτὴν ἐξ Ἀβύδου ὁρμώμενοι ἐγεφύρουν τοῖσι προσέκειτο, τὴν μὲν λευκολίνου Φοίνικες, τὴν δ᾽ ἑτέρην τὴν βυβλίνην Αἰγύπτιοι. ἔστι δὲ ἑπτὰ στάδιοι ἐξ Ἀβύδου ἐς τὴν ἀπαντίον. καὶ δὴ ἐζευγμένου τοῦ πόρου ἐπιγενόμενος χειμὼν μέγας συνέκοψέ τε ἐκεῖνα πάντα καὶ διέλυσε. ὡς δ᾽ ἐπύθετο Ξέρξης, δεινὰ ποιεύμενος τὸν Ἑλλήσποντον ἐκέλευσε τριηκοσίας ἐπικέσθαι μάστιγι πληγὰς καὶ κατεῖναι ἐς τὸ πέλαγος πεδέων ζεῦγος. ἤδη δὲ ἤκουσα ὡς καὶ στιγέας ἅμα τούτοισι ἀπέπεμψε στίξοντας τὸν Ἑλλήσποντον. Godley's Translation, http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.01.0126%3Abook%3D7%3Achapter%3D35%3Asection%3D1.

19 On the reception of this episode in Procop's Work *On Buildings*, see Biamino in the present volume.

> materials, that in proportion as the greater body of water dashed against the bridge, so much the closer were its parts held fastened together. These beams were bound together by timber laid over them, in the direction of the length of the bridge, and were [then] covered over with laths and hurdles; and in addition to this, piles were driven into the water obliquely, at the lower side of the bridge, and these, serving as buttresses, and being connected with every portion of the work, sustained the force of the stream: and there were others also above the bridge, at a moderate distance; that if trunks of trees or vessels were floated down the river by the barbarians for the purpose of destroying the work, the violence of such things might be diminished by these defenses, and might not injure the bridge. (Caes. Gall. 4.17.3–10)[20]

The military significance of bridges is investigated in more detail in the following two studies. Miloš Macan's article refers to a famous chapter in history, the conquests of Alexander. However, by studying how his army crossed rivers, he focuses on an aspect that has gained little attention both in ancient records and in modern scholarship. As he demonstrates, Alexander's troops commonly employed three methods of overcoming rivers: building pontoon bridges, fording, or using rafts. Various options are therefore used here to cross rivers. It is particularly important that the bridges can be erected quickly, especially in the case of military actions. It is impressively shown how experienced the troops are in building bridges so that their movements follow quickly.

The subsequent article is devoted to an example from Roman times. Aleksandar Simić examines the so-called "Trajan's Bridge" across the Danube in the Djerdap region of present-day Serbia. As Simić's study includes previous ways to cross the Danube in that region, he elaborates on the continuity with local culture and the innovative dimension of the Roman bridge. Furthermore,

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20 rationem pontis hanc instituit: tigna bina sesquipedalia paulum ab imo praeacuta dimensa ad altitudinem fluminis intervallo pedum duorum inter se iungebat. haec cum machinationibus immissa in flumen defixerat festuculisque adegerat, non sublicae modo derecte ad perpendiculum, sed prone ac fastigate, ut secundum naturam fluminis procumberent, his item contraria duo ad eundem modum diiuncta intervallo pedum quadragenum ab inferiore parte contra vim atque impetum fluminis conversa statuebat. haec utraque insuper bipedalibus trabibus immissis, quantum eorum tignorum iunctura distabat, binis utrimque fibulis ab extrema parte distinebantur. quibus disclusis atque in contrariam partem revinctis tanta erat operis firmitudo atque ea rerum natura, ut, quo maior vis aquae se incitavisset, hoc artius inligata tenerentur. haec derecta materia iniecta contexebantur et longuriis cratibusque consternebantur. ac nihilo setius sublicae et ad inferiorem partem fluminis oblique agebantur, quae pro ariete subiectae et cum omni opere coniunctae vim fluminis exciperent, et aliae item supra pontem mediocri spatio, ut si arborum trunci sive naves deiciendi operis causa essent a barbaris missae, his defensoribus earum rerum vis minueretur neu ponti nocerent. McDevitte's and Bohn's translation, https://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.02.0001%3Abook%3D4%3Achapter%3D17.

he illuminates the military function of the bridge by placing it in the historical context of the Roman expansion into Dacia and their withdrawal from that region. This shows the extent to which bridges can be used to trace historical events and how the buildings can contribute to understanding the times. Once again, the military aspect is emphasized here, making cultural developments comprehensible.

The study of river crossings also includes their potential religious significance. As a river potentially poses a deadly threat to the life of a human being, the act of crossing it can be charged with existential meaning. Accordingly, several sources from ancient Greece attest to the belief that the respective deities must be appeased before crossing a river.[21] This implies that the act of crossing requires some protection against threatening forces from the divine sphere. This aspect is addressed in the following article by Isidora Tolić. She provides a case study of the ritual embedding of a bridge from ancient Greece, the tradition of mockery on the bridge over the river Kephissos within the Eleusinian ritual complex. Tolić interprets this ritual as a case of apotropaic aischrology, which has the purpose to protect the members of the Eleusinian procession in their vulnerable moments, during the transition from the public to the private part of Eleusinian rituals.

An example of the symbolic significance of bridges at the intersection of politics and theology is analyzed by Martina Biamino in her article on Justinian's bridges as presented in Procopius's work *De Aedificiis*, where the Byzantine emperor himself is propagated as a bridge-builder and a personified bridge. This article demonstrates the importance of examining the archaeological evidence in the context of written accounts. It is precisely the interplay between the two types of sources that allows for a comprehensive analysis.[22]

The following section is devoted to Roman bridges throughout the Mediterranean world. In the Roman period, bridges were built in many regions across the empire, which was facilitated by technical innovation. In particular, the technique of stone arches was constantly developed further, and the use of opus caementitium was fundamental to this. Before we get to the specific case studies offered here, some general works in the area of Roman bridges must be mentioned. The first comprehensive cataloging of Roman bridges was carried out in 1963 by Piero Gazzola in his work "Ponti Romani."[23] Equally

21 For example, Hes. Op., 737–741; Arr. exped. Alex., 5.3.5–6; cf. Jones 2005, 19.

22 For the development of bridge building from the Roman to the Byzantine period and the connection to Christian religion in the latter, see the comprehensive studies Fingarova 2014; Fingarova 2021.

23 Gazzola 1963.

fundamental is the work by Vittorio Galliazzo of 1995.[24] He compiled a catalog of Roman bridges and developed a concept for their categorization. Other works that deal with Roman bridges generally address primarily structural issues. The monographs "Roman Bridges" by Colin O'Connor[25] and "Roads and Bridges of the Roman Empire" by Horst Barow[26] should be mentioned here as fundamental works. However, none of these studies deals with constructing bridges throughout Antiquity across different regions and cultures.

In addition, many previous studies have focused on the architectural history of bridges, which is also important in this anthology. It should be emphasized that Vitruvius in his work *De architectura* does not describe exactly how bridges were built. Therefore, detailed studies are only possible based on preserved bridges, which can be used to reconstruct the way they were built. Such detailed studies of individual bridges are provided by the next two articles.[27] Moritz Reinäcker offers a meticulous study of the Ponte di Augusto at Narni, Italy, carefully delineating the different construction periods, analyzing the changing building techniques involved, and explaining the importance of construction history. Thus, he demonstrates that detailed building surveys are necessary to accurately date bridges. Overall, it should be noted that it is very difficult to date round arch bridges made of stone if they do not bear an inscription stating the date of construction. Many of these bridges have been restored or redesigned several times over the centuries, making it almost impossible to reconstruct their original date. Analyses of the building history help to date the structures precisely and, therefore, offer great potential for archaeological research into bridge structures. This reaffirms the need for interdisciplinary research on ancient bridge construction.

The above-mentioned difficulty in determining the location of bridges and the importance of historical building surveys are made clear once again in the following article. Whether a historical bridge is of Roman origin is not always certain. One such example from the western edge of the Roman empire is the Bayyana bridge in Almería, Spain, which is analyzed by Patricia Argüelles, Enrique Aragón and M. Juana López-Medina. Their study of the bridge gives fresh insights into the use of non-invasive methods in establishing the evidence that points to a Roman origin. At the same time, the article illustrates the current significance of studies on (presumably) Roman bridges and the potentials of new methods in archaeological research, including digital reconstruction.

24 Galliazzo 1995.
25 O'Connor 1993.
26 Barow 2003.
27 See also the contribution by Anna Klara Falke mentioned above.

In sum, bridges are much more than just a part of the infrastructure: they enable communication, traffic, and transfer across different parts of the country, cities, and communities. Moreover, they symbolize the overcoming of natural obstacles and barriers and the widening of what people perceive as reality.

This anthology emerged from the workshop "Bridges in Antiquity" on July 29 and 30, 2022, at the University of Münster, organized by Anna Klara Falke and Florian Neitmann. The idea for this workshop arose from Falke's doctoral thesis on ancient bridges in the Near East.

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