چهره حاکم سلوکی و دیگر پیکره‌های مفرغی کال چندار / شمی، نتایج مطالعات سال‌های ۱۳۹۴ و ۱۳۹۵ در موزه ملی ایران

گونور لیند اشتروم

خلاصه

این مقاله به بررسی یکی از بزرگ‌ترین مجموعه‌های مجسمه‌سازی هلنی و اشکانی در ایران می‌پردازد که در حدود سال ۱۳۱۴ خورشیدی در کال چندار کشف شد، این محوطه یکی از مهم‌ترین محوطه‌های الیمایی در ارتفاعات خوزستان است. در ابتدا، سر مفرغی یک فرمانروای هلنی است که در دوران باستان به شدت آسیب دیده و تغییر شکل یافته است، و ویژگی‌های صورت سابقش با فناوری نوآورانه سه بعدی بازسازی شده است. این پرتره در اینجا به عنوان پادشاه اولیه سلسله کامناسکیر شناخته شده و تاریخ آن در حدود ۱۴۰ پیش‌ازمیلاد است. تکه‌های بیشتر این مجسمه بازسازی کل پیکره را ممکن می‌سازد، که سبک آن از رایج‌ترین قالب‌های شاهانه هلنی پیروی می‌کند. این «حاکم هلنی» اکنون نخستین نماد یک پادشاه هلنی است که برای مناطق ایران و شرق بیشتر شناخته شده است. تمرکز دوم، مطالعات تطبیقی تکنیک ریخته‌گری و آلیاژ مجسمه‌های مفرغی بیشتر مجموعه کشف شده است. آنها نشان می‌دهند که تقسیم سبک مفرغ‌های کال چندار به گروه‌های «یونانی» و «غیریونانی» بر اساس تفاوت‌های فنی است، که نشان‌دهنده تغییر قابل‌توجهی در تولید مجسمه‌های مفرغی از اواخر دوره هلنی تا دوره اشکانی است. در مجموع، مطالعات ارائه شده در اینجا پتانسیل تحقیق بر روی مجسمه‌های کال چندار که تاکنون نادیده گرفته شده بود را نشان می‌دهد، پتانسیلی که در پروژه‌ای که در بهار ۲۰۲۱ آغاز شده است به طور کامل مورد بهره‌برداری قرار خواهد گرفت.

واژگان کلیدی: هنر هلنی، هنر اشکانی، الیمایس، سلسله کامناسکیریان، خوزستان، پناهگاه، پرتره، مجسمه‌سازی، ریخته‌گری مفرغ، آلیاژهای مفرغ، آزمایش ایکس آر اف، فتوگرامتری، مدل‌سازی سه بعدی، بازسازی سه بعدی.

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The Portrait of a Hellenistic Ruler and Other Bronze Sculptures from Kal-e Chendar/Shami Results of the 2015 and 2016 studies in the National Museum of Iran

Gunvor Lindström[a]

Abstract

This article examines one of the largest find complexes of Hellenistic and Parthian sculpture in Iran, discovered around 1935 at Kal-e Chendar, arguably the most important sanctuary in the land of Elymais in the highlands of Khuzestan. The starting point is the bronze head of a Hellenistic ruler, already badly damaged and deformed in antiquity, whose former facial features are reconstructed with innovative 3D technology. The portrait is identified here as a king of the early Kamnaskirid dynasty and dated around 140 BC. Further fragments of the same statue enable the reconstruction of the entire figure, whose pose followed the most common format of Hellenistic royal figures. This 'Hellenistic Ruler' is now the first larger-than-life representation of a Hellenistic king known for the regions of Iran and further east. A second focus is comparative studies of casting technique and alloy of the further bronze statues of the find complex. They reveal that the stylistic division of the Kal-e Chendar bronzes into a 'Greek' and an 'un-Greek' group of sculptures is carried through to technical differences, indicating a significant change in the production of bronze sculptures from late Hellenistic to the Parthian period.

Overall, the studies presented here show the potential of research on the hitherto neglected cache of sculptures from Kal-e Chendar, a potential that will be fully exploited in a project begun in spring 2021.

Keywords: Hellenistic Art, Parthian Art, Elymais, Kamnaskirid dynasty, Khuzistan, Sanctuary, Portrait, Sculpture, Bronze casting, Bronze alloys, pXRF, Photogrammetry, 3D modelling, 3D reconstruction.

a. Eurasia Department, German Archaeological Institute, Podbielskiallee 69-71, 14195 Berlin, Germany
gunvor.lindstroem@dainst.de

Introduction

In 1936, under the title 'Traces of Alexander the Great', the Times of London reported the latest discovery of legendary archaeologist and explorer Sir Aurel Stein: a sensational find of at least 11 bronze and two marble sculptures in Kal-e Chendar, near the Shami gorge high in the Zagros Mountains in south-western Iran (Stein 1936). Though most were fragmentary, the Kal-e Chendar sculptures still represent one of the largest caches of Hellenistic and Parthian sculptures in Iran.

The most famous of these is the almost completely preserved statue of a 'Shami Prince', also known as the 'Parthian Nobleman', which today stands in the center of the 'Parthian Hall' of the National Museum. That the 'Shami Prince' is so well known distracts from the fact that the find complex as a whole has been little studied and its importance has not been recognised, especially in Classical Archaeology. This is probably because many of the sculptures belong to the tradition of 'Parthian art', which prevailed in southwest Iran from 139 BC to 224 AD. From a 'classical' artistic point of view, Parthian art is often said to be stiff and rigid, and thus tacitly but commonly inferred to be inferior among historians of ancient Greek art.

Also on display, but until recently relegated to the periphery of the exhibition, is the portrait of a Hellenistic ruler (Fig. 1). This head, which is one of the very few examples

Fig. 1. Portrait head of the 'Hellenistic Ruler' (National Museum of Iran Inv. 2475 and National Museum of Iran Inv. 2477), Photo: Gunvor Lindström, German Archaeological Institute (DAI), Eurasia Department

of large-scale Hellenistic sculpture from Iran, was the starting point for the studies presented here. Although it was already identified by Stein as the portrait of a Hellenistic king, and although it remains one of the few Hellenistic ruler portraits preserved in the original, it has received little attention in classical archaeology. One reason the head may have been discounted is that its facial features are deformed; a problem the work presented here has used innovative methods to resolve.

This paper presents the research conducted during a few weeks in 2015 and 2016 at the Iranian National Museum and the Eurasia Department of the German Archaeological Institute. The studies initially focused on the head of the 'Hellenistic Ruler' and its reconstruction, then moved into the reconstruction of the entire statue, and finally included the other bronzes from Kal-e Chendar, mainly examining technological features.

The preliminary results of this research were presented in 2015 at the International congresses on ancient bronzes, held at the Getty Center and Villa in Los Angeles, USA and in 2018 at the University of Tübingen, Germany. This article summarises the papers published in the corresponding conference proceedings (Lindström 2017; Lindström 2019).

Art-historical classification of the bronze statues

The most comprehensive overview of the Kal-e Chendar sculptures is by Aurel Stein (1940) and André Godard (1937), although not all statues and fragments are illustrated in these publications. Later publications deal with individual pieces, but never include all finds (e.g. Kawami 1987; Mathiesen 1992; Fleischer 2016). A reasonably complete overview of the Kal-e Chendar sculptures was only obtained through the research presented here (Lindström 2017). During these investigations, several pieces were 'rediscovered' in the museum's storage rooms. In addition, previously unpublished bronze fragments were identified and thus added to the corpus, leading to the current number of at least 11 bronze and 2 marble sculptures from Kal-e Chendar.

Despite the limited research on the sculptures, several scholars have suggested that they form two groups in terms of style and iconography (e.g. Mathiesen 1992, 165; Fleischer 2016, 270-271): on the one hand, the 'Greek' sculptures in heroic nudity and/or with attributes of Greek deities, including the 'Hellenistic Ruler'. On the other hand, the 'un-Greek' or Iranian sculptures in tunic and trousers, including the 'Shami Prince'. This classification led to an approximate dating of the 'Greek' group to the 3rd or 2nd century BC, the period after the Macedonian conquest of Persia, when the influence of Greek art was strong, presumably a reaction to the demands of Greek and other Western settlers in Persia and the more or less Hellenised local elites. In contrast, the 'un-Greek' group of sculptures has generally been dated to the Parthian period, which lasted in southwestern Iran from 139 BC to about the early 3rd century AD. This dating is based on the observation that the Arsacid kings who ruled the Parthian Empire departed from Hellenistic portrait conventions - at least as far as their depictions on coins were concerned - by presenting themselves in long, loose robes, bearded and with longer hair. There have been attempts to date the 'Shami Prince' more precisely, with a tendency towards the 1st century BCE (Kawami 1987, 66, Boyce and Grenet 1991, 43).

However, the dating of the 'Shami Prince' in particular and of the Kal-e Chendar sculptures in general faces the problem that the Parthian period lacks a coherent corpus of art (Abdi 2017, 79). Sculptures are known from only a few widely dispersed artistic centres, namely Hatra, Palmyra, Dura Europos and Nisa. Research has revealed that there was no single style of 'Parthian art' or 'art in the Arsacid Empire' (Invernizzi 2011; Jacobs 2014; Hauser 2014). In any case, the dating of the Kal-e Chendar bronzes, both the 'Greek' and the 'un-Greek' groups, is based on general assumptions about the historical conditions that favoured the transmission of Greek style and iconography, or that promoted a un-Greek visual culture, may it be called 'Parthian', 'Iranian' or simply 'Oriental'.

Current approach to a classification of the bronze statues

An overly generalized focus on the 'Greek' and 'un-Greek' dating of the Kal-e Chendar sculptures has deflected attention from their archaeological significance. And while some scholars have suggested that the different style-groups of Kal-e Chendar sculptures were produced at different times and, hence, by different workshops, this has been inferred rather than directly investigated. The author's current research reveals that the stylistic division of the Kal-e Chendar bronzes into two groups is carried through to technical differences in Hellenistic- and Parthian-period sculpture production, indicating a significant change in the production of bronze sculptures.

Moreover, and in contrast to the generalized dating of the sculptures as a group, this research has led to a probable identification of the Hellenistic ruler portrait as an Elymaean king of the Kamnaskirid dynasty, dated to around 140 BC. The association of the Elymaean king's portrait with the further reconstruction of the entire statue, and the novel methods used to identify the technological commonalities and differences among the corpus of Kal-e Chendar bronze sculptures, show the potential of research on this hitherto neglected cache of sculptures, a potential that will be fully exploited in a project begun in spring 2021.

This paper first gives some background information on the discovery of the Kal-e Chendar statues in the 1930s and on the location and interpretation of the site itself, considering the results of the recent Iranian-Italian fieldwork. It will then present the results of the author's current research in three analytical steps: First, the research on the head of the 'Hellenistic Ruler', whose facial features were reconstructed using photogrammetry and 3D technology. Based on the head's reconstruction it is here proposed to date this prime example of the 'Greek' Kal-e Chendar bronzes in the years around 140 BCE. The second analysis is devoted to the reconstruction of the entire figure of the 'Hellenistic Ruler', which was one of the spectacular results of the current project (Lindström 2017). Although the pieces of the figure do not directly join, the results of visual examination with a focus on casting technique and pXRF analysis proofed their belonging to the same statue. The same analytical methods are applied in a third step to additional bronze statuary from Kal-e Chendar, both from the 'Greek' and the 'un-Greek' group of sculptures, which indicates that the groups differ not only in terms of style and art, but also in terms of technology (Lindström 2019).

Discovery and Ancient Context

The sculptures, some almost complete but most as fragments, were discovered by chance during construction work in 1934 (Godard 1937, 290) or 1935 (Stein 1940, 130). They were confiscated by the military governor of the region and taken to his residence in Mālamīr, now Izeh, where in early 1936, the famous explorer Sir Aurel Stein while on his 'Fourth Expedition to Southwest Iran' go to see them. Stein recognised the significance of the finds and visited the site of their discovery. During a rescue excavation lasting a few days, he uncovered a small shrine enclosed by a wall of 23 by 12 meter, with an altar in the centre (Stein 1940, 130-134 and 141-146).

The architecture of the sanctuary was largely destroyed, first by a fire, later by rebuilding and finally by quarrying activity and the foundation for the modern buildings. Nevertheless, Stein was able to note the find spots of the sculptures discovered a few months earlier by the local population, and he unearthed additional, but smaller fragments of bronze statues. According to the 'local heads and others', almost all the bronze pieces were found in a heap outside the enclosure, while the most intact statue of the find complex, the 'Shami Prince' was from the central part of the shrine. Of the seven image bases preserved on site, Stein discovered only three bases in situ: two bases for larger statues were found on both sides of the central altar and another with dowel holes for smaller statues stood near the enclosure wall. Even though Stein's own finds were not very significant in view of the high-quality statues found by the locals, it was concluded that the

site was one of the most important religious places of ancient Elymais, at least during the Hellenistic an Parthian periods.

An agreement with the Iranian authorities allowed Sir Aurel Stein to temporarily send all objects to the British Museum for examination and study, subject to the subsequent division into half shares (Stein 1940, XIV; Sims-Williams 2012). However, because most of the sculptures did not come to light during the excavations but beforehand, almost all the bronzes were sent back to Iran in 1937 or 1938. Only around 20 smaller fragments accredited as British share remained in the British Museum and are now in the storage of the Department of the Middle East (British Museum Collection Online 2021).

Despite the importance of the site as one of the few sanctuaries in the Hellenistic East, there was no further archaeological research at Kal-e Chendar until very recently. The reasons for this include the isolated location of the site in the Zagros Mountains on an altitude of ca. 1000 m. However, from 2012 to 2017, the Iranian-Italian Joint Expedition in Khuzestan re-examined the site and discovered that the ancient ruins cover a much larger area than Stein had assumed (Mehr Kian and Messina 2019; Messina and Mehr Kian 2014 and 2016; Baqherian et al. 2016; Bucci et al. 2017 and 2018). In addition to the terrace partly excavated by Stein the walls of at least two other monumental terraces were identified, similar to those of Masjid-e Suleyman and Bard-e Nechandeh, sanctuaries that are also located in the mountainous Elymais (Ghirshman 1976). But in the immediate vicinity of the Kal-e Chendar sanctuary was a large necropolis, which is a special feature of this cult site (see also Godard 1962, 177-180). The Iranian-Italian team excavated only four of the 32 tombs identified, but expects that hundreds more will be discovered in the future. The monumental impression of some tombs seems to relate to an aristocratic milieu, which is also suggested by what remains of the grave goods. For these reasons, the excavators assume that Kal-e Chendar was, if not a dynastic (as assumed by Sherwin-White 1984; Canepa 2015, 78), at least an elite sanctuary (Bucci et al. 2018, 49). If so, some of the statues would refer to this function, namely the 'Hellenistic Ruler' and the 'Shami Prince'.

The 'Hellenistic Ruler' portrait head: condition and a first attempt at reconstruction

The head of the 'Hellenistic Ruler' was found in two pieces (National Museum of Iran Inv. 2475 and National Museum of Iran Inv. 2477), obviously cut and heavily damaged in antiquity. The first published photo shows both fragments lying on the side, juxtaposed (Fig. 2). Although Stein noted that both parts fit together, the dissimilar side view of the faces led some scholars to assume that they represent two different portraits (for example Ghirshman 1962, 21; Colledge 1967, 156 and 221; Colledge 1987, 152; Parlasca 1991, 465; Fleischer 2016, 271). For aesthetic and museum display reasons the two parts were fixed together sometime in the 1960s and the join was covered with epoxy. The head has a clean shaven face with both ears, parts of the hair, and the front part of the neck, which is bent forward. The upper and back parts of the head were detached from the face and are not preserved.

The traces of the destruction seem not only the result of a partition of the casting to manageable pieces to melt them down. A photograph taken by Stein preserved in the archives of the British Library (Fig. 3) shows the assembled parts of the head before restoration. The marks of a chisel are visible at the left side of the forehead (Fig. 4). From there, the cut is running along the bridge of the nose to the chin. Because this is not the easiest line to divide a bronze head, a non-practical purpose of the partition is to be considered. Moreover, the bulge in the cheek was carried out by several heavy blows with an edged tool, presumably a stone. The entire nose is pushed to the right side of the face, making the right side of the nose compressed and the left cheek bulged. The brutality of the actions and the deliberate distortion is obvious. Presumably the damage is a damnatio memoriae and the performers aimed to destroy the image and the memory of the ruler.

Fig. 2. The two pieces of the 'Hellenistic Ruler's' head, photo taken by Aurel Stein at the residence of the local military governor at Mālamīr, now Izeh, Photo after Stein 1940, pl. IV

Fig. 3. The two pieces of the 'Hellenistic Ruler's' head as assembled in the British Museum in 1937, Photo: The British Library Board, India Office Select Materials, Prints and Drawings Collection, Photo 392/39 (406)

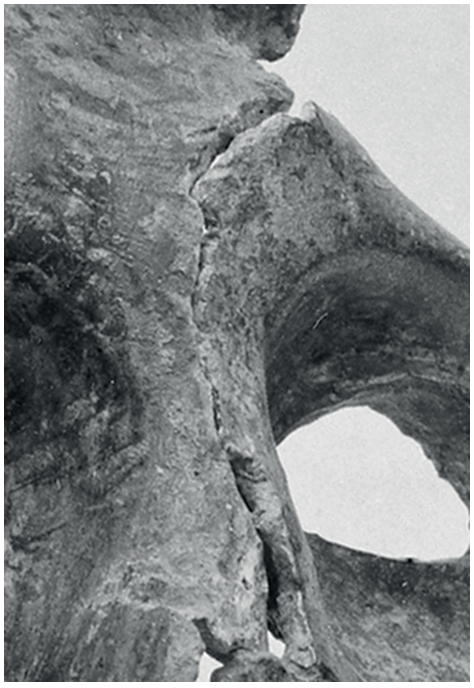

Figure 4 Detail of fig. 3 showing cut marks made by a chisel, Photo: The British Library Board, India Office Select Materials, Prints and Drawings Collection, Photo 392/39 (406)

Because the head is a portrait of a ruler, there were of course attempts to identify the sitter by comparing him with coin portraits. However, as Stein already recognised, this comparison was impossible due to the severe deformation of the facial features. For this reason, he initiated a first reconstruction of the original facial features. This is attested only by a picture taken by Aurel Stein in 1937. It was published by Stein (1938, fig. 8) and Picard (1939, fig. 35) without noting that it shows the reconstruction. However, the picture is reproduced in Michael Rostovtzeff's "Social and Economic History of the Hellenistic World", where the caption reads "photograph of a lead cast supplied by Sir Aurel Stein" and "pro tempore in the British Museum" (Rostovtzeff 1941, pl. 10.1). Since the head belongs to the collection of the National Museum, one wonders how a cast could get into the British Museum. But as mentioned above the head together with other sculptures was sent to the British Museum for examination. During its stay in London, the medalist and sculptor Frank Bowcher made a piece mold of the head and produced the lead cast. This is evident from a correspondence between Stein and Fred Andrews, who supervised the examinations of Stein's finds at the British Museum (excerpts of the correspondence published by Sims-Williams 2012). The sculptor added the eye, squeezed out the depression in the right cheek, and put some parts of the head back in place, such as the neck. Unfortunately this reconstruction could not be traced in the British Museum and other collections in the United Kingdom.

Since the discovery of the portrait head, numerous attempts were made to identify the sitter. Several identifications have been proposed from Alexander the Great to Antiochus I and II or Seleucus II, to Antiochus III, Antiochus IV and Antiochus VII. It has even been proposed Kamnaskires I, the first king of a local Elymaean dynasty ruling under Parthian domination since the middle of the second century BC (see references in Lindström 2017, 184-185 with note 10-16). But most of these identifications are merely speculations, and based more on historical considerations than on a comparison with the coin portraits of the respective kings. Because of the strong deformation of the face some scholars admit that it is difficult or even impossible to identify the ruler (Kyrieleis 1980, 22 n. 80; Kawami 1987, 28; Fleischer 1991, 105-106; 2000; 2016, 283; Mathiesen 1992, 88-89). So despite Stein's hope that expert examination of the head may lead to the identification of the king (Stein 1938, 325) the depicted ruler has not been identified.

The reconstruction of the original features of the head

The reconstruction of the original features of the Hellenistic ruler was attempted anew in the project started in August, 2015. Based upon a series of digital images and by means of photogrammetry, a three-dimensional state model was created (Fig. 5). This, in turn, was modified by means of computer animation. There were a few areas of the face that remained relatively undamaged, such as the right side of the fore-

Fig. 5. State model of the 'Hellenistic Ruler's' head: profiles, front, and back. 3D modelling: Thomas Kersten, Photogrammetry & Laser Scanning Lab, HafenCity University, Hamburg

undamaged, such as the right side of the forehead to just below the eye; this area was digitally copied, then mirrored to serve as a template on which the surface data of the left side of the face were applied. In addition, the dents created by hammering were compensated for, and parts with folding or bending, like the hair above the right ear, were put in place.

The result of the reconstruction is a surprisingly youthful face of triangular shape with a broad forehead and a narrow chin; the jawline is not particular strong (Fig. 6). Short, curved strands of hair cover the forehead and form a tong slightly offset from the central axis. The nose is straight and not very prominent; it has a somewhat large distance to the upper lip. The mouth is narrow with small and tight lips. As one of the objectives was to make the original quality of this demolished head clear to a wider audience, the digital data of the 3D reconstruction were printed on the original scale and the print-out handed over to the National Museum of Iran, where it is now on display, right next to the original.

The second objective of the reconstruction was to come closer to an identification and thus to a dating of the bronze portrait. For this purpose the method of choice is to compare the bronze portrait to coin portraits of kings. For historical reasons alone, the search for the sitter can be limited to those rulers who were portrayed beardless and with short hair, and thus, the Parthian kings, always characterized by a beard or by long hair, are to be excluded. Because a portrait statue would be erected only for a ruler who actually controlled the region the search can also be limited to kings who, at least at some time, were in power in southwestern Iran. Therefore, the Kal-e Chendar portrait can either be a king of the Seleucid dynasty, who ruled in Iran and the neighbouring lands from 301 BCE on (for the portraits see Fleischer 1991; Houghton, Lorber and Kitt 2002; Houghton, Lorber and Hoover 2008), or of the

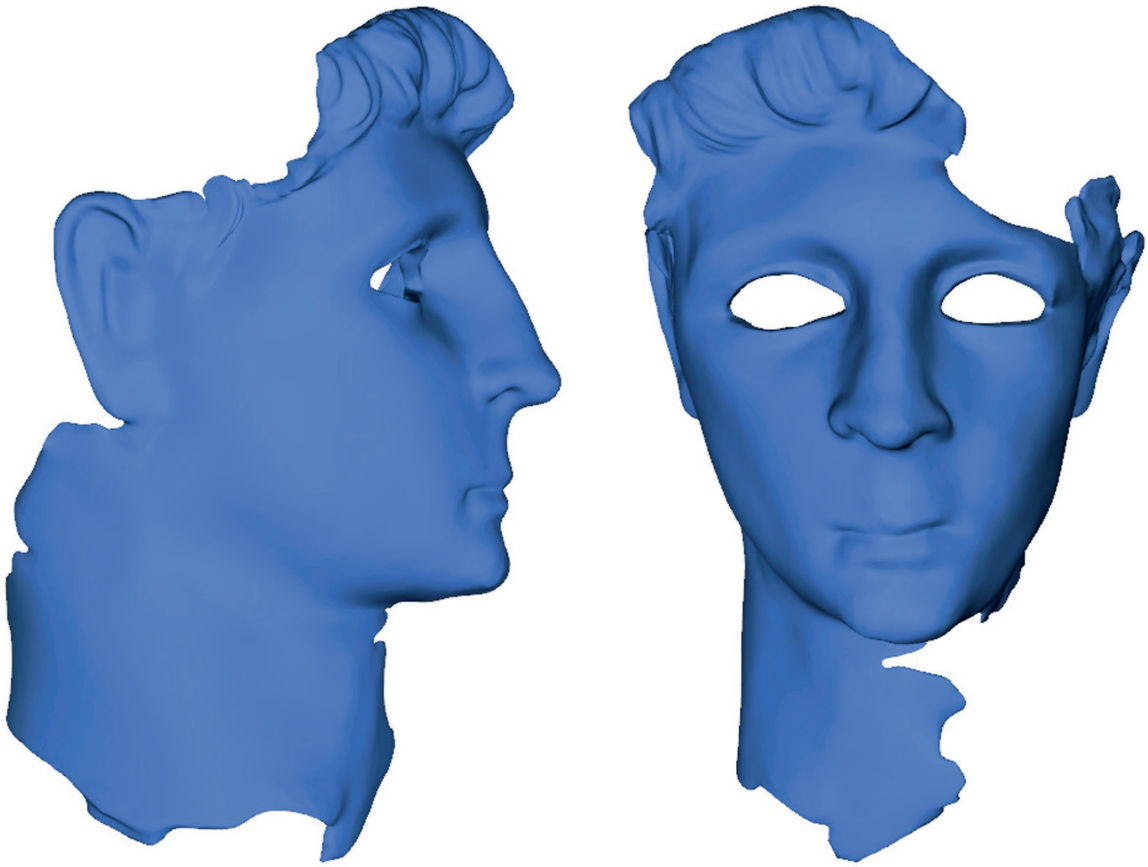

Fig. 6. Digital 3D reconstruction of the 'Hellenistic Ruler's' head, Reconstruction: Simon Deggim/Thomas Kersten, Photogrammetry & Laser Scanning Lab, HafenCity University, Hamburg in consultation with Gunvor Lindström, German Archaeological Institute (DAI), Eurasia Department

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Although the facial features of the bronze portrait described above are not enough to identify the ruler, they may well lead to exclude certain identifications. For it is very unlikely that our bronze head represents Seleucus I, as he is never as youthful on the coins, or Antiochus I, who, like his father, is always characterized by a strong jawline that our portrait lacks. Antiochus II, Seleucus II, and Antiochus III are also unlikely because they are always characterized by a long, pointed nose – and our portrait doesn't have a prominent nose. In addition, Antiochus III is characterized by receding hairlines, a feature that is also typical for the portraits of his successors Seleucus IV and Antiochus IV – but our portrait has full hair. Antiochus V is to be excluded because he ruled only two years and was not important in the East. It is also unlikely Demetrius I, because his coin portraits have a characteristic anastolé and a short nose-to-mouth distance, unlike our bronze portrait. It is certainly not Alexander Balas, because in contrast to the bronze head his coin portraits are characterized by a prominent jawline. And that brings us to Demetrius II, who, in his first reign (145-139 BCE), is depicted like the bronze head from Kal-e Chendar youthful and with a remarkably small, narrow mouth. However, during and after the succession conflict between Demetrius and Alexander Balas, the Seleucids had already lost control over Elymais. Thus, it is unlikely that a statue of Demetrius II would have been erected in a sanctuary high up in the Zagros Mountains. However, the Elymaean kings took over the mint of Susa, and the coins minted by Kamnaskires I and Okkonapses represent the local kings in a similar way as Demetrius II, with a small mouth and beardless. Hence, the sitter of our portrait is most likely one of

Fig. 7. Reconstruction of the 'Hellenistic Ruler's' sculpture using the 3D-reconstruction of the head and scaled photos of the preserved fragments, Drawing: Helga Kosak in consultation with Gunvor Lindström, German Archaeological Institute (DAI), Eurasia Department

these Elymaean kings of the interphase, as already suggested by Frantz Grenet (Boyce and Grenet 1991, 43 n. 47), Matthew Canepa (2015, 85) and by Robert Fleischer on the basis of the right half of the head (2016, 280).

To summarize, although we cannot definitely identify the sitter of the Kal-e Chendar bronze portrait, a dating around 140 BCE is most likely. So the prime example of the 'Greek-style' group of bronze statues actually dates back to the time when Southwest Iran was still under strong Greek influence.

Fig. 8. Raised left arm of the 'Hellenistic Ruler's' sculpture (National Museum of Iran Inv. 2874, 2473 and 2471), compared to the arm of a man 1.76 meters tall
Photo: Gunvor Lindstrom, German Archaeological Institute (DAI), Eurasia Department

The 'Hellenistic Ruler' statue reconstructed

A spectacular and unexpected outcome of the research on the head of the 'Hellenistic Ruler' was the identification of previously unidentified remains of the same statue in the museum's storerooms, which allowed the reconstruction of the entire figure (Fig. 7). Leaning naked on a spear held with the raised arm, the statue followed the most popular format of Hellenistic royal figures. Although it is assumed that ruler statues of this type were common throughout the Hellenistic world, the Hellenistic king from Kal-e Chendar is now the first known for the regions of Iran and further east.

That some fragments belonged to the same statue as the head was suggested by the above-mentioned photographs from Stein's archive, which, in contrast to Stein's plates, show an exact scale. Five fragments in these photos have similar proportions to the head. When

colleagues at the National Museum of Iran used the photographs in August 2015 to gather these fragments, some of which had been lying dormant in the museum's storerooms, it turned out that two fragments (National Museum of Iran Inv. 2874 and 2473) directly fit to the left hand (National Museum of Iran Inv. 2471). They form a raised left arm, the fingers grasping a long object, most likely a spear (Fig. 8), thus in a pose that was often chosen for the depiction of Hellenistic rulers. Being significantly larger than the arm of an average-size European, the bronze arm indicates a sculpture slightly more than two meters tall. The super-life size, which was actually only considered for the depiction of gods and rulers, and the princely pose of the statue confirms that the statue represents a Hellenistic king. Although it is assumed that representations of rulers of this type were common throughout the Hellenistic world, little archaeological evidence of their existence has been found in the East. The reconstructed ruler statue from Kal-e Chendar thus fills a gap.

In 1987 Trudy S. Kawami, commenting on the statue then witnessed only by the head, noted that "the presence of such an important work so far from a major city is difficult to explain" (Kawami 1987, 28). However, judging from the first results of the Iranian-Italian excavations at Kal-e Chendar the sculpture was erected at one of the most reputed religious places of ancient Elymais. From a Mediterranean point of view, the quality and 'Greekness' of the statue reassembled within the project may cause surprise, especially when regarding its discovery in Iran. However, it just points out our limited knowledge of Hellenism in the regions east of the Tigris River.

Due to the proportions, the fragment of a right arm (NM 2470) and a piece of the left leg from below the knee to just above the ankle (National Museum of Iran Inv. 2478) were also assigned to the statue. Since the torso is missing not all fragments directly join. Hence, investigations moved to identifying other possible consistent features. In fact, a visual examination revealed long relief bands at the interior of all pieces of the extremities attributed to the 'Hellenistic Ruler' (Fig. 9). These indicate the use of a specific technique of lost-wax-casting, the indirect process that was commonly applied by Greek bronze sculptors from the early 5th century BCE on (Mattusch 1996). The indirect method to model and cast a bronze statue has two main advantages over the simpler direct method: First, the indirect modelling allows any number of attempts to cast the figure.

Fig. 9. Interior view of the 'Hellenistic Ruler's' left arm (National Museum of Iran Inv. 2874, 2473 and 2471), long relief bands as evidence for indirect moulding and casting, Photo: Gunvor Lindström, German Archaeological Institute (DAI), Eurasia Department

For example, if the casting of an arm failed, it was possible to repeat it, receiving in the result an exactly fitting piece. For this reason, the indirect method was of specific importance for casting large scale sculptures which were always cast in pieces. The second advantage of this method was the lining of the master moulds with wax, which results in thin and even metal walls (often only 0.3-0.5 cm). It also meant that less material had to be spent, so the casting was more economical.

All fragments of the arms and legs attributed to the 'Hellenistic Ruler' show the long relief band at their interior surface: both fragments of the left arm, the line observable at the larger of these fragments running into the interior of the left hand, the fragment of the right arm and the piece of the left leg. These bands result from the lining of the master moulds with oblong, thin slabs of beeswax that were stuck together at their overlaps. Because during casting the wax was replaced by bronze, these 'seams' are visible on the interior of the castings. However, lining with oblong wax slabs was suitable for tubular castings, like arms and legs, but it was not for spherical castings, like the head. And indeed, on the interior of the head no seams are observable. Apparently, in this case the hot wax was poured into the mould, the mould slued and swivelled around so that the wax was distributed evenly on the inner walls. However, at one spot at the interior of the right cheek it seems that the result of the application was not satisfying. Here, three parallel traces of a spatula can be observed that was obviously used to press the wax firmly to the mould (Fig. 10). These features are also evidence of the application of the indirect casting process.

In addition to the visual examination of the castings, elemental analysis by portable XRF (pXRF) was performed by Daniel Steiniger from the DAI's Eurasia Department. Because pXRF provides results only at the surface where the metal composition is potentially altered by corrosion the measurements were taken at relatively 'corrosion-free' areas, multiple spots on each of the bronzes were analysed, obvious outliers were excluded and the measured values were averaged. The results of the pXRF analysis show that the individual castings consist of a very similar alloy, a bronze with a tin (Sn) content of 5.5% to 8.8% and a considerable lower lead (Pb) content of around 1.8% to 5.4% (Fig. 11). To prove the validity of the pXRF surface analysis, additional measurements were performed on fresh cut sections, taken by the museum's conservator at the breaks of the head, the right and left arm, and the left leg. The results show a basic consistency with the values obtained at the bronze surface (Lindström 2019, 135). The only outlier is the piece of the right arm, with a considerable higher amount of lead (16.5%). However, it is still highly probable that this fragment belongs to the same statue for it has a straight raised line at its interior surface that runs parallel to the length of the arm, thus indicating the use of an oblong wax plate to line the mould. As will be elaborated below, this feature is specific for the 'Hellenistic Ruler' statue and cannot be observed at the pieces belonging to other sculptures from Kal-e Chendar.

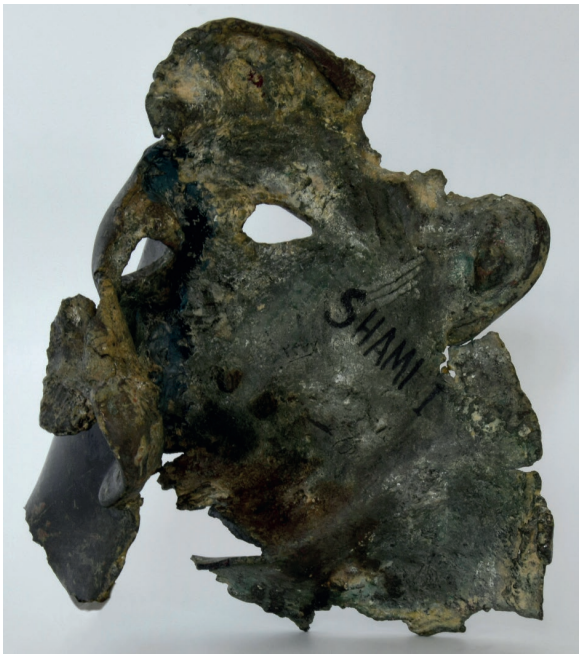
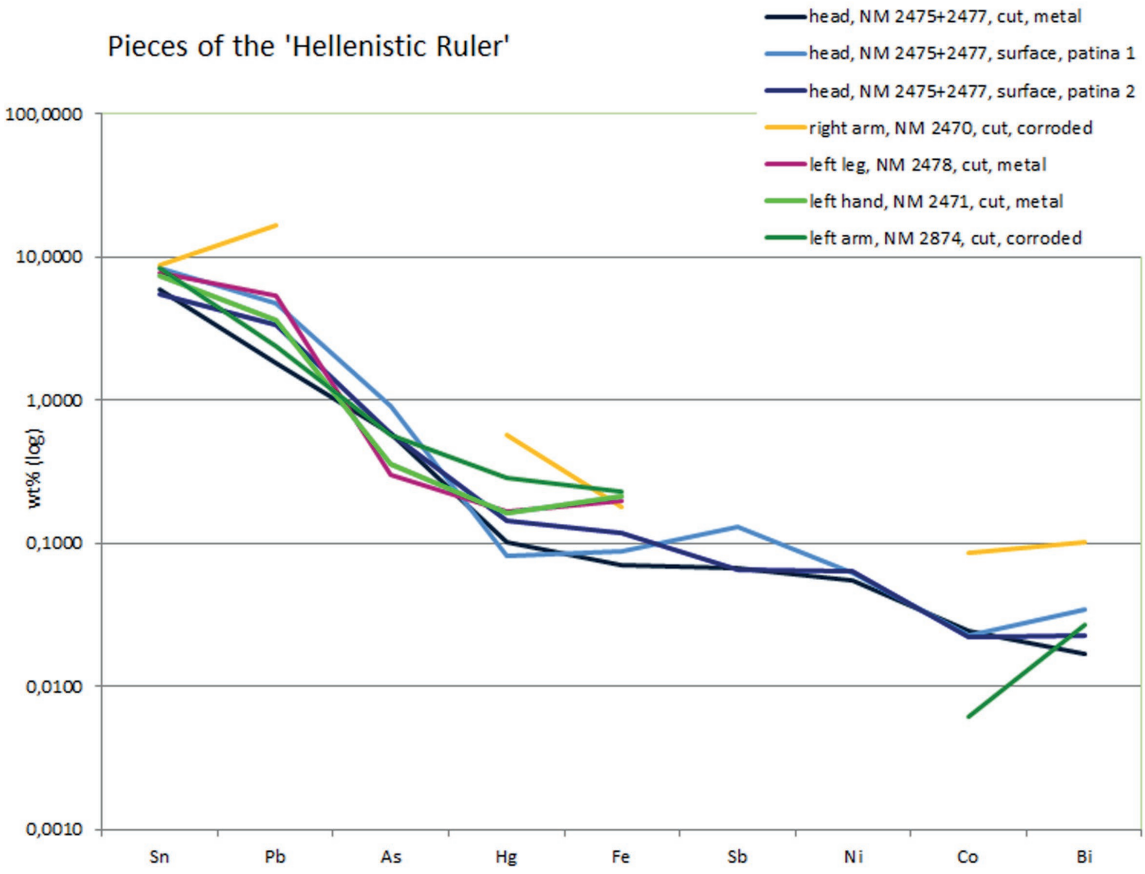


Fig. 10. Interior view of the 'Hellenistic Ruler's' head (National Museum of Iran Inv. 2075 and 2077), impressions of a spatula as evidence for indirect moulding and casting, Photo: Gunvor Lindström, German Archaeological Institute (DAI), Eurasia Department

As a result, the consistent technological features of the bronze pieces assigned to the 'Hellenistic Ruler' indicate that they are



ID	sample	material	Sn	Pb	As	Hg	Fe	Sb	Ni	Co	Bi	Bi
head, NM 2475+2477	cut	metal	5,90	1,79	0,59	0,10	0,07	0,07	0,05	0,02	0,02	0,02
head, NM 2475+2477, patina 1	surface	patina	8,34	4,74	0,90	0,08	0,09	0,13	0,06	0,02	0,03	0,03
head, NM 2475+2477, patina 2	surface	patina	5,54	3,34	0,59	0,14	0,12	0,07	0,06	0,02	0,02	0,02
right arm, NM 2470	cut	corroded	8,83	16,45	-	0,57	0,18	-	-	0,09	0,10	0,10
left leg, NM 2478	cut	metal	7,78	5,40	0,30	0,17	0,20	-	-	-	0,02	0,02
left Hand, NM 2471	cut	metal	7,32	3,60	0,36	0,16	0,21	-	-	-	0,03	0,03
left arm, NM 2874	cut	corroded	8,40	2,37	0,57	0,29	0,23	-	-	0,01	0,03	0,03

Fig. 11. Results of the pXRF analysis of the bronze castings attributed to the figure of the 'Hellenistic Ruler' Results of the pXRF analysis by Daniel Steiniger

produced as parts of one and the same statue. That the sculptor or workshop who made the statue in around 140 BCE not only applied Greek style and iconography, but also the indirect casting method demonstrates that he was also technically in a Greek workshop tradition.

Comparing the 'Greek' and 'un-Greek' bronzes from Kal-e Chendar

The above described technological features of the 'Hellenistic Ruler' statue can only be considered unifying criteria if the other pieces from the same locality can be demonstrated to be different. Therefore, the other bronze castings from Kal-e Chendar were preliminary examined. As outlined above, they form two groups by motif and style: on the one hand 'Greek' figures and on the other hand 'un-Greek' representations in tunic and pants. To the 'Greek-style' group of the 'Hellenistic Ruler' belong three additional figures: a nude male statue, represented by a piece of the left lower leg (National Museum of Iran Inv. 2092; Stein 1940, pl. V.6), a statue with a club, apparently a Heracles (National Museum of Iran Inv. 2093, Fig. 12); and a small statuette represented by a panther skin, so presumably a figure of Dionysus (National Museum of Iran Inv. 2479; Stein 1940, pl. VI.14). The 'un-Greek' group consists of the famous 'Shami Prince' (National Museum of Iran Inv. 2401, Fig. 13), the back head of a life-size figure (National Museum of Iran

Fig. 12. Fragment of a statue with a club, apparently a Heracles (National Museum of Iran Inv. 2093), Photo: Gunvor Lindström, German Archaeological Institute (DAI), Eurasia Department

Inv. 2476, now lost), and pieces of six additional figures, mostly presented by their extremities: a larger than-life right arm covered with a wide sleeve (National Museum of Iran Inv. 2474; Stein 1940, fig. 48); a life-size right hand which was obviously intended for insertion into an arm of a clothed statue, the sleeve of which would have covered the seam (National Museum of Iran Inv. 2472; Stein 1940, pl. V.5); a right arm with hand, sleeve and bracelet of two-thirds life size (National Museum of Iran Inv. 2091, Fig. 14); a statuette of a man in loose, long-sleeved robe, long trousers and boots of a supple material (National Museum of Iran Inv. 2090; Stein 1940, fig. 48); and left foot and ankle covered with a similar loose-fitting moccasin-like shoe (National Museum of Iran Inv. 2468; Stein 1940, pl. VI.16).

The question was whether and how these castings differed from the fragments attributed to the 'Hellenistic Ruler' in terms of casting

Fig. 13. 'Shami Prince' (National Museum of Iran Inv. 2401), Photo: Nima Mohammadi Fakoorzadeh, National Museum of Iran

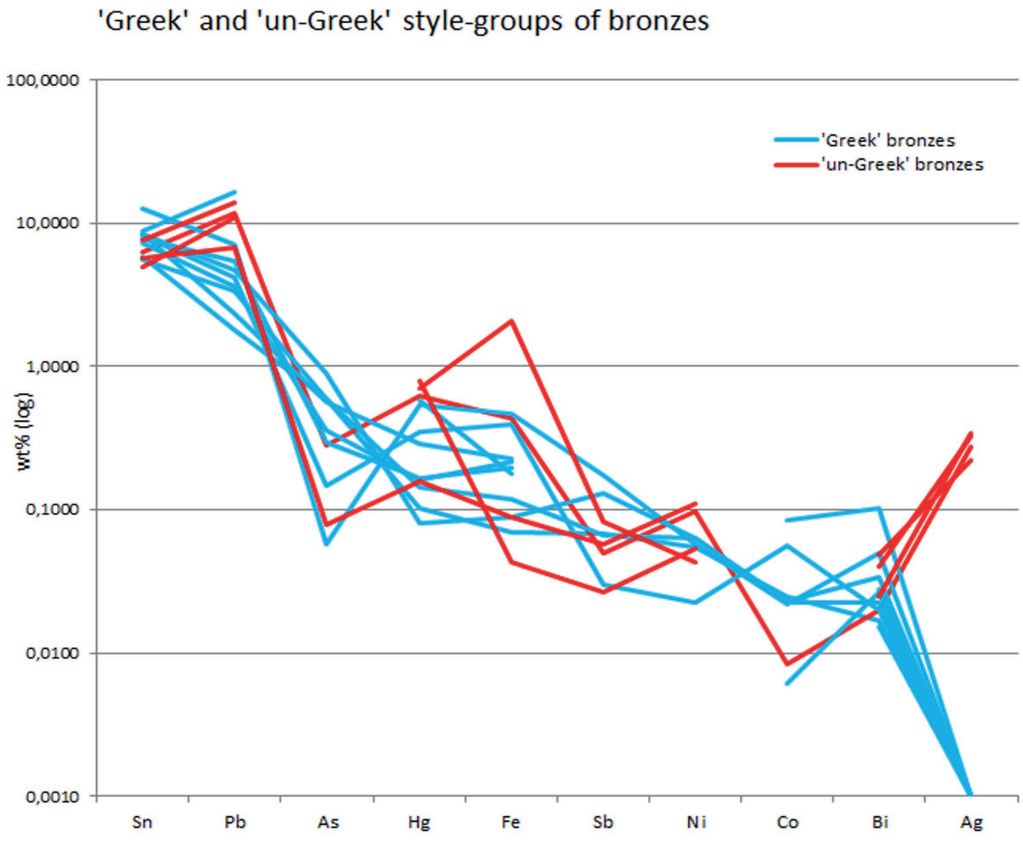
Fig. 14. Right arm of a statue with sleeve and bracelet (National Museum of Iran Inv. 2091)
Photo: Gunvor Lindström, German Archaeological Institute (DAI), Eurasia Department

technique and alloy composition. In addition, the comparative study of the entire group of bronze statues from Kal-e Chendar was to show whether the grouping based on art-historical criteria could be confirmed by technological criteria. This part of the study consisted of the same investigations as for the fragments of the 'Hellenistic Ruler', i.e. visual examinations focusing on the casting technique as well as pXRF measurements to determine the alloys used in casting the figures.

With regard to the alloys, pXRF clearly confirmed the division of the bronzes into two groups. From the 'Greek' group of bronzes, despite the pieces of the 'Hellenistic Ruler' statue the panther skin National Museum of Iran Inv. 2479 and the Heracles' club National Museum of Iran Inv. 2093 were analysed, from the 'un-Greek' group of sculptures the 'Shami Prince' National Museum of Iran Inv. 2401, the right hand National Museum of Iran Inv. 2472, the right foot National Museum of Iran Inv. 2468 and the right arm National Museum of Iran Inv. 2091. The method of measurement was as described above, measuring multiple spots on each casting, at the 'Shami Prince' even 16 spots.

The results show that the 'Greek' castings are bronzes – copper with a significant addition of tin – whereas the 'un-Greek' castings are high leaded bronzes – copper with more lead than tin (Fig. 15). A striking difference is also evident in the trace elements: while the 'Greek' bronzes contain no silver at all, the 'un-Greek' bronzes have a relatively high content of silver (0.22 to 0.34 ppm). As it is unlikely that the silver was added to the alloy it can be regarded as a trace element and, therefore, is related to the ore source of the main metal components. In summary, this part of the investigation has found that the bronze sculptors and the workshops of the 'Greek' and 'un-Greek' bronzes used different recipes and relied on different sources of metal ores.

With regard to the casting technology, relief bands at the inner surface indicating casting by the indirect process were only observed at the piece of a left leg (National Museum of Iran Inv. 2092) – nude and thus belonging to the 'Greek' group of sculptures. But in contrast to the 'Hellenistic Ruler' pieces, the relief band here runs horizontally, that is transverse to the direction of the leg. Since the inner surfaces of the other castings could not be adequately examined without an endoscope or lighting device, it is not possible for the time being to make definitive statements about the particular casting technique used. One thing, however, is obvious at first sight: the metal walls of the 'Greek' group of sculptures are relatively thin (0.3 to 0.5 cm), whereas the metal walls of the 'un-Greek' group are considerably thicker (0.8



ID	sample	material	Sn	Pb	As	Hg	Fe	Sb	Ni	Co	Bi	Ag
head, NM 2475+2477	cut	metal	5,90	1,79	0,59	0,10	0,07	0,07	0,05	0,02	0,02	-
head, NM 2475+2477, patina 1	surface	patina	8,34	4,74	0,90	0,08	0,09	0,13	0,06	0,02	0,03	-
head, NM 2475+2477, patina 2	surface	patina	5,54	3,34	0,59	0,14	0,12	0,07	0,06	0,02	0,02	-
right arm, NM 2470	cut	corroded	8,83	16,45	-	0,57	0,18	-	-	0,09	0,10	-
left leg, NM 2478	cut	metal	7,78	5,40	0,30	0,17	0,20	-	-	-	0,02	-
left Hand, NM 2471	cut	metal	7,32	3,60	0,36	0,16	0,21	-	-	-	0,03	-
left arm, NM 2874	cut	corroded	8,40	2,37	0,57	0,29	0,23	-	-	0,01	0,03	-
panther skin, NM 2479	surface	patina	8,15	4,18	0,15	0,35	0,39	0,03	0,02	0,06	0,02	-
Heracles' club, NM 2093	surface	patina	12,55	7,13	0,06	0,54	0,46	0,17	0,06	0,02	0,05	-
'Parthian Nobleman', NM 2401	surface	patina	6,33	11,75	0,28	0,63	0,43	0,05	0,10	0,01	0,02	0,28
right hand, NM 2472	surface	patina	5,67	6,79	0,08	0,16	0,09	0,06	0,11	-	0,02	0,34
right foot, NM 2468	surface	patina	4,99	10,90	-	0,79	0,04	0,03	0,05	-	0,04	0,33
right arm, NM 2091	surface	patina	7,65	14,00	-	0,70	2,07	0,08	0,04	-	0,05	0,22

Fig. 15. Ratio of tin (Sn) and lead (Pb) (left side) and silver content (Ag) (right side) in 'Greek' and 'un-Greek' sculpture fragments Results of the pXRF analysis by Daniel Steiniger

to 1.4 cm). This can be seen very well at the break of the right arm of the 'Shami Prince' (Fig. 16).

To summarize the comparative investigations on technology, the differences in alloy composition and of the thickness of the Kal-e Chendar bronze statuary confirms the stylistic classification into a 'Greek' and 'un-Greek' group. The sculptors and workshops involved in casting these bronzes obviously drew on different recipes and raw material sources for the bronze. While the workshops of the 'Greek' statues obviously used indirect casting, the workshops of the 'un-Greek' statues either did not apply this method or varied the method at a crucial point.

Discussion and future research

The thick metal walls would actually speak in favour of direct casting process, in which the wax is modelled over a clay core, resulting in relatively thick and uneven wax layers and, hence, thick metal walls. However, since the development of the innovative, indirect cast-

Fig. 16. 'Shami Prince' (National Museum of Iran Inv. 2401), break of the right arm. Metal wall at this spot 1.3 cm, Photo: Gunvor Lindström, German Archaeological Institute (DAI), Eurasia Department

ing process at the end of the 6th century BCE, the direct casting process was no longer used to produce large-scale sculptures, at least not in the geographical regions whose bronze castings are well-researched. This has to do with the two great advantages of indirect casting, namely lower material expenditure and reproducibility of the casting process. The latter was extremely important for casting large, complex forms, like life-size bronze figures.

Here it is assumed that the 'un-Greek' Kal-e Chendar bronzes also were cast by the indirect process, at least the large statues. Logistical restrictions make the direct casting of life-size figures difficult, if not impossible. Because casting only succeeds if sufficient bronze can be kept at high temperature ready for pouring into the mould. Hence, the size of the castings is limited by the size of smelting furnaces and crucibles. Therefore, the life-size statues likely were cast in pieces. And in this case, the bronze sculptor had to make sure that the individual pieces actually fit together, which was most easily ensured by using the indirect modelling and casting process.

However, at this preliminary stage of investigation, piece casting can be proved only for one example of the 'un-Greek' group of Kal-e Chendar bronzes, the 'Shami Prince'. It was noted by Stein that the legs, the upper body and the head were found as separate pieces (Stein 1940, 131), most likely broken along the welding seams. As can still be observed at the exhibit, the head was definitely cast as a separate piece (cf. also Godard 1937, fig. 119) which, however, fitted that close to the body that it was not even necessary to weld it. Nevertheless, a close examination of the 'un-Greek' group of Kal-e Chendar bronzes remains an important issue. An endoscope inserted for example into the 'Shami Prince' may reveal precise traces of the applied casting method.

For the time being, it can only be stated that the workshops that produced the 'Greek' sculptures used all the advantages of the indirect process, the workshops of the 'un-Greek' sculptures have foregone a significant advantage of this process, namely the saving of material. In addition, the alloys of the 'Greek' and 'Parthian' group of sculptures differ significantly in terms of trace elements, suggesting that the workshops used raw materials from different regions and that they were thus integrated into different trade-networks in raw materials. All in all, the differences indicate that the statues were made by different workshops that used different techniques and raw materials and certainly did not work side by side at the same period.

The results achieved so far motivate further research, which was started in spring 2021 with the support of the German Research Foundation (DFG). Since the finds from Kal-e Chendar are unique for the large number of preserved bronze and marble sculptures, the corpus is ideal for a diachronic investigation of the stylistic development from the Hellenistic into the Parthian period. This is one of the main goals of the project. Moreover, the historical reasons for the observed changes in style, and in technology and alloy composition of the bronze

sculptures are investigated. To what extent Parthian art draws on Greek traditions? Does the specific way of presentation of the human body in Parthian art relate to older Iranian traditions? Hence, the project explicitly refers to the recent discourse concerning a re-evaluation of Parthian art (Hauser 2014, Jacobs 2014). In addition, the project seeks to reconstruct the sculptures, for the first time including the above mentioned London fragments, and elucidate the former context of the statues, taking into account the stone pedestals preserved at the site. Do the statues form a sculptural program? Who do they represent and how do they relate to the sanctuary in Kal-e Chendar that was at least an elite, if not a dynastic sanctuary? Finally, the question should be raised why the statues of Kal-e Chendar have been preserved at all – why were they not melted down and the metal reused? In summary, the results of this archaeological and art-historical investigation are expected to shed light on one of the hitherto under-researched periods of Iran.

But the project goes beyond archaeological and art historical considerations. It examines in detail the technology and alloy composition of the two mentioned groups of sculptures. As in recent research on Greek and Roman bronze statuary technological observations and archaeometry are of great importance to the project, including scientific analysis of the metals and the core material. This makes the project the first one on Hellenistic bronzes from the East to link production technology and scientific analysis. From these investigations, new information about technology transfer and the integration in trade networks (trade of copper, tin, and lead) will emerge, as well as insights into workshops and technological signatures.

The will be conducted in close collaboration with the National Museum of Iran, especially the Conservation and Restoration Laboratory of the National Museum, and archaeometrist from the Art University of Isfahan.

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