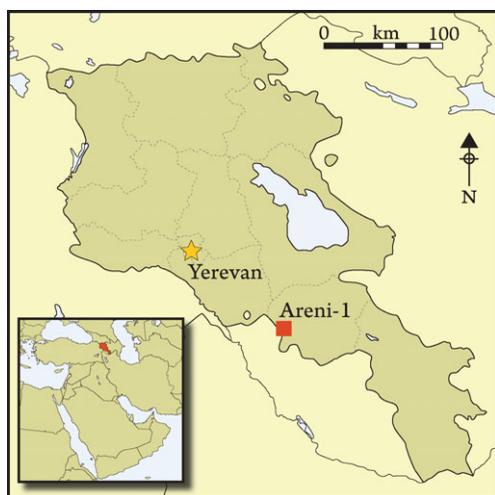


The chalcolithic of the Near East and south-eastern Europe: discoveries and new perspectives from the cave complex Areni-1, Armenia

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The archaeological exploration of a cave in the southern Caucasus revealed evidence for early social complexity, ritual burial and wine-making in the early fourth millennium. The marvellous preservation of wood, leather and plants offers a valuable contrast to the poorer assemblages on contemporary tell sites. The authors make the case that the Areni-1 cave complex indicates connections between the urbanisation of early Mesopotamia and the Maikop culture of south Russia.

Keywords: Caucasus, Armenia, Chalcolithic, fourth millennium BC, Maikop, Uruk, cave, storage, wine-making, preserved shoe

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Introduction

The current perception of Chalcolithic societies of the Middle East, Central Asia, and many parts of south-eastern Europe dating to *c.* 5000–3000 BC is shaped by more than a century of excavations at numerous *tells* or *tepes* (for a general discussion of Chalcolithic *tells* in the Caucasus see Djavakhishvili 1973, Areshian 1996 and Kushnareva 1997). The study of *tells* reveals substantial similarities in the lifeways of their inhabitants from the western foothills of the T'ien-Shan and Hindu-Kush mountains in the east to the Danube Plain in the west and the Nile Valley in the south. But how comprehensive and adequate is their account of the Chalcolithic?

A different perspective began to emerge in the 1960s when several major discoveries were made at other types of sites, such as the Nahal Mishmar hoard in a cave of the Judaeen Desert near the Dead Sea (Moorey 1988; Levy 2007), the Varna necropolis on the west coast of the Black Sea in Bulgaria (Ivanov & Avramova 2000) and the huge (450ha) Tal'janki settlement in the Ukrainian steppe (Kruc 1994). These discoveries suggest something much more complex than the single model generalised from *tells*.

In particular, the significance of caves to the study of Chalcolithic societies in the mountainous regions of the Near East was hinted at by finds from the 'Cave of the Warrior' and the 'Cave of the Treasure' (Nahal Hemar, Peqi'in) in the southern Levant (Schick 1998), and the Kunji (Wright *et al.* 1975: 131–3) and the Wezmeh (Abdi *et al.* 2002) caves in the central Zagros. Here we provide a brief account of the discovery in 2007–2009 of a Chalcolithic cave site in the canyon of the Arpa River in the central part of the Near Eastern highlands in Armenia, notable for its rich intensive occupation and exceptional preservation of organic remains.

The cave complex Areni-1

Archaeological survey in 2006–2009 in the middle part of the Arpa River drainage in the Vayots Dzor province of Armenia, not far from the border with Iran, located 39 caves, most of which contained traces of human presence (34 of these are mapped on Figure 1). Systematic excavations began in 2007 at the cave complex Areni-1 (known locally as 'Bird's Cave') which is located approximately 1.5km east of the village of Areni on the highway connecting the Ararat Plain with the highland plateau of Syunik (39°43' 53.4" N, 45°12' 13.4" E; Figure 2). Around the village of Areni, to the west of the cave, the canyon opens onto a narrow valley, the floor of which is covered by alluvial deposits of the final Pleistocene and Holocene, creating fertile strips of land along both banks of the Arpa. The modern vegetation covering the mountain slopes near the site is characteristic of a dry steppe with patches of small trees, bushes, and shrubs in the canyons and along streams surrounding the abundant orchards and vineyards cultivated on irrigated land.

Areni-1 consists of three distinct areas (from north to south)—the steep northern slope of the talus (approximately 40 × 30m, Trench 4 on Figure 3), an external rockshelter (Trench 3) and three cave galleries, extending to a depth of more than 40m into the rock with subsidiary caverns and niches (Trench 1). The height of the eastern gallery exceeds 10m at its entrance measured from the modern surface. The western gallery is partially

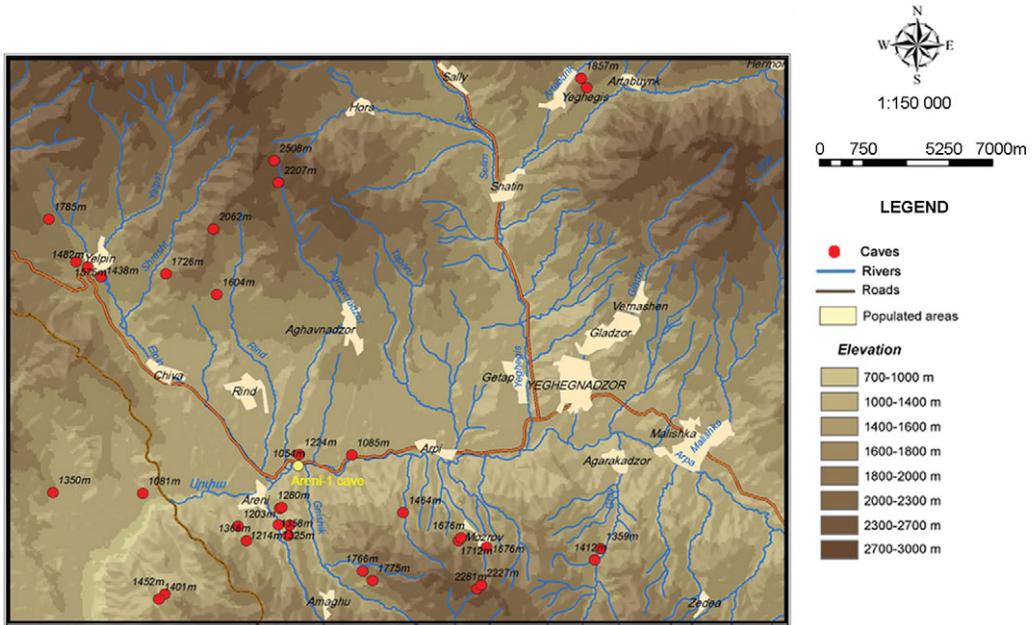


Figure 1. Map of the central part of Arpa valley with locations of occupied caves.



Figure 2. View of the Areni-1 cave complex from the opposite rim of the Arpa River canyon.

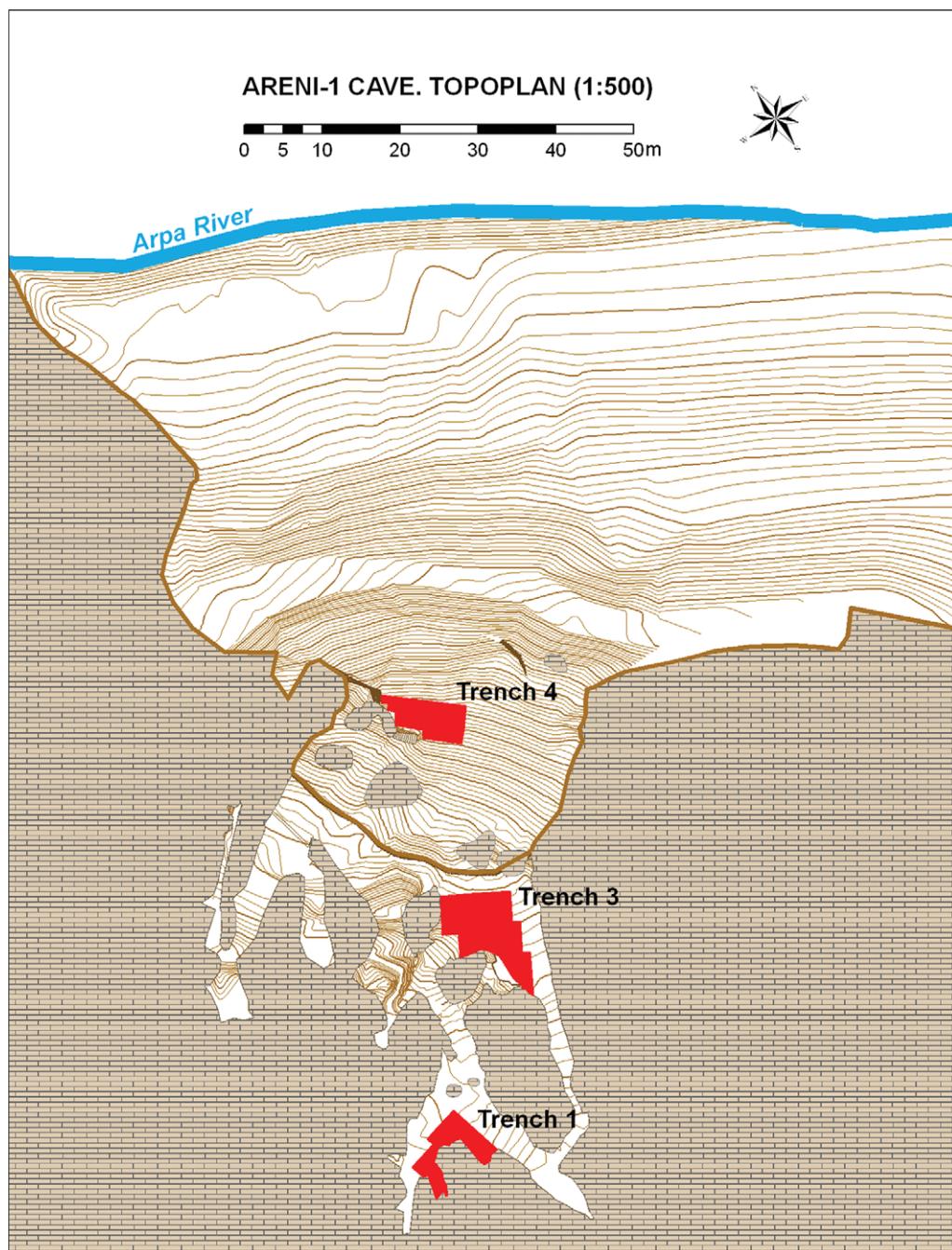


Figure 3. General plan of the site showing the trenches under excavation in 2007–2009.

damaged by abandoned attempts to construct a restaurant inside it some years ago. The external (northern) edge of the rockshelter was formed by a monumental wall of cyclopean dry masonry built of conglomerate rocks, of which only the three lowest courses of the small western portion still stand. The wall must have functioned simultaneously for slope retention and defence.

Excavations were started in Trench 1, located deep within the central gallery, in Trench 3 placed in the eastern part of the rockshelter, and in Trench 4 on the upper part of the cave talus between the shelter and the river bank (Figure 3). Most of the work reported here was focused on Trenches 1 and 3, in which remains of occupation (with some gaps) range from the Neolithic to the medieval period, with the most important discoveries belonging to the Chalcolithic. The Neolithic period was identified in a small sounding in the corner of Trench 1 at a depth of over 4m: charcoal collected above the bedrock yielded a ^{14}C date of 7440 ± 25 BP (UCIAMS-40181), calibrated to 6390–6240 BC at 95.4% probability (Table 1). The earliest post-Chalcolithic remains date to the Early Iron Age (c. 1100–800 BC) including few characteristic potsherds and a bronze adze. The cave was also used in the Middle Ages. At least one dwelling was built in the rockshelter during the period of domination of Armenia by the Islamic Caliphate during the eighth and ninth centuries (^{14}C dates: OxA-20584, OxA-20585, Table 1). Later structures, a fragment of an Armenian manuscript, two well-preserved ovens, wine-storage jar, associated pottery, fragments of glass, and other small finds date to the twelfth to fourteenth centuries AD. One ^{14}C date of 635 ± 15 BP (AD 1293–1392; UCIAMS 52415, calibrated) assigns the uppermost level to the second half of the Mongol Ilkhanid imperial domination of the region (Table 1). Large quantities of cotton seeds, unprocessed cotton fibres, and smaller amounts of dyed textiles indicate textile production in the dwellings built in the rockshelter area during the fourteenth century.

Chalcolithic deposits in the rockshelter area (Trench 3)

The Chalcolithic features in the rockshelter, Trench 3, were uncovered at a depth of only a few centimetres below the modern surface (Figure 4). The excavation yielded evidence of household activities, including hearths, cylindrical storage bins of clay, grindstones, obsidian and chert tools, animal bones and cereal grains. The majority of stone implements are of obsidian, although chert artefacts are also present in the assemblage. The colour of the obsidian may suggest that it originated from two groups of sources: P'ok'r Spitakasar (or Geghasar) and the Vorotan group, located at 90 and 95km from Areni-1 respectively. Judging from the presence of fragmentary cores and flaking products, the production of chipped-stone tools took place in the rockshelter area. High quality flint deposits are easily accessible within a distance of 20km and closer to Areni-1, whereas obsidian does not occur in the Arpa valley. The most common stone tools are retouched blades, end scrapers, backed knives, burins and chisels. Artefacts with bifacial processing include sickle inserts and arrowheads. One obsidian artefact was shaped by polishing of the edges and parts of the surface. As a whole, the assemblage of stone tools is characteristic of hunting and crop harvesting, as well as processing secondary products such as skins, bone and wood. Perhaps the most important discovery from the upper Chalcolithic level of the rockshelter is a well-preserved leather shoe

Table 1. ¹⁴C dates from the Areni-1 cave complex (calibrated using OxCal 4.1).

	Laboratory	Trench	Unit	Situation	Date	Calibrated date 1σ	Calibrated date 2σ
1	UCIAMS-52415 (KCCAMS)	3	Unit 2014	Cotton from the bottom of a pit sunken from the first (upper) medieval level	635±15 BP	1290–1320 AD (39.0%)	1291–1392 AD (95.4%)
2	OxA-20585	3	Square P30, locus 2, spit 7	Textile from oily soil saturated with archaeobotanical remains, second medieval level	1214±26 BP	770–870 AD (68.2%)	709–889 AD (95.4%)
3	OxA-20584	3	Squares N/30/O30/P30	Straw from clay plaster of the wall of dwelling structure, second medieval level	1237±25 BP	690–860 AD (68.2%)	688–874 AD (95.4%)
4	UCIAMS-65187 (KCCAMS)	3	Square P31, spit 7	Charred reed collected underneath the foundation of the same structure, second medieval level	1200±20 BP	780–870 AD (68.2%)	774–888 AD (95.4%)
5	OxA-18600	3	Square L29, spit 2	Charcoal of <i>Acer</i> sp. from the burnt layer underneath the structure 2 of the second medieval level	4460±29 BP	3323–3030 BC (68.3%)	3336–3022 (95.4%)
6	OxA-18601	3	Squares N30/O30, spit 5/6, locus 2	Charcoal of <i>Tamarix</i> sp. from the first (upper) Chalcolithic level	4601±28 BP	3491–3352 BC (68.2%)	3500–3139 BC (95.5%)
7	UCIAMS-65186 (KCCAMS)	3	Square S32, pit 3, locus 7 (spit 7)	Leather from the shoe found inside a storage bin of the first (upper) Chalcolithic level	4700±20 BP	3520–3379 BC (68.2%)	3626–3374 BC (95.3%)
8	OxA-20582	3	Square S32, pit 3, locus 7 (spit 7)	Leather from the shoe found inside a storage bin of the first (upper) Chalcolithic level	4708±32 BP	3626–3378 BC (68.3%)	3632–3373 BC (95.4%)
9	OxA-20581	3	Square S32, pit 3, locus 7 (spit 7)	Leather from the shoe found inside a storage bin from the first (upper) Chalcolithic level	4725±32 BP	3629–3381 BC (68.2%)	3635–3376 BC (95.4%)
10	OxA-20583	3	Square S32, pit 3, locus 7 (spit 7)	Grass taken from the shoe found inside a storage bin of the first (upper) Chalcolithic level	4810±31 BP	3644–3535 BC (68.2%)	3653–3524 BC (95.4%)

Laboratory	Trench	Unit	Situation	Date	Calibrated date 1 σ	Calibrated date 2 σ
11 OxA-18198	3	Unit 2002	Desiccated grasses wrapping a jar from the second Chalcolithic level	5098 \pm 29 BP	3959–3811 BC (68.2%)	3967–3800 BC (95.4%)
12 UCIAMS-65186 (KCCAMS)	1	Unit 1001, square O17	Organic residue from a jar from the first (upper) Chalcolithic level	5095 \pm 20 BP	3957–3812 BC (68.2%)	3962–3804 BC (95.4%)
13 OxA-18197	1	Unit 1002	<i>Prunus</i> seed, from the first Chalcolithic level	5077 \pm 29 BP	3949–3804 BC (68.2%)	3959–3797 BC (95.4%)
14 UCIAMS-48413 (KCCAMS)	1	Unit 1002	Desiccated grape vine from the first or second Chalcolithic level	5240 \pm 20 BP	4048–3991 BC (68.2%)	4223–3978 BC (95.5%)
15 UCIAMS-40183 (KCCAMS)	1	Unit 1003, square R23, Burial 1	Charcoal found near plastered head 1, second Chalcolithic level	5090 \pm 25 BP	3954–3810 BC (68.2%)	3962–3800 BC (95.4%)
16 UCIAMS-65187 (KCCAMS)	1	Unit 1003, square R23, Burial 1	Brain tissue from the skull of the plastered head 1, second Chalcolithic level	5230 \pm 20 BP	4043–3991 BC (68.2%)	4146–3973 BC (95.4%)
17 OxA-19332	1	Unit 1003, square R23, Burial 1	Tooth from the skull of the plastered head 1, second Chalcolithic level	5323 \pm 30 BP	4233–4068 BC (68.2%)	4252–4047 BC (95.4%)
18 OxA-19331	1	Unit 1003, square R22, Burial 2	Tooth from the skull of plastered head 2, second Chalcolithic level	5366 \pm 31 BP	4322–4080 BC (68.2%)	4329–4058 BC (95.4%)
19 OxA-18599	1	Unit 1004, square P23 Burial 3	Tooth from the skull of plastered head 3, second Chalcolithic level	5285 \pm 28 BP	4227–4045 BC (68.2%)	4232–4000 BC (95.4%)
20 UCIAMS-40182 (KCCAMS)	1	Unit 1004	Charcoal from the bottom of the second Chalcolithic level	5230 \pm 25 BP	4043–3989 BC (68.2%)	4222–3970 BC (95.3%)
21 UCIAMS-40181 (KCCAMS)	1	Unit 1006	Charcoal from the bottom of the deep test pit inside T1	7440 \pm 25 BP	6371–6256 BC (68.2%)	6388–6242 BC (95.4%)



Figure 4. View of Trench 3 (rockshelter area) at the end of the 2009 field season.



Figure 5. Chalcolithic leather shoe found in Trench 3.

(Figure 5) found in a plastered storage bin together with fragments of Chalcolithic pottery and animal bones. The shoe is filled with grass, most likely to keep it dry during storage.

Four ^{14}C dates from the leather of the shoe and the grass filling range between 3653 and 3377 cal BC (Table 1). Additional ^{14}C dates associated with the two upper levels of Chalcolithic occupation in the rockshelter area also cover the first two thirds of the fourth millennium BC. The earliest date of 3967–3800 BC (OxA-18198 calibrated) was obtained from desiccated (non-carbonised) grasses that were wrapping a fully preserved jar found



Figure 6. A part of the upper Chalcolithic level in Trench 1 (central gallery).

in situ. Two other dates of 3500–3139 BC (OxA-18601) and 3336–3022 BC (OxA-18600) (Table 1) may indicate a continuation of occupation of this particular area through the middle of the fourth millennium BC, and possibly slightly later.

Chalcolithic levels in the central gallery (Trench 1)

The present floor surface in the central and eastern galleries is formed by a layer of dust containing sparse quantities of Early Iron Age and medieval material. This covers an exceptionally hard, naturally-formed white crust 15–20cm thick, underneath which Chalcolithic remains were excavated in Trench 1, in two levels (Figure 6). The crust, coupled with the extreme dryness and absence of fungi in the cave, created special conditions conducive for the exceptional preservation of organic remains (Eliso Kvavadze, *pers. comm.*). Besides a large assemblage of organic artefacts, desiccation allowed the preservation of a full spectrum of species and plant parts, including leaves.

The excavated surface of the upper Chalcolithic level is occupied by two large, only partially excavated, basin-shaped clay structures (Figure 6), surrounded by a variety of vessels found *in situ*, arranged in such a dense manner that movement in the gallery was quite restricted. Some of the pots were covered with flagstone lids whereas the mouths of



Figure 7. Grape pressing installation in Trench 1.

others were plastered with clay, preserving traces of fingerprints. Another smaller installation, also surrounded by storage-type jars, was encountered in the lower level. This installation consists of a shallow clay tub, the centre of which is occupied by the mouth of a large jar (Figure 7). This basin may well have been for the pressing of grapes or berries on its surface, with the juice flowing into the mouth of the jar in the centre of the installation, an interpretation endorsed by the discovery of desiccated grapes, grape seeds and skins still attached to pedicels, and even of grape rachises (stems) in close proximity. Preliminary measurements of the Chalcolithic grape pips suggests that the grapes are an intermediary form between wild and domestic (according to Stummer's Index; Jacquat & Martinoli 1999), so it is possible that the process of grape domestication may be witnessed at Areni-1. The presence of large storage jars around the pressing installation may even indicate that secondary fermentation took place there. Plastering of jar mouths would have created an airlock, protecting the wine from oxidation. The cool and stable temperatures in the cave were propitious for cold stabilisation and wine preservation. Three ^{14}C samples (OxA-18197, UCIAMS-40182 and UCIAMS-48413) selected from the area of the 'grape crushing basin', including one obtained from a desiccated vine, establish the date between 4223 and 3790 cal BC (Table 1).

Burial in Trench 1

Three burials of human heads, each in spherical receptacles made of unbaked clay were uncovered by the wall of the cave at the bottom of the second Chalcolithic level. Burial 1 is a gracile subadult with vertical forehead and sloping orbits aged 6–10 (8 ± 2 years: Buikstra & Ubelaker 1994). This fractured skull contained well-preserved remains of a desiccated brain. A second clay hemisphere (Burial 2) contained a cranium of a child (Figure 8) aged between 8.5 and 13.5 years (11 ± 2.5 years: Buikstra & Ubelaker 1994). This receptacle also contained a left femoral shaft of an adult, with evidence of post-mortem carnivore damage (serrated edges and some rounding) at both ends, presumably by a large carnivore (most likely dogs, based on the faunal assemblage). A third vessel contained another subadult cranium. The dentition indicates that the individual is older than 15 years. There are no recognisable pathologies on the ectocranial surface of the skull but the left part of the parietal region of the endocranial surface has extensive new bone development suggesting an inflammatory reaction. A burnt adult femur missing both proximal and distal ends was recovered from another vessel found in the upper Chalcolithic level. It displays carnivore chewing damage similarly to the femur from Burial 2. In addition, a rib fragment, left shaft of a humerus, two shafts of a left femur and the left shafts of a fibula and tibia (Minimum Number of Individuals [MNI]=2) were recovered from the upper Chalcolithic level of Trench 1.

Radiocarbon gave dates for the teeth between 4329 and 4000 cal BC, for the brain tissue between 4055 and 3975 BC, and a sample of charcoal collected nearby gave a date of between 3962 and 3800 BC. A preliminary investigation of the brain tissue was conducted in the Department of Pathological Human Anatomy at Yerevan Medical University. A small sample was processed first by hydrating, then dehydrating and obtaining a histological slide. According to Alexander Kanayan, a microscopic analysis of the tissue revealed the presence of preserved blood vessels, as well as of preserved individual cells. The placement of skulls inside receptacles clearly indicates that the heads have been severed after death from the body and preserved.

Chalcolithic assemblage (Trenches 1 and 3)

A large number of well-preserved artefacts of wood, cloth, grass, reeds, seeds, rope, etc. were found in the two Chalcolithic levels. Some of these had been charred, but the majority were preserved in a desiccated condition. There were also desiccated pips, fruits, peduncles and twigs of grape (*Vitis* sp.), nutstones of almond (*Amygdalus* sp.), plums (*Prunus* spp.), pear (*Pyrus* sp.), hackberry (*Celtis* sp.), walnut (*Juglans* sp.), silverberry (*Elaeagnus* sp.), as well as desiccated and charred grains of emmer wheat (*Triticum dicoccum*), bread wheat (*Triticum* cf. *aestivum*), naked and hulled barleys (*Hordeum vulgare*) and seeds of lentil (*Lens* sp.) and grass pea (*Lathyrus* sp.), indicating heavy exploitation of tree fruits. Very little is known about plant use in Armenia in antiquity and, to date, there is only one comprehensive archaeobotanical study concerning the Neolithic sites of Aratashen and Aknashen in the Ararat Plain (Hovsepyan & Willcox 2008). Outside Armenia, existing data point to the central Near Eastern highlands as an important location for the domestication of a variety



Figure 8. Chalcolithic Burial 2: head plastered in a clay hemisphere.

of fruits. Until now, however, there were no remains to test this hypothesis. Knowledge of the early use and cultivation of fruits such as apricot (*Armeniaca vulgaris*), peach (*Persica vulgaris*) and nuts such as walnuts (*Juglans regia*) in particular, is patchy and Areni-1 may shed light on their early use.

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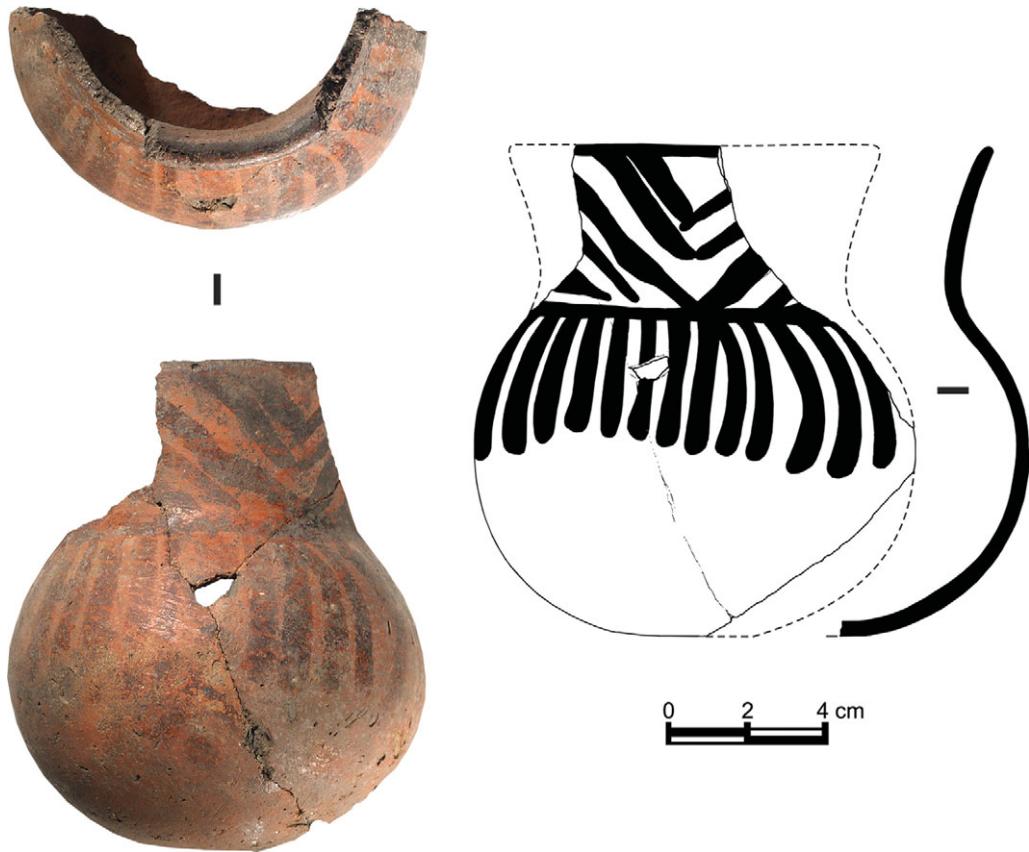


Figure 9. Painted Chalcolithic bowl.

Another remarkable group of finds is represented by metal weapons that include a pike head, a knife (from Trench 1) and a small dagger (Trench 3). All three are made of arsenical copper with use of an open mould and additional hammering. The pike head contains 1.28%, the knife 2.81% and the dagger 3.0% arsenic (analysis by Kh. Meliksetyan).

A large, highly heterogeneous assemblage of stylistically diverse pottery found in the top Chalcolithic levels of Trenches 1 and 3 is dated between 4300 and 3500 BC and provisionally divided into five major groups: (A) chaff-tempered coarse vessels including storage jars, pans and drinking cups, decorated by combing, piercing, engraving, notching and applications such as knobs and anthropomorphic ornaments. As a whole this group is well represented in Chalcolithic sites of the southern Caucasus, including Adablur, Sioni, Damtsvari-Gora, Leilatepe (Areshian 1991; Kiguradze & Sagona 2003: 40–44, 51–9; Narimanov *et al.* 2007); (B) painted pottery, previously unknown from the Caucasus, with black or dark-brown designs over a red or pinkish slip covering the surface of the vessel, including jars and bowls of various shapes and sizes (Figure 9); (C) a small number of sherds of very fine quality, well-fired, dark-gray, thin-walled burnished vessels. It is almost certain that group B and maybe group C are affiliated with the traditions of Early and Middle Chalcolithic pottery-making of the northern and central Iranian plateau (Ghirshman 1938: 24–45;

Burton-Brown 1951: 20–27, 1979: 70–102; Majidzadeh 1981; Tala'i 1983: 67; Dyson 1985: 343–4; Henrickson 1985, 1989; Kroll 1990: 62–6; Fazeli *et al.* 2004; Fazeli & Sereshti 2005: 15–18); (D) a group characterised by two distinct types of jars: one with rounded bottom, low neck, and S-shaped rim, the other with a pointed bottom and vertical rim have a characteristically smoothed surface either brown in colour or covered with a coating of ochre paste that can easily be removed if rubbed with fingers. Very similar pottery is known from south-eastern Europe, specifically from sites of the pre-Maikop period in the foothills of the north-western Caucasus, where it represents the earliest pottery-producing assemblages at the settlements of Jasenevaja Poljana, Zamok and Svobodnoe, and in Vorontsovskaja Cave. Currently available ¹⁴C dates place those assemblages in the second half of the fifth millennium BC (Korenevskij 2009: 72–81; Korenevskij & Lovpache 2009: 91) which fully agrees with the dates obtained for Areni-1. The production of such pottery continued in the north-western Caucasus into the Early Maikop period during the fourth millennium BC; (E) early Kura-Arax pottery, including burnished cups and jars with black external surface and light (pink or orange) interior which often have semi-globular handles. This pottery is characteristic of the first phase of the Early Bronze Age in the southern Caucasus and is conventionally dated at many sites *c.* 3400–2900 BC.

Discussion

Our findings suggest that Chalcolithic caves in the Near Eastern highlands were not just temporary shelters for mobile pastoralists or secluded habitations of mountaineer hunter-gatherers, but were used by communities engaged in long-distance complex interactions, suggested by the pottery, metal and obsidian artefacts. The discrepancy between the scale of human activities inside the galleries unrelated to daily lives of households, and the modest size of habitation in the rockshelter area is an indication that the Areni-1 cave complex may have been used by different social groups inhabiting the surrounding valley, plateau and canyons. Areni-1 is one of the oldest sites in the world with well-preserved organic remains, from dried prunes, grapes and grasses, to textiles, rope, mats and wooden implements dating to *c.* 4000 BC. Moreover, the site sheds much light on the early exploitation and possible domestication of a variety of fruit trees, including walnut and apricot. The preservation stands in marked contrast to that on the tell sites. Rituals were an essential part of the activities in the galleries, which may have been conceived of as sacred spaces. The central gallery contained evidence for burial and possible human sacrifice, with the earliest example of preserved human brain tissue. This was followed in the sequence by the world's oldest known remains of a full cycle of wine production.

From an interregional perspective the discovery of pottery of group D is significant in that it relates to the pre-Maikop and Early Maikop culture of the northern Caucasus. Traditional accounts of the Maikop chronology mostly place it within the third millennium BC synchronising it with the Early Dynastic period in Mesopotamia. At the same time, R.M. Munchaev (1975: 328–9, 1994: 169–70, 214) and M.V. Andreeva (1977) have pointed to substantial similarities between Maikop pottery and that of northern Mesopotamia and Syria of the Late Uruk period. These comparisons convinced Andrew Sherratt that “the Caucasus was involved right from the beginning in the process of urban expansion in the Uruk period and the social changes consequent upon it” (1997: 464).

The discovery of the pre-Maikop and Early Maikop component at Areni-1 supports a recent hypothesis that early Maikop assemblages, including the two famous burial mounds of Maikop and Staromyshastovskij, must be dated no later than the middle or the second half of the fourth millennium BC (Lyonnet 2000, 2007; Ivanova 2007). Such a deepening of the Maikop chronology has groundbreaking implications for the archaeology of Mesopotamia. Since the first stage of the Early Bronze Age Maikop culture must be considered as a contemporary to the Late Chalcolithic Uruk, the artistic metalwork from Maikop may actually represent imports from Uruk or, at least, echoes its products. If confirmed, this would suggest that the Uruk trade networks extended far beyond the limits previously perceived, reaching such distant regions as south-eastern Europe.

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