SELEVCIA IX, 2019, 75-90
ISSN 2148-4120

Makale Geliş | Received : 29 Mart 2019
Makale Kabul | Accepted : 15 Mayıs 2019

The Far Side of the Bridge: Eastern Perspectives on Roman Bridge Technology

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Köprünün Öteki Ucu: Roma Köprü Teknolojisine Doğulu Bakış Açısı

Öz

Roma ordusu köprüleri hem askeri birliklerin intikali, hem de propaganda amaçlı olarak kullanmıştır. Etkin ve hızlı kurulumları gerçekleştirilen bu yapılar Roma teknolojisinin ve lojistik becerisini yansıtmakta, imparatorluğun sınır boylarında düşmanı korkutmakta ve etkilemektedir. Köprü yapımı konusunda bilinenler, mimari yapıların oluşturulmasındaki Roma yaklaşımını da vurgulamaktadır. Bu çalışmada iki ayrı örnekten yola çıkılarak Roma köprü mühendisliği konusundaki Doğulu düşünceler incelenmekte, konu ile ilgili "öteki tarafın" bakış açısına yer verilmektedir. Bunlardan ilki, Partların yenilgiye uğramış Romalıları aşağılamak ve onların kazandıkları başarıların değerini düşürmek amacıyla köprüyü kullanmalarıdır. Diğer örnek ise Sasanilerin uzak diyarlarda köprü inşa etmek üzere Romalı esirleri görevlendirerek, köprü teknolojisini kullanmalarıdır.

Anahtar Sözcükler: Roma mimarisi, Köprü inşaatı, Septimius Severus, Romalılaşma, Partlar, Sasaniler.

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Abstract

The Roman army deployed bridges for both the movement of troops and for propaganda. Erected quickly and efficiently, such structures demonstrated Roman technological and logistical expertise, shocking and impressing enemies at the edges of the empire. Narratives about bridge building have long emphasized the Roman perspectives about architectural production. This article explores the view from the far side of the bridge by considering complex Eastern attitudes toward Roman bridge engineering and technology transfer in two specific examples. In one the Parthians used bridge building to humiliate defeated Romans and debase their achievements. In the other the Sasanians acquired bridge technology by transferring Romans, tasking relocated captives with building bridges in distant territories.

Keywords: Roman architecture, Bridge construction, Septimius Severus, Romanization, Parthians, Sasanians.

The building of large bridges is challenging, impressive, costly, complicated, and disruptive. An act born of necessity in both times of peace and war, state construction of such large structures also serves propaganda agendas. In the Roman world, bridges brought armies to foreign lands and helped to connect the diverse parts of the empire. Beyond conquest and connectivity, bridge construction was a demonstration of technological and logistical prowess essential to military success. Assessing the bridge created by the emperor Trajan across the Danube Dio Cassius exclaimed "[it was] erected for the sole purpose of demonstrating that there is nothing which human ingenuity cannot accomplish" (68.13).[1] The complex organization of materials and men, as well as architectural ingenuity in dealing with different sites and conditions impressed Roman and non-Roman spectators alike.[2] Writing for an audience in Rome in the first century BCE, Julius Caesar described the bridges he built during the Gallic Wars with precise technical detail

1 Dio Cassius wrote more about construction of the Danube bridge than other event of the Dacian War, even though in his day only the piers remained; Goldsworthy 2007, 101. Numerous representations on coins and art attest to the propaganda value of bridges.

2 Roby 2016, 46.

and thoroughness. He also noted the enemies' reaction; seeing a great bridge rise over the Rhine in a mere 10 days, the Gallic tribesmen took flight (*BGall.*iv.17-19). Obviously the Romans considered their military engineering achievements impressive and far superior to those of others. Yet opinions, like bridges, are multi-directional. What was the view from the far side of the bridge? What did non-Romans value, absorb, and reject in Roman narratives about technological superiority in bridge building born in the context of conflict?

From 'Shock and Awe' to Humiliation

Two specific encounters in the Near East provide some insights about non-Roman reactions to the act of bridge building by soldiers, and the engineering involved.[3] The first occurred during the Roman-Parthian War under the emperor Nero (58-63 CE). Faced with renewed Parthian aggressions the emperor in 61 CE tasked the governor of Syria Gnaeus Domitius Corbulo with protecting the Roman border at the Euphrates River, and Caesennius Paetus, legate of Cappadocia, with establishing Roman administration over Armenia to the north. Corbulo directed his troops to take the fight across the riverine border at the Euphrates. His forces launched huge ships with turrets and war machines to provide protective cover for building a legionary fortress and a lengthy pontoon bridge, "with a speed and a display of strength which induced the Parthians to drop their preparations for invading Syria" (Tac.*Ann.*15.9) **(Fig.1)**.[4] Like Caesar's bridge, the project impressed not only with the technological skill displayed, but also with the swiftness and efficiency of creation.[5]

Thwarted in his push in the south, the Parthian king Vologeses I turned his attention to Armenia. Paetus responded and headed eastward. Ignoring several bad omens, including one while crossing a bridge over the Euphrates (probably that at Tomeis), he entered enemy territory and proceeded to march toward Tigranocerta (near Diyarbakır).[6] He

3 Roman authors provide the majority of information about reactions to bridge building. Near Eastern perspectives generally date to post-antiquity; Kennedy 1996.

4 Clark 2011; Ash 2015, 148-149.

5 General Corbulo rigorously trained his troops to display the maximum discipline and efficiency; Tac.*Ann.*13.35, 15.26.

6 While on the bridge, the horse carrying the consul's official emblems took fright and fled to the rear; Tac.*Ann.*15.7.

skirmished with Vologeses' army, but was compelled by poor planning and the onslaught of winter to retreat over the Taurus Mountains. He set up camp at Rhandeia on the Arsanias River (Murat Su). Having sent many of his men to Pontus or on furlough, and lacking sufficient provisions, Paetus was ill prepared and too proud to ask Corbulo for support before Vologeses appeared outside his camp with a vast army (Dio Cass 62.21). Unaware that Corbulo and his forces were already on the way to his aid, Paetus capitulated and agreed to surrender all Roman forts and supplies, and vacate Armenian territory. Not content with these stipulations, King Vologeses subjected the Romans to various humiliations.[7] According to rumors, the Parthians entered the camp before the Romans had vacated, seized their clothing, and compelled the soldiers to pile up the weapons and bodies of their comrades in a grisly display and, perhaps most degrading of all, to pass under a yoke (*sub iugum*; Tac.*Ann.*15.15). In the midst of the hurried preparations for retreat, Volganes surprisingly put the Romans to work. Tacitus described the event,

> *… Paetus threw a bridge over the river Arsanias which ran hard past the camp, ostensibly to prepare himself a line of retreat in that direction, though the work had, in fact, been ordered by the Parthians as evidence of their victory: for it was they who utilized it….Vologeses, …was seeking a reputation for moderation, now that his haughtiness had had its fill. Sitting on an elephant, he charged across the River Arsanias, as did the king's entourage on a team of straining horses, because a rumor had circulated that the bridge would yield under their weight owing to the guile of its manufacturers; but those who dared to go onto it ascertained its sturdiness and reliability (Ann.15.15).*

Though the exact location of Paetus' camp and Rhandeia remains uncertain, ancient sources agree that the bridge was of functional use to neither victor nor vanquished.[8] Why build it? Several motivations are plausible. By tasking Paetus and his troops with erecting the bridge

7 For literary interpretations of Tacitus' descriptions of the events see Clark 2011; Ash 2015.

8 The specific location of Paetus' camp at Rhandeia remains debated, with some scholars placing it on the north shore of the Arsanias River, and others on the south; in either case the bridge served neither the logistical advance of the Parthians nor retreat of the Romans; Henderson 1903; Marciak 2017, 34-36; Daryaee 2016,40.

Vologases transformed the Roman fighting men into lowly slave-like laborers compelled by the Parthian victors to undertake a useless, demeaning task.[9] Rapidly constructed following Paetus' capitulation, the structure must have been a pontoon bridge, as there was scant time to erect a more stable construction with stone footings. The process of building was revealing, much like that recorded by the late Roman writer Vegetius in *De Re Militari*,

> *… the most commodious invention is that of the small boats … very light both by their make and the quality of the wood. The army always has a number of these boats upon carriages, together with a sufficient quantity of planks and iron nails. Thus with the help of cables to lash the boats together, a bridge is instantly constructed, which for the time has the solidity of a bridge of stone* **(Fig. 2)**.[10]

Only a few months before, the Parthian troops (perhaps including some of the very men with Vologases at Rhandeia) had been shocked and awed by Corbulo's rapid creation of a huge pontoon bridge over the Euphrates. With the smaller-scaled construction over the narrow Arsanias, the Parthians saw the process debunked. Composed of unexceptional materials and prefabricated parts put together in simple sequential steps, the Roman pontoon bridge appeared mundane, not miraculous. The evidence of team management based on Roman military discipline and logistical rigor was obviously efficient, but such organization was not necessarily to be admired. For the Parthians and other ancients repetitive tasks belonged to the realm of slaves and low-level workers, the same people who might be expected to be deceitful and commit sabotage, as Vologenes alluded.

A great king, the Parthian ruler conquered nature by charging across the river on an elephant, not by relying on small sticks and commonplace, repetitive architectural design. Such a display was in line with Parthian notions of status and psychological warfare, with the great beast and presence of the ruler, not a construction of wood, providing the shock and awe. Simultaneously, the choreographed crossing through the river was pragmatic; elephants notoriously become disoriented on the wobbling surfaces of pontoon structures as captured in a sixteenth century Mughal

9 There are indications that some Roman soldiers found bridge building, quarrying, and other such tasks demeaning; Speidel 2009, 250-253.

10 Flavius Vegetius Renatus, trans. Clark, 1944, 81-82

painting **(Fig. 3)**. Better for the king to ride atop the royal elephant, perched high above other humans -- and probably the pontoon bridge as well. Such positioning placed Vologenes as separate, and literally as well as figuratively "superior" (Dio Cass.62.21).[11] The Arsanias bridge construction was more than just a condescending "make work" project; it was a useful act of propaganda and a clear demonstration of Near Eastern ideas about the humiliation of enemies, and about technology transfer.[12]

From Theirs to Ours (theirs)

Construction of the Arsanias Bridge demonstrated the advantages of preplanning and worker organization to build quickly, but offered the Parthians no significant models of advanced engineering technology. Nor would one expect them. After all, the Near East had a rich history of pontoon bridge building, and boasted some of the largest known examples, including that over the Euphrates at Zeugma. The construction of large stone bridges, on the other hand, was another matter. In the third century the Sasanian Persians rapidly expanded outward from Iran and lower Mesopotamia. In these territories, transport traditionally had been by pack animals, not wheeled vehicles. Paved roads were few, as were permanent bridges since many waterways were fordable most of the year. As a result, the Persians had limited technical knowledge of stone bridge building. With rapid expansion the Sasanians needed to move large numbers of troops and unify vast territorial holdings; to do so they needed engineering knowledge and skills.

In modern terms, technology transfer is defined as the dispersal of knowledge from the originators to secondary users. The peoples of the Near East had a different strategy. Rather than learn technical methods, they acquired people. From the earliest Persian kingdoms of the fifth century BC, rulers brought together proficient laborers from within their vast empires and relocated skilled workers captured in battle.[13] For example, Diodorus Siculus notes that after a victory in

11 Gilmartin 1973, 616-617; Clark 2011, 217-218.

12 For a historiography of approaches to technological transfer see Potts 2012.

13 P'awstos Buzand 1985. The practice of transferring skilled builders continued in the Near East for generations. Faustus of Byzantium recorded that the Armenian King Pap in the fourth century CE told his troops, "allow many of the [captured soldiers] to live. For we will …put them to work making bricks, as stone-cutters, and masons [creating] what is useful for our cities, mansions, and whatever else" (5.4).

Egypt, "the Achaemenid Persians, by … taking artisans along from Egypt constructed their famous palaces in Persepolis and Susa and throughout Media" (1.46.4).[14] In addition to royal residences the Persian kings sought experts to work on such large projects as city building and land reclamation throughout their territories.[15] Known for advanced engineering, the Romans were especially desirable prisoners of war.

As the third century progressed, the Romans and Sasanian Persians increasingly came into conflict. In the second of his major campaigns against the Romans, King Shapur I ravaged Syria and gained control of Armenia and Georgia. The Roman emperor Valerian reclaimed Syria, but disastrously pursued the Persians. In 260 CE, the two armies met near Edessa **(Fig. 1)**. Shapur I soundly defeated the Roman troops made up of 70,000 soldiers from almost every part of the Roman Empire, along with Germanic allies. For the first time in history the unthinkable happened: a Roman emperor was taken captive. The Sasanians transferred him, along with the uninjured soldiers to distant parts of their Empire. More and more detainees followed with each victory, including 400,000 from Caesarea in Cappadocia. While the numbers may be exaggerated, they indicate the staggering scale of relocations to remote parts of Assyria, Susiana, Persia, and other regions more than 1,000 kilometers from the battlefields, an impressive logistical feat indeed.[16] Evidence about the treatment of detainees is limited, and often contradictory; it seems Shapur I was more interested in productivity than punishment. The captives were allowed to live and work together; some were given land -- two incentives aimed to discourage flight.[17] The Sasanians put them to work on engineering projects exploiting Roman organizational and technological expertise, including the building of towns. At Gondesapur in lower Mesopotamia

14 Dandamayev 1975. The Romans also orchestrated several mass relocations, but primarily for propaganda purposes rather than technology transfer; they put most captives to work farming; Dingas and Winter 2007, 159-163; Drijvers 2012, 450-451. More commonly they sold the prisoners into slavery, as did Septimius Severus when he captured the Parthian capital at Ctesiphon.

15 With expansion, the Sasanian kings faced a man power shortage. By putting captives to work they freed up their own men to serve in the army; Lieu 1986, 480.

16 In an inscription near Persepolis Shapur I boasted about the captured cities and thousands of captives he relocated; *Res Gestae Divi Saporis,* 18-22, 30; Lieu 1986, 476-87.

17 Lieu 1986, 478; Dignas and Winter, 256.

the detainees laid out a new settlement with a plan similar to that of a Roman military camp (*castrum*) **(Fig. 4)**.[18]

The massive influx of Roman artisans, architects, machinists, and other skilled workers greatly stimulated urbanization, agriculture, and architecture in the Sasanian Empire. The tenth-century poet Firdowsi wrote about a Roman named Baranush (Varanus, identified by some to be Valerian) who became an intimate of Shapur I:

> *Wherever he went he took Baranush with him and paid attention to what he said. There was a river near Shushtar that was so wide no fish could swim across it. Shapur said to Baranush, 'If you are an engineer, build a bridge here so strong that when we pass away it will remain, as a sign to the wise. Make it a thousand cubits long. When you have done this, ask me for whatever treasure you desire. Use the knowledge of Roman savants to build monuments in this country; when you have made the bridge, which will lead to my palace, you can live as my guest, in happiness and safety.*[19]

Today the great structure at Shushtar remains known as Band-e Kaisar ("Caesar's bridge"). Stretching over the Karun River it carried an important road between the Sasanid centers of Pasargadae and the former Parthian capital at Ctesiphon.[20] With both the city and the surrounding farmland requiring water, the project called for the incorporation of a dam.[21] The result is a huge dam bridge or weir with a continuous overflow. Roman know-how is evident in its scale, design, and execution.

The audacious first step in creating the bridge was to provide a dry construction site by erecting a temporary dam upstream and cutting a large canal to the east to divert the river, a massive undertaking that recalled similar schemes for Roman bridge and harbor projects. With a

18 The name Gondesapur has been variously translated as: "acquired by Shapur," "military fortress of Shapur," or "Better-than-Antioch of Shapur," the last referring to the relocation of captives from Antioch on the Orontes in 256 CE; Shahbazi 2019.

19 Firdowsi 2016, 684-685. Stories about Valerian's treatment in captivity are numerous and divergent; his participation in building the bridge is unlikely; Cuzon 1890, 710-711.

20 Similar bridge dams were constructed during the same time; Hartung and Kuros, 232, 245-250; Smith 1976, 56-61; O'Connor 1993, 130-131; Smith 1976, 56-60.

21 The combination of overflow dam and bridge is not found in the west with the possible exception of that at Montignies-St. Christophe, though a Roman dating is contested; O'Connor 101.

clear view of the dry riverbed, the engineers determined where to place the piers for maximum stability, incorporating solid rock formations and outcroppings.[22] As a result the structure did not follow a straight line as is common with most Roman bridges, but meandered over 500 meters from shore to shore **(Fig. 5)**. The large pentagonal piers with pointed cutwaters upstream were similar in form and construction to those from western examples such as the Roman bridge at Mainz. The core was of mortared rubble (identified by some scholars as Roman hydraulic *opus caementicium*) encased in ashlar masonry held secure with leaded clamps. Alternating courses penetrated into the core to create a strong, compartmentalized structure.[23] Above the piers over forty round arches supported a paved roadway. Between and around the piers the engineers built a gravity dam ten meters in width. This barrier impounded water the water upstream to a depth of approximately four meters, with the excess continuing downstream. Smaller flood arches above the piers provided further release and minimized pressure on the piers during floods. To limit erosion, the workers paved a large area of the dry riverbed upstream, another substantial enterprise. When the last stone was in place they removed the canal dam and the river roared through the arches of "Caesar's" bridge.

Construction of Band-e Kaisar took years to complete, attracting spectators who marveled at the dry riverbed, as well as the engineering prowess and bustling organization demonstrated by the prisoners of war. The soldier-workers must have deployed large-scale machinery perfected by Roman military engineers for warfare, and then adapted for building, including ingenious lifting towers and huge cranes with guy ropes. In fact, the need for solid ground to secure capstans to keep ropes taut may have been another motivation for paving the riverbed. The deportees' reactions to their forced labor are unknown. Were the soldiers humiliated by the work, or elevated by having their skills valued and displayed -- even if on a project for their enemy? Did they feel superior in their engineering proficiency, or readily collaborate with the Persians who had developed extensive, but different, expertise with

22 Hodge 2000, 334; Kleiss 1983. Though motivated by site conditions, and possibly by the lack of hydraulic cement, the meandering path of the Shushtar bridge visually dilutes association with projects in the Roman world.

23 Reuther 1938, 571; Hartung and Kuros 1987, 232.

regional water management?[24] Relocated from the contracting Roman Empire to the expanding Sasanian kingdom the Roman captives may have accepted their fate. After all, the Sasanians respected their skills, and allowed them to live together as a community. Integration with the Persians must have occurred through marriage as well as knowledge sharing, though such melding is hard to track. The ashlar blocks with mortared-rubble at the late third century Paikuli monument near Persepolis also reveal Roman influences, though it is difficult to determine if the work was by detainees, their descendants, or Sasanian workers who learned from them.

In any case, the identification of the Romans with technological expertise endured in the Near East.[25] The Shushtar crossing is to this day known as "Caesar's Bridge," not "Shapur's." There was no known donor inscription on the bridge built, according to Ferdowsi's passage, to be an independent "sign to the wise." This affirms the Sasanian tendency to compartmentalize parts within the whole. By keeping the Roman detainees (and possibly their technologies) separate, they remained distinct, each an individual tessera within a larger mosaic. Their techniques became part of the Sasanian history, but remained identifiably Roman. Such atomization had an impact on both technology transfer and endurance. The Sasanians acquired experts and kept them, and presumably their descendants, in insulated settlements. As a result, Roman technological knowledge did not disseminate widely throughout the Sasanian empire. Thinking in terms of isolated components, Shapur I and later kings never absorbed western lessons about provisioning and maintaining an empire-wide infrastructure. Unlike Roman rulers, those in the Near East did not develop empire-wide policies or programs to deal with the distribution of architectural materials or the on-going care of transportation systems including roads and bridges.[26] The Shushtar Bridge was part of the Sasanian world, but simultaneously associated with Roman engineering intellectual property. Inside the empire, but distinct, the structure reflected attitudes toward construction knowledge from both ends of the bridge.

24 Reuther 1938, 570-571. Acknowledging the complex historical water system at Shushtar, the entire site has been placed on the UNESCO World Heritage List.

25 The Ottomans likewise tended to rely on loosely segregated "nationalities" (*milliyetler*) for specific skills.

26 Kleiss 1983, 105.

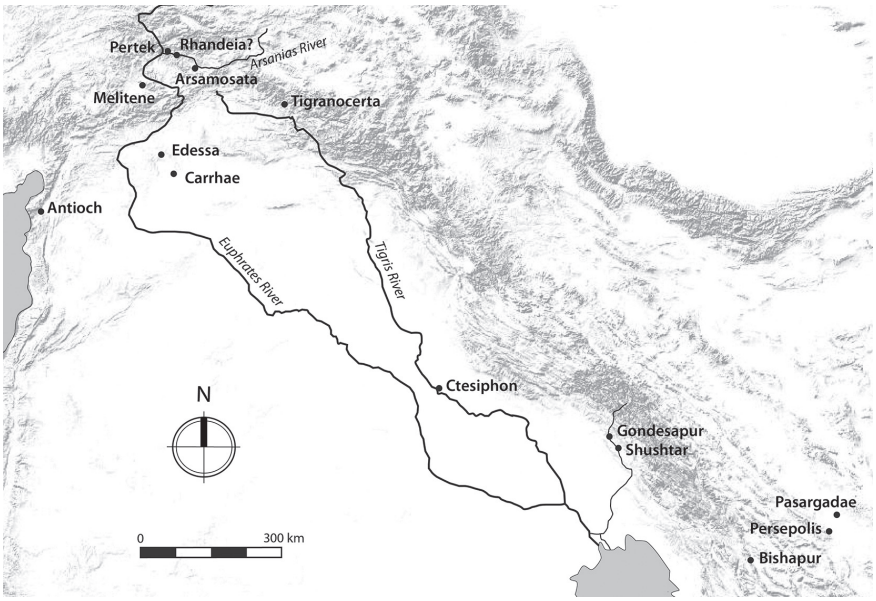

Fig. 1. Map of Eastern Turkey and Western Iran; rendering by author.

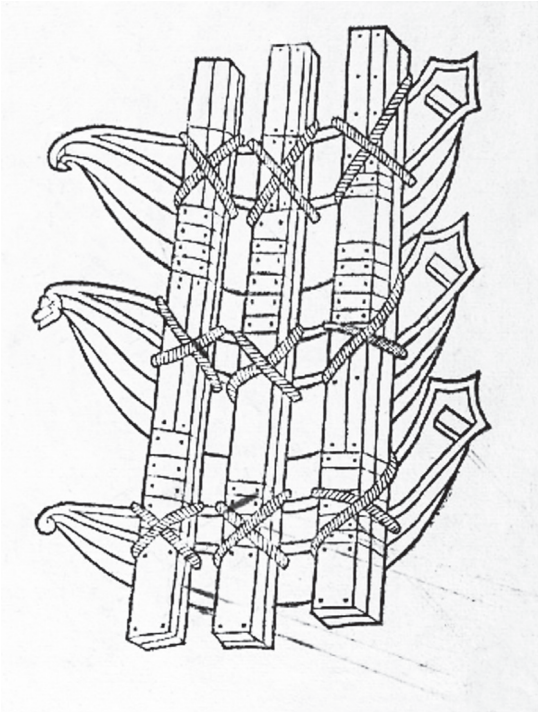

Fig. 2. 1475 illustration of a pontoon bridge from Vegetius, *De Re Militari* (late 4th c), published 1475.

Fig. 3. Mughal emperor and elephants on collapsing pontoon bridge; Basawan and Chetar Munti, *Akb ar's Adventure with the Elephant Hawa'i,"* 1561; Wikimedia.

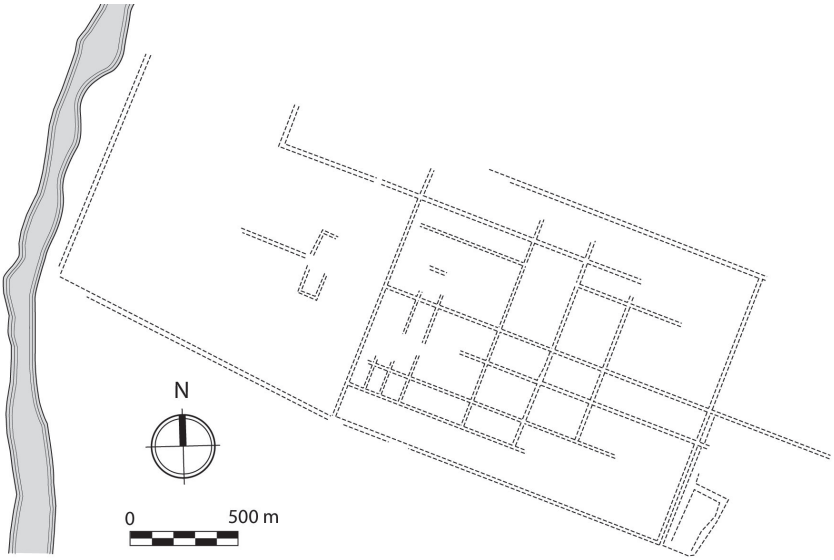

Fig. 4. Plan of Gondesapur; rendering by author.

Fig.5. Photograph of Band-e Kaisar Bridge (pointed arches date to post antique restorations); M. Dieulafoy, 1884.

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