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The Saka 'Animal Style' in Context: Material, Technology, Form and Use

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Abstract: The Iron Age Saka population of the eastern Eurasian Steppe is considered one of the earliest of the Scythian groups to emerge at the beginning of the 1st millennium BCE, consequently producing some of the earliest expressions of 'animal style' art. Recent excavations of burial mounds (kurgans) in the East Kazakhstan region have provided invaluable data on the depositional contexts of such objects. This paper combines contextual archaeological data and visual analysis with data on the chemical composition and technological production (through X-ray fluorescence and optical microscopy) of some of the gold artefacts from the Eleke Sazy funerary complex in East Kazakhstan. It is demonstrated that the positioning of wearable ornaments within undisturbed archaeological contexts can give vital information about their form and function, while evidence of production techniques and use-wear indicate the time investment and status the objects may have held. It is concluded that the Saka engaged in a complex process of design and execution of their art, depicting many different elements of the natural world. Further research is needed into understanding Saka lifeways and belief systems in relation to large-scale processes of climate change, land use, time, and society from securely dated and well-documented funerary and domestic archaeological contexts.

Keywords: Saka; Scythian; animal style; archaeological science; Iron Age; hare

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1. Introduction

The Iron Age Saka population of eastern Eurasia is considered the earliest of the Scythian groups to emerge in the 1st millennium BCE, as well as being the most substantial part of the Eastern group of the pan-Scythian family, occupying almost the entire territory of modern Kazakhstan, Kyrgyzstan, Tajikistan, northern Afghanistan, north-west China and northern Mongolia, and substantial parts of western and eastern Siberia (Davis-Kimball et al. 1995; Gnecchi-Ruscone et al. 2021). Among the earliest securely dated Iron Age Eurasian pastoralist sites of the whole region are the burial mounds (kurgans) located on the territory of western Siberia and East Kazakhstan, including Arzhan-1 and 2, and Baigetobe (Panyushkina et al. 2016; Chugunov et al. 2017; Zaitseva et al. 2004, 2005, 2007). These sites provide excellent examples of contextualised archaeological finds of Saka art, including numerous gold objects, in contrast to many of the collections of the last 200 years, which were instead looted or displaced from their original resting places with minimal or no provenance information (Rudenko 1962; Curtis 2004). It is highly probable that these two regions gave an initial spark of emergence and development of the whole Saka-Scythian world that expanded and flourished for almost a millennium (Samashev 2021b). In this paper we focus on a few Early Iron Age Saka gold objects recently discovered at the funerary complex of Eleke Sazy in the East Kazakhstan region, excavated under the direction of Zainolla Samashev and Abdesh Toleubayev (Toleubayev et al. 2021; Samashev 2021b; Samashev et al. 2018, 2019; Toleubayev et al. 2020), and exhibited at the Fitzwilliam Museum, Cambridge as part of the 'Gold of The Great Steppe' exhibition (September 2021–January 2022), on loan from the East Kazakhstan Regional Museum of Local History,

Ust'Kamenogorsk, Kazakhstan. We explore the contribution that archaeological context and a deeper look at technologies of production can bring to our understanding the symbolic and ecological life of the Saka of East Kazakhstan through their 'animal style' art, its origins, production, and distribution.

The Eurasian Steppe during the Iron Age (c. 900–c. 200 BCE) is associated with a peak of transhumant pastoralism, signified by the presence of different confederations of nomadic tribes, such as Scythians, Sakas, Sarmatians, Sauramatians, Massagetae, Issedons, Tagar, and Slab Grave cultures and others (Brosseder 2011; Davis-Kimball et al. 1995; De Barros Damgaard et al. 2018; Herodotus 1987; Smirnoff 1966; Smirnov 1964, 1984; Beisenov 2015; Artamonov 1973). The geographic spread of nomadic cultures in that period was expansive, spanning from the Black Sea region to Central Asia and Siberia. Usually, the pan-Scythian cultures are divided into two main groups: (1) the classical Scythians, who occupied the Northern part of the Black Sea regions and are known due to the reports of Herodotus (Western group); and (2) the Saka, Sarmatians, Massagetae and other nomadic cultures who inhabited the vast remainder of the steppe region (Eastern group). Despite the enormous spatial spread of these groups, they shared a general uniformity of their material culture (as materialised in the famous 'animal style' art, horse harnesses, and weaponry) and genetic pool, which confirm their extremely high mobility and interaction (Davis-Kimball et al. 1995; Korolkova 2000; Unterländer et al. 2017; Gnecchi-Ruscone et al. 2021). Although sharing some key cultural, social, artistic, and economic traits, the pan-Scythian peoples were not fully homogenous in their artistic or economic activities. While transhumant pastoralism rose to be the dominant subsistence strategy of the steppe zone during the Iron Age, recent research is demonstrating the complexity of land use by Iron Age populations, further cementing the view that the Saka had deep and wide-ranging connections to each other, and utilised the full geographical variety of the lands in which they lived (Chang et al. 2003; Samashev 2021b; Spengler et al. 2013; Toleubayev 2018; Ventresca Miller et al. 2020; Spengler et al. 2021). This new research is beginning to redress the imbalance in the archaeological record since the majority of our information about the Saka still comes from the study of their funerary monuments, as indeed will the material discussed in this paper.

2. Background and Context

Identification and absolute dating of the earliest Saka sites is a challenging task since attempts at radiocarbon dating at the earlier end of the Saka period give a wide time span of c. 800–400 BCE due to the presence of a large plateau on the radiocarbon calibration curve, known as the Hallstatt plateau (van der Plicht et al. 2004) This problem cannot be tackled by adjusting the precision of the measurements, and it complicates analyses and refinement of the chronology of the development of the Early Eurasian Steppe Iron Age cultures and sites. One of the most reliable methods to overcome the Hallstatt plateau problem is by combining radiocarbon dating with dendrochronological analyses (counting of tree-rings) using timbers found in burial chambers and using the ^{14}C tree-ring wiggle-matching method (Zaitseva et al. 2005, 2007). However, not all Iron Age Eurasian steppe region burials were constructed of wood, and in some of the burials, the wood preservation was poor or even degraded completely and is under increasing threat from climate change melting protective permafrost (Han 2008). Consequently, only a few burials are eligible for accurate dating using the wiggle matching method, giving relatively precise dates of the Saka burials located on the territory of Kazakhstan and Western Siberia, such as Arzhan 1 and 2, Shilikty kurgan (Baigetobe), Berel, Pazyryk and others as shown in Table 1 (Panyushkina et al. 2016; Toleubayev 2018; Chugunov et al. 2017; Zaitseva et al. 2005, 2007).

Table 1. Dates of the Saka kurgans (Beisenov et al. 2017; Chugunov et al. 2017; Gnecchi-Ruscone et al. 2021; Panyushkina et al. 2016; Zaitseva et al. 2005, 2007).

Year BCE	Name of Saka Kurgan Complex, Kurgan *(Date)*	
	wiggle-matching (^{14}C+dendrochronology)	conventional ^{14}C
800	Arzhan-1 *(~794 (−7/+6))*	Eleke Sazy, Bes Shatyr (k.6), Taldy-2 (2,4,5 and 8), Akbeit-1, Aksu-Ayuly-4, Karashoky, Berel (k. 18 and 36) *(800–400 BCE, Hallstatt plateau)*
750		
700	Shilikty, Baigetobe *(~730–690 BCE)*	
650	Arzhan-2 *(~659 BCE, ~671–609)*	
600		
550	Bes Shatyr, Kurgan 3 *(~550 BCE)*	
500		
450		
400		
350	Berel, kurgan 1 *(~363 BCE)*	Issyk kurgan *(400–200 BCE)*
300	Pazyryk 1, 2 *(~300 BCE)*	
	Berel, kurgan 11 *(~297 BCE)*	
250		
200		
150		
	located in Western Siberia	
	located in Kazakhstan	

Saka sites that are not eligible for wiggle matching dating may be attributed to certain Iron Age periods, including the Early Saka period (c. 800–500 BCE), based on other features, such as the form of construction of the kurgan or stylistic features of the burial assemblage (Samashev 2021b; Tairov 2006) (Figure 1). While these attributions should be considered with caution due to the difficulties encountered in absolute dating, such attributions and classifications are in many cases justified and are considered acceptable taking into account the extensive excavation experience and research on the Iron Age archaeological sites of the region by local archaeologists (Chugunov 2020b). Consequently, research and interpretation of the Early Iron Age artefacts, even when properly excavated, is objectively complicated and restricted. Interpretation of museum collections that are attributed to Iron Age pastoralist cultures, but completely lacking in archaeological context or provenance, becomes even more problematic.

The emergence of military horse riding 'elite' took place at the beginning of the Final Bronze Age (FBA) period, if not earlier in the territory of Central and East Kazakhstan and Tuva (Chugunov 2015). The emergence of the FBA elite stratum was connected to controlling copper and tin ores mining and large-scale production of bronze, as well as ensuring the safe transportation of metals to other regions of Eurasia together with the import of foreign 'exotic' goods back to controlled territories. Therefore, the FBA population was engaged in active interactions with neighbouring and more distant cultures and played an important role in the trade and exchange of different goods (Chugunov 2015; Beisenov and Bazarbayeva 2013; Berdenov 1998, 2008; Margulan 1998, 2001). During the FBA period massive stone burial constructions, Begazy-Dandybai cultures mausoleums, started to appear in these territories, showing the presence of social stratification of the FBA societies (Margulan 1998). A fundamental shift from a sedentary/semi-sedentary economy to a dominance of mobile stock-breeding pastoralism during the Final Bronze Age further fuelled this process. Huge Saka elite kurgans, full of precious objects, including numerous

gold artefacts, were constructed together with a great number of small assemblage-free kurgans (Beisenov 2015; Toleubayev 2018; Chang 2018; Khabdullina 1994).

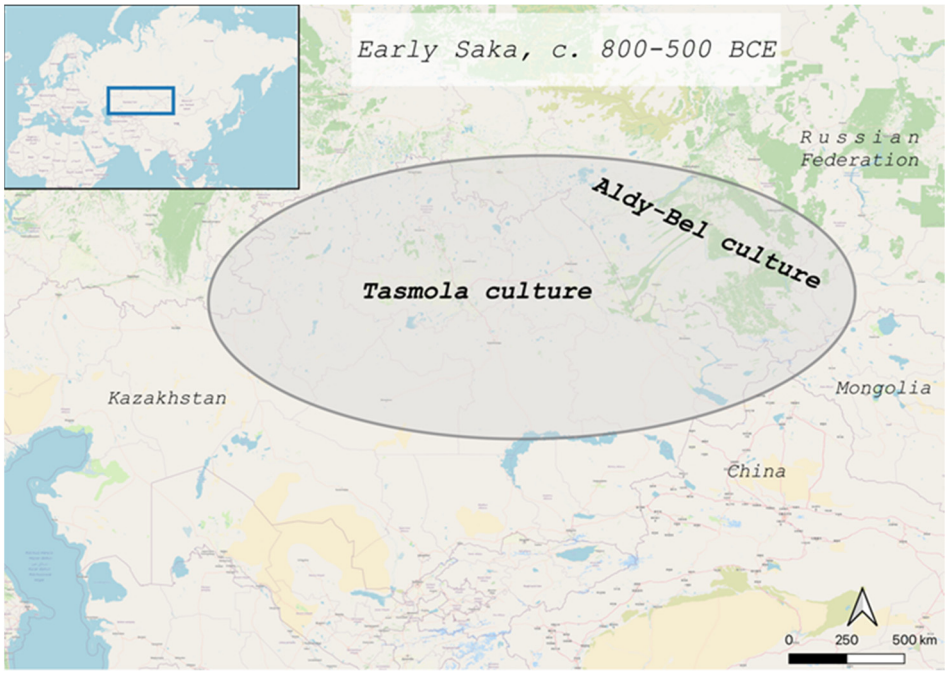

Figure 1. Early Iron Age Saka cultures as identified through archaeological material (c.800-500 BCE). Source: (Beisenov et al. 2017; Beisenov 2015; Chugunov 2015; Tairov 2006; Khabdullina 1994). Map data from OpenStreetMap under the Open Database License (CC BY-SA 2.0).

The 'animal style' of stylised, dynamic zoomorphic art is a geographically and temporally broad concept, covering vast territories of the Eurasian steppe regions as well as Siberia and southern parts of Central Asia (Sher 1988). From a temporal point of view the phenomenon endures beyond the Iron Age absorbing the post-Saka/Scythian periods until c.200 CE or even later (Andreeva 2018; Minyaev 2007; Zasetskaya 2008). As animal-style art is tightly connected to the Iron Age pastoralist societies of the Eurasian steppes its earliest appearance is believed to be linked to the initial emergence of the Iron Age pastoralist population, during the Early Iron Age or Early Saka period (Samashev 2021b). There are some key elements that are currently considered markers of identification of Iron Age cultures: types of arrows, metal belt elements, jewellery, and iconography (Chugunov 2000, 2020b). One of the most distinctive iconographic markers of the Early Saka period is the absence of depictions of mythical creatures (Chugunov 2020b). Moreover, Chugunov argues that some shapes, for example, the famous curled feline plaque from Arzhan-1, were in use exclusively within a narrow time window of around 300 years in the Early Saka period (Chugunov 2015, 2020a).

However, it is also worth noting that some objects had a long history of ownership. For example, Bronze Age arrows have been found in some Iron Age burials, hundreds of years after their production and use, usually as a single example, probably a talisman, that is easily distinguished among many typical Iron Age arrows (Chugunov 2000, 2019, 2020a).

The Iron Age on the territory of Kazakhstan, Western Siberia, and part of Xinjiang witnessed numerous shifts and variations in population, culture, and society across time and space, and the study of the period requires localised contextual studies beyond overarching generalisations (Shulga 2015; Chugunov 2020b).

Saying this, the inheritance of cultural and technological traditions over time should not be overlooked, to avoid representing the history of the region as non-stop migrations of different populations. Substantial archaeological data as well as the results of recent aDNA analyses show a complex process of genetic and cultural interactions of local and

immigrant populations that took place throughout the Bronze and Iron Ages, during which some local traditions survived or were adapted, and others were replaced (Allentoft et al. 2015; De Barros Damgaard et al. 2018; Narasimhan et al. 2019; Gnecchi-Ruscone et al. 2021; Unterländer et al. 2017).

One of the largest contextualised archaeological gold artefact collections of the Eurasian steppe Iron Age period originates from East Kazakhstan: the Eleke Sazy burial mound complex (Samashev 2021a, 2021b; Samashev et al. 2018, 2019; Toleubayev et al. 2020, 2021). Eleke Sazy is a high-altitude flat river valley, surrounded by the Tarbagatai Mountain range (Figure 2). The funerary complex consists of a large cemetery of burial mounds of different sizes and sometimes shapes, dating from as early as the Early Iron Age (Early Saka period) through to the Turkic and ethnographic Kazakh period. Despite extensive looting, both in the past and more recently, recent archaeological discoveries and excavations have recovered human remains, structures, gold, and other artefacts in undisturbed contexts, offering unique insights into Saka burial rituals and practices (Samashev 2021a). Over the last five years, Saka kurgans and other funerary monuments have been excavated at Eleke Sazy under the direction of Z. Samashev and A. Toleubayev by teams from the A. Kh. Margulan Institute of Archaeology, Astana, and Kazakh National University, Almaty, Kazakhstan, providing valuable contextual data and materials, including gold objects (Samashev 2019, 2021b; Samashev et al. 2018, 2019; Toleubayev et al. 2020, 2021).

Figure 2. Location of Eleke Sazy, Arzhan 2, Tasmola and Urzhar kurgan burials. Map data from OpenStreetMap under the Open Database License (CC BY-SA 2.0).

Here, we focus on a small selection of gold objects from three kurgans at Eleke Sazy with the aim of illustrating an approach to artistic materials that also considers materials, technologies, and contexts. These are Kurgans 4 (Group II), Patsha (Group VI) and Kurgan 7 (Group IV).

Kurgan 4 Group II (diameter 50 m, height 0.6–1.25 m) is a double inhumation burial of a male and female (aged c. 17–18 and c. 13–14 years, respectively). Although the female burial had been heavily looted, the male burial was not looted and included numerous gold objects decorating the body and associated weaponry, including microbeads and clothing plaques (Samashev 2021a). The burial is a unique example of the very few undisturbed Saka inhumations excavated in modern times, and thus allows us to reconstruct the clothing, weaponry, and other attributes of an Early Saka male. In addition to the burial, a hoard was found under a stone of the crepidoma (structural platform) of the kurgan, consisting of different gold plaques, gold beads and microbeads, gold spirals, a gold pendant, stone beads, and a bronze mirror (Samashev 2021a). Based on the morphology of the arrowheads accompanying the buried youth, the kurgan was recognised as one of the earliest in the

region (Samashev 2019), partially supported by the C^{14} data for Kurgans 4 and 9 Group II: 793–547 cal BCE and 770–494 cal BCE, 2σ) (Gnecchi-Ruscone et al. 2021), which would make the burial one of the earliest unlooted in situ Early Iron Age Saka burials in the whole region.

Kurgan Patsha, Group VI (diameter 80 m, height 2.5 m) is the largest kurgan in Group VI and is among the largest burial mounds of the whole complex, also known as the 'Great Earthen Mound'. Unfortunately, the kurgan was recently and heavily looted, probably in 2007–2008 (Samashev 2021b). During the excavations of the kurgan in 2019, a hoard was discovered between the stones at the base of the grave shaft constructed under the burial at a depth of 4.5 m. The Patsha burial hoard consists of over 140 objects, including iron and bronze objects with gold overlay, pure gold objects some with precious stones, stones, and gold beads (Samashev 2021b). The hoard is one of the most diverse collections of gold objects discovered at the Eleke Sazy complex from a goldsmithing point of view. It includes cast and gold foil objects, gold microbeads, goldsmithing granulation discards, and gold nuggets. They have been given a preliminary stylistic date of between the 6th to 5th centuries BCE by Z. Samashev (Samashev 2021b), within the Early Saka period, and could possibly be of an earlier date, towards the end of the 7th century BCE, broadly contemporaneous to the Arzhan-2 kurgan.

The hoard was found in the form of a monolith of compacted artefacts mixed with soil and products of corrosion. Many objects appear to have been intentionally deformed. The monolith was disassembled in the laboratory of the East Kazakhstan Regional Museum of Local History; the artefacts were cleaned from the soil and the corrosion products, and some of them, mainly gold objects, were mechanically unbent. The work was done by a professional conservator, but a substantial amount of cleaning and conservation work was taken into account during the interpretation of the objects.

Kurgan 7, Group IV (diameter 89 m and height 5.5 m) is the largest construction in Group IV and one of the largest kurgans of the Eleke Sazy burial complex. The burial mound is surrounded by two stone ditches and a few rows of standing large stone altars. The burial chamber was excavated in 2020 and found to be empty, but a large hoard was found at the foot of the kurgan, at its south-eastern part, under the stone-made 'shell' of the burial mound (Toleubayev et al. 2020). The hoard was placed in a hole with a total diameter 50–60 cm, at a depth of 70–75 cm. The total number of gold objects unearthed was 830 pieces, including pendants in the form of fruits, a miniature cauldron, and three-dimensional and flat plaques (Toleubayev et al. 2021). Another small hoard was found under one of the altars and consisted of 23 bronze belt pieces and a few mushroom-shaped gold microbeads. The areas around the other altars were looted. The burial mound as well as the hoards are believed to be dated to the Middle Saka period—5th–4th centuries BCE (Toleubayev et al. 2021).

3. Results

3.1. Placement of Ornamentation

The discovery of extremely rare undisturbed and/or partially surviving early Saka burials over the last twenty years represents a substantial breakthrough in our understanding of early Saka culture. Among the most important discoveries are two such burials, burial 5 of the Arzhan-2 kurgan and Kurgan 4 (Group II), Eleke Sazy (Samashev 2021a; Chugunov et al. 2017). Finding the archaeological artefacts in situ affords a wealth of valuable information on how widely known and distributed animal-style gold objects were among the Saka population, and how they were placed on the body.

The excavated gold artefacts show that the Early Saka period decorative elements display a combination of sophisticated and original stylistic design and a high level of craftsmanship integrated into some cases with practical elements for use during their lifetime (where evidence for use-wear is present).

Miniscule gold beads, many just 1 mm in diameter, were used as adornment exclusively on the lower parts of the costumes, such as trousers, the edge of the skirt and on shoes (Figure 3). At Arzhan-2 more than 250,000 microbeads of three types were used to decorate

costumes of deceased individuals, who were both male and female (Figure 4) (Chugunov et al. 2017). At Eleke Sazy Kurgan, 4 tiny gold microbeads, numbering 1781 with a total weight of ~23 g, were used to decorate the shoes of the teenage boy buried there (Figure 5). The total weight of another type of cylindrical microbeads (total number 10,358) found in the hoard under a crepidoma stone of the same Kurgan 4, is only about ~42 g which is a testament to their tiny size (Figure 6). These beads have been interpreted by Z. Samashev as having adorned a piece of lower-body clothing such as trousers (Samashev 2021a).

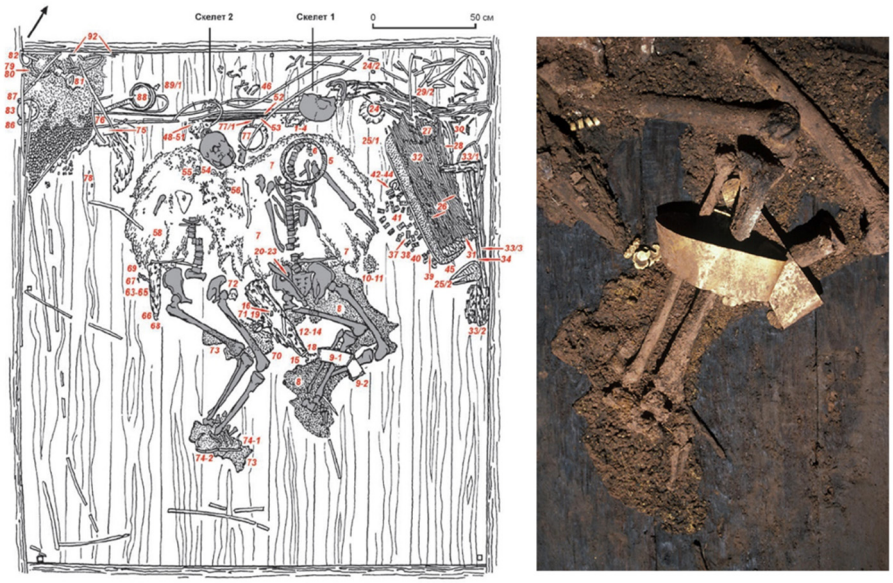

Figure 3. Arzhan-2 kurgan, burial 5, (**left**) double inhumation burial of a man and woman showing gold beads decorating the trousers and shoes of the man and edge of the skirt and shoes of the woman. (**Right**) Photo of the legs of the man with gold microbeads decorating the trousers and the shoes. Source: courtesy of K.Chugunov.

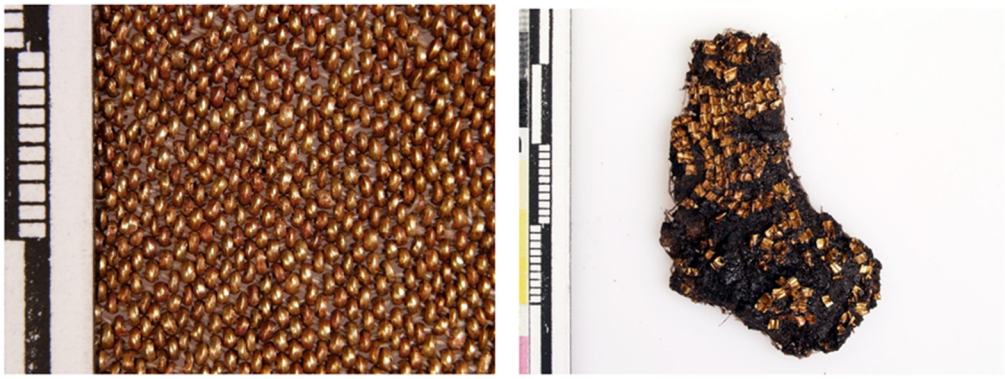

Figure 4. Two types of gold microbeads, Arzhan-2, burial 5. Source: courtesy of K.Chugunov. Photographer Terebenin V.S.

Figure 5. (**Left**) Gold microbeads decorating the shoes of the teenage boy, Kurgan 4 (Group II), Eleke Sazy, and (**right**) digital microscope image of the bead (Internal Museum Number КПо93-38630/1-1781). Source: (left) courtesy of Samashev (2021a).

The use of beads/microbeads for the adornment of costumes and shoes has a very long history in the steppe region, starting with the Middle Bronze Age Sintasha culture (the first chariot culture). In the territory of Kazakhstan, many bronze microbeads were identified in the burial of a Sintashta young woman, Grave 23, Tanabergen II burial ground, which is located in northern Kazakhstan (2480–1930 cal BCE (2σ)) (Tkachev 2007, 2020). The Late and Final Bronze Age Andronovo population (c. 1500–800 BCE) occupying the territories of East Kazakhstan and neighbouring regions, continued the use of bronze beads and microbeads to decorate their shoes and the edges of the lower part of their costume (Avanesova 1991; Usmanova 2010).

Horsemanship was a crucial part of Saka cultural expression, particularly for the elite (Tishkin and Besetayev 2019), with the presence of horse harnesses forming part of the 'Scythian triad' (along with weaponry and animal style art) (Besetayev 2021; Besetayev and Kariyev 2016), and therefore mobility of the lower part of a rider's body, i.e., for horse mounting and dismounting, was a matter of necessity, with nothing to constrict the movements of the rider. It is worth considering that the Saka people did not use stirrups (Tishkin and Besetayev 2019) and the horse was controlled exclusively by the muscles of the Saka rider, with the leg muscles, in particular, playing a crucial role. Therefore, the choice of microbeads as a decorative element of the lower part of a costume was a practical and at the same time elegant way of ornamenting trousers, skirts and shoes. At the same time, as noted above, the use of microbeads/beads as a decorative element was a long-lasting tradition of the Bronze Age steppe population, possibly inherited by Iron Age pastoralist societies.

Furthermore, the microbeads that decorated the trousers, skirts, or shoes of a horse rider were visible and could be appreciated by dismounted people, being located at their eye level. While the microbeads are remarkably small, they create a dazzling effect when sewn onto clothing and shoes in large quantities, as demonstrated by reconstructions of the costumes from Arzhan-2 and Eleke Sazy (Samashev 2021a; Chugunov et al. 2017).

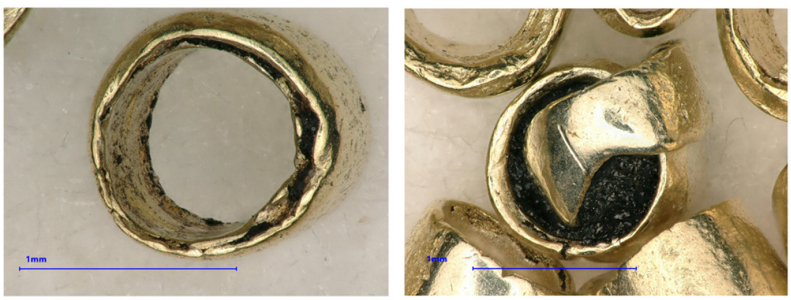

Figure 6. (**Left**) Digital microscope image of cylindrical gold bead, Kurgan 4 Eleke Sazy. (**Right**) Black carbonised substance inside of the bead. Internal Museum Number КПо93-38631/1-10358.

It is challenging to estimate whether such elaborately decorated costumes were in use in real life or produced as burial outfits only. If they were used at all, they were unlikely to have been used for everyday wear, but rather for occasional wear. While some of the Eleke Sazy microbeads display clear signs of use-wear, others do not. For example, the cylindrical microbeads found in the hoard most probably were never used: many of the beads still have a black carbonised substance inside of them and no signs of use. As such, these beads could have been obtained from a goldsmith specifically for their deposition as a part of the hoard.

In contrast to the use of small beads for the lower part of the body, larger gold plaques were used to decorate the upper part of the costumes in Arzhan-2, such as jackets and coats (Figure 7) (Andreeva 2021; Liu et al. 2021b; Chugunov et al. 2017). These plaques are large in comparison with the microbeads but still light. The reverse side of the plaques shows that regardless of their manufacturing technique (cast or forged) the plaques are hollow, making them relatively light (weight range: ~3.11–3.54 g each, average length ~2.0 cm, width range ~1.1–1.2. cm, thickness 0.4 cm) (Chugunov et al. 2017). There is an open question as to whether making them hollow aimed to save precious metal or simply to make the objects lighter and easier to wear and transport as part of a mobile society. It is likely that both possibilities were considered by ancient goldsmiths during the production of the plaques.

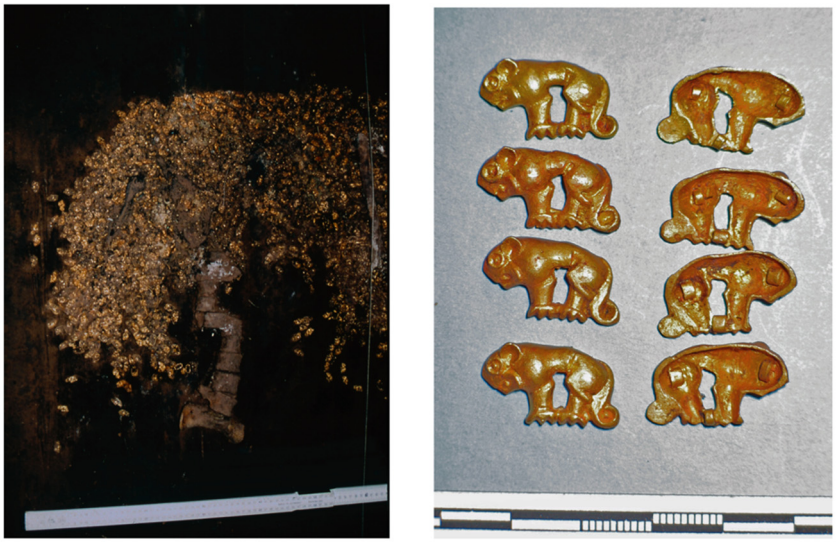

Figure 7. (**Left**) Decoration of a female's jacket with gold feline plaques, Arzhan-2, burial 5. (**Right**) Feline plaques. Source: courtesy of K.Chugunov.

The Arzhan-2 plaques are depictions of a single standing feline, left or right facing. The plaques were positioned on the costume of the deceased individuals differently, horizontally and vertically, creating the ornamentation of the outfits (Chugunov et al. 2017). From a technological point of view, the Arzhan-2 costume decoration plaques are cast or pressed using a die (pressed sheet technique) (Armbruster 2009). There are two or three sewing loops located on the reverse side of each plaque (Figure 7).

At Eleke Sazy, some costume decoration plaques depict a combination of different animals in a complex and stylised way, and in these cases, the question of the positioning of the plaques on a costume as a decorative element becomes more complex. A unique form of gold plaque found in the Patsha kurgan is one such example (Figure 8). The plaque is an example of the stylised combination of different animals. At least three (a hare, eagle, and owl) may be identified, and perhaps more are present in the design, for example, the stripes of a tiger. Therefore, it can be positioned on clothing in different ways to emphasise the shape of a certain animal depending on its orientation. Found as part of a hoard, the function and exact placement on either human or horse costume is uncertain due to the

lack of context in relation to the body as would be found in a burial, but the suggestion that the plaques were used to decorate the upper part of a costume is justified since their size and the fastening mechanism are very similar to the Arzhan-2 costume plaques, with two/three sewing loops on the back of the plaques (Figures 7 and 8).

Figure 8. Digital microscope images of Patsha sitting hare gold plaque, front and back sides, Patsha kurgan, Eleke Sazy VI, Internal Museum number КПо94-38837.

The total number of the unearthed 'hare plaques' is 24, and right- and left-facing plaques were found. The average weight per plaque is ~1.95 g inside the range of 1.49–2.52 g. The average length is ~2.9 cm, and the width is ~1.45 cm.

The use of decorative plaques to adorn the clothing of the upper body dates to at least 3000 BCE, as evidenced by a series of 240 leaf-shaped worked bone plaques with pierced attachment holes discovered in situ in an Eneolithic female burial at Menovnoe, Ust'-Kamenogorsk, East Kazakhstan (Samashev et al. 2007). One of the earliest examples of metal costume decoration plaques in the region, including some that had loops on their reverse sides that were attached to the main body using high-temperature joining techniques, date to the Late Bronze Age period Andronovo culture, on the territory of Kazakhstan (Avanesova 1991). Consequently, as with the beads, it is likely that the cultural traditions of wearing and the technological knowledge of the production of clothing plaques represent continuity from the Bronze Age to the Iron Age steppe populations.

3.2. Technology of Production

The 'hare' plaque was most probably a product of serial production, considering the presence of twenty-four identical plaques found in the hoard. The probable production process can be restructured as follows. Initially, a flat blank in the shape of the hare was cut from a gold sheet, and afterwards the blank was embossed/pressed using a die made of hard material, such as bronze or hardwood (Figure 9). It is not convincingly clear whether a positive or negative die was used for production of the plaques. However, some features point to the use of a positive die. Positive wooden dies were used extensively by Saka goldsmiths for the production of pressed sheet objects, such as the Arzhan-2 gorytos decoration plaques (Chugunov et al. 2017; Minasyan 2014).

In the next production step, the plaque was possibly anchored to a pitch-like material, i.e., tree resin, or the positive die itself was used to finish the plaque's front side through meticulous, if not exaggerated, chiselling (Figure 9). In a few cases, the chiselling was extensive to the point of perforating the gold sheet as if in an attempt to exaggerate the depictions of the animals inside the plaque.

Piercing of the metal due to chiselling as well as chiselling marks is clearly visible (Figure 9). It is worth mentioning that a corrugated metal form is substantially more robust than a flat form (Brepohl 2001). Considering that the plaques were made of rather thin gold sheets ~300 μm (0.3 mm), extensive chiselling of the plaques was possibly one of the ways to make the whole object more resistant to deformation, especially if it was being produced for use in life, and not only for deposition in a funerary or hoard context. The smoothness of the edges of the plaques, together with the scratched and the slightly depressed surface of the protruding parts of the front sides, and missing loops on some of the plaques, indicate

that the plaques were possibly in active use and worn as part of a costume in life, as opposed to having been produced solely for funerary deposition (Figure 9).

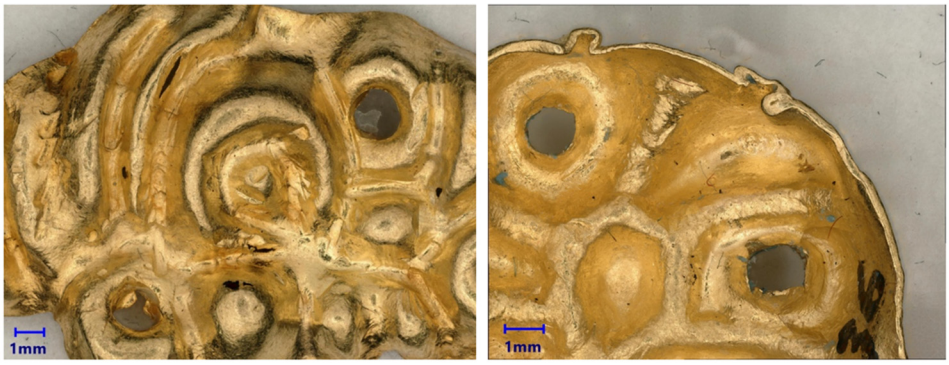

Figure 9. Digital microscope images of Patsha sitting hare gold plaque. (**Left**) Chiselling marks and protruding areas and (**right**) smooth edges on reverse side. Patsha kurgan, Eleke Sazy VI. Internal Museum number are КПо94-38838 and КПо94-3883.

The next production step was the piercing of four holes, mainly from the front to the back. Three holes mark the eyes of the creatures (hare, eagle, and owl), and the fourth probably defines the forelegs of the hare. However, it may mark the eye of another as-yet unidentified creature. The holes were pierced as decorative elements only, and they were not used as attachment mechanisms. The final production step was welding three sewing loops onto the reverse side of the plaque.

The Patsha hare plaques and the Arzhan-2 feline plaques share similarities in their production, namely that they were serially made using dies and chiselling, and had sewing loops joined onto the reverse side.

3.3. Chemical Composition

The results of the elemental analyses by a portable X-ray fluorescence spectrometer (pXRF) of the front side of the plaques are consistent in identifying gold of relatively high purity, about 90–91% (Figure 10). A relatively small amount of silver, of an average of ~7 up to a maximum of ~9%, was detected with ~1% of copper. The identified composition (the presence of silver as well as the amount of copper not exceeding 1%) corresponds more with native, alluvial gold (Martinón-Torres and Uribe-Villegas 2015; Martinón-Torres et al. 2007). No traces of PGE (platinum group elements) or tin (Sn), have been detected.

In contrast, the loops are joined to the plaques using a high-temperature technique and the pXRF data showed that the areas of the loops are copper-enriched in comparison with the front side of the plaques, sometimes with as much as ~4.5% copper. The substantial increase in copper content on the loop areas of the plaque most probably does not indicate the use of a different gold alloy for the production of the loops but rather the use of copper salts or copper-enriched solder for making high-temperature joins between the plaques and the loops (Figure 11). The addition of copper substantially decreases the melting temperature of gold alloys, enabling the goldsmith to make a join without damaging the objects themselves through melting (Scrivano et al. 2013, 2017; Brepohl 2001; Loepp 2021).

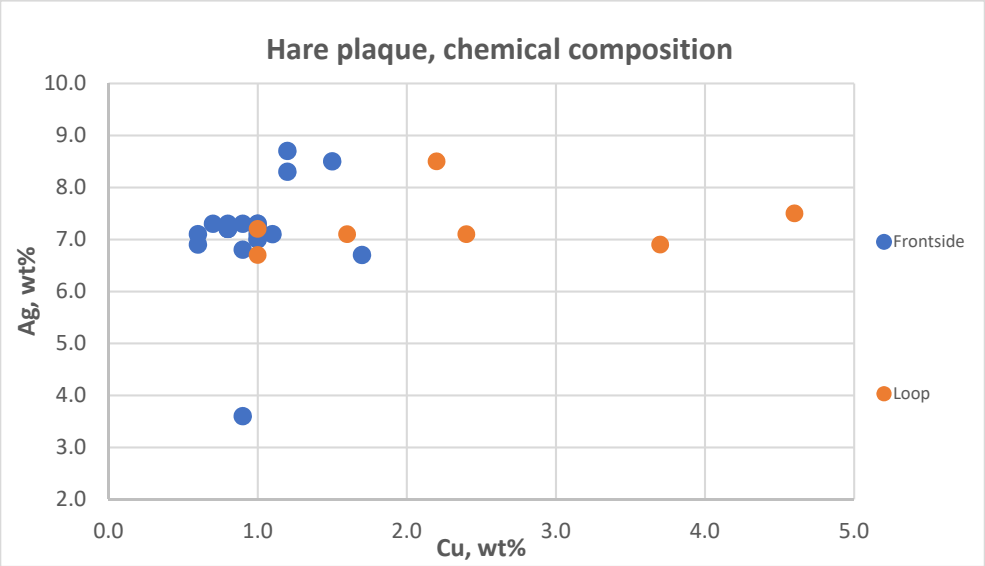

Figure 10. Scatterplot of the average copper and silver levels of the hare plaques (front side and loops) from kurgan Patsha, Eleke Sazy VI. Note that the pXRF detector window is larger than the loop, and hence 'loop' analyses include part of the surrounding metal sheet. Data averaged and normalised.

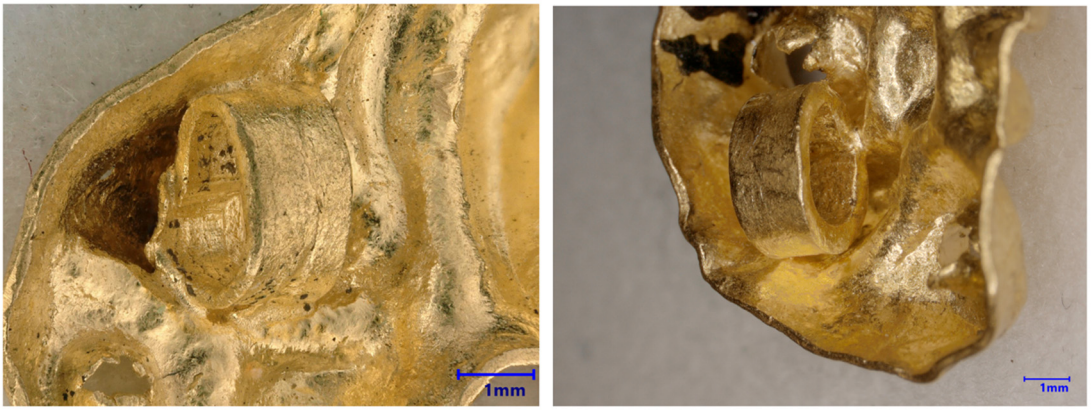

Figure 11. Digital microscope images of the reverse side of the Patsha sitting hare plaque, sewing loops. Patsha kurgan, Eleke Sazy VI, КПо94-38838 and КПо94-38837.

3.4. Comparative Analyses of Form

At least three animals are combined in the Patsha plaque. They are a sitting/resting hare and the heads of two birds, an eagle and an owl, embedded inside the hare's body (Figures 12–14). The body of the sitting/resting hare is profoundly depicted, including a massive hip joint and forelegs. However, the shape of the hare is not clearly visible as the plaque is tightly filled in with details of two birds and probably a feline, perhaps a tiger, that is indirectly messaged through the application of the horizontal stripes on the neck of the eagle/hare. The only explicit representation that immediately grasps attention in the plaque is an eagle head. The owl's head is a beautiful example of a realistic depiction of an animal, with the bird's head tilted to one side (Figure 13).

Rotating the plaque as well as exploring its reverse side affords an understanding of the goldsmithing skills and the way the goldsmith embedded the heads of the birds inside the hare's body. Interestingly, both depicted birds hunt hares, and the choice of the birds looks more intentional rather than simply stylistic as if the birds are ripping the hare apart (Figure 12). The predator/prey motif is common in other Saka art, more commonly depicting a feline biting a deer (Rudenko 1962; Artamonov 1973; Andreeva 2018; Chernikov 1965; Minasyan 1990). The plaque looks overburdened with details. It seems as if no place was left plain intentionally by the goldsmith.

Figure 12. Sitting hare (Lepus tolai) and digital microscope image of Patsha plaque, Patsha kurgan, Eleke Sazy VI. Source: Yuriy Danilevsky (https://commons.wikimedia.org/wiki/File:Lepus_tolai;_Baikonur_03.jpg, used under CC BY-SA 3.0 https://creativecommons.org/licenses/by-sa/3.0/legalcode, no changes made, accessed on 5 December 2022). Internal Museum number is КПо94-38837.

Figure 13. Owl and digital microscope image of Patsha plaque, Patsha kurgan, Eleke Sazy VI. Internal Museum number is КПо94-38837.

Figure 14. Golden eagle and digital microscope image of Patsha plaque, Patsha kurgan, Eleke Sazy VI. Internal Museum number is КПо94-38837.

There are other gold plaques dating to the Iron Age that resemble hares, usually named "secret depictions" or "a sophisticated whorl" artefacts (Grach 1980; Beisenov and Bazarbayeva 2014; Beisenov et al. 2017). However, the most striking example that also represents a sitting hare is a carved antler costume buckle from Tasmola 5 burial ground, Kurgan 3, which was excavated by Kadyrbayev in 1961 in Central Kazakhstan (Margulan et al. 1966) (Figure 15). The burial ground is considered to be an early Saka complex attributed to the Tasmola culture (one of Early sub-Saka cultures), roughly dated to 700–500 BCE (Margulan et al. 1966), making it broadly contemporaneous with the Patsha kurgan hare plaques. Kurgan 3 of the Tasmola 5 cemetery was found partially looted, and prior to excavation had a diameter of 20 m and height of 1.6 m. The hare-shaped buckle was found near the right shoulder of the deceased person with four other bone/antler-made small pieces. The buckle's shape resembles a sitting/resting hare, with a few animals carved inside of the hare's body.

The length of the buckle is 5.2 cm, the width is 4.2 cm, and the depth is 1.1 cm. At least eleven animals can be identified inside and two of them are represented in their full shapes: a hare and a boar. Depictions of other animals include exclusively their heads. Among the depicted animals are three different birds of prey, ibex, saiga, elk, argali, two boars, and another unidentifiable animal (wolf or mouse?) (Figure 16). As was aptly noted by Beisenov and Bazarbayeva (2013) the plaque looks over-crowded by images as if the craftsperson was in fear of leaving a single plain surface.

The animal figures and parts are so tightly packed that without specific attention the plaque appears to be simply full of ornamentation, a similar visual effect to that of the Patsha gold hare plaque. Both objects look slightly overburdened, and at first glance, consist of unclear ornaments and details.

Figure 15. Tasmola 5 Kurgan 3 antler carved costume buckle, front and back sides. Source: National Museum of Kazakhstan.

It is interesting to note that both objects were made of different materials and found in different regions, but share the same principles of their creation: the internal space of a sitting/resting hare is fully filled with other animals with no space left empty. Moreover, both plaques can be rotated to change and reinterpret the shape of the plaque, creating a shape-shifting and dynamic effect. The head of the hare in both plaques appears to be either being ripped by the horns of two animals or transferred into the head of the bird of prey.

Figure 16. Tasmola 5 Kurgan 3 antler buckle with depictions of eleven animals. Source: National Museum of Kazakhstan.

3.5. Botanical Motifs

The Saka did not only represent the animal kingdom in their art, and depictions of different parts of plants in the form of whole plaques as well as beads and pendants constitute not the largest, but a substantial part of the Eleke Sazy gold assemblage. One simple and elegant group of gold objects from the Eleke Sazy collection are the gold flower plaques, which number 12 pieces (Figure 17). The four-petalled form of the flowers bears a striking resemblance to the Greater Celandine (*Chelidonium majus*), which is found in the Altai mountains of the East Kazakhstan region (iNaturalist contributors 2022). As mentioned by Pliny, Greater Celandine has a long history of medicinal use (Grieve 1931). Although high in toxins, it is used in traditional medicine to clear the sight and treat cancer and liver ailments, and the latex is used topically to treat warts and corns (Grieve 1931; Chevallier 1996; Plants for a Future 2022). While we do not know why this plant was chosen for depiction in the gold clothing plaques, if the identification of *Chelidonium majus* is correct, we can speculate that the plant held significance for the Saka perhaps because of its medicinal qualities.

Figure 17. Flower plaques from Eleke Sazy, Patsha kurgan, hoard. Source: Fitzwilliam Museum/East Kazakhstan Regional Museum of Local History. Internal Museum Numbers КПО94–38891 to КПО94–38902.

Another example of plant depictions are beads from the hoard unearthed from Kurgan 4, Eleke Sazy, where different types of beads resemble seeds (Figure 18). The beads are made of two parts joined together, and are around 2 mm in length, using a high-temperature process that is technologically time-consuming and requires meticulous temperature con-

trol skills. The lenticular beads may resemble seeds from *Chenopodium* spp., perhaps *Chenopodium album* (Sukhorukov and Zhang 2013), which has both food and medicinal uses. The barrel-shaped ribbed beads perhaps resemble the schizocarp of the Apicaeae family, a plant family with many members having culinary and medicinal uses, including cumin and coriander, as identified at a Saka female burial at Urzhar, East Kazakhstan (Nigmatova and Baitanayev 2019).

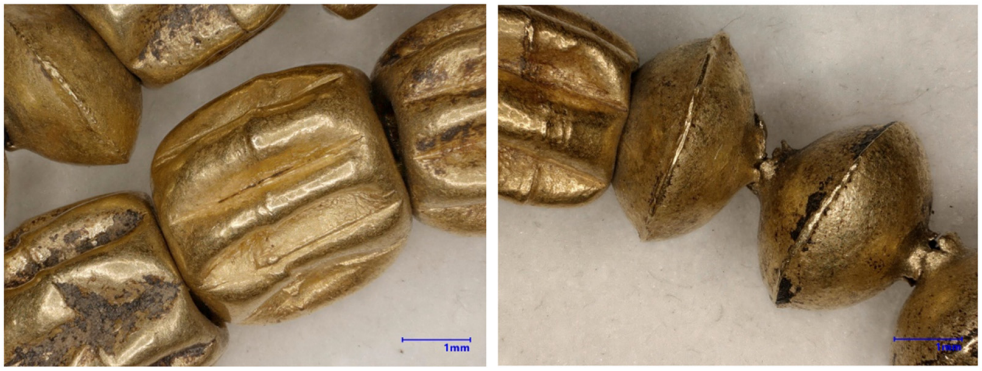

Figure 18. Digital microscope images of gold beads, Kurgan 4, Eleke Sazy II. Internal Museum number КПо93-38580/1-128.

The leaf-shaped pendant from the hoard discovered in Kurgan 4, Eleke Sazy II—having four lobes and a perforation at the terminal described as a 'beech nut' design by Liu (acknowledging that beech seeds have three lobes) (Liu et al. 2021a)—is found across the Eurasian steppe region in similar contemporaneous designs (Liu 2014): at mound M3 of the Dongtalede cemetery in the Southern Altai Mountains, Xinjiang (9th to 7th centuries BCE) (Liu et al. 2021a); burial mound 1 of Filippovka I, southern Urals (4th century BCE) (Yablonsky 2015); kurgan 6 of Taksai-1 site in western Kazakhstan (6th–5th centuries BCE) (Liu et al. 2021a; Lukpanova 2017); and kurgan 8 in the necropolis of Mecet-Saji in the Black Sea region (5th–4th centuries BCE) (Parzinger 2007; Liu et al. 2021a) (Figure 19).

Figure 19. Digital microscope images of beech nut design gold pendant, Kurgan 4, Eleke Sazy II. Internal Museum number КПо93-38580/1-128.

As well as demonstrating the mastery of local plant knowledge in their gold working, the Saka also used their adornments to show off their access to long-distance trade routes and exotic foodstuffs, as demonstrated by two pendant designs that appear to show fruits that were unlikely to have been cultivated locally, unearthed from the Kurgan 7 Eleke Sazy IV hoard (Figure 20). The first is a unique piece of jewellery in the form of a bunch of grapes, consisting of two different sizes of granules joined together at high temperatures. The larger spheres are made from two joined hemispheres and are hollow inside. The smaller granules appear to be made of solid gold. Grapes (*Vitis vinifera*) were domesticated in the Transcaucasian region beginning around 6000–8000 years ago, spreading westward into the Mediterranean, and eastward into China by the 2nd century BCE (Miller 2008;

Grassi and Arroyo-Garcia 2020; Zohary and Hopf 2000). A small number of grape seeds were recovered from the Saka-Wusun settlement site of Tuzusai in south-east Kazakhstan (410–150 BCE date range from a series of ^{14}C dates), and it is unclear whether they represent imported or locally cultivated fruits (Spengler et al. 2013). The grapes depicted in the Eleke Sazy pendant may therefore represent an exotic foodstuff, or symbolise wine drinking among the elite (Miller 2008).

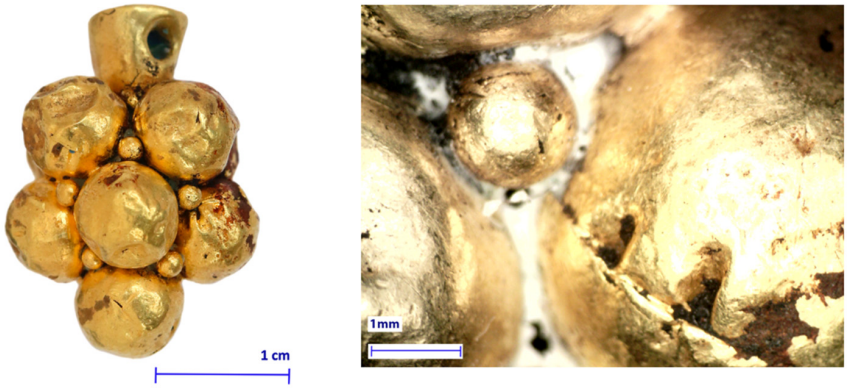

Figure 20. Bunch of grapes gold pendant and digital microscope image of the pendant (Dinolite images), Kurgan 7, Eleke Sazy IV. Macro photograph source: Y. Domashev/East Kazakhstan Regional Museum of Local History. Internal Museum number КПо93-39392.

The final botanical motif to consider is a pair of pendants from the same hoard, once again representing extremely fine and detailed work. The pendants are spiky in appearance, appearing to be covered in either individual grains, or represent the textured surface of a fruit exocarp (Figure 21). A distinctive feature of these two pieces is undoubtedly signs of wear and tear, where due to extensive wearing some spikes on the pendants have been almost erased by what appears to be long-term and extensive use (Figure 22). These were pieces that seem to have been prized possessions, worn frequently, and not simply made as part of a burial outfit or tribute. The technology used to produce the pendant is visible in the microscope images (Figure 22). Each spike is made of a hollow cone that has no visible joins, which are then joined to a sphere that itself was made of two hemispheres. The joining technology resembles the granulation technique, but instead of globular granules, small cones were used. The interpretation of these pendants is not clear in terms of what is being represented. Liu et al. (2021a) speculates that this conical shape may represent individual seeds; however, it is also possible that the pendants represent a sheaf of cereal, or indeed a fruit such as lychee (*Litchi chinensis*) or *Arbutus unedo*, which would represent exotic imports indeed from either eastern China or western Europe.

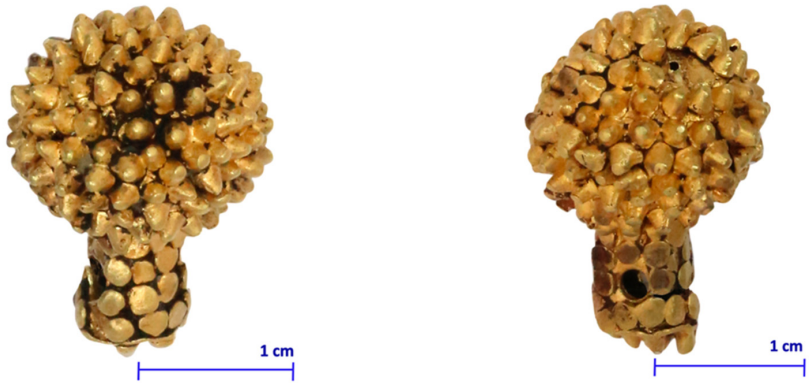

Figure 21. Two spiky gold pendants, Kurgan 7, Eleke Sazy IV. Y. Image source: Y. Domasehv/East Kazakhstan Regional Museum of Local History. Internal Museum numbers КПо 94-39387/1 and КПо 94-39387/2.

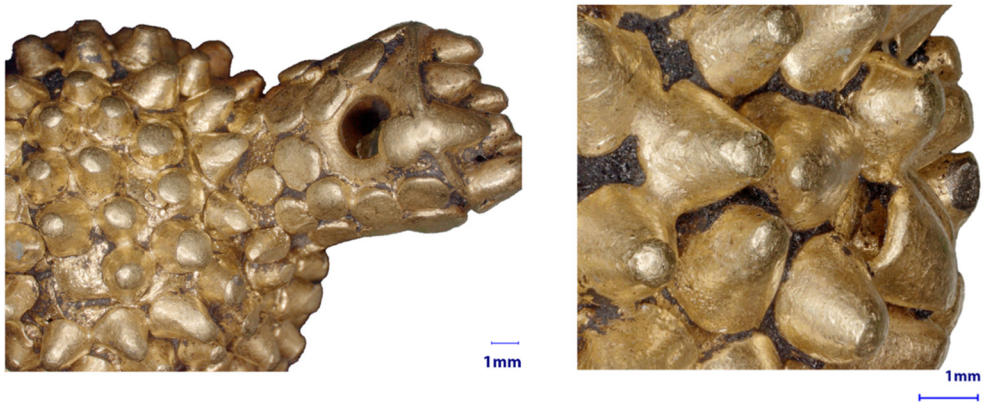

Figure 22. Digital microscope images of spiky gold pendants, Kurgan 7, Eleke Sazy IV. Internal Museum number КПо 94-39387/2.

4. Materials and Methods

Elemental analyses of the gold objects from Eleke Sazy described here were performed using an Olympus Vanta portable X-ray fluorescence spectrometer (pXRF), equipped with an Rh anode and a silicon drift detector, operating at 40 kV and 100 μA, with an aluminium filter in the X-ray path and a 3 mm collimator. Quantification was supported by the in-house Gold6 calibration, which is based on the factory-built Alloys Extra fundamental parameters algorithm, but further optimised for archaeological gold and silver alloys through empirical calibration with certified reference materials.

Objects were examined using a Keyence VHX6000 high-resolution 3D or Dinolite digital microscopes. Observations under various magnifications focused on traits of manufacture, wear, current condition, and microstructure. All the analyses took place at both the East Kazakhstan Regional Museum of Local History in Ust-Kamenogorsk, Kazakhstan, and the Archaeological Science Laboratories of the University of Cambridge, UK, within the frame of the 'Gold of the Great Steppe' exhibition, which took place between September 2021 and January 2022 at the Fitzwilliam Museum, Cambridge. Raw data from the pXRF and East Kazakhstan Regional Museum of Local History accession numbers for objects are provided in the Supplementary Material.

5. Discussion

It is clear that the Saka did not only depict the animals in their world with great care and attention, but also employed a detailed language of plants to express their skills, abilities, wealth, and contacts. How might we begin to understand the significance of the animals and plants depicted, beyond the fact that Saka goldsmiths invested many hours of skill and effort into recreating the natural world in such detail?

Herodotus, in his *History* (4.134.1) describes an incident of an unexpected appearance of a hare that caused the Scythians to start chasing it under the eyes of the amazed army of Darius (Herodotus 1987). Observation of the hare chasing persuaded Darius to retreat and leave the battlefield. It is not clear from Herodotus's words whether the hare was considered a good or bad sign by the Scythians themselves and what were the reasons for them to start chasing it. On the contrary, Herodotus mostly describes the reaction of Darius to the sudden appearance of the hare in the Scythian army, explaining the Persian interpretation of the incident and its consequences. What is clear is that symbolically the hare was very important for both sides. The Scythians were ready to catch it in the face of the enemy, and the Persians decided to retreat after the effect of its appearance. Despite the probable symbolic importance of the hare for the Scythian and Saka population, depictions of hares are not as common in Eurasian steppe region art, and specifically among the Saka population, as are deer, eagles, or felines. Consequently, if the hare was symbolically important among the Eurasian pastoralist societies, as was indicated by Herodotus, why then so far, are depictions found so rarely among the largest Eastern part of the pan-Scythian

world created by the Saka? Meanwhile, it is worth noting that depictions of hares in a more conventional form can be found more often in the Scythian-Greek and Scythian-Achaemenid bordering regions, where they probably bore culturally mixed symbolism (Molev 2015).

While the words of Herodotus were and should be considered in a critical manner, a few recent archaeological findings confirm his observations about the Scythians and their eastern steppe neighbours, including their use of cannabis, the pre-inhumation ceremonies of local rulers, their use of unusual organic materials (human skin) and wearing mini gold cups attached to belts (Spindler et al. 2020; Chugunov et al. 2017). Consequently, the chronicles of Herodotus are at least partially supported by recent archaeological evidence.

The shift from a sedentary to a predominantly (not wholly) transhumant pastoralist society that happened at the end of the Bronze and the beginning of the Iron Age in the Eurasian steppe region was an enduring and successful economic strategy according to the archaeological data of the period. It is hard to believe that the Iron Age pastoralist societies of the region did not use a calendar or had no idea of astronomy, considering the massive annual periodic movements of people and animals, the large scale of their political territories, their knowledge of both domesticated and wild plant resources for food and medicine, and the mixed agro-pastoralism practised by those living at the border of steppe and mountains (Spengler et al. 2013; Samashev 2021b; Chang 2018). A traditional calendar was used by pastoralist societies of the region starting from at least the 1st millennium CE, and the first official written evidence of its use was recorded in the 7th c. CE (Zakharova 1960).

It was in active use until the beginning of the 20th c. CE and called Tengrian, Turkic, Turkic-Mongol, or Mushel calendar. It was still in use at the beginning of the 20th c. CE in some steppe regions as well as is unofficially in use in many Turkic speaking countries, i.e., in Kazakhstan and Western Siberia (Dimitriyev 1982; Mukhanbetova 2001). It is a 12-year animal named calendar, the 4th period of which is named as a hare year, traditionally considered as the worst, "disastrous" year of the whole 12-year period. Many extremely deadly juts (mass mortality of livestock due to extreme weather conditions, drought, or ice-covered ground) happened in the past on the territory of Kazakhstan and Siberia during the hare year (Atusheva 2000). A few massive juts on the territory of Kazakhstan in 19th c. CE, 1867–1868, 1879–1980, 1891–1892, 1915–1916 were named by the local population as "total hare", "great hare", "younger hare" and "white hare" accordingly. During the juts mass mortality of the livestock could reach up to 72% and it was a disaster for the pastoralist societies where the main wealth, treasure, and source of food is livestock (Mukhanbetova 2001).

If a calendar with animal associations was in use during the Iron Age the Saka were aware of the disastrous hare year and their wish to soften its consequences is understandable. The creation of plaques that include a hare, the shape of which is completely obscured in depictions of other animals or ornamentations, could have had symbolic importance for the Saka population and could be connected to their knowledge of climate, time, astronomy, and landscape. Moreover, some of the depicted animals are the Mushel calendar symbols, such as a boar and bird. Leaving no written records, we can only speculate as to the calendar and astronomy knowledge of the Iron Age pastoralist societies; however, the sophistication of the visual message created by the Saka through the use of complex animal and plant designs hints at a deep understanding and symbolic structuring of the natural world, part of the 'Altai-Sayan' belief system as coined by Z. Samashev (Samashev 2021b).

The importance of medicinal plants—and the skills of those who were able to use them—to the Saka has been demonstrated by the discovery of the burial of Saka women in a kurgan at Tasaryk, Urzhar district, East Kazakhstan, dated to between 408–383 cal BCE (1σ) (Dzhumabekova and Bazarbayeva 2020). Known colloquially as the 'Urzhar Priestess' (Altynbekov 2018) the Saka woman, aged around 30–35, was discovered in a stone-constructed kurgan, as a single undisturbed burial in a 'box' made of large stone slabs. She was buried with an elaborate gold headdress depicting a mythical bird with fern-like adornments and accompanied by grave offerings in the form of animal bones, ceramic vessels, a wooden cup and dish, and a rounded worked-stone item interpreted as an altar

that was placed near her head (Baitanayev 2019). Significantly, her burial was accompanied by numerous organic remains. She was found to be wearing a wig made of vegetable fibres containing fern spores. Her body appears to have been placed on a mat or layer of sedges, rushes, and ferns. Seeds of *Cannabis* sp., *Rumex* sp. (most likely sorrel) and the apline plant *Dryas octopetala* (Mountain avens) were found in her pelvic area, and she was buried with a 'pouch' containing plants known for their medicinal properties, including *Polygonum aviculare* (prostrate knotweed), Carex sp., cereal lemma, Silene, possible coriander and cumin, *Gratiola officinalis* (hedge hyssop), *Carduus acantoides* (welted thistle), *Cannabis* sp., *Plantago* sp. (plantain), and pine needles and bark (Nigmatova and Baitanayev 2019).

Both the form and the function of Saka decorative metalwork are better understood by studying the context and provenance of the objects, and by employing the techniques of archaeological science to understand the decisions made by Saka craftspeople and their patrons. The choices and use of different decorative elements and consequently choices in manufacturing technologies and materials were directly connected with and driven by the mobile lifestyle of the Saka population, and evidence of use-wear on gold artefacts indicates that in many cases the objects had a life before being deposited in a funerary context, be that in a burial chamber or as a hoard tribute to honour the dead. It seems that stylistically and technologically Saka craftspeople followed the physical needs of society and adjusted their skills accordingly, for example, by serially producing tiny microbeads and light decorative plaques for decorating the costumes of horse riders. At the same time as these technical considerations, the complex integration and mixing of depictions of different animals in a single object were perhaps related to Saka society's beliefs, knowledge of climate, landscape, time, and astronomy, and requires more research in the future.

Animals were not the only motifs depicted by Saka craftspeople, and the botanical world was also rendered with great care and attention in fine gold work. The technological skill required to create such tiny and intricate depictions of the plant world, together with the evidence for heavy wear in some cases, demonstrates that the 'animal style' of the Saka would perhaps be better described as the 'ecological style'. Animals and plants adorned people and horses, each with their own underlying symbolic language and social significance. Through careful further study of the archaeological context, both funerary and domestic, and the underlying technological choices behind these images, future research may enable us to understand Saka lifeways and beliefs in greater depth.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/arts12010023/s1, Table S1: Hare_pl_Patsha_ES_VI_Chem.

Author Contributions: Conceptualization S.A. and R.C.R.; methodology, S.A.; formal analysis, S.A. and R.C.R.; writing—original draft preparation, S.A. and R.C.R.; writing—review and editing, R.C.R. and S.A.; unless otherwise indicated, all images by S.A. All authors have read and agreed to the published version of the manuscript.

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