[title]The Influence of East and West on Bronze Objects Found in Central Anatolia: Small Bronze Finds from Kaman-Kalehöyük

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[A-head]Abstract

[abstract]

The influences from the East and West manifested in ancient bronze (copper-tin alloy) technology in Central Anatolia are examined, specifically at the site of Kaman-Kalehöyük, which has been excavated by the Japanese Institute of Anatolian Archaeology (JIAA) since 1986. Evidence of copper and bronze refining and manufacture has been found from the Middle Bronze Age (MBA, ca. 1950 BC) through the Middle Iron Age (ca. 600 BC) at Kaman-Kalehöyük. Crucibles, fibula molds, an unfinished fibula, stone molds for casting small bronze objects, and copper slag are considered material evidence of bronze working and manufacture at the site. The results of analytical studies on bronze objects and slag composition indicate the importation of materials and the selective use of copper ores. Given its location along ancient trade routes, Kaman-Kalehöyük may have served as a conduit for the intraregional exchange of materials and manufacturing technologies. Several fibulae are presented to illustrate these exchanges and the multiethnic influences at Kaman-Kalehöyük. The authors examine some of these influences and movements as they relate to ancient bronze technology in Anatolia.

[A-head]Introduction

[main text]

This paper reviews the influences from the East and West on bronzes (copper-tin alloys) found in Anatolia while focusing on the archaeological finds from the site of Kaman-Kalehöyük. Given its location along ancient trade routes, Kaman-Kalehöyük may have served as a conduit for the intraregional exchange of materials and manufacturing technologies. We examine some of these influences and movements as they relate to ancient bronze technology in Anatolia.

Kaman-Kalehöyük consists of a tell, or mound, 280 meters in diameter and 16 meters high (918 x 52 ft.). It was a rural settlement situated 100 kilometers (62 miles) southeast of Ankara and 3 kilometers (1 1/4 miles) east of Kaman in Kırşehir province, in Central Anatolia (**fig. 21.1**). Since excavation commenced in 1986, cultural levels have been traced from the Early Bronze Age (EBA) through the Ottoman period.[[1]](#endnote-1) The Japanese Institute of Anatolian Archaeology (JIAA) was established near Kaman in 1998 by the Middle East Culture Center in Tokyo. Two new excavations were initiated in 2009: Buklukale to the Northwest and Yassihoyuk to the East.[[2]](#endnote-2)

[A-head]Early Bronze Age

Kaman-Kalehöyük excavations have thus far yielded a total of 9,120 catalogued copper and copper-alloy objects, including arrowheads, spearheads, awls, chisels, axes, pins, rings, stamp seals, and fibulae. A few of these objects have undergone compositional analysis. In the middle of the fourth millennium BC, objects were made from arsenical copper in Anatolia and copper, lead, and silver were mined in the Troad.[[3]](#endnote-3) The earliest instance of bronze in Anatolia dates from the early third millennium BC (EBA). The sources of tin in Bronze Age Turkey have yet to be located; if small deposits of tin did exist in northwest Anatolia, they were soon exhausted.[[4]](#endnote-4) Instead, throughout the Bronze Age, the Anatolians traded their plentiful silver for tin, derived most likely from Afghanistan. In the third millennium BC, pure copper, bronze, and arsenical copper were all being used in Anatolia, though bronze was more common in the Troad than in Central Anatolia.[[5]](#endnote-5) By the second millennium BC (MBA), arsenical copper was still more common that bronze in Anatolia while bronze artifacts were more prevalent at Kanesh-Kültepe in Central Anatolia.[[6]](#endnote-6) The development of copper-alloy metallurgy followed similar paths in Anatolia and Mesopotamia throughout the Bronze Age, with the practice of interring bronze instead of arsenical copper objects in elite burials.

[A-head]Middle Bronze Age

Bronze working in the Assyrian Colony period is examined starting with Kanesh-Kültepe, located 192 kilometers (120 miles) southeast of Kaman-Kalehöyük. Kanesh-Kültepe was the capital of the kingdom of Kanesh and during the Assyrian Colony period in the MBA served as the administrative and distribution center of the colony network in Anatolia.

In 2004, X-ray fluorescence (XRF) analysis of numerous copper alloy objects from the MBA (1945–1730 BC) at Kanesh-Kültepe identified small ornamental objects as arsenical bronze and larger weapons as leaded bronze, indicating the intentional selection of arsenic and lead.[[7]](#endnote-7) The authors believe these results indicate the selective use of arsenic-bearing sulfide copper ores. Copper-alloy metallurgy during the Assyrian Colony period was heavily influenced by technology in the East.

[A-head]Trade Networks

Clay tablets from Kanesh-Kültepe document the trade in tin between the East and Anatolia: as much as two tons of tin per year were imported into Kanesh-Kültepe.[[8]](#endnote-8) Metal workshops with crucibles and molds have been discovered at Kültepe.[[9]](#endnote-9) Complex trade networks developed during the Bronze Age. A cuneiform tablet dating from the eighteenth century BC in Syria documents the distribution of tin to Ugarit and as far west as Crete.

A trade route leads from Assur, the capital of the Assyrian Empire (located today in modern Iraq), northwest through Kanesh-Kültepe into Central Anatolia.[[10]](#endnote-10) The three sites being excavated by the JIAA—Kaman-Kalehöyük, Yassihoyuk, and Buklukale—are all situated along this route, which promoted Assyrian Colony trade (see fig. 21.1). In addition to the silver being traded from Anatolia for tin from Afghanistan, there was copper from Cyprus flowing into the Near East in the EBA and MBA (nineteenth century BC).[[11]](#endnote-11) This trade persisted into the Late Bronze Age (LBA), as we know from the Uluburun shipwreck, which sank off the coast of Turkey while carrying ingots of copper and tin, probably on its way to or from Syria.

[A-head]Evidence of Bronze Manufacture Discovered by the JIAA

Evidence of bronze manufacture consists of numerous crucibles and molds from the three sites excavated by the JIAA: 33 stone molds for the casting of metal objects have been found dating from the Bronze Age and Iron Age, 27 of which derive from Kaman-Kalehöyük. A rectangular, two-sided mold (KL05-34; **fig. 21.2**) has parallels in Hattusa, the capital during the Hittite Empire period, and dates to the LBA, Hittite Empire period (1400–1200 BC).[[12]](#endnote-12) It was used for casting styli, small figurines, and an eight-spoked wheel.[[13]](#endnote-13) Another rectangular mold (KL88-127) found at Kaman-Kalehöyük was used for casting arrowheads and other unidentified objects.[[14]](#endnote-14)

The copper slags from Kaman-Kalehöyük were analyzed using inductively coupled plasma optical emission spectroscopy (ICP-OES) and electron microprobe metallographic analysis (EPMA).[[15]](#endnote-15) This study revealed the presence of iron and copper sulfide, indicating that copper sulfide ores (such as chalcopyrite) were smelted to obtain copper at the site during the MBA (1950–1400 BC). Differences in chemical composition among the copper slags indicate that copper ore or smelted copper came from different regions during this period.

According to a study in 2005, approximately 40 percent of the slag found at Kaman-Kalehöyük between 1996 and 2004 is copper slag with a glassy matrix, indicating copper refining in crucibles.[[16]](#endnote-16) The slags were recovered in one area dating to the MBA Old Hittite Kingdom period (1700–1400 BC) and in another area from the Early Iron Age (1200–775 BC). Copper ore with lead and zinc impurities was more prevalent in the Early Iron Age than in the MBA, indicating different sources of copper ore throughout history. The selective use of copper ores containing arsenic impurities is evidenced by the detection of copper and tin in one crucible (KL140628) and copper and arsenic in another crucible (KL140710) with XRF analysis.[[17]](#endnote-17)

[A-head]The Iron Age

The collapse of the Hittite Empire after 1180 BC led to the beginning of the Iron Age and a very complex period in the history of Central Anatolia. The Early Iron Age is often referred to as the Dark Age, in which a Neo-Hittite civilization sprung up. Kaman-Kalehöyük, Hattusa, and Alişar were three main Iron Age sites in what was previously Hittite territory. During the Iron Age, Kaman-Kalehöyük was exposed to diverse ethnic, cultural, and artistic influences, drawing from a wide radius. The Assyrians entered Central Anatolia in 838 BC, bringing with them strong artistic and cultural influences. They took control of Central Anatolia from 744 to 727 BC, forming the Neo-Assyrian Kingdom of Tabal. Concurrently with the Assyrian presence, an ever-growing Phrygian influence was felt at Kaman-Kalehöyük beginning in the late eighth century BC, with the expansion of the Phrygian Empire over the next few centuries.

In the Late Iron Age, the Medes invaded Central Anatolia from northwest Iran and controlled the area to the east of the Halys River in the region of Kaman-Kalehöyük from around 605 to 550 BC. Northwest Iranian fibulae in the Kaman collection are evidence of this occupation. The Achaemenid Empire replaced the Median Empire from 550 to 334 BC; at this point, the Persian Royal road from Susa to Sardis was established that was used later during the Hellenistic period.[[18]](#endnote-18)

[A-head]Bronze Fibulae

The bronze objects that most readily illustrate the intraregional exchanges and multiethnic influences at Kaman-Kalehöyük are the fibulae dating from the Middle Iron Age to the Hellenistic period. The earliest fibulae come from the Mediterranean area in the thirteenth century BC; they then spread to the Near East, where they were used until the seventh century BC.[[19]](#endnote-19) During the Middle Iron Age, the fibula was introduced to Central Anatolia, where it became very popular. From the beginning of the Kaman-Kalehöyük excavation in 1986, a total of 586 fibulae have been found. The most common type is the Phrygian fibula, followed in order of prominence by north Syrian, northwest Iranian, southeast Anatolian, Greek, and Aegean fibulae (**fig. 21.3**).[[20]](#endnote-20)

The Phrygians were the first Anatolians (apart from the Ionians) to adopt the fibula, which they did around 750 BC.[[21]](#endnote-21) Horizontal horns projecting from the sides of the catch and the semicircular shape are the trademarks of the Phrygian fibula, characterized as Blinkenberg Type XII.[[22]](#endnote-22) The pin was usually cast separately and attached by insertion into a drilled hole. It is unusual for the pin to be preserved, as it has been in the Phrygian fibula in the top left of figure 21.3.

Gordion, the capital of Phrygia, had abundant trade with the Greeks, resulting in the influx of Greek fibulae at Gordion and Phrygian metalwork in mainland Greece.[[23]](#endnote-23) Aegean and Greek fibulae have been found in many parts of Anatolia, including Kaman-Kalehöyük, as attested to by the Aegean and Greek fibulae (see fig. 21.3, bottom row, center and right). In the Archaic period, the Anatolian kings, such as Midas of Gordion in Phrygia and Croesus of Sardis in Lydia, commissioned numerous works from Greek artists; by the sixth century BC, the art of Gordion and Sardis showed considerable Greek influence.[[24]](#endnote-24)

Three Phrygian and three north Syrian fibulae from Kaman-Kalehöyük were analyzed with XRF, X-ray diffraction, and X-radiography.[[25]](#endnote-25) The fibulae were found to be copper-tin bronze with traces of arsenic, and some were intentionally leaded. Antinomy was found in the Phrygian fibulae and vanadium in a Syrian fibula. Arsenic and antimony were often added to copper, as was tin, to decrease the melting point, to improve hardness when cold working, to render a particular color to the metal, and to improve the quality of casting.[[26]](#endnote-26) According to John Twilley’s analysis, the levels of arsenic and antimony were not high enough to have been intentional additions and therefore none are considered to be arsenical copper.[[27]](#endnote-27) The Anatolian highlands were rich in polymetallic ores containing many elements including arsenic and antimony, which may account for the Phrygian composition. The fact that vanadium was found only in the north Syrian fibula indicates a diversity of ores being smelted in Syria during this period. Zinc was not found in these Kaman fibulae whereas it was prevalent in several fibulae from Tumulus MM at Gordion.[[28]](#endnote-28)

A few stone and ceramic molds for manufacturing fibulae have been discovered at Kaman-Kalehöyük. The ceramic mold pictured here (KL88-16; **fig. 21.4**) was for the manufacture of a Phrygian type fibula.[[29]](#endnote-29) Evidence of Greek influence is seen in the unfinished fibula (KL90-62; **fig. 21.5**) found at Kaman-Kalehöyük.[[30]](#endnote-30) Although it closely resembles Blinkenberg Type XII 9h[[31]](#endnote-31) from the region of Ankara, it preserves the remnants of a transverse piece, similar to Blinkenberg Type XII 10a[[32]](#endnote-32) from Olympia, Greece. A series of studs along the bow and transverse piece would have completed this fibula.

[A-head]Urartian bronzesatKaman-Kalehöyük

This period in the development of the bronze fibula in Anatolia was accompanied by the growth of the powerful Urartian Empire in eastern Anatolia. Urartu was a prominent metalworking center in the Near East in the first millennium BC. Various casting methods were used, after which articles were embellished with repoussé, engraving, chasing, tracing, inlaying, plating, granulation, soldering, and brazing.[[33]](#endnote-33) First-millennium-BC Urartian bronze has a high proportion of copper-zinc-tin alloys, sometimes with lead, which has been attributed to the intentional smelting of polymetallic ores.[[34]](#endnote-34) Comparisons in alloy composition have been made with Greek bronzes from this period.[[35]](#endnote-35)

Urartian bronze objects are found in Gordion and in many areas of Greece. Trade between Urartu and Gordion from 730 to 675 BC followed two east–west routes across northern and southern Anatolia.[[36]](#endnote-36) Given that Kaman is situated between the northern and southern routes, midway between Gordion and Urartu, it is not surprising that Urartian bronzes have been discovered in Kaman-Kalehöyük. A bronze object resembling a quiver (KL03000069) but of undetermined function was discovered in Kaman-Kalehöyük from a Late Iron Age layer dating to the seventh or sixth century BC. It was made from sheet metal that was decorated with repoussé, and it demonstrates several Urartian characteristics such as rows of chevrons alternating with what may be rows of four-legged animals (**fig. 21.6**).[[37]](#endnote-37)

A bronze belt or strap showing strong Urartian characteristics (KL12000010) was found in thirty-four pieces and was reconstructed to a length of 45 centimeters (17 3/4 in.; **fig. 21.7**, top).[[38]](#endnote-38) Double rows of decoration delineating horizontal bands of human and animal figures were a common motif on Urartian belts.[[39]](#endnote-39) In raking light, it is possible to distinguish similar two- and four-legged creatures along two registers on an Urartian belt fragment in the Metropolitan Museum of Art (**fig. 21.7**, bottom).[[40]](#endnote-40) Extensive corrosion of the Urartian bronzes found at Kaman-Kalehöyük impedes a more precise iconographical interpretation.

[A-head]The Hellenistic Period

Following the conquest of Anatolia by Alexander the Great and his death in 323 BC in Babylon, the Seleucid Empire took over much of Central Anatolia, including Kaman-Kalehöyük, from around 312 BC. Under the influence of the ruling Seleucid dynasty, which preserved and promoted Hellenistic culture, a strong Hellenistic influence was felt in Gordion as well as in Kanesh-Kültepe.

In about 279 BC the Celts invaded Central Anatolia from Thrace and established the Galatian Empire. The Galatians took over a small area of the Seleucid Empire, making Ankara their capital city. The Hellenistic cities and King Attalus of Pergamon fought the Seleucids and the Galatians, confining them to their own territories, which included Kaman-Kalehöyük. Galatia was much less affected by the Hellenistic movement than was Pergamon, where Hellenistic influences strongly took hold. These influences are most noticeable in the silver coins minted by the later Galatian rulers.[[41]](#endnote-41)

Habitation during the Hellenistic period appears to have shifted for the most part off the mound and into surrounding areas. A paleo-environmental study by Kaoru Kashima has determined that rising waters from heavy rainfall partially submerged the mound, which is situated on the lowest terrace of an alluvial fan on the side of Mount Baran.[[42]](#endnote-42) In spite of this population displacement, a few Hellenistic artifacts have been recovered from Kaman-Kalehöyük, such as silver coins of Alexander the Great, a small marble bust, and a terracotta figurine.

Skeletal remains of Galatian cult practice in the form of human and animal sacrifices during the Hellenistic period have also been recovered from the mound.[[43]](#endnote-43) Round pits previously used for grain storage were adopted by the Galatians as repositories for human and animal bodies. The Galatians were known to hold sacrificial rituals during the Hellenistic period in Central Anatolia, and similar burials have been found at Gordion from the Galatian occupation.

[A-head]Conclusion

Considerable evidence of copper and bronze refining and manufacture has been discovered at Kaman-Kalehöyük from the MBA (1950–1400 BC), when technological and artistic influences came largely from Assyria and Mesopotamia. Copper and bronze refining and manufacture continued there in the Early and Middle Iron Age (ca. 750–ca. 600 BC), a period when fibulae were very popular in Central Anatolia. Greek influence in the Phrygian capital of Gordion preceding the Hellenistic period undoubtedly affected Kaman-Kalehöyük; increased contact with Gordion during the expansion of the Phrygian kingdom is evidenced by the large number of Phrygian fibulae found at the site. The unfinished Phrygian fibula found in Kaman-Kalehöyük, resembling Blinkenberg Type XII 10a found in Olympia, strongly suggests influence from mainland Greece in the eighth century BC (see fig. 21.5).

An in-depth study of copper and bronze working is needed at Kaman-Kalehöyük, to examine the relationship between slag, crucibles, molds, copper and bronze artifacts, and related architectural remains. Such study will elucidate the contribution of this site to the development of the metallurgical industry in Central Anatolia during the Bronze and Iron Ages.

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30. Omura 1992, 331, Resim 7.4. [↑](#endnote-ref-30)
31. Blinkenberg 1926, 215. [↑](#endnote-ref-31)
32. Blinkenberg 1926, 217. [↑](#endnote-ref-32)
33. Piotrovskii 1967; Wartke 2007, 416. [↑](#endnote-ref-33)
34. Eremin 2014, 81. [↑](#endnote-ref-34)
35. Hughes et al. 1981, 144. [↑](#endnote-ref-35)
36. Birmingham 1961, 192. [↑](#endnote-ref-36)
37. Dubin 2016. [↑](#endnote-ref-37)
38. Tsatsouli 2016, 124–27. [↑](#endnote-ref-38)
39. Ergürer 2010, 12, 14, 17, 21, figs. 1, 5, 12, 19 (from Kellner 1991, figs. 8, 122, 182, 185). [↑](#endnote-ref-39)
40. Muscarella 1988, 433, no. 578; Metropolitan Museum of Art 2016, inv. 52.123; Tsatsouli 2016, 124–27. [↑](#endnote-ref-40)
41. Darbyshire et al. 2000, 95. [↑](#endnote-ref-41)
42. Kashima 2008, 262. [↑](#endnote-ref-42)
43. Matsumura 2007, 97. [↑](#endnote-ref-43)