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Bridge between the urban centres in Mesopotamia and the
Pontic steppes in the 4th and 3rd millennium BC

The transfer of knowledge and technologies between
East and West in the Bronze Age

Brücke zwischen den urbanen Zentren Mesopotamiens und der
pontischen Steppe im 4. und 3. Jahrtausend v. Chr

Der Transfer von Wissen und Technologien zwischen
Ost und West in der Bronzezeit

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Metal and Knowledge Transfer: Armenia during the 4th and 3rd Millennium BC

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Abstract

The present article discusses developments in metallurgy and the trends of cultural contacts during the Late Chalcolithic period (ca. 4400/4300–3500/3400 calBC), the Early Bronze Age (ca. 3500/3400–2500/2400 calBC) and the Middle Bronze Age (ca. 2500/2400–1600/1500 calBC) in Armenia. During these periods the cultural contact between the Near East and the Southern Caucasus is essentially reflected in metal matters. This speaks for existence of concrete exchanges and knowledge-sharing concerning technologies and values. In this respect, the idea that metal was the main object of interest of Syro-Mesopotamian societies in the region and the main impetus for contacts can be true, although also other factors such as obsidian or wine could have played a certain role for such contacts, realised either by trade or through nomadic pastoralists. As a result of such relations also advances in the mental sphere are visible, reflected e.g. in the use of weight systems directly connected to metallurgical procedures. Such advances were accompanied by process of essential social transformations.

Introduction

During the Chalcolithic and the Early and Middle Bronze ages the Southern Caucasus region on the whole and Armenia as part of it are marked by the existence of various cultural traditions to be characterised by high-quality craft production, especially that of metallurgy. The discovery of thousands of metal artefacts from different archaeological sites, as well as the existence of specialised settlements prove the functioning of a high-level metallurgy in the region. All these data are supplemented by the evidence concerning the use of ancient metal ore mines during the above-mentioned periods. Recent archaeological works demonstrate that the region under consideration was part of a greater Near Eastern network and that metal was perhaps one of the most important impetus of corresponding relations.

Time and metal: chronological implications and cultural traditions

Recently developed calibrated 14C chronology for Armenia reflects the existence of various cultural traditions during the late 5th to 3rd millennia BC. The Late Chalcolithic (ca. 4400/4300–3500/3400 calBC) is represented by Haghtanak-Mushakan, Areni and Godedzor traditions, with such sites as Areni-1 cave, Haghtanak-3, Mushakan-4, Mastara-1, Teghut and Nerkin Godedzor settlements. Society is characterised by a diversity of cultural complexes, growing social complexity and relations to the Syro-Mesopotamian (Late Ubaid, Uruk) and North Caucasian (Early Maikop) worlds. This period marks the final transition to extractive metallurgy in the territory of Armenia. The evidence of metallurgical activities in the region increases especially during the early 4th millennium BC (Figs. 1–3), represented by finds of knives, bead-like ornaments, pit furnaces, slags, casting moulds, heavy tools like axes or knives/daggers of copper with low arsenic inclusions,

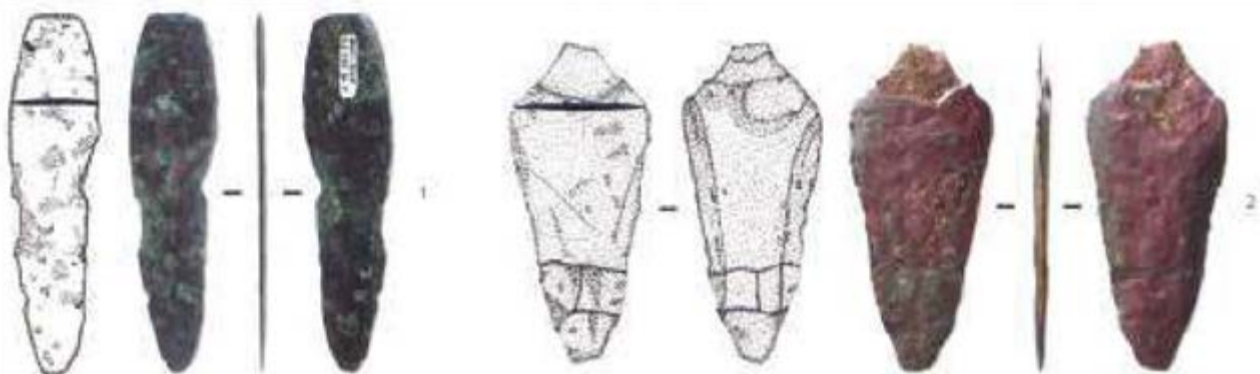


Fig. 1 Knives or small daggers:
1. Areni-1 cave, second Chalcolithic horizon
ica. 4000–3700 calBC; 2. Teghut settlement
ica. 4000–3700 calBC; 3. 5000–2 settlements,
horizon IIIa ica. 3700–3400 calBC.

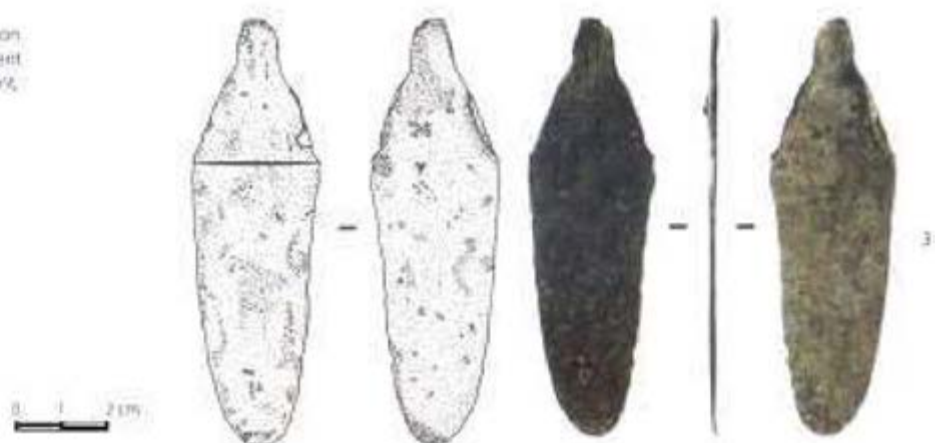
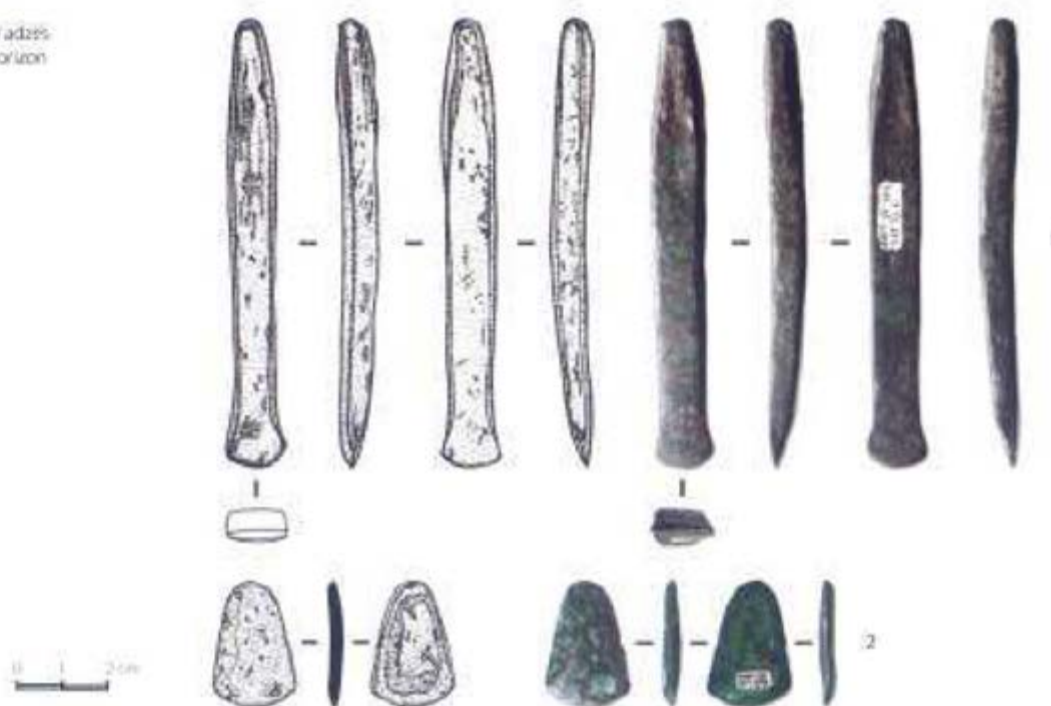


Fig. 2 Areni-1 cave, copper adzes
from second Chalcolithic horizon
ica. 4000–3700 calBC.



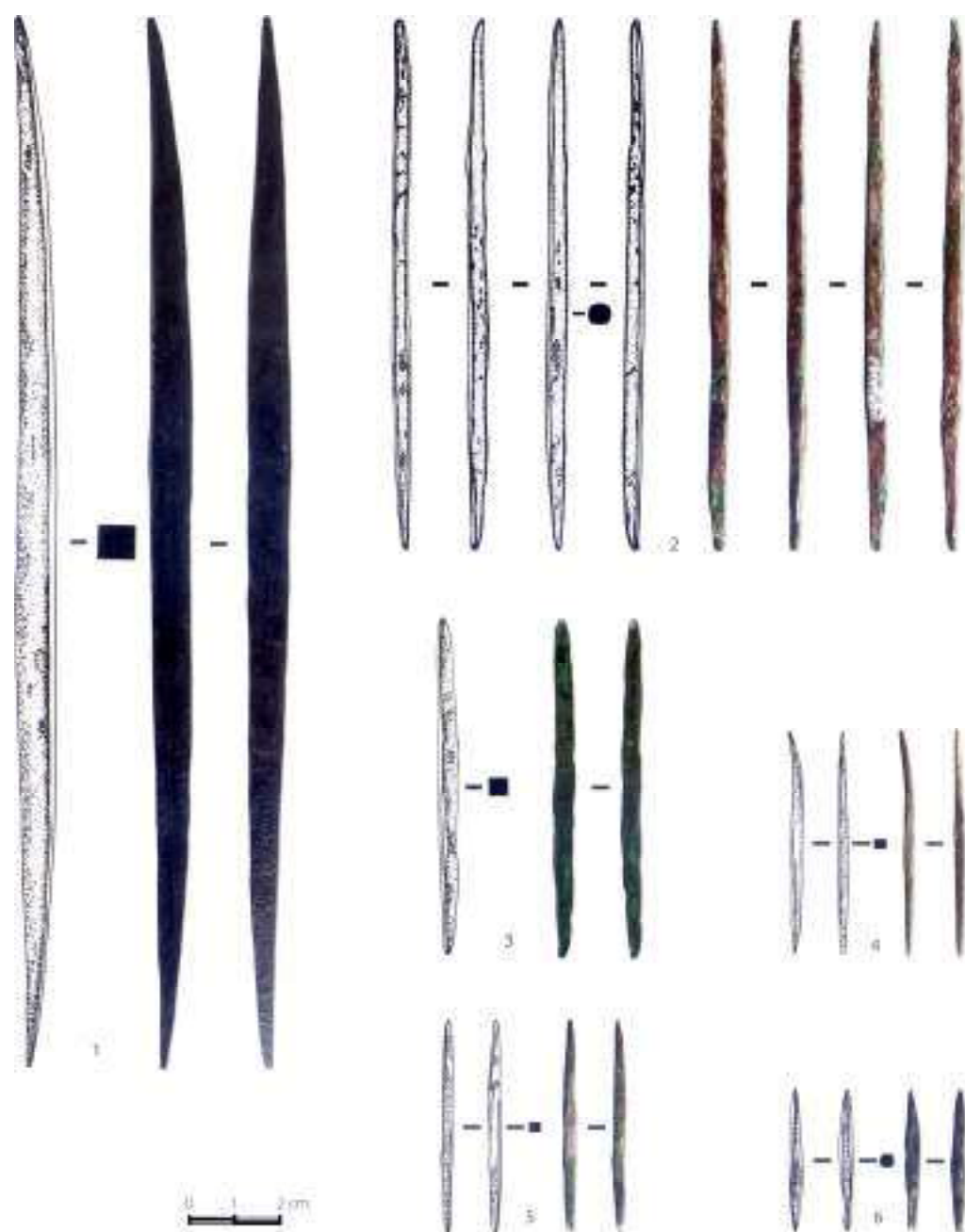


Fig. 3 Flint heads and awls of copper: 1–3 Areni-1 cave, second Chalcolithic horizon (ca. 4000–3700 calBC); 4–6 Nerkin Gogedzor settlement (ca. 3700–3400 calBC).

and the presence of gold and electrum beads. In this regard especially important data derive from the site Areni-1 (Fig. 4), where a complete *chaîne opératoire* is demonstrated (Fig. 5).

The Early Bronze Age (ca. 3500/3400–2500/2400 calBC) corresponds to the period of

existence of Kura-Araxes traditions, represented by sites such as Shengavit, Elar, Mokhrablur and Gegharot. This period witnesses the formation of a large but uniform cultural region, overlapping the territory of the Fertile Crescent, characterised by the presence of red-black burnished



Fig. 4 Areni-1 cave view from the North



Fig. 5 Areni-1 cave, trench 1: 1 clay structures inside the first gallery; 2 copper ores; 3 clay crucibles from the second Chalcolithic horizon (ca. 4000–3700 calBC).





ware. Typical for the metallurgy of this period is the appearance of workshops (Jrahovit, Shengavit) and specialised sites (Tioletovo, Margahovit), a rich repertoire of metal artefacts, and the mass production of arsenical bronze (see below Figs. 7–8). Gold (and also silver) are rare finds in Early Bronze Age sites.

The Middle Bronze Age (ca. 2400/2300–1600/1500 calBC) is known in Armenia by such traditions as the Early Kurgan, Trialeti-Vanadsor, Sevan-Artsakh, Karmir-Berd and Karmir-Vank groups, and is represented by key sites of Karashamb (Fig. 6), Vanadsor and Lori-Berd. This period is characterised by cultural diversity,

Fig. 6. Karashamb, tomb 750. 1 general view of the grave with finds in situ; 2 tin bronze spearhead; 3 tin bronze sword; 4 tin bronze dagger. Middle Bronze Age, Trialeti-Vanadsor tradition (ca. 1900–1700 calBC).

with various sequential groups of black and painted pottery traditions, by the dominance of a semi-nomadic life style, barrows and in lesser number settlements, and by active relations with Anatolia and the Aegean. The diversity of artefacts and the use of imported tin bronze are typical for metallurgy of this period. Gold objects are also popular, especially in the framework of the Trialeti-Vanadsor tradition. Although the Middle Bronze Age is well-known through the recovery of high-quality metal objects, nonetheless there is no major evidence of metal production¹.

Between the periods under consideration there are both similarities and differences. Accordingly, the Early Bronze Age metallurgy seems to be connected in some traits with the former Late Chalcolithic period. Like Kura-Araxes metal products, some items from Late Chalcolithic sites show an early presence of arsenic (ca. 1 to 4 %, rarely up to 5 %). Moulds and heavy tools of types characteristic for the Kura-Araxes tradition first appear during the Late Chalcolithic period. However, this is in marked contrast to the nature of the Late Chalcolithic and Early Bronze Age cultural traditions and to the directions of their contacts. The Late Chalcolithic diversity (typical features of which are painted pottery, the use of the potter's wheel, seals, jar burials and the first kurgans, as well as the use of gold, silver, and lapis lazuli, and Upper Mesopotamian and Maikop relations) is alien to the uniform Kura-Araxes complex. However, the cultural diversity and social mobility typical for the Chalcolithic period reappears in the Middle Bronze Age, when also traditions of painted pottery, the use of precious metals and kurgans become popular again.

Space and metal: landscape use and inner communication system

Social and cultural developments of the Chalcolithic, Early and Middle Bronze ages in modern

Armenia should be considered in three spatial contexts demonstrating the various levels of cultural affinities: 1. the territory of the Republic of Armenia itself, 2. South Caucasia, Eastern Turkey and North-Western Iran, to which Armenia demonstrates high-level cultural affinity; 3. the Near East and the Circumpontic regions, to which essential cultural contacts existed especially in the metallurgical sphere.

Present-day Armenia appears as a kind of social system essentially based on the use of metal resources. Its territory is divided into eleven provinces, six of which are metalliferous (Lori, Tavush, Kotayk, Vayots Dzor, Syunik and Gegharkunik), and the other five which are non-metalliferous (Yerevan, Ararat, Armavir, Aragatsotn and Shirak). However, all of the aforementioned eleven provinces attest very active prehistoric and early historic metallurgical activities, which are reflected both in the exploitation of ancient mines (in the metalliferous provinces) and in secondary metal production (in the metalliferous as well as the non-metalliferous provinces). Preliminary reconstructions reveal that ancient metallurgy was part of the social system of the local cultures. They highlight the ways and methods of mining, the distribution of metal products, the routes of its spread, as well as its concrete and abstract values within society².

Excavations and surveys show that the sites located near mines for metal ores as well as those located far from them are important from the viewpoint of metal production and distribution. In fact, sites in the Ararat valley, such as Jrahovit (Fig. 7) or Metsamor, situated far from the mines, were the main centres of metal production and distribution in the common Armenian context. On the other hand, sites situated in mountainous and semi-mountainous regions, such as Tsaghkasar (Fig. 8) and Gegharot, could also have been very important points on the routes of metal distribution, not to speak of sites, such as Fioletovo,

¹ For the Chalcolithic cf. Avetisyan/Chataigner/Pakumbi 2006; Chataigner *et al.* 2010; Areshian *et al.* 2011; Areshian 2012; Zardaryan/Gasparyan 2012; Wilkinson *et al.* 2012; for the Bronze Age cf. Badalyan/Avetisyan 2007; Smith/Badalyan/Avetisyan 2009; Avetisyan 2014;

for metallurgical development cf. Gevorgyan 1980; Chernykh 1992; Korenevskii 2011; Meliksetyan/Perinicka/Badalyan 2007; Meliksetyan *et al.* 2011; Gasparyan/Arimura 2014.

² Cf. Bobokhyan *et al.* 2017.



Fig. 7 Jirahovit: 1 general view of excavated areas of the Early Bronze settlement; 2 central area of the Early Bronze Age Horizon 3 (ca. 2900–2600 calBC).

2

Margahovit, Meghradsor or Sotk 2, which were located directly at or near metal mines. At the same time, we also have sites/cemeteries in which metal and especially precious metal were accumulated (e.g. Lchashen, Lori Berd and Karashamb).

Therefore, by considering metal mining and production in Chalcolithic and Bronze Age Ar-

menia, we see it within a common social network, which enables us to trace the ways through which the metal was used and distributed. The existence of a clear infrastructure was the background for cultural relations and transfer of knowledge.

On the second level of social and cultural affinities is the highland zone around the lakes



Fig. 8 Tsaghkasar: 1. general view of the excavated areas of the Early Bronze Age settlement (ca. 3200–2900 calBC); 2. arsenic bronze flat axe; 3. arsenic bronze sickle from the Early Bronze Age settlement.

Van, Urmia and Sevan, which share common trends in developments³. Since the Late Chalcolithic period the landscapes of modern Eastern Turkey, North-Western Iran and the Southern Caucasus “fall into a series of parallel, largely comparable yet individual clusters of sites that develop in lockstep and share a general lifestyle, visible from a closely related material record”⁴. This is a landscape of mountainous communities which by their mode of life are clearly distinguished from the Maikop people in the North (inhabitants of river valleys in the environment of steppe landscapes) and that of the Syro-Mesopotamian peoples in the South (inhabitants of the lowlands).

For the third level of contacts, especially in a metallurgical context, specialists refer to “Circumpontic province”⁵, “Anatolian-Transcaucasian province”⁶, a “Mediterranean cultural world”⁷, an “Iranian-Mesopotamian-Caucasian world”⁸, or a “Caspian-Aegean world”⁹. These designations, although common, nonetheless reflect wider regions of cultural relations in which, together with artefacts, knowledge was transferred.

Metal and the transfer of knowledge

Cultural contacts between the Near East and the Southern Caucasus are mainly reflected in metal matters. This speaks once more for the existence of exchanges and shared knowledge concerning technologies and values. In this respect, the point of view that metal was the main object of interest in the Syro-Mesopotamian societies in the Southern Caucasus and the main impetus for contacts¹⁰ may be true, although also other factors such as obsidian¹¹ or wine¹² could have played a certain role for such contacts, realised

either through trade¹³ or through nomadic pastoralists¹⁴.

Contact directions

During the Late Chalcolithic period Southern Caucasian societies on the whole and Armenia in particular were on the way to growing complexity, which was accompanied by the emergence of centralised hierarchies and the blossoming of long-distance trade, which manifest the increase of the “Near Eastern way of life”. Two main directions of contacts are visible in this period: to the North – to Maikop, and to the South – to Ubaid-Uruk¹⁵.

These processes slow down during the second half of the 4th millennium BC. Similar to highly developed Chalcolithic Carpatho-Balkan metallurgical centres, which collapsed at the beginning of the Bronze Age in connection with invasions of steppe nomads. In the Southern Caucasus the “Near Eastern way” stopped, too, with the emergence of the traditional, in essence Kura-Araxes complex, the communities of which seem at first glance to separate the Highlands from the Mesopotamian world¹⁶. However, in difference to Carpatho-Balkan Early Bronze Age invaders, the Kura-Araxes people, indigenous to the region, possessed highly developed metal-working and ceramic-making traditions, and they made use of the achievements of the “civilised world”.

During the following Middle Bronze Age we can trace the revival of Late Chalcolithic processes, as reflected in the appearance of elite, prestigious objects, in the use of status symbols etc. Long-distance trade becomes very essential, moderated by centralised hierarchies: the direction of contacts to Anatolia and Aegean as well as to Syria and Mesopotamia is clearly visible¹⁷.

3 Cf. Lyonnet 2000; Marro 2007.

4 Helwing 2012, 201–203.

5 Chernykh 1992.

6 Frankfort 1932, 34.

7 Kuftin 1941.

8 Kushnareva/Chubinshvili 1970, 123.

9 Areshian 2008.

10 Cf. Munchaev 2007, 9; Lyonnet 2007, 15.

11 Cf. Chataigner *et al.* 2010, 401–402.

12 Areshian *et al.* 2012, 128–129.

13 Cf. Palumbi 2007, 75.

14 Cf. Chataigner *et al.* 2010, 401–405.

15 Munchaev 2007, 8–9; Areshian *et al.* 2012, 128–129.

16 Cf. Marro 2007, 92.

17 Cf. Areshian 2008.

Fig. 9. Irahovit shaft-hole axe mould from a metallurgical workshop in the central area of the Early Bronze Age horizon 3 (ca. 2900–2600 calBC).



Routes

Two routes can be traced for Near Eastern contacts in the region, passing through two important contact zones: the Urmia Basin¹⁸ and the Upper Euphrates region¹⁹. At the same time the Southern Caucasian route via Dagestan to North-West Caucasus could have been essential for the transmission of Near Eastern influences to the North, and vice versa²⁰. A rather more Iranian-Central Asian than Mesopotamian direction of contacts with Maikop was recently postulated on the basis of metal and precious stone finds²¹. Chemical and isotope characteristics of Chalcolithic metal artefacts (e.g. from Nerkin Godedzor) suggest that also a North-West Iranian ore source could have been utilised to produce copper²².

Advances in the mental sphere

The use of weight systems in early cultures is directly connected with metallurgy and seems to be “one of the major achievements of the human intellect”²³. Weight systems are known in Near Eastern societies at least since the mid-4th millennium BC. A study of corresponding stone objects and moulds demonstrates that balance weights and their models could have been used within the wider Southern Caucasian area, too.

since the Late Chalcolithic/Early Bronze Age. Moreover, it turns out that most probably those balance weights might reflect Near Eastern weight systems as well²⁴.

The finds of balance weights in metallurgical workshops is a widespread phenomenon in the Ancient Near East and the Aegean. Similar contexts are also known from sites of Kura-Araxes related traditions, such as Norşuntepe and Korucutepe in the Upper Euphrates region²⁵. Other evidence from sites of the same period such as Irahovit (Fig. 9) in Armenia demonstrates that there were special moulds for casting copper ingots (weighing ca. 500 g = ca. 1 Sumerian *mina*)²⁶ as well as axes²⁷ (which clearly were also used as a means of exchange, as reflected in the Sumerian word GIN = “exchange unit” and “axe” of the same time²⁸). The metallurgists of Shengavit and Garni workshops were familiar with and made use of models for casting oval/sphendonoid forms corresponding to the Mesopotamian *shekel* unit²⁹. Moreover, the foundry plaster of the moulds displays parallels to sphendonoid/oval balance weights of Early Bronze Age Near Eastern and Anatolian centres³⁰.

Advances in the mental sphere were accompanied by a process of incipient social organization, as is visible for example in the Ararat Valley, where settlements such as Irahovit, Mokhrablur, Shreshblur, Shengavit and Norabats prove to be epicentres of social transformation³¹. These

18. Ivanova 2012, 23.

19. Cf. Marro/Bakhtolajev/Ashuriev 2011.

20. Munchaev 1982, 124.

21. Ivanova 2012.

22. Chataigner et al. 2010, 399–401.

23. Renfrew 1992, VII.

24. Cf. Mederos/Lamberg-Karlovsky 2004.

25. Bobokhyan 2010.

26. Gevorkyan 2004.

27. For the context of the axe mould of Irahovit cf. Khanezhyan 1991, 11–12. The mould itself is published in this article for the first time.

28. Cf. Bobokhyan 2008, 11–12.

29. H. Simonyan, personal communication, and Khanezhyan 1969, Pl. IX/9.

30. Nessel 2014, 214–215.

31. Areshian 2007.

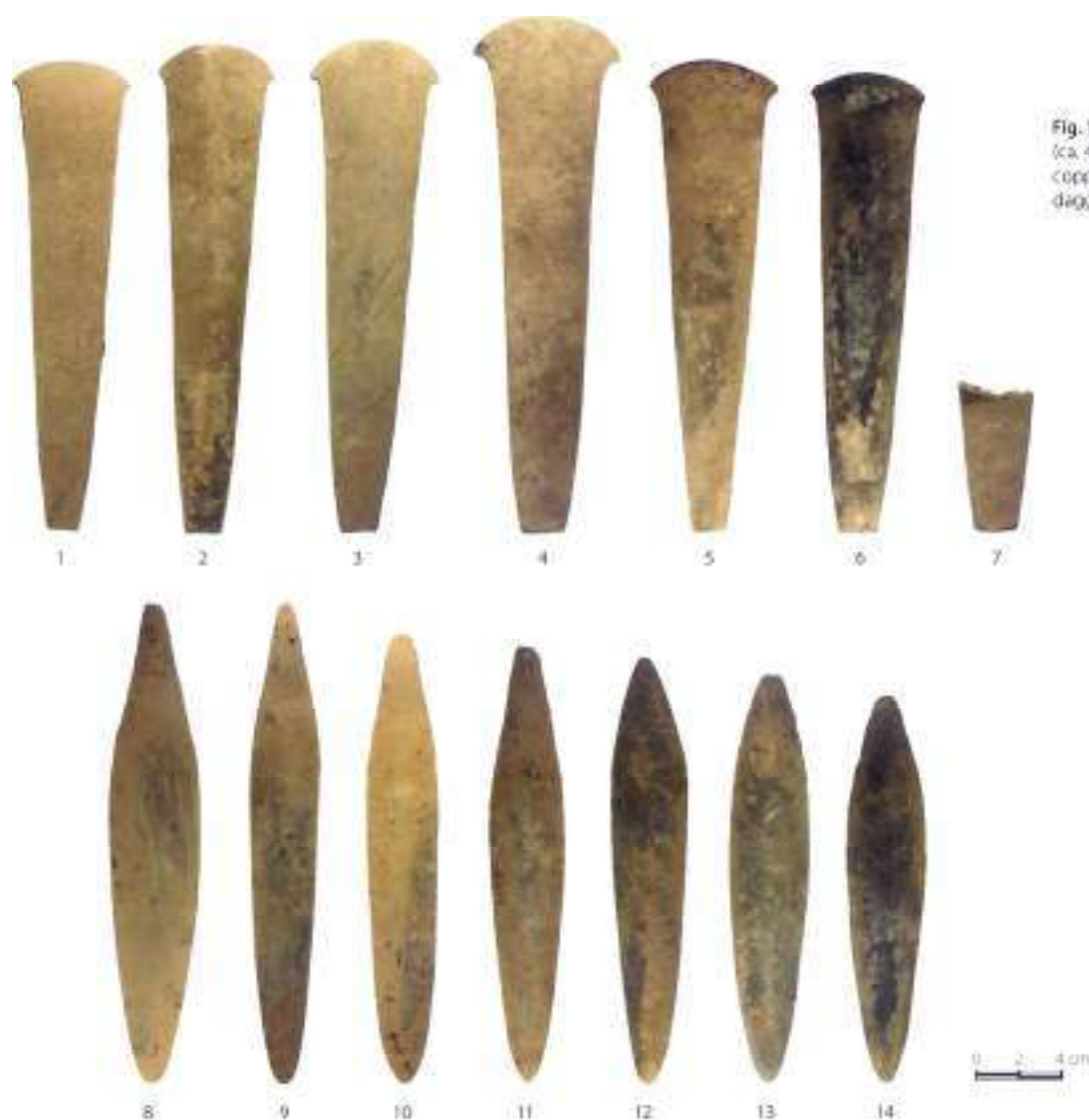


Fig. 10 Dvin hoard (ca. 4000–3400 calBC). Copper adzes (1–7) and daggers (8–14).

changes are directly reflected in metallurgical developments, as well. Only since the Early Bronze Age does metal seem to be an essential hallmark of wealth accumulation and trade for Kura-Araxes communities. Investigations have revealed that arsenic-based metallurgy was highly developed in the society under consideration, with its professional metallurgists and metallurgy-oriented specialised sites. On the other hand, intensive contacts to the Syro-Mesopotamian and Anatolian-Aegean worlds

are clearly visible, both in metal artefact forms and in their alloys³².

The recent discovery in Dvin (Ararat Valley) of a Late Chalcolithic hoard containing 14 copper adzes and daggers (Fig. 10), viewed together with the earlier known Early Bronze Age hoard from Yerevan (Ararat Valley) of ten flat axes, one shaft-hole axe and eight pick-axes of arsenic bronze, represents the best evidence for tracing the principal ways of wealth accumulation in an Armenian context³³. The limited typological rep-

³² Meliksetian et al. 2011.

³³ The hoard from Dvin was originally deposited in a hill near the village. It was discovered by B. Gasparian in

2018. For the Yerevan hoard, cf. Martirosyan/Mnatsakanyan 1973.

ertoire of the hoards suggests that such assemblages were not merely a collection of precious items, nor do they seem to be the spoils of war. Rather, the hoards represent a series of heavy, roughly standardised, metal artefacts to be used as means of exchange: “examples of archaic money”. Essential parallels of the metal axes to Near Eastern counterparts, both in forms and alloys (for example, high traces of nickel in the Yerevan hoard), imply the possibility of long-distance trade³⁴.

These additional data suggest that Near Eastern weight systems could indeed have been used in Kura-Araxes tradition. The south-western area of the highland zone directly bordering on the Syro-Mesopotamian world could have been the mediator of such contacts to the North: for example, such sites as Norşuntepe, Korucutepe or Titrish, where balance weights of similar forms and systems have been found³⁵.

Contact mechanisms

Social and cultural transformations in the aforementioned zone have often been connected to the establishment of Mesopotamian related communities. Various models of migration or early imperialism theories have been suggested as possible interpretations of these developments.

However, recent approaches suggest new models that acknowledge more locally rooted ways towards complexity in the highlands³⁶. The relations visible in material similarities are thereby understood to indicate shared practices, knowledge of production and consumption.

Conclusion

Archaeological data prove a high level of metal production and distribution in the Late Chalcolithic and the Early and Middle Bronze ages in Armenia, which can be understood only within the context of the local social system and its outer relations. During the periods under consideration Armenia is an integral part of a cultural zone around the Van, Urmia and Sevan lakes, the contacts of which mainly extend towards the Near East and the Circumpontic area. It is clear that metal could have been a very essential factor both for the definition of inner values within the aforementioned zone and for its outer connections – seen in this perspective the active Near Eastern relations of the region can be interpreted only as driven by the “metal factor”. Such relations of Armenia, which undoubtedly accelerated the process of the appearance of early complex societies in the region, should be interpreted more as a result of the transfer of knowledge.

34 The hoard of Yerevan is reflected in this context in Areshian 2007, 34–35.

35 Bobokhyan 2010.

36 Cf. Helwing 2012.

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