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A new player in the game?

An archaeological and archaeometallurgical approach in detecting long distance relations in Late Chalcolithic Anatolia

ABSTRACT: *The settlement of Arslantepe (South-East-Anatolia) developed in autonomous manner, but was also influenced by contacts with the cultural sphere of the Mesopotamian Uruk culture (e. g. architecture, wheel thrown pottery, use of seals) and contemporaneously also with cultural groups from the Caucasian highlands (e. g. Kura-Araxes pottery, metallurgy). Considering new ^{14}C-data from the necropolis of İkiztepe (being no longer a late Early Bronze Age cemetery) it is possible to connect the whole region of North-Anatolia more to the south-east, especially to Arslantepe. Based on archaeological comparisons as well as on natural science analyses it seems that in Late Chalcolithic Arslantepe and İkiztepe had at least sporadic contact and maybe they exploited the same ore sources or had the same suppliers of raw material.*

KEYWORDS: LATE CHALCOLITHIC, ARSLANTEPE, İKIZTEPE, PALACE HOARD, ROYAL TOMB, CEMETERY, METALLURGY, ARCHAEOLOGICAL COMPARISON, CHEMICAL ANALYSES, LEAD ISOTOPE DATA

Introduction

It has recently been stated that the emergence of complex technologies and their organization can be linked to indigenous progresses. Early metallurgical developments obviously took place in regions where mineral resources were abundant. So, technological (metallurgical) and social innovations occur for example in the highlands of Anatolia or the Balkans, simultaneously and independently. These technological developments can be observed before formal interactions with Mesopotamian communities began (Lehner and Yener, 2014).[1]

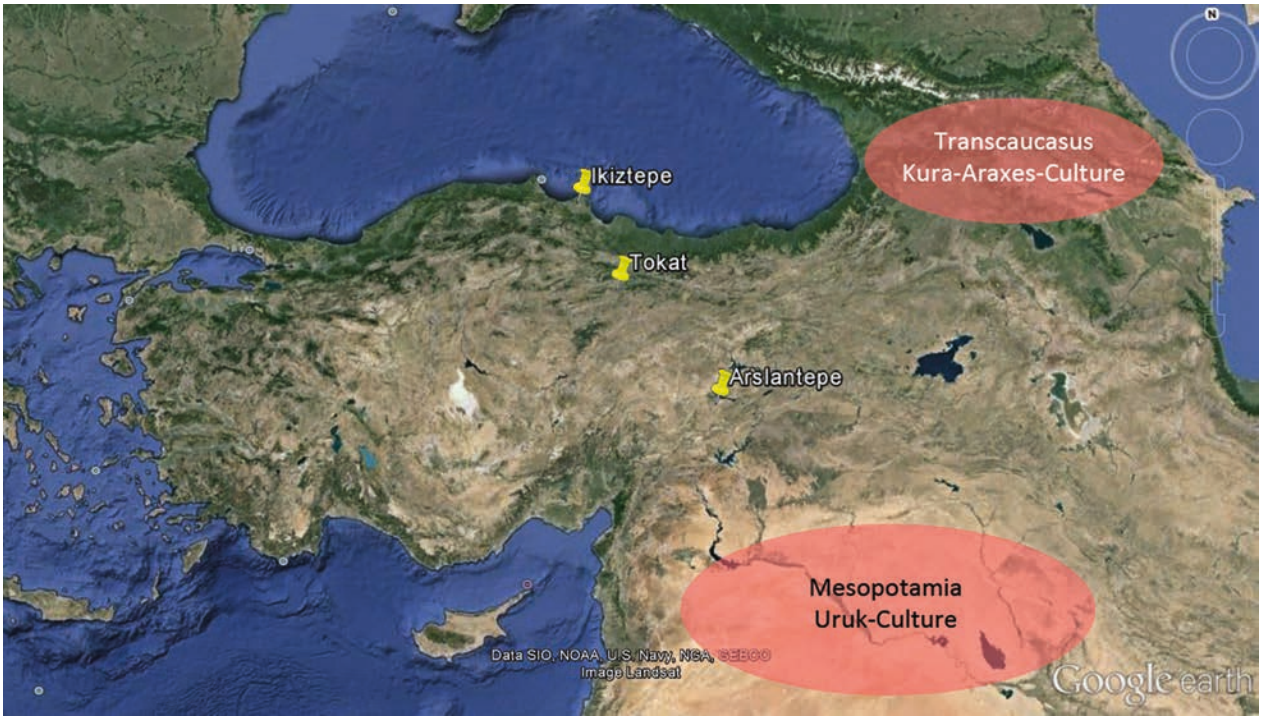

Fig. 1. Map showing main archaeological sites mentioned in the text and cultural regions of Transcaucasia (Kura-Araxes culture) and Mesopotamia (Uruk culture) (map based on google-earth, graphic: Michael Klaunzer).

Arslantepe, Province Malatya

Arslantepe is one of these places that obviously profited well from the geographic location in the upper Euphrates within and near abundant mineral resources (e. g. mining districts of Keban, Ergani Maden etc.). Arslantepe is located in the Province of Malatya in South-Eastern-Anatolia (Fig. 1) and looks back on a long history of settlement activities from the Chalcolithic to Roman and Byzantine times (di Nocera, 2004, p.18). Some of the most important cultural layers represent the Late Chalcolithic and the beginning of the Early Bronze Age (Arslantepe VI A and VI B1-2). Radiocarbon analyses suggest an absolute dating of these layers from 3350-2900 B.C. (Palmieri, 1981, p.102, table 1).

During period Arslantepe VI A which is corresponding with Late Uruk culture in Mesopotamia (approx. 3350-3000 B.C.), a monumental building complex (palatial complex) was erected in the south-west of the hill (Frangipane, 1997, p.49). In some of the buildings lots of wheel thrown mass produced bowls, thousands of cretulae (sealings/seal impressions in clay) as well as animal bones were found. The whole architectural complex is linked to an advanced administrative structure of a central institution that controlled the production of goods and organized their systematic (ritualized) redistribution (Frangipane, 1997, pp.66-70; Frangipane, 2012, pp.27-33). These observations can be linked to similar and contemporaneous developments in the Uruk culture of southern Mesopotamia, based on long lasting and close relations between these ancient cultures (Frangipane, 2001, pp.3-4)

In Room A 113 of the massive Building III (that was part of the Palatial complex), Alberto Palmieri and his team discovered the hoard of twelve spearheads, nine swords and one quadruple spiral (the so called “palace hoard”). All items were made of arsenical copper and were lying in two bundles near one of the walls. The assemblage is an excellent example of the high quality of craftsmanship in the late 4th millennium B.C. (Palmieri, 1981, pp.104, pp.109-110, fig. 3-4; di Nocera, 2010, pp.257-261) (Fig. 2).

At the end of the 4th millennium B.C., the palatial complex was destroyed and a new group of people, probably pastoralists from the Caucasian highlands settled in Arslantepe beside the local population. Houses built in wattle and daub structures and the characteristic Kura-Araxes potteries (red-black ware) are connected to this influence from the north-east (Frangipane, 2001, p.4).

In 1996, an outstanding grave, called “royal tomb”, was excavated on the mound. The grave complex dates to the end of the 4th and beginning of the 3rd millennium B.C. (Layer Arslantepe VI B1) and describes the changing situation at Arslantepe in the beginning of the Early Bronze Age and the increasing influence of the cultures from the highlands in the north-east. Four persons were buried in a pit immediately above a stone cist where the main burial was found. Beside ceramic vessels of Uruk tradition and pottery of Transcaucasian origin, the grave furniture consisted of several kilograms of metal objects (weapons, tools, vessels and jewellery) made from different metals (copper, arsenical copper, arsenical copper rich in nickel, copper-silver, silver and gold) (Frangipane, 1998; Hauptmann, et al., 2002). Most of the metal items out of the royal tomb have got comparable objects from the Caucasian metallurgy (e. g. pins with double spiral head, spiral rings (hair rings), also spearheads and diadems) (Kushnareva, 1997, pp.196-203, fig. 73, 75). The metal finds suggest intense interactions between local people (at least the elites) of Arslantepe and nomads (specialists in metallurgy?) from the Caucasian highland (Frangipane, 1998; Frangipane, 2001, pp.6-7, Palumbi, 2004, p.116).

Whereas cultural interactions with the north-east (Caucasian highland) and south-south-east (Uruk culture) can definitely be stated, interaction spheres to the region north-west of Arslantepe are more difficult to determine. In the following, special attention is drawn to some metal artefacts from the palace hoard of Arslantepe that

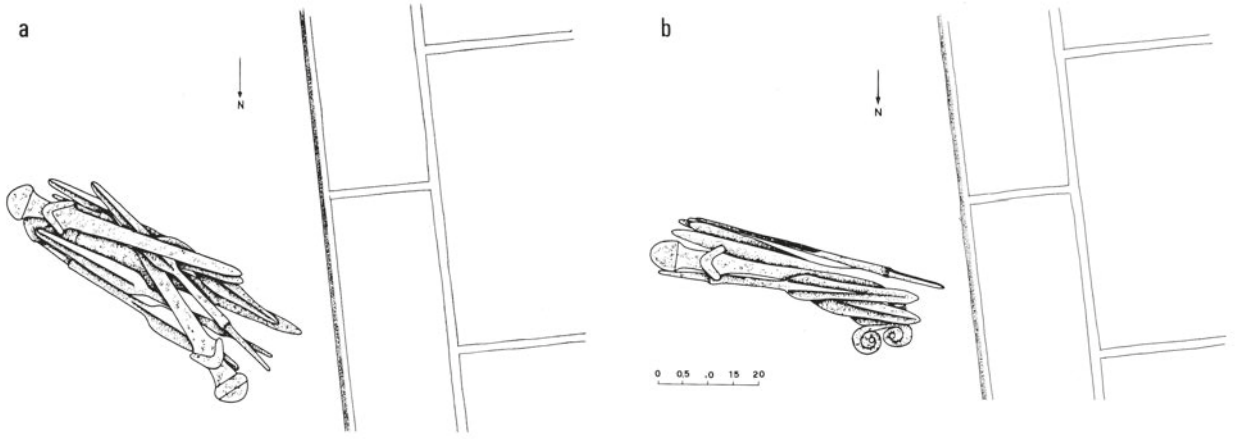

Fig. 2. Arslantepe: Late Chalcolithic palace hoard with swords, spearheads and quadruple spiral in situ (Frangipane and Palmieri, 1983, p.314, fig. 18).

find their parallels in grave goods of the necropolis of İkiztepe near the Black Sea coast and, more general, in the region of North Anatolia.

İkiztepe, Province Samsun

İkiztepe, a tell settlement consisting of four hills, is situated in a favourable geographic position on the Bafra-plain near the Black Sea coast (Fig. 1). Excavations resulted in an almost complete stratigraphy from Chalcolithic to Middle Bronze Age and also Late Iron Age (Bilgi, 2001, pp.24-32). Beside architectural remains, İkiztepe is well-known for an extended graveyard with over 650 graves, traditionally assigned to the late Early Bronze Age (around the mid and second half of the 3rd millennium B.C.) (EBA II-III) (Bilgi, 2005, pp.15-16).

The necropolis of İkiztepe has led to many controversies. Criticism was attracted because of certain grave goods that find their parallels more in Late Chalcolithic times than in late Early Bronze Age. Moreover, the extensive and almost exclusive use of arsenical copper for most of the metal items seems to fit better with metallurgy of the Late Chalcolithic and beginning Early Bronze Age than with Late Early Bronze Age metallurgical artefacts (e.g. Parzinger, 1993, p.237; Lichter, 2008, pp.180-187; Zimmermann, 2011, pp.304-305). In this case, the whole cemetery of İkiztepe should better be assigned and dated to the 4th millennium B.C., like the Chalcolithic graves of Ilıpınar in Western Anatolia (Roodenberg, 2001; Begemann, et al., 1994; Lichter, 2008, p.187).

M. L. Welton could confirm these assumptions by performing some new ^{14}C-dates of some of the burial remains (bones) from the cemetery, in the course of her PhD thesis. The analyses suggest a date in the late 4th millennium (Late Chalcolithic) rather than the second half of the 3rd millennium B.C. (Welton, 2010, pp.103-104).[2] On the basis of the new radiocarbon dates, the whole necropolis can possibly be dated back some 1000 years. This implies an enormous impact on Anatolian prehistory because such an extended, extramural graveyard is not known in Late Chalcolithic Anatolia until now.

People from İkiztepe were buried in simple earth inhumations in supine, stretched position and the grave can be equipped with a variable number and quality of grave goods. In male graves, there are sometimes rich weapon inventories, in outstanding female graves we find more jewellery, sometimes weapons (daggers) and rare grave goods like pottery vessels, in comparison to burials with only a few or completely without grave goods. Furthermore, this means that we can observe a social stratigraphy that was generally accepted within the group (Yakar, 1985, p.32). Warriors (with regard to the grave goods, they had the highest social status) and and related females represent the top of the social hierarchy.

The equipment of a male warrior, as indicated by the metal implements in the graves, consisted of a variable number of metal artefacts (arsenical copper), mostly

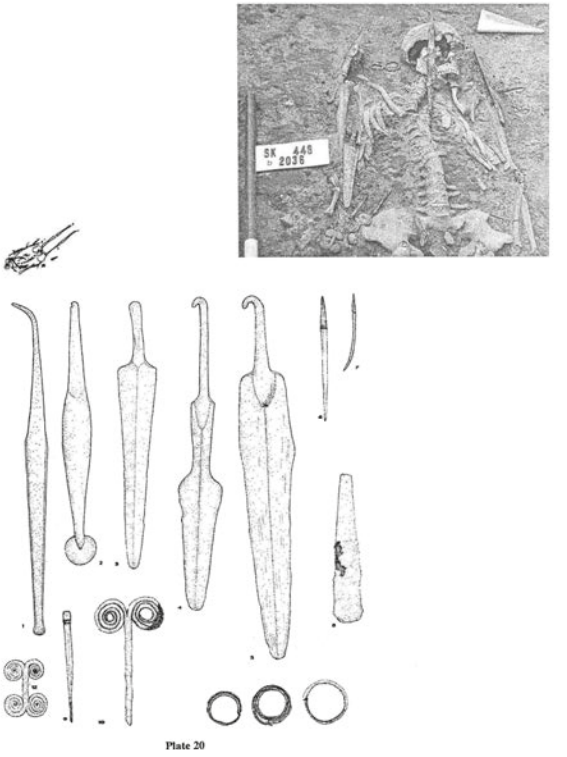

Fig. 3. İkiztepe: Sk. 448 as an example of a well-equipped burial with jewellery and weapon inventory (after Bilgi, 2005, plate 20 and fig. 23).

weapons (spearheads, daggers, axes), sometimes together with one or two piercers and jewelery items (ear rings, bracelets, pearl necklaces) (Fig. 3 – e. g. burial Sk. 448 with various metal artefacts).

Quadruple Spirals

Beside weapons, some of the warrior graves also include a quadruple spiral. These artefacts are an exclusive male grave good that were found in 14 warrior graves; in some other graves similar objects, like horned emblems, were found, too.[3]

The spiral is a common and widely distributed motive with a long tradition in the prehistoric world. As early as in Paleolithic times, the spiral was carved into bones or used as decoration for ceramic vessels in Neolithic. From Early Bronze Age onward, the spiral appears more frequently in the Ancient Near East. The motif can have different forms, for example S- or C-Form or as a running spiral, and can be found in form of seals or impressions in clay, as part of paintings, on artefacts (e. g. as a part of ceramic pots[4]) or as objects (Crowley, 1989, pp.105-112, pp.453-457, fig. 281-308).

In form of clay impressions or as a seal, the quadruple spiral was found at Arslantepe (layer VI B, 3000-2900 B.C.) (Palmieri, 1981, p.110, fig. 10, 2) as well as in the Amuq plain (Phase G, late 4th and early 3rd millennium B.C.) (Braidwood and Braidwood, 1960, p.330, fig. 253,

7; chronology of Phase Amuq G: see Yener and Wilkinson, 1999, p.17).

More often, the spiral appears as tubular beads with spiral endings from the middle of the 3rd millennium B.C. onward. However, this kind of quadruple spiral is significantly smaller than the spirals from Arslantepe and İkiztepe. Tubular beads show a wide distribution from Greece (Mycenae), the Aegean and Anatolia to the Caucasus and Mesopotamia. Chronologically, they can be dated from the 3rd to the end of the 2nd millennium B.C. (Culican, 1964, pp.36-43; Maxwell-Hyslop, 1989, pp.215-220; cf. Trejster, 1996, p.210).

In general, early forms of quadruple spirals are considered as a symbol of water. The tubular beads with spiral endings are associated with deities (e. g. depicted on seals) or priests and other persons of high social standing (used as amulets). In this case, the symbol of the quadruple spiral has as well apotropaic function (protective) (Maxwell-Hyslop, 1989, pp.218-220).

Quadruple spirals as part of the warrior equipment

Mostly, the quadruple spirals from the warrior graves of İkiztepe were lying at the hips of the deceased. Ö. Bilgi interprets them either as belt buckles or as some kind of religious item of unknown function (Bilgi, 1984, p.72; cf. Palmieri, 1981, p.109, fig. 3, 4). Some of the pieces still show rests of textiles on them (e. g. quadruple spiral of Grave Sk. 395, cf. Bilgi, 1990, p.164, fig. 19, 440); they could have been sewn on the clothing of the dead.

As an object, like in the graves of İkiztepe, the quadruple spiral (as well as horned emblems and a few other objects like a double spiral) is firstly associated with male individuals and secondly with weapons. They could be interpreted as some kind of insignia of warriors.

When we compare the quadruple spiral of the contemporaneous (Late Chalcolithic) palace hoard of Arslantepe, which was associated with weapons as well (swords and spearheads), we detect some remarkable similarities (although the quadruple spiral at Arslantepe comes from a different context). Fig. 4a-b (see also Fig. 6a) shows a comparison of two quadruple spirals: on the left side a spiral from grave Sk. 545 of İkiztepe and on the right side the piece found in the Arslantepe hoard.

Both quadruple spirals are almost identical. They are made of arsenical copper and are similar in size. The spiral of Arslantepe is heavier than the other one.

In order to discuss the provenance of metals, archaeometallurgists look upon chemical elements in the composition of artefacts that characterize the ore and the metal smelted out of it. These elements, especially silver (Ag) and nickel (Ni), remain in the metal even after roasting, smelting and melting/casting the metal (Pernicka, 1990, pp.76-77, tab. 8; Pernicka 1999, p.165, pp.169-170, tab. 1).

In Fig. 5, the nickel and silver values of some of the quadruple spirals from İkiztepe[5] are shown in comparison to the artefacts from the palace hoard of Arslantepe (swords, spearheads and quadruple spiral). The spiral of Arslantepe (indicated by a red arrow) has got silver and nickel contents that are comparable with the spirals of İkiztepe. The material and typological similarity of the quadruple spirals could probably indicate the same origin of the raw material. Of course, we must not overestimate one single analysis that would lead to premature conclusions. However, material and typological similarities are striking.

These observations (chronological and typological conformity and similar material composition) could possibly indicate that İkiztepe was the production site, maybe also the place of origin of quadruple spirals. Whatever significance they had, it seems that İkiztepe kept relations to or had (at least sporadic) contacts with Arslantepe already in Late Chalcolithic times.

However, the quadruple spiral from the palace hoard of Arslantepe is not the only comparable artefact. The spiral was deposited together with spearheads and swords, and for these finds we also detect other comparable objects in the region of North-Anatolia (İkiztepe and region of Tokat) (Fig. 6).

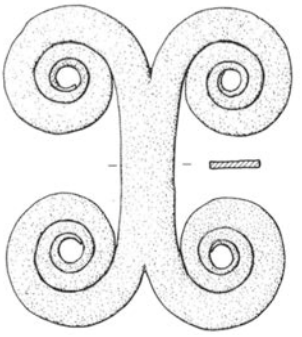

Fig. 4a. Quadruple spiral İkiztepe Grave Sk. 545, Late Chalcolithic (3300-3000 B.C.), arsenical copper, h 14,5 cm; w 13 cm; t 0,4 cm; wt 280 g. Bilgi, 1990, fig. 19, 438.

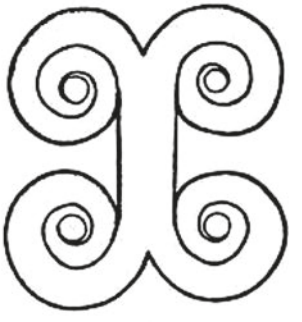

Fig. 4b. Quadruple spiral Arslantepe Palace hoard, 3350-3000 B.C., arsenical copper, h 13,5 cm; w 13,3 cm; t 0,6 cm; wt 396 g. Palmieri, 1981, Fig. 3, 5 (© British Institute at Ankara).

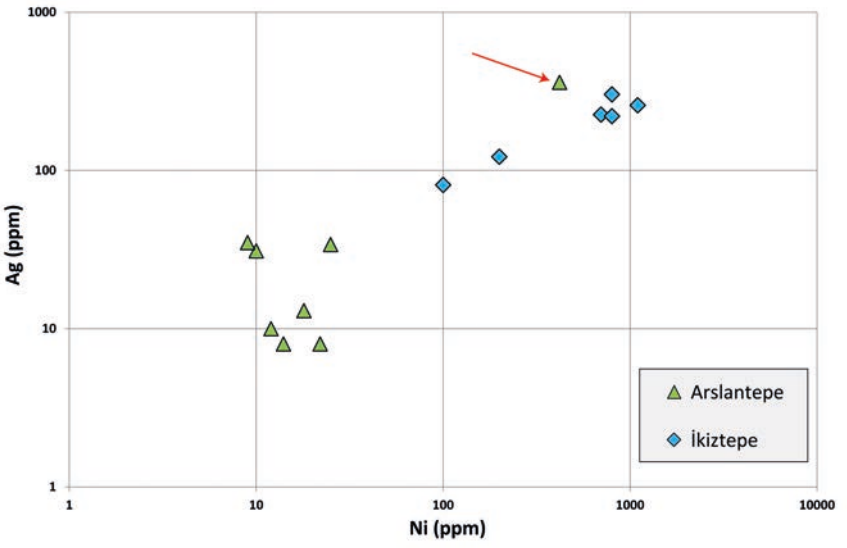

Fig. 5. Binary silver-nickel-diagram of some of the quadruple spirals from İkiztepe in comparison to artefacts from the palace hoard of Arslantepe; the spiral from Arslantepe (indicated by red arrow) is in the range of the İkiztepe spirals. A similar origin of the raw material, maybe the same production site (North Anatolia) can be assumed (data of Arslantepe given by Hauptmann, et al. 2002, p.49, table 5; İkiztepe: H. Özbal, unpublished data).

Spearheads

The spearheads found in the palace hoard as well as in the royal tomb of Arslantepe have got a quite common form: the blade is leaf-shaped, with or without mid rip, and tapers off to a slim middle piece with circular cross section that ends in a straight tang.

Almost similar spearheads with more or less the same features were found from North-Central-Anatolia as far as Mesopotamia (Stronach, 1957, pp.113-115, fig. 8, 4; for further comparisons in the Ancient Near East see also Gordon, 1951, pp.48-51, fig. 2, pp.15-35). Differences can be observed in the length and form of the blade, the tang and the diversity of the solid middle piece. For instance, this type of spearhead occurs in Horoztepe (Özgüç and Akok, 1957, p.216, fig. 13), Tülintepe (Harmankaya, 1993; Yalçın and Yalçın, 2008, pp.106-109, fig. 6-10), Birecik (Sertok and Ergeç, 1999, p.93, p.106, fig. 10, A-B) or in the royal cemetery of Ur (Woolley, 1934, pl. 227, type 2a, 2b, 3).

A very similar spearhead type appears as a grave good in the necropolis of İkiztepe. The only difference to the examples from Arslantepe is the tang that is bent sharply (u-form) at the spearheads of İkiztepe (see for instance Bilgi, 1990, p.121, pp.209-210, fig. 10-11).[6] (Fig. 6b)

Comparable spearheads with bent tangs are known from the Museum of Sivas, Central Anatolia (without context) (Bilgi, 1993, p.602, fig. 3), from Silifke/Cilicia (Bittel, 1955, pp.117-118, fig. 10) or from "Tbilissi"[7] and Achalziche in Georgia (Kushnareva, 1997, p.199, fig. 73, 3-4).

Although this type of spearhead has a wide distribution and dates chronologically from the late 4th millennium (Arslantepe) to the second half of the 3rd millennium (Horoztepe), connections or contacts from North-Central-Anatolia to the east (Caucasian highland) and southeast can be stated as early as in Late Chalcolithic times.

Swords

The swords of Arslantepe represent the oldest examples of this weapon type (swords with a solid hilt) ever found (with secure context). It is possible that these weapons also signalize a new meaning of warfare which was, like the economic structure, organized by ruling elites (Palmieri, 1981, p.109). The contents of arsenic in the copper ranges between 4-5 wt% in swords (Caneva and Palmieri, 1983, p.639), indicating that this kind of alloy was intended. A little arsenic in copper improves the material properties, so the weapons were most probably functional and made for fighting and not exclusively for symbolic and/or ritual purposes. On the other hand, three of the swords are decorated with silver inlays in form of triangles and zigzag bands (the earliest examples of this technique), and besides, the location of these finds in the palatial complex (palace hoard) perhaps indicates that in the beginning swords were used primarily for prestigious purposes (Palmieri, 1981, p.104, pp.109-110, fig. 3-4; Caneva and Palmieri, 1983, p.649, tab. 1, sample No. 30; di Nocera, 2010, p.261).

Just recently, T. Zimmermann et al. published a sword of the same type as in the palace hoard of Arslantepe (sword type "Arslantepe"). The sword belongs to the Collection Necdet Dilek and was purchased by the Museum of Tokat in North-Anatolia (Fig. 1; Fig. 6c). Unfortunately, there are no hints, neither of the site where it was found nor about the external circumstances (Zimmermann, et al., 2011, pp.1-7, fig. 1, e; fig. 2). Correspondingly, the following consideration must be regarded as cautious. It is possible that the sword stems from the region of Arslantepe (or elsewhere) and found its way to North Anatolia indirectly, by art trade.

However, formal properties (size, weight, type) of the sword of Tokat and the examples from Arslantepe correspond, as well as the material, so for example, the

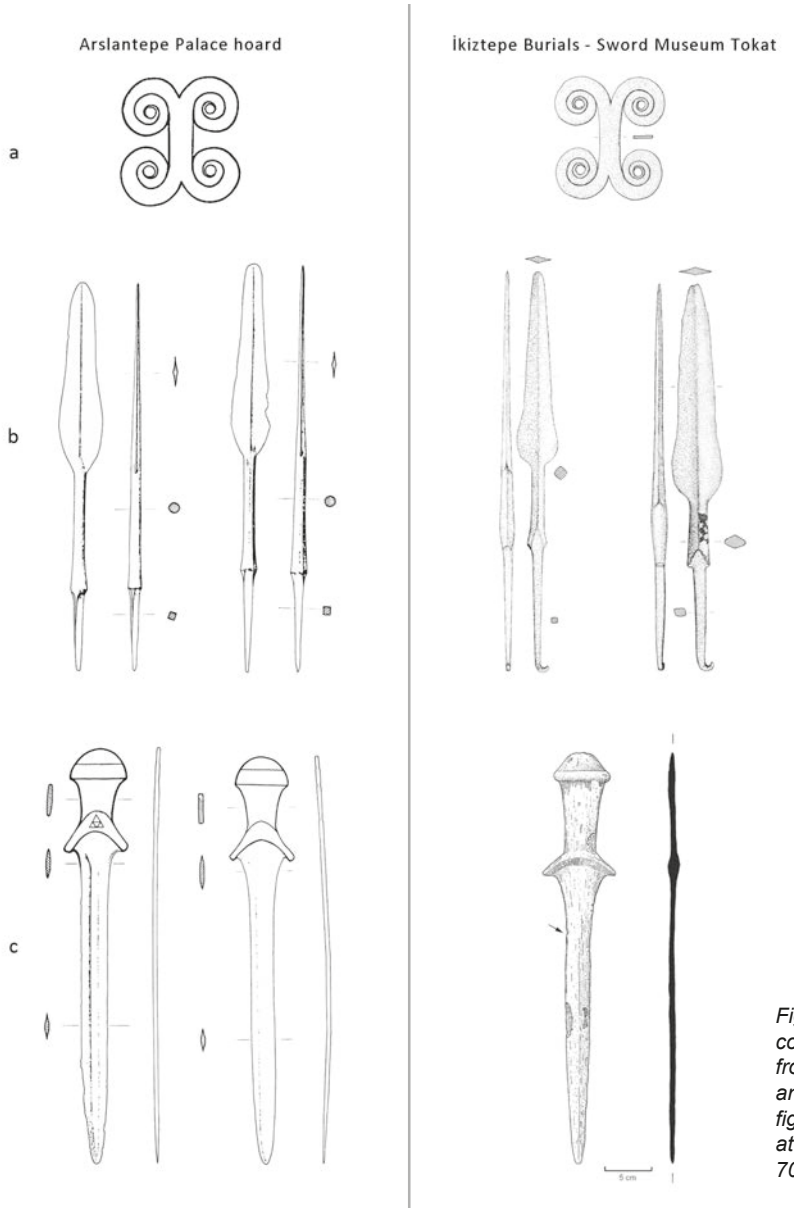

Fig. 6. Comparison of finds from the Late Chalcolithic palace hoard of Arslantepe and finds from the region North-Central-Anatolia (İkiztepe and region Tokat) (Palmieri, 1981, pp. 107-108, fig. 3, 2, 4-5 and fig. 4, 2-3 (© British Institute at Ankara); Bilgi, 1990, fig. 19, 438 and fig. 10, 70, 75; Zimmermann, et al., 2011, Abb. 2).

metal used for the weapons is comparable: a p-XRF-analysis shows high arsenical copper with a little nickel content.[8] The swords from Arslantepe have lower arsenic contents, but nickel is similarly low (Caneva and Palmieri, 1983, p.641, pp.647-648; Hauptmann, et al., 2002, p.47, p.49, tab. 3, 5).

Moreover, along the edge of the blade Zimmermann et al. observed notches that indicate the practical use of this kind of weapon. Consequently, swords were used most probably for battles/fighting actions (for closed combats and as a cutting or stabbing weapon) at the end of the 4th and beginning of the 3rd millennium B.C. Although swords are not proven in the necropolis of İkiztepe, the sword of Tokat (even though of unknown origin) can be considered as another indicator of cultural contacts to the region of North-Central-Anatolia and confirms supposed connections and contacts in Late Chalcolithic times.

Lead isotope data of İkiztepe and Arslantepe

Last but not least, lead isotope analyses (LIA) of artefacts from the graveyard of İkiztepe are presented here. LIA are a good tool in order to find the origin of metals and metal artefacts respectively (Gale and Stos-Gale, 2000; Stos-Gale and Gale, 2009; Begemann and Schmitt-Strecker, 2008; Klein, 2007). In the following, lead isotope data of 18 analyzed objects from the cemetery of İkiztepe[9] (all made of arsenical copper) are shown in comparative manner and opposed to metal artefacts from Arslantepe (palace hoard and royal tomb).

The purpose of this study is to show differences and similarities between the LIA-data from İkiztepe and Arslantepe that should underline the supposed contacts and interactions between the two sites. However, the origin of the metals (i. e. provenance studies) is not discussed here,

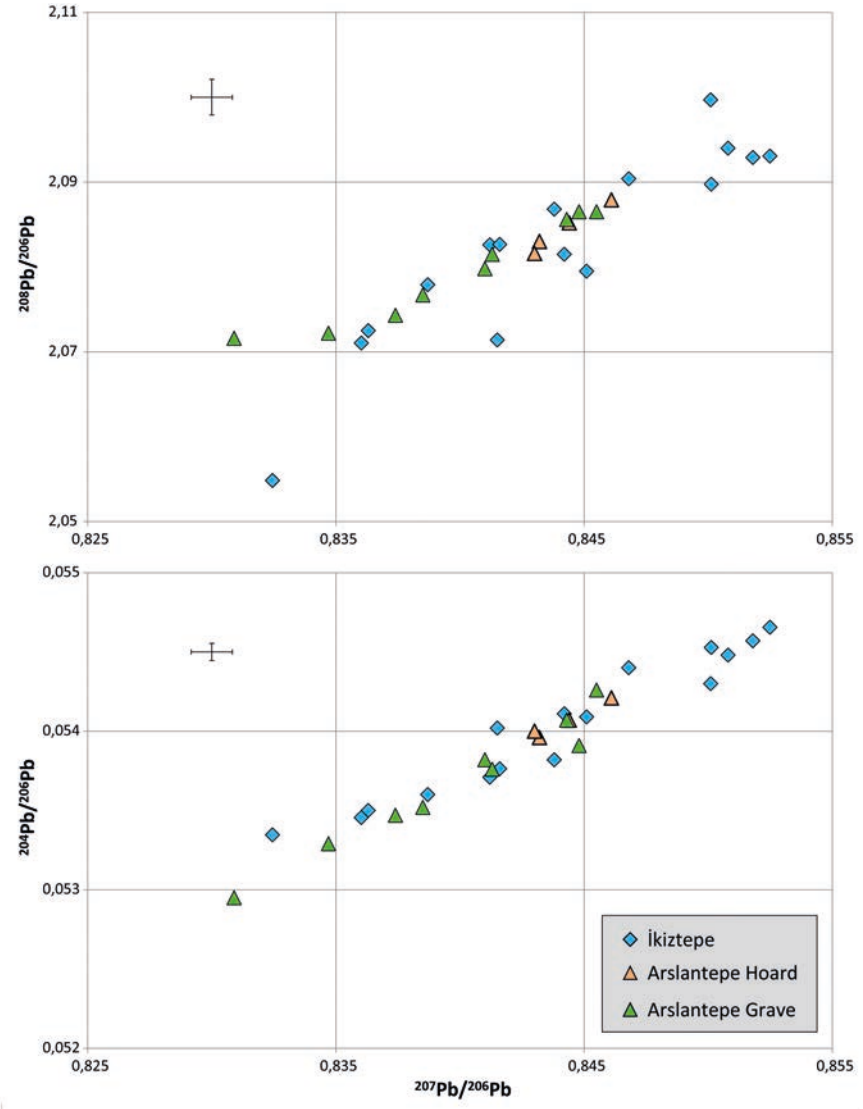

Fig. 7. ^{206}Pb-normalized isotope abundance ratios of arsenical copper artefacts from the graveyard of İkiztepe, the "Palace hoard" and the "Royal tomb" of Arslantepe suggest at least for some of the artefacts the same origin of the raw material; Experimental uncertainties <0,1 % (Hauptmann, et al., 2002 and PhD-Thesis of Michael Klaunzer).

because this would go beyond the scope of this article. Provenience studies are very complex and it's often very difficult to decide which ore deposit might have provided the raw copper for the arsenic containing copper artefacts (compare the problems and difficulties that Hauptmann et al. (2002, pp.61-63) faced when they were searching for the origin of the arsenical copper artefacts found at Arslantepe).

In Fig. 7, lead isotope analyses of arsenical copper objects from İkiztepe and Arslantepe are opposed. We can see a wide spreading of the LIA-data from İkiztepe as well as from the royal tomb of Arslantepe. Most artefacts from the palace hoard of Arslantepe cluster in a small group and could possibly stem from the same ore source. It is interesting that the data from İkiztepe and Arslantepe (hoard and grave) show some overlapping. It would be conceivable that Arslantepe and İkiztepe had the same suppliers of raw materials or exploited the same ore sources.

Conclusions

The comparison of archaeological artefacts from Arslantepe with finds from the region of North-Central-Anatolia and their typological parallels (e. g. quadruple spirals, spearheads, swords) suggest relations in Late Chalcolithic times. By considering new radiocarbon data from the necropolis of İkiztepe – assigning the graves to the second half of the 4th millennium B.C. – it is most likely that the two regions had contacts and exchanged goods, maybe also raw materials. Natural science analyses (chemical and lead isotope analyses) give further hints of the proposed contacts. The region of Arslantepe obviously had connections to the Mesopotamian Uruk culture as well as to the East-Anatolian and Caucasian cultures, but it seems that Arslantepe also kept contact with the region of North-Central-Anatolia at least in the late 4th millennium.

One of the urgent research questions is how the people got into contact and respectively, how they met each other in prehistoric times. One explanation or scenario for the late 4th millennium could be that the contact happened when transhumance brought people from different cultural groups together. Those people, who moved into the landscape, could have discovered mineral resources that have been exploited in the following. Perhaps, there is some kind of early barter, gift exchange or even prestigious goods exchange but anyway, the mechanisms behind cultural groups and their exchange (between warriors from İkiztepe and the ruling people from Arslantepe) are difficult to determine.

If we consider prestigious goods and their barter and exchange between elites of different cultural groups, the question of what kinds of commodities were exchanged is still to be answered. Maybe there was the supply of raw materials (ore, even raw metals) to the local artisans at Arslantepe where objects were produced in the settlement. Perhaps, people from İkiztepe can be identified as some kind of intermediaries who produced or delivered metals – just before Transcaucasian influence got stronger at Arslantepe in the beginning of the 3rd millennium B.C. (indicated by wattle and daub structures, particular metal objects, Kura-Araxes ware).

The sword of Tokat could be the result of a supply with raw metals from North-Anatolia that was a gift of exchange or a custom work and didn't find its way to the final destination. On the basis of the new dating of the necropolis of İkiztepe, the whole cultural environment of North-Central-Anatolia gets more involved in the major key players of the Late Chalcolithic times.

Acknowledgement

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Notes

1 For early metallurgy in Anatolia see Yalçın, 2000; for developments on the Balkans and South-East-Europe see Pernicka, et al., 1993; 1997; Radivojević, et al., 2010; Radivojević, et al., 2013.

2 There are ^{14}C-dates for only two skeletons; nevertheless, these dates confirm the early dating of the necropolis of İkiztepe. However, we must consider the freshwater reservoir effect in performing radiocarbon dating. This effect can be observed, e. g. by consumption of fish (which can be expected for people of İkiztepe) that can make samples some hundreds to thousand years older than they are in reality (Philippsen, 2013).

3 Quadruple spirals were found in 14 male burials (Bilgi, 1984, pp.72-73, fig. 18, 272-277; Bilgi, 1990, p.164, fig. 19, 438-445). In some cases horned emblems also occur (e. g. Grave Sk. 176 (Bilgi, 1984, p.72, fig. 18, 271) or Graves Sk. 462, Sk. 569 and Sk. 554 (Bilgi, 1990, p.163, fig. 19, 435-437). In burial Sk. 172 (Bilgi, 1984, p.71, fig. 18, 269), a double spiral was found.

4 A quadruple spiral is depicted in relief on a Kura-Araxes vessel from the settlement of Kvemo-Aranisi, Aragvi plain (middle of the 3rd millennium B.C.) (Bobokhyan, 2008, p.184, citing Ghlonti, 2006, p.56, fig. 2).

5 There wasn´t enough sample material left of the here shown quadruple spiral from burial Sk. 545. In the course of the analysis in the 1980ies, the nickel value wasn't determined for this artefact.

6 According to D. B. Stronach, spearheads with bent tang correspond to Type 5a (Stronach, 1957, pp.113-115, fig. 8, 5).

7 Unknown origin without context; finding place "Tbilissi" is stated.

8 A non-destructive analysis performed on the sword shows 89, 5% copper, 9, 9% arsenic and 0, 5% nickel (Özen and Zarasız in Zimmermann, et al., 2011, 5-6, fig. 5).

9 Data of lead isotope analyses will be published in the course of the author's PhD thesis.

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