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The Neolithic of the Caucasus

Christine Chataigner, Ruben Badalyan, and Makoto Arimura

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Abstract and Keywords

This article presents our current state of knowledge on the Neolithic of the Caucasus based on reviews of previous and continuing research. In this region, this period has generally been divided into two cultural stages: Early/Aceramic Neolithic and Late/Ceramic Neolithic. However, the records from Early Neolithic sites are incomplete due to a lack of radiocarbon dates and palaeoenvironmental data. Moreover, the transition from the Mesolithic of the early Holocene to the full Neolithic of the Aratashen-Shulaveri-Shomutepe culture remains obscure. Although recent research provides new insights on the domestication of plants and animals in the Caucasus, the crucial issue involving the origin and timing of Neolithisation in this region remains unsolved.

Keywords: Caucasus, early Holocene, Neolithic, Aratashen-Shulaveri-Shomutepe culture, domestication

Introduction

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Figure 1 . Map of the main sites mentioned in the text.

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Situated between the Black and Caspian Seas and intersected by the Greater Caucasus Mountains, the Caucasus isthmus has been presented as either a land bridge or a barrier between the Eurasian steppes and Western Asia. Today, this territory includes the Republic of Georgia, Azerbaijan, and Armenia as well as the Greater and Lesser Caucasus Mountains, the intra-Caucasus depression (including the Rioni and Kura River basins), and the Arax River valley (Figure 1). Natural resources such as plants, animals, obsidian, and copper ore are abundant.

Surveys and excavations carried out by Soviet researchers up until the 1990s revealed the existence of archaeological sites from the beginning of the Holocene. They were distributed equally on the shores of the Black and Caspian Seas and in the Kura and Arax River basins. However, this poorly disseminated research lacks reliable radiocarbon dating, stratigraphic contexts, and palaeoenvironmental data. For the past twenty years, international missions have been conducted to supplement the Soviet research with new methods of investigation.

First, we briefly review the environmental context of this region and different definitions of the local Neolithic, then we summarize characteristics of the Neolithic in the Caucasus by distinguishing two phases traditionally used in Caucasian prehistory: pre-pottery and pottery. Finally, we discuss the issue of domestication using the currently available data.

Environmental Context

The mountain chain of the Greater Caucasus presents an impassable barrier to the masses of cold Arctic air. This chain channels on its southern slopes depressions coming from the Black Sea, allowing the southern Caucasus to benefit from varied climatic conditions. The coastal plain of western Georgia (Colchis) is characterized by a Mediterranean climate, approaching subtropical conditions along the Black Sea shore, where the annual precipitation reaches 2100 mm (Connor and Kvavadze, 2008). Further to the east in eastern Georgia and Azerbaijan, the climate becomes drier and colder, approaching steppe conditions. The highlands of the Lesser Caucasus are marked by sharp temperature contrasts between summer and winter months due to a more continental climate. The Kura and Arax River basins are rich in fertile soils, which would have provided ideal conditions for the development of early agriculture (Connor et al., 2004).

Climate reconstruction has been the objective of much palaeoenvironmental research in Georgia (Connor, 2006), but it is only beginning to develop in Armenia and Azerbaijan (Ollivier et al., 2012). Results of current pollen analyses indicate the development of mixed oak forests at about 6000 BC in the Caucasus, as in the neighboring mountainous

regions (Zagros, eastern Taurus) (Djamali et al., 2008; Wick et al., 2003), about 3000 years later than the Mediterranean coast.

Definitions of the Neolithic in the Caucasus

In the Soviet era of the 1970s to the 1990s, the Neolithic was generally defined as a shift in subsistence patterns oriented toward the domestication of plants and animals (cf. Dzhaparidze and Dzhavakhishvili, 1971; Munchaev, 1975). However, some researchers did not consider this criterion of domestication to be necessary and believed that a hunting and gathering economy could be called Neolithic if it satisfied other conditions related to the tool kit (Formozov, 1977; Korobkova and Masson, 1978). These included the appearance of new techniques (e.g., polishing of stone, production of pottery), development of new tool types (e.g., polished axes, sickle blades, objects for grinding), or the disappearance of “typically” Mesolithic elements such as microliths. Thus in western Georgian sites, the cultural change from the Mesolithic to Early Neolithic was exclusively observed in the lithic industry (e.g., the appearance of “bullet cores,” polished stone axes, grinding slabs, handstones, and pestles). As for the transition between the Early and Late Neolithic, across the entire Caucasus region it was defined essentially by the appearance of pottery (Dzhaparidze, 1989; Gogitidze, 1977; Nieberidze, 1972). However, current research in the southern Caucasus is shedding new light on the Neolithisation process in this region.

Early Neolithic

By studying the cultural processes from the late Pleistocene to the early Holocene, we can better understand Neolithisation in the southern Caucasus. However, the archaeological evidence for this period is not yet sufficient due to the lack of sites with undisturbed thick deposits and radiocarbon dates. After giving a brief survey of archaeological investigations during the Soviet era, we evaluate new results from recent excavations.

Review of the Mesolithic and Early Neolithic in Previous Studies

In past studies, the vast majority of archaeological research concerning the early Holocene comes from investigations in Georgia. The only sites studied outside of this area are rockshelters located near the Caspian Sea or in Dagestan (Chokh) and Kobystan.

Georgia

In western Georgia, Mesolithic sites are generally divided into four distinct regional groups (Kushnareva, 1997; Gabunia and Tsereteli, 2003): Black Sea coastal area, Rioni valley, Trialeti, and Javakheti. Regardless of whether such groupings are valid, they are based on variability in the lithic industries. For example, Mesolithic sites on the Black Sea coast have produced microscrapers and trapezoids, while sites in Trialeti are characterized by the abundance of scalene triangles. This variability could result from regional or chronological differences. Two or three subperiods were defined, according to techno-morphological differences in the lithic industries. Again, the lack of radiocarbon dates prohibits confirmation of such a chronological division (Meshveliani et al., 2007). There is little archaeological evidence concerning the subsistence economy during the Mesolithic, although cave bear was heavily hunted at Kvachara Cave on the Black Sea coast (Kushnareva, 1997).

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Figure 2 . Lithic industry from the ‘Early Neolithic’ site Anaseuli-1 (western Georgia).

[Credit line: after Korobkova 1996, fig. 2. © Kozlowski, S.K., and Gebel, H.G.K. (eds.), Neolithic Chipped Stone Industries of the Fertile Crescent, and Their Contemporaries in Adjacent Regions Proceedings of the Second Workshop on PPN Chipped Lithic Industries. Studies in Early Near Eastern Production, Subsistence, and Environment 3 (Berlin: Ex Oriente)].

Sites attributed to the Early Neolithic are relatively abundant in western Georgia, especially on the Black Sea coast. Most of these are open-air sites. At Anaseuli-1, the lithic industry is blade-oriented, using both obsidian and flint. According to analyses, obsidian (up to 50%) comes from Chikiani in southern Georgia, more than 150 km away (Badalyan et al., 2004). Some bullet-type cores and standardized blades recovered from the site indicate that a pressure-flaking technique was used to make blades **(**Figure 2:1–5). Diagnostic tools are short symmetrical trapezoids (transverse arrowheads, Figure 2:11–14) and sickle blades (Korobkova, 1996). This latter tool type is important, as it indicates that crop cultivation could have been practiced at Anaseuli-1. In addition, ground stone artifacts such as polished axes (Figure 2:15) and grinders were found.

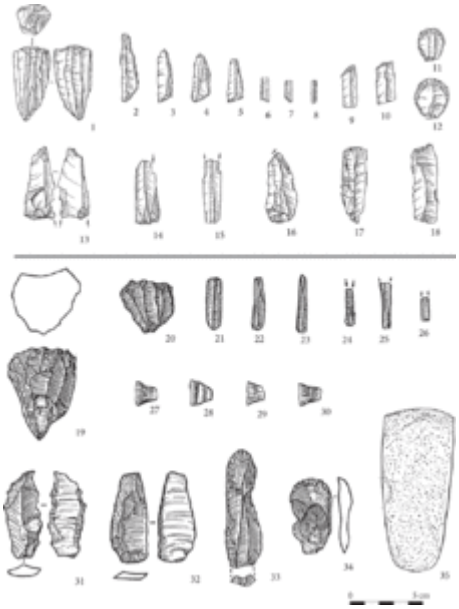

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Figure 3 . Lithic industry from the Darkveti rockshelter (western Georgia), Layer V 'Mesolithic' (1-18) and Layer IV 'Early Neolithic' (19–35).

[Credit line: after Korobkova 1996, fig. 3 and 4. © Kozlowski, S.K., and Gebel, H.G.K. (eds.), Neolithic Chipped Stone Industries of the Fertile Crescent, and Their Contemporaries in Adjacent Regions Proceedings of the Second Workshop on PPN Chipped Lithic Industries. Studies in Early Near Eastern Production, Subsistence, and Environment 3 (Berlin: Ex Oriente)].

The other site often mentioned is Darkveti rockshelter, situated in the Kvirila valley in western Georgia (Korobkova, 1996; Kushnareva, 1997; Gabunia and Tsereteli, 2003). Darkveti is a multilayered site dating from the Mesolithic to Early Bronze Age. In the Mesolithic layer (V) and the Early Neolithic layer (IV), lithic industries are blade-oriented with pyramidal or bullet cores (Figure 3; Korobkova, 1996). However, there is a remarkable difference between the two layers concerning the microliths: short trapezoids made on blades were found in the Early Neolithic layer (Figure 3:27–30), whereas asymmetrical triangles and backed bladelets were recovered from the Mesolithic layer (Figure 3:2–8). Ground stones such as polished axes were found only in the Early Neolithic layer (Figure 3:3–5). According to the excavator (Nebieridze, 1978), the presence of domesticated animals is attested in Layer IV. However, some researchers doubt the identification of domesticated animals at this site (e.g., Matskevich and Meshveliani, 2009).

Some sites in northern Georgia, the so-called Paluri-Nagutni sites, were placed in the Proto-Neolithic or aceramic Neolithic without any radiocarbon dates (Grigolia, 1977; Kiguradze and Menabde, 2004). Their lithic industries differ from Anaseuli-1 in western Georgia by the scarcity of geometric microliths and regular blades and by the presence of a specific tool type, "tools with hooked projections". Characterized by continuously retouched lateral edges, tools with hooked projections are important, since similar retouched tools (so-called Çayönü tools) were recovered from aceramic Neolithic sites in Turkey and Iraq (Anderson and Formenti, 1996). Moreover, specimens recently found in Armenia could be compared with these tools (see the Kmlo-2 section under Early Neolithic). The subsistence economy of the Paluri-Nagutni sites is unclear due to the

scarcity of faunal and floral evidence. Unlike Anaseuli-1 in western Georgia, ground stone tools such as querns or grinders are not generally present in the Paluri-Nagutni sites.

Dagestan

Located on the northeastern slope of the Greater Caucasus Mountains, the site of Chokh has produced two Mesolithic layers (E-D) and one Neolithic layer (C) (Amirkhanov, 1987), attributed to the eighth to seventh and the sixth millennia BC, respectively. However, no radiocarbon dates were available.

In the Mesolithic layers, the lithic material (flint) is characterized by scalene triangles, highly asymmetrical trapezoids, and points of the Chokh type (points with thinned butt and diagonallytruncated edge) (Amirkhanov, 1994).

In the Neolithic layer, the presence of pottery and fully domesticated cereals suggests that this occupation belongs to the Late Neolithic (see the Dagestan section under Late Neolithic).

Kobystan (or Gobustan)

In Kobystan, huge blocks of stone broken off from the edges of a limestone layer, form natural shelters that were often covered with engravings. The rockshelters of Kyaniza and Firuz have produced two layers of homogenous lithic material, the lower level being aceramic (Mesolithic or Early Neolithic) and the upper level containing vessels with pointed bases evoking the Neolithic of the eastern shore of the Caspian Sea (Formozov, 1966; Rustamov and Muradova, 1972, 1978). Pit burials attributed to the Neolithic were found at Kyaniza. However, without radiocarbon dating and precise descriptions of the cultural material, a chronological attribution for these assemblages is impossible.

In conclusion, it should be noted that our current knowledge of the early Holocene is quite poor because it is based on information published in the 1960s to 1990s that lacks radiocarbon dates or sufficient data on subsistence strategies. However, investigations over the past decade have produced new information on the early Holocene cultures in the southern Caucasus.

Current Research in the Early Holocene

The sites of Kotias Klde in Georgia and Kmlo-2 in Armenia have yielded evidence of early Holocene occupations that are important for understanding this period. In addition, the resumption of excavations at Anaseuli-1 has enabled to establish a chronology for the Early Neolithic of western Georgia.

Kotias Klde

Kotias Klde is a cave site situated in the Kvirila River basin of western Georgia (Meshveliani et al., 2007; Bar-Oz et al., 2009). The deposits are divided into four layers,

ranging from the Upper Palaeolithic to the Bronze Age. A series of radiocarbon dates indicates a time range of the eleventh to ninth millennia BC (10850–8240 cal BC) for Layer B (Mesolithic) and eighth millennium BC (7690–7300 cal BC) for Layer A2 (Early Neolithic).

Excavations at this site produced rich lithic and faunal assemblages. In both layers, the faunal remains belong exclusively to wild species, mainly wild boar and bear (>75% of the assemblage). The lithic artefacts are mainly made from flint/radiolarite, a local raw material. A few obsidian pieces were also present, indicating long-distance expeditions or trade for acquisition of this material; the nearest source is Chikiani, some 80 km from the site.

The Mesolithic industry of Kotias Klde is characterized by microliths. Backed bladelets, including broken pieces, are quite numerous, which may show a continuous tradition from the late Upper Palaeolithic. A significant Mesolithic tool type is the scalene triangle (backed bladelet with obliquely truncated ends). End scrapers made on flakes and blades are dominant among retouched tools, while burins are less common. In the Neolithic layer, we see tools with hooked projections similar to those found in the Paluri-Nagutni sites. According to the excavators, the Mesolithic and Neolithic materials have close parallels with the assemblages of Layers V and IV at the nearby site of Darkveti (Matskevich and Meshveliani, 2009).

Kmlo-2

Kmlo-2 is a small cave located on the western slope of a deep valley formed by the Kasakh River, east of the Aragats massif. The excavations revealed dark brown sandy deposits that were divided into five layers based on sediment texture and features (Arimura et al., 2012). According to the ^{14}C dates, occupations at Kmlo-2 can be divided into five phases: Phase I: Middle Ages; Phase II: Chalcolithic (end of sixth to fifth millennia BC); Phase III: early Holocene (mid-ninth to mid-eighth millennia BC); Phase IV: beginning of the Holocene (tenth to mid-ninth millennia BC); and Phase V: late Pleistocene (twelfth to eleventh millennia BC).

Hearths containing charcoal and ash were found in several layers, along with abundant obsidian artifacts and animal bones. In Phases V to III, the faunal remains belong to large bovids (aurochs or bison) and mountain caprids (wild goat and wild sheep). Based on the thin deposits and size of the cave, Kmlo-2 was a temporary camp site (e.g., a hunting camp).

Four seasons of excavation have produced numerous lithics made from local obsidian. Other raw materials, such as dacite and flint, were used sparingly. Cortical flakes of obsidian indicate that river pebbles approximately 10 cm in length were brought to the cave and knapped there. Such obsidian pebbles are available on the banks of the Kasakh River, which transports blocks from extensive obsidian sources in the Tsaghkunyats Mountains.

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Figure 4 . Lithic industry from Kmlo-2 (Armenia).

[Credit line: drawings M. Arimura; © Archaeological Mission “Caucasus” of the French Ministry of Foreign Affairs (head: C. Chataigner)].

The lithic industry of Kmlo-2 appears to be blade-oriented, since there are numerous blades and bladelets corresponding to blade or bladelet cores (Figure 4:1). These blades/bladelets are removed from pebbles or flakes without specific core preparation. Butt preparation is generally carried out by abrasion. Most blanks were apparently detached by direct percussion. Several thin bladelets of regular form were probably detached by a pressure-flaking technique, but such pressure-flaked specimens (attested in Phases IV–II) are uncommon (Figure 4:3–6). One small bullet core is evidence for such bladelet production at the site **(**Figure 4:2).

One important characteristic of the Kmlo-2 tool assemblage is an abundance of microliths (Figure 4:16–28). Various forms such as lunates and trapezoid-rectangles exist, but backed bladelets and scalene triangles are predominant (Figure 4:18–19). The presence of microburins and remnants of microburin scars on backed bladelets indicate that the microburin technique was used for their production (Figure 4:23, 28–29).

The most remarkable finds at Kmlo-2 are obsidian “Kmlo tools,” which are named after the site (Figure 4:10–15). This tool type could be a marker for an early Holocene cultural entity in Armenia, since Kmlo tools have been found at other sites nearby (Arimura et al., 2010). Kmlo tools are characterized by continuous and parallel retouch by pressure flaking on one or both lateral edges. They are usually made on blades but are also made on flakes. In many cases, linear or heavy abrasion can be seen on the retouched edge. Additionally, the lateral (retouched) edge is often removed by a burin blow. The ends of the tool are also frequently truncated or snapped off. Kmlo tools are absent in Phase V (twelfth to eleventh millennia BC), appear at the very end of Phase IV, and gradually increase in Phases III and II.

The late Pleistocene/early Holocene occupations at Kmlo-2 could include two different cultural stages. The earlier phases (V–IV), dominated by scalene triangles and backed bladelets, are comparable with Mesolithic sites in Georgia (Kotias Klde Layer B). The

later Phase III, characterized by the presence of Kmlo tools, could be compared with aceramic Neolithic sites such as Paluri-Nagutni (Kotias Klde Layer A2) in Georgia.

A comparison with prehistoric sites in western Asia provides a broader perspective. The lithic industry at Kmlo-2 appears comparable to those from Epipalaeolithic and aceramic Neolithic sites in the Taurus and Zagros Mountains (cf. Peasnall and Rosenberg, 2001). In particular, specimens similar to Kmlo tools are present in western Asia (Çayönü tools), as noted previously. Although direct relationships between the Çayönü tools, Kmlo tools, and Paluri-Nagutni tools are not obvious, we suggest that an atmosphere existed in which populations from both the northern part of western Asia (southeastern Anatolia and northern Mesopotamia) and the southern Caucasus shared common ideas for making certain tools.

Anaseuli-1

New excavations conducted at Anaseuli-1 (Matskevich and Meshveliani, 2009) revealed a single, well-preserved cultural horizon on the surface that was approximately 5 to 10 cm thick. Cultural material consisted mostly of lithics of which a high percentage was obsidian (50%). An exceptional find was a cache of five long (11–13 cm), complete obsidian blades. Charcoal dates place this site at 5746 to 5595 cal BC, indicating that it was contemporaneous with the Late Neolithic culture of Aratashen-Shulaveri-Shomutepe (see the Late Neolithic section).

Perspective on Cultural Development in the Early Holocene

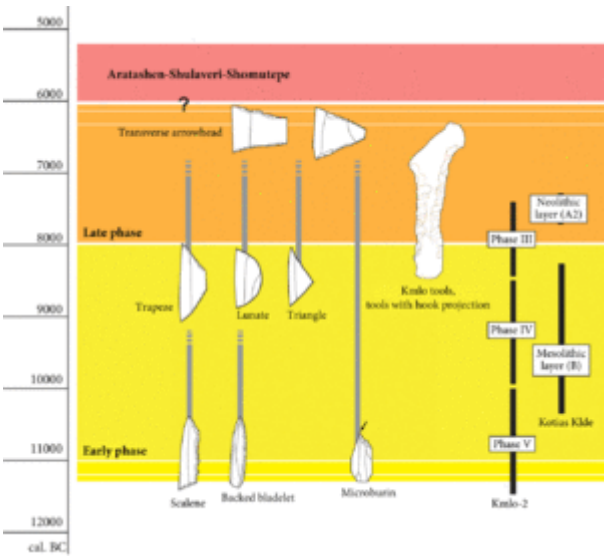

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Figure 5 . Chronological framework of the evolution of the lithic industry.

[Credit line: drawings M. Arimura; © Archaeological Mission “Caucasus" of the French Ministry of Foreign Affairs (head: C. Chataigner)].

There appears to be a missing link between the cultural complexes of the early Holocene and the Late Neolithic (“Aratashen-Shulaveri-Shomutepe” culture). In order to gain a chronological perspective for future research, we propose a preliminary chronological framework for the early Holocene (Figure 5).

Early Phase: Mesolithic

This phase covers the end of the Pleistocene and beginning of the Holocene,

roughly the eleventh to ninth millennia BC. Kmlo-2 Phases V–IV, Kotias Klde Mesolithic Layer B, and some Mesolithic sites (Kvachara, Darkveti Layer V) are included in this phase.

Although information on subsistence strategy is generally scarce, the mammals hunted by humans were mostly bears. A microlithic tradition using flint and/or obsidian is clearly observed in this phase. Backed bladelets or simply retouched bladelets are dominant among the retouched tools, showing continuity from the Upper Palaeolithic. However, a distinctive geometric form, the scalene triangle, becomes dominant in this phase. Other geometric forms such as trapezoids or lunates are relatively rare. The presence of a microburin technique could represent a new component for this period; this technique is thought to have been effective for making an obliquely truncated end, which is especially useful for a scalene. The first Kmlo tools probably appeared at the very end of this phase (end of Phase IV at Kmlo-2, ninth millennium BC).

In summary, this phase could show cultural continuity from the Upper Palaeolithic with human groups dependent on hunting and gathering but with the appearance of some new lithic components such as scalene triangles.

Late Phase: Late Mesolithic or Early Neolithic

Cultural eras such as the Late Mesolithic or Early Neolithic (aceramic Neolithic) are included in this phase and involve sites on the Black Sea coast, in the Kvirila River basin (Darkveti Layer IV), in the Paluri-Nagutni group (Paluri, Kotias Klde Layer A2), and in Kmlo-2 Cave (Phase III). Tentatively, this phase is attributed to the end of the ninth to seventh millennia BC.

In this phase, blank production for tools appears to have shifted from microblades to larger blades or in some cases to flakes. Geometric microliths were still used and were dominated by long trapezoids with related forms (triangles, lunates), while scalene triangles and backed bladelets were less common. Toward the end of this phase, short trapezoids (transverse arrowheads) appear to have been predominant. Distinct tools of this phase have fine, parallel retouch on their sides (obsidian, and in some cases, flint), such as Kmlo tools in Armenia and tools with hooked projections in Georgia. Such tools show a close morphological resemblance to Çayönü tools from Neolithic sites in western Asia.

As previously noted, the appearance of domesticated plants and animals in the early Holocene in the southern Caucasus remains unclear. The presence of domesticated animals in the Darkveti Layer IV, proposed in the 1970s (Nebieridze, 1978), has not been confirmed by the recent excavations at Kotias Klde, located near Darkveti (Matskievich and Meshveliani, 2009). Therefore, future research should evaluate whether this phase can be identified as an early stage of the Neolithic in regard to the subsistence economy.

Late Neolithic

Research History

Understanding the culture that is currently defined as the Late Neolithic began during excavations of the lower level of Kültepe-1 near Nakhichevan (1951–1964). After the discovery of the Shomutepe settlement in the Kura River basin of northwestern Azerbaijan in the first half of the 1960s, the newly revealed culture was then named the Shomutepe. Later in the mid-1960s, analogous sites were discovered in Georgia (e.g., Shulaveri, Arukhlo), resulting in the names Shomutepe-Shulaveri or Shulaveri-Shomutepe culture.

In Armenia, several Late Neolithic sites were recorded in the Ararat valley between the 1960s and 1980s (Sardaryan, 1967). However, only the excavations over the past fifteen years (e.g., Aratashen, Aknashen-Khatunarkh) have provided a relatively complete picture of the Late Neolithic period in this region. The sixth millennium BC sites of the Arax and Kura River basins can be considered to be a homogenous Aratashen-Shulaveri-Shomutepe complex due to the similarity of their material culture. This is the earliest currently known culture of the southern Caucasus based on a production economy, having yielded the first recorded examples of house construction, pottery production, and metalworking.

Beyond the basins of the Kura and Arax Rivers, the most recent research on the Mil steppe in Azerbaijan (Aliyev and Helwing, 2009) has revealed a cultural complex from the middle of the sixth millennium BC (Kamiltepe), which had been known before only from surface collections (Iessen, 1965) and which is clearly distinct from the “Aratashen-Shulaveri-Shomutepe” culture. Two other cultures, previously attributed to the Early Neolithic, have been dated to the sixth millennium BC in recent studies: Chokh Level C in Dagestan and Anaseuli-1 in western Georgia.

The following sections discuss the “Aratashen-Shulaveri-Shomutepe” culture and the other sites in the Mil steppe, Dagestan, and western Georgia.

The Aratashen-Shulaveri-Shomutepe Culture

Geography and Chronology

Currently known sites of this culture (Figure 1) are connected by the main watercourses of the region—the Arax and Kura Rivers—and form two strictly localized groups or “oases,” which represent two cultural variants.

The first oasis is located in the middle sector of the Kura River. In Georgia, the sites Shulaveris-gora, Imiris-gora, Gadachrili-gora, Dangreuli-gora, Arukhlo, and Khramis Didi-

gora are located on the Marneuli plain (270–500 m a.s.l.). Further to the southeast in Azerbaijan lie the sites of Shomutepe, Toiretepe, Gargalartepesi, Göy Tepe, and Mentesh Tepe.

The second oasis, along the middle stream of the Arax River, includes the Ararat valley (800–1000 m a.s.l.) in Armenia with the sites of Aratashen, Aknashen (former Khatunarkh), Masis-blur (former Yengidzha), Tsaghkunk, and the Nakhichevan valley with Kültepe.

Beyond the boundaries of these oases in the surrounding intermountain basins of the southern Caucasus, no possible analogous settlements are known. However, an analogous artifact complex beyond the Kura-Arax interfluve is represented by lower horizon (III) materials of Tilki-tepe (Korfmann, 1982) on the eastern shore of Lake Van (1660 m a.s.l.). At the same time, this site indicates the northern boundary of the widely distributed Halaf ware. Sporadic finds of imported pottery, often defined as Halaf ware, were criteria for relative dating of the Shulaveri-Shomutepe culture in the sixth millennium BC (Kavtaradze, 1983).

Regardless of the evolving concepts concerning absolute dating of the complex, the sites of the southern oasis (Aknashen, Masisi-blur, Nakhichevan Kültepe) were attributed to later, final stages of the culture (Kiguradze, 1976; Kavtaradze, 1983) in the framework of relative chronology. This theory raised objections (Narimanov, 1987) and has subsequently been completely contradicted by data from new investigations.

During the past decade, new series of dates have been obtained for the sites in the Kura and Arax River basins (Badalyan et al., 2007, 2010; Lyonnet and Guliyev, 2010; Lyonnet et al., 2012). The majority of these dates fall in the first half of the sixth millennium BC at Aknashen (Horizons V, IV, and part of III); Aratashen (Layer II); Masis-blur; Arukhlo; and Mentesh Tepe. Göy Tepe dates to the middle of the sixth millennium BC, and several dates from Arukhlo and the upper horizons of Aknashen (II, part of III) point to the third quarter of the sixth millennium BC.

Thus, according to ^{14}C data, the “Aratashen-Shulaveri-Shomutepe” complex dates to *c*. 6000–5250 cal BC. These dates indicate that settlements of this complex appeared and developed simultaneously in both the Kura and the Arax River basins. An attempt at periodization of this culture (Kiguradze, 1976) was unsuccessful since the new data did not confirm its patterns of development.

Environment and Settlements

In the sixth millennium BC on the Ararat plain, geomorphological and sedimentological research indicates that the Kasakh River water level was full and formed a broad basin with small lagoons and lakes, where carp (*Cyprinus carpio*) and catfish (*Silurus glanis*) could be fished. Around Aratashen and Aknashen, the vegetation consisted of wetlands (*Cyperus* sp., *Carex* sp.), gallery forests along the rivers (*Salix, Populus, Tamarix*), and mixed oak forests (*Quercus, Acer, Amygdalus, Celtis*) in the surrounding foothills. Forested areas were inhabited by aurochs (*Bos primigenius*), red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*), gazelle (*Gazella* sp.), and moufflon or ibex (*Ovis orientalis, Capra aegagrus*) (Badalyan et al. 2007, 2010). Landscapes consisting of a mosaic of gallery/riparian forests, and mixed deciduous forests were also reconstructed for the Kura basin and Khrami valley (Connor and Sagona, 2007). The region where Mentesh Tepe is located had more pronounced aridity, resulting in the presence of open shrublands (elm, buckthorn) (Lyonnet et al., 2012).

Human settlements that developed in this landscape formed mounds, called blur (in Armenian), gora (in Georgian), or tepe (in Turkish). Most cover an area of approximately 1 ha (sometimes larger: Khramis Didi-gora was ~3 ha) and are 2.5 to 3.5 m in relative height. The Neolithic layers can measure 4.5 to 6.0 m or more in thickness (e.g., 8–10 m at Nakhichevan Kültepe-1 and Gargalartepesi). These layers were partially buried under alluvial sediments in the Ararat valley and in the Marneuli valley, where the ancient surface is 2 m below the modern one. Judging from the available data, these settlements were established in previously uninhabited places. On the Marneuli plain, the settlements formed clusters of four to six at a distance of 0.5 to 2 km apart (Dzhvakhishvili, 1973). In the Ararat valley, the settlements appear to be more isolated, with 3 to 6 km separating them.

With deep cultural horizons and permanent dwellings, the “Aratashen-Shulaveri-Shomutepe” sites certainly provide an impression of sedentism. However, the sites’ function and status could have differed or changed over time, and some settlements could have been seasonal. For example, all age classes of sheep and goat are represented in Aratashen, but in Aknashen the very young adults and juveniles are absent. In other words, lambing did not occur in Aknashen (Badalyan et al., 2010; Balasescu et al., 2010). Preliminary geoarchaeological data gleaned from Horizon IV of Aknashen indicate the rarity or near absence of charcoal and ash in contrast with the high content of domestic animal dung. This evidence might not support an argument for a year-round community presence. However, only part of the population might have engaged in seasonal mobility. The presence of domestic pig in all horizons (V–II) of Aknashen demonstrates that at least some inhabitants settled here all year.

Click to view larger

Figure 6 . Architectural remains from Aratashen, Levels IIc–d (Armenia).

[Credit line: photo P. Lombard, © Archaeological Mission “Caucasus" of the French Ministry of Foreign Affairs (head: C. Chataigner)].

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Figure 7 . Architectural remains from Arukhlo (Georgia).

[Credit line: after Lyonnet et al., 2012: fig 83–84, 92–93; © Archäologische Mitteilungen aus Iran und Turan (Berlin: Deutsches Archäologisches Institut)].

In the Kura and Arax River valleys, the architecture follows the same principles. A dense, chaotic group of structures is observed nearly everywhere, mainly consisting of one-room dwellings 3.5 to 5.0 m in diameter and cylindrical household structures with diameters between 0.4 and 1.0 m (Figure 6). The Kura dwellings are built of plano-convex mud bricks (Figure 7). On the Ararat plain, the use of bricks and/or clay blocks was found only rarely at Aratashen (Layers IIb–IId) and Aknashen (Horizon IV). Here and in Kültepe-1, the predominant building material was *cob,* plastic earth containing a high content of organic remains such as threshed cultivated cereals and wild desert madwort (*Alyssum desertorum*).

Cylindrical structures (perhaps silos) made from clay slabs were randomly placed inside dwellings or in the open air. Also common were rounded and oval hearths made of pebbles surrounded by a clay border and working platforms that were amorphous accumulations of natural pebbles with fragments of stone tools, obsidian cores and blades, bones and bone tools, stone axes, and grooved stones resting on them in situ. Traces of specialized activities are recorded in some locations, for example concentrations of microflakes, microfragments, and cores (e.g., Aratashen, Layer IIc; Aknashen, Horizons IV and V). Moreover, a few semisubterranean structures occur in the

settlements of the Kura valley, particularly in Arukhlo (Masson et al., 1982) and Shomutepe (Narimanov, 1987).

Two parallel ditches were found in Arukhlo. In addition to one recorded in Imiris-gora (Dzhavakhishvili, 1973), these ditches were dug out and filled during the occupation of the settlement (Lyonnet et al., 2012) and probably functioned as an enclosure, as a water reservoir, or for irrigation.

The settlements were also a place for burials. In the lower layer of Nakhichevan Kültepe (below 19 m), burials of children and adults were revealed among dwellings and under the floors. The skeletons were found lying on one side in flexed position. Sometimes a red colorant had been used on the corpse. The burials are generally found without cultural objects, though some of them contained items such as obsidian blades, beads, or rare stone tools and clay vessels (Abibullaev, 1982). Remains of burials were found at Aknashen in Horizons IV and V, at Imiris–gora (Dzhavakhishvili, 1973) and at Arukhlo (Kiguradze, 1986). The only example of cremation in the southern Caucasus was discovered at Arukhlo (Lyonnet et al., 2012). For the same period (mid-sixth millennium BC), cremation was attested at Sialk I in Iran, where five examples were found (Soltysiak and Fazeli, 2010).

Material Culture

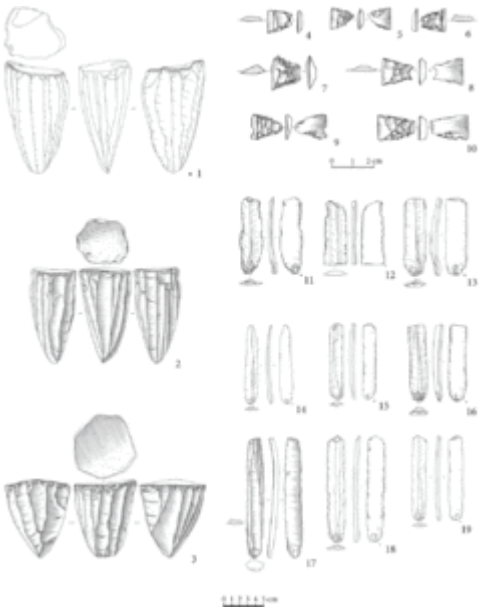
Lithic industry.

The lithic industry of all Aratashen-Shulaveri-Shomutepe sites is based on obsidian. Flint, dacite, quartz, and other raw materials make up only a very small percentage of the assemblage (0.4% at Aknashen in Armenia, 3.5% at Mentesh Tepe in Azerbaijan) (Badalyan et al., 2010; Lyonnet et al., 2012).

A total of 36,700 units were found at Aknashen during eight excavation seasons, made on obsidian originating from various sources. Five to six (up to ten at Aknashen) sources were generally exploited, of which one or two played a dominant role. In the Ararat valley, these are Arteni (southwest of Mt. Aragats), Gutansar, and Hatis (western foothills of the Geghama range), and to a lesser extent Geghasar (southern part of Geghama range) at a distance of 40 to 65 km (Badalyan, 2010; Badalyan et al., 2007, 2010; Chataigner and Gratuze, 2013). Chikiani (Javakheti range) was the predominant obsidian source for the Kura valley in Georgia (Khramis Didi-gora) (Badalyan, 2010), whereas in Azerbaijan (Mentesh Tepe), the sources of Gegham and Tsaghkunyats were predominant (Lyonnet et al., 2012).

Along with this Caucasian obsidian, which represented 80% or more of the supply, some more distant sources were found. Evidence for sources in the Lake Van basin (3a/Meydan Dağ) and from Sarikamish was found at Aratashen, whereas the obsidian at Mentesh Tepe came from Bayazet (Tendurek?) and at Khramis Didi-gora from Sarikamish. Obtaining this material most likely occurred through contacts indirectly connected with the obsidian trade. At Aratashen, some Meydan Dağ samples were found in association with Halaf

ware; in this case, the sporadic dissemination of Lake Van obsidian probably occurred with the import of pottery into the Ararat valley.



Click to view larger

Figure 8 . Lithic industry from Aratashen (1, 11–16, 18–19) and Aknashen (2–10, 17) (Armenia).

[Credit line: drawings J. Leclerc (Aratashen) and G. Devilder (Aknashen); © Archaeological Mission "Caucasus" of the French Ministry of Foreign Affairs (head: C. Chataigner)].

The obsidian industry is morphologically and technologically characterized by a predominance of long blades (up to 20 cm) (Figure 8:11–19). Of the items at Aratashen, blade tools make up 97.7% and flake tools 2.3% of the assemblage. Various techniques were applied for producing the blades: indirect percussion, pressure with crutch, and pressure with lever (Badalyan et al. 2007, 2010; Chabot and Pelegrin, 2012). The pressure technique using a lever emerged in the upper valley of the Tigris (Çayönü Tepesi) between 7340 and7080 cal BC (Altinbilek-Algül et al., 2012).

The usewear analysis of blades from Aratashen and Aknashen demonstrates their connection with agricultural activities such as harvesting, stripping, and threshing. Sickle and tribulum elements were defined among the tools (Badalyan et al., 2007, 2010; Chabot et al., 2009). Composite sickles with a wooden or bone frame (e.g., mandibula with blades fixed with bitumen) were found in Shomutepe and Toiretepe (Chataigner, 1995).

The question concerning geometric microliths in the Aratashen-Shulaveri-Shomutepe industry is of special importance. It has been suggested that microliths are uncharacteristic of this culture. Single finds at Imiris-gora and Khramis Didi-gora seemed to appear only in relation to the later cultural stages (Kiguradze, 1976). It is currently assumed that the presence or absence of microliths in the complex is related to economic activity. Although no microliths were found at Aratashen among more than 20,000 artefacts, 120 samples were collected in the neighboring contemporaneous settlement of Aknashen. These involve transverse arrowheads, including trapezoids and (less frequently) triangles with thinned backs (Figure 8:4–10), the number of which regularly increases from the upper to lower horizons. Microliths were also found in Arukhlo (Hansen et al., 2006, 2007) and Göy Tepe (Lyonnet and Guliyev, 2010).

Bone, horn, and antler.

Numerous bone and horn artifacts make up one of the most specific cultural-typological and functionally important categories of the Aratashen-Shulaveri-Shomutepe culture. This industry is represented by a wide variety of objects in the early phases of the culture. Data from Aknashen show that the number of such objects decreased gradually in the upper layers of the settlement until the technical degradation of these objects during the Chalcolithic (Badalyan et al., 2010).

Click to view larger

Figure 9 . Bone industry from Aratashen (1–2, 4–7, 9–11, 13–15, 19) and Aknashen (3, 8, 12, 16–18, 20) (Armenia).

[Credit line: drawings H. Sargsyan; © Archaeological Mission “Caucasus" of the French Ministry of Foreign Affairs (head: C. Chataigner)].

Most of the tools (50%–80%) are awls/punches, with their percentage increasing in the upper horizons. The other objects, whose diversity is related to all types of activity, include handles of composite sickles, hoes, picks, hammers, hafts, arrowheads, spoons, palettes, toothed tools, burnishers, and pins (Figure 9).

Ground stone.

Click to view larger

Figure 10 . Ground stone from Aratashen (1, 4–5, 7, 9–10, 12–13) and Aknashen (2–3, 6, 8, 11) (Armenia).

[Credit line: drawings H. Sargsyan; © Archaeological Mission “Caucasus" of the French Ministry of Foreign Affairs (head: C. Chataigner)].

The assemblage includes basalt and sandstone grinders, querns, hammers, pestles, mortars, pumice tools, plummets, and maceheads, which were related to the processing of cereals, mineral and pigment pounding, and stone grinding (Hamon, 2008). Polished axes (celts) (Figure 10:9–13) and grooved stones (“shaft-straighteners”) (Figure 10:1–8) were also found. Grooved stones appear to be rare and have simple forms at the Kura River basin sites (e.g., have only one groove at Imiris–gora and Khramis Didigora) (Hamon, 2008), whereas in the south (Aratashen, Aknashen, Tilkitepe Layer III), they are represented by a wider range of variants (Badalyan et al., 2007, 2010; Korfmann, 1982). These tools, whose grooves are generally transverse like those from the Zagros in the eleventh millennium BC onward (Badalyan et al., 2010), appear to have disappeared in the southern Caucasus at the end of the sixth millennium BC. This was concurrent with the time when the bone-working techniques degraded.

Pottery.

Pottery of the Aratashen-Shulaveri-Shomutepe culture represents the earliest examples of production in the southern Caucasus. In the Ararat valley, the lower (II) layer of Aratashen does not contain pottery, except for a few imported painted fragments of Halaf ware. The upper part of the lowest horizon (V) at Aknashen yielded a small number of relatively high-quality sherds with grit temper (Grit II). Made with well-levigated clay containing also grog, these had burnished surfaces. In Horizon IV, Grit II predominates over a production of coarse ware (Grit I), but the quantity of sherds remains low. In Horizon III, Grit II decreases proportionally to an increase of coarse pottery (Grit I) and pottery with organic temper. The latter is predominant in Horizon II.

Click to view larger

Figure 11 . Pottery from Aknashen (Armenia) (1–7, 9, 11, 13–14 – grit-tempered ware I; 8, 10, 12 – grit-tempered ware II; 15–21 – chaff-tempered ware).

[Credit line: drawings H. Sargsyan; © Archaeological Mission “Caucasus" of the French Ministry of Foreign Affairs (head: C. Chataigner)].

Grit-tempered pottery is morphologically represented by handmade coiled vessels that were cylindrical and barrel-shaped, with wide, flat bases and heel-shaped profiles. These vessels are not decorated; there are only a few examples with large attached lug handles (Palumbi, 2007; Arutyunyan, 2011; Arutyunyan and Mnatsakanyan, 2010) (Figure 11:1–14).

Although a small amount of pottery in the lower horizons and its gradual increase in the upper horizons is also evident in the Kura basin settlements, the technological and stylistic traditions vary. Having great morphological similarity with the Aknashen pottery, the ware from Nakhichevan Kültepe-1 also contains organic rather than mineral temper. Chaff-tempered pottery makes up a large proportion of sherds from Mentesh Tepe (Lyonnet et al., 2012), while pottery with nonorganic temper prevails (80%–85%) at Shomutepe (Narimanov, 1987).

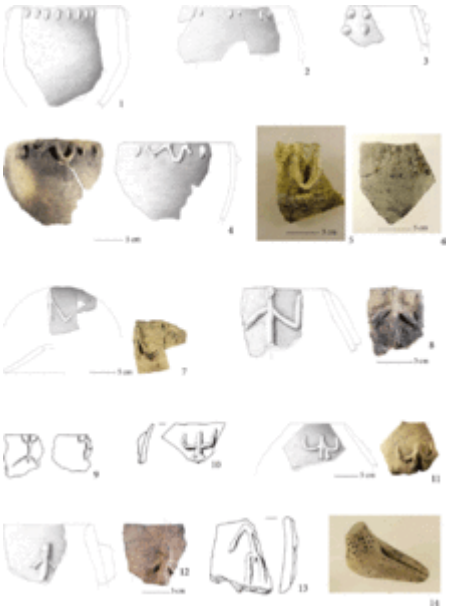


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Figure 12 . Pottery from Arukhlo (Georgia).

[Credit line: after Lyonnet et al., 2012: fig 110–114, 116–124; © Archäologische Mitteilungen aus Iran und Turan (Berlin: Deutsches Archäologisches Institut)].

Local characteristics are evident when the vessels’ decoration is compared. The grit-tempered pottery from Aknashen and the chaff-tempered pottery from Kültepe are both undecorated, whereas *plastique* decoration (e.g., rounded and oval knobs, horseshoe-shaped, circular and zigzag decorations on the rim’s outer edge) is very common for the grit-tempered ware of the Kura basin, including anthropomorphic motifs at Arukhlo, Imiris-gora, and Khramis Didi-gora (Figure 12) (Lyonnet et al., 2012). One-third of the fragments at Arukhlo are decorated (Hansen et al., 2006, 2007). The rounded and vertical knob decoration under the vessel rims from Shomutepe is characteristic of grit-tempered pottery. Similar decoration is characteristic of Aknashen and Aratashen pottery containing organic temper from the upper horizons (Figure 11:15–21).

However, these technological and stylistic differences in the morphologically homogenous pottery assemblages of the Arax and Kura basins raise important questions concerning the origin and development of Neolithic pottery in the southern Caucasus.

Metal.

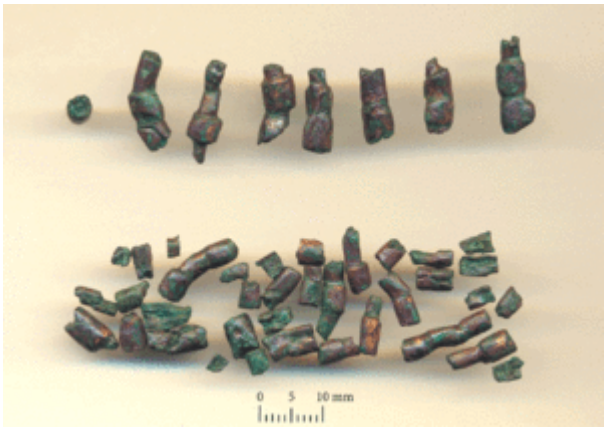

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Figure 13 . Copper beads (bracelet) from Aratashen (Armenia).

[Credit line: photo R. Badalyan; © Archaeological Mission “Caucasus" of the French Ministry of Foreign Affairs (head: C. Chataigner)].

Copper artifacts found in Aratashen-Shulaveri-Shomutepe sites are the earliest known metal objects in the southern Caucasus. These consist of small ornaments, particularly beads (Aratashen, Aknashen, Nakhichevan Kültepe I, Khramis Didi-gora, Arukhlo, and Gargalar tepesi). Fabricated from copper leaf rolled around a rod on one or two lathes, the beads are of a standard type found across western Asia in the eighth to sixth millennia BC. Fifty-seven of these beads (Figure 13) formed a bracelet about 6 cm in diameter (Badalyan et al., 2007) found in situ at Aratashen (Layer IIb). The beads are made of pure native copper containing only minor natural impurities (Meliksetian et al., 2011).

Fragments of malachite and azurite are regularly found starting in the lower horizons of Aratashen, Aknashen, and Arukhlo. These minerals were common in Neolithic sites of western Asia (Schoop, 1999) and could have been raw materials for making artifacts and ornaments or a source for pigments. The same uses are possible for galena, which is also present at Aknashen. Both galena and lead artifacts are known in the Neolithic of western Asia (Schoop, 1999; Munchaev and Merpert, 1981). Traces of malachite and hematite are preserved on the working surfaces of several grindstones and pestles from Aknashen.

The Mil Steppe

Surveys carried out in the 1950s (Iessen, 1965) on the Mil steppe revealed this region’s rich archaeological potential. Researchers found several tells (e.g., Kamiltepe, Shahtepe) that yielded painted pottery called Mil Steppe Painted Ware, attributed to the Chalcolithic (Narimanov, 1987).

In 2009, excavations were resumed at the tell of Kamiltepe in the Qarasu valley (Alyev and Helwing, 2009; Lyonnet et al., 2012). The occupation of the site extends over two phases: a massive mud brick construction, built in the center of the village, was then surrounded by domestic architecture with evidence for storage and food preparation. Some 700 m to the southwest of Kamiltepe lies another tell (MPS 4) that produced a semisubterranean round building with evidence of a shell bead workshop (Lyonnet et al., 2012).

Click to view larger

Figure 14 . Pottery from Kamiltepe (Azerbaijan).

[Credit line: after Lyonnet et al., 2012: fig 110–114, 116–124; © Archäologische Mitteilungen aus Iran und Turan (Berlin: Deutsches Archäologisches Institut)].

The cultural material consists of handmade, chaff-tempered pottery (often with geometric painted decoration in black or dark red on a light surface; Figure 14), obsidian and flint tools, and occasional ornamental objects, such as beads made from shell, carnelian, or turquoise. Radiocarbon dating places the occupation of Kamiltepe-1 during the mid-sixth millennium BC (Aliyev and Helwing, 2009).

The recovered animal bones largely consist of domesticated animals; caprids are most numerous, followed by cattle and pigs. Among the wild species are gazelles and red deer. The large number of birds, especially duck, as well as some fish bones and molluscs, indicate the availability of aquatic resources probably near the site.

This culture presents few analogies with the neighboring Aratashen-Shulaveri-Shomutepe culture. However, its architecture (monumental platform) and pottery (painted decoration) are clearly related to northern Iran and the region around the southern edge of the Caspian Sea (Lyonnet et al., 2012).

Dagestan

In the Neolithic layer (C) at Chokh, a large stone building with a corridor-like entrance yielded abundant material (Amirkhanov, 1987). Continuity is obvious in the lithic material from the Mesolithic layers: scalene triangles still predominate and small blades become frequent. Grinding stones and pottery (mineral-tempered ware with flat bases) also appear, and a sherd decorated with two knobs evokes the Aratashen-Shulaveri-

Shomutepe culture. Bone sickle handles decorated with incised diamond shapes closely parallel the culture of Sialk I (sixth millennium BC) on the Iranian plateau (Wechler, 2001).

Based on the presence of domesticated animals (sheep) and a large assortment of cereals, the excavator considers this site evidence of local domestication (see the Discussion section).

Western Georgia

The Early Neolithic of western Georgia was followed by a Late Neolithic, represented by sites distributed on the coastal strip (e.g., Anaseuli-2, Odishi, Makhvilauri) and characterized by the appearance of pottery (Nebieridze, 1972; Kiguradze, 2001). The undifferentiated red-baked jars with a button base could be decorated with incised geometric ornaments and grooves on the rim. The lithic industry was characterized by the blade technique and an abundance of geometric microliths (trapezes and lunates); ground stone tools (querns, grooved stones) were also found (Kiguradze and Menadbe, 2004).

However, conclusive evidence for the use of domesticated plant and animal resources is still absent, and radiocarbon dates are again lacking. Based on typological parallels of the pottery assemblages with the Early Chalcolithic of eastern Georgia (Sioni culture) (Kiguradze and Menabde, 2004), it appears plausible that the Late Neolithic of western Georgia was partly contemporaneous with the Late Neolithic of eastern Georgia (Aratashen-Shulaveri-Shomutepe culture) and partly with the Early Chalcolithic (Sioni culture).

Discussion

On a theoretical level, the transition from Mesolithic hunter-gatherers to Neolithic farmers can be understood through two factors: (a) migration, or the spread of agricultural societies; and (b) diffusion, when indigenous hunter-gatherers adopt items, ideas, and practices associated with agricultural society (e.g., domestic plants and animals, pottery) (Budja, 2005). Migration and diffusion represent the ends of a variegated spectrum of mechanisms, including folk migration, demic diffusion, elite dominance, community infiltration, leapfrog colonization, exchange in frontier zones, and regional exchange (Zvelebil and Lillie, 2000).

In regard to the Caucasus, the scattered nature of the data and rarity of radiocarbon dates make it difficult to examine the Neolithisation process. However, a review of

hypotheses formulated in the past and information from recent excavations enable us to propose a new direction of research on the regional domestication of plants and animals.

Domestication of Plants

Previous Theories

In the Soviet literature concerning the Caucasus, there is a broad consensus that the emergence of agriculture was clearly a local phenomenon, due to its manifestation within the area of natural distribution of cereals (Lisitsyna and Prischepenko, 1977; Janushevich, 1984).

According to Nebieridze (1986), the emergence of agriculture was a local Caucasian invention, completely independent from the development of agricultural communities in western Asia. She bases her conclusion on evidence of the gradual progress of cultural and economic development in western Georgia. The process of diffusion out of the west Georgian center took place much later and led to the emergence of the Aratashen-Shulaveri-Shomutepe culture of eastern Georgia.

Based on the cultural sequence observed at Chokh in Dagestan, in which a Neolithic layer succeeded Mesolithic occupations, Amirkhanov (1987) proposed a model suggesting an independent development of agriculture in the northern Caucasus and its later spread to the south.

The hypothesis of Kiguradze (1976, 1986) states that the primary center of the Caucasian agricultural revolution was eastern Georgia, where the Aratashen-Shulaveri-Shomutepe culture had developed. Kiguradze does accept the idea that the process of domestication resulted from cultural contact with western Asia but considers domestication itself to be a process accomplished by the local population.

Current Research

Present research shows that the first two hypotheses cannot be supported. Indeed, in western Georgia, the early Neolithic represented by Anaseuli-1 presents no clear evidence for plant domestication. As for Chokh in Dagestan, two hearths in the lowest part of the Neolithic level have produced evolved varieties of wheat (einkorn, emmer, naked wheat) and barley (six-row barley) but no wild cereals (Amirkhanov, 1987; Wechler, 2001). It is likely that cereals were already domesticated elsewhere before arriving at Chokh. Thus the early process of plant domestication cannot be observed in the Caucasus.

The assortment of domesticated species found on the sites of the Aratashen-Shulaveri-Shomutepe culture during the 1960s to 1980s (Lisitsyna and Prischepenko, 1977) is evidence for a large variety that includes hulled and naked barley (*Hordeum vulgare*), einkorn *(Triticum monococcum)*, emmer *(T. dicoccum*), hexaploid wheats (*T. spelta, T.*

aestivum), and millets (*Panicum miliaceum, Setaria italica*). However, some of these identifications have been questioned (Zohary and Hopf, 2004). All of these species were cultivated in the northern part of western Asia in the eighth to seventh millennia BC, and the introduction of most of them to the Caucasus seems probable.

However, recent excavations have confirmed some originality of plant use in the Neolithic Caucasus: hexaploid wheat *(T. aestivum*) largely predominates over emmer, with einkorn being very rare (Hovsepyan and Willcox, 2008; Lyonnet et al., 2012). Even in the Mil steppe culture (Kamiltepe), where naked barley *(Hordeum vulgare)* is the main cultivated crop and the percentage of wheat is very low, the only wheat identified is *Triticum aestivum* (Lyonnet et al., 2012). This free-threshing wheat is of particular significance because it is quite rare in Neolithic sites in western Asia during the same period (seventh–sixth millennia BC) (Guliyev and Nishiaki, 2012). This evidence suggests that not all domesticated plants were introduced from western Asia, but some species could have been locally domesticated.

In fact, the naked hexaploid wheat (*T. aestivum*) is a derivative of the hulled variety, spelt (*T. spelta*), which was also reported from sixth-millennium BC contexts on the Kura River plain (Arukhlo) (Zohary and Hopf, 2004). Molecular studies of hexaploid wheats show that this Asian spelt originated from the hybridization of a tetraploid wheat with the diploid wild grass *Aegilops tauschii* (*squarrosa*) (Petersen et al., 2006). Other studies have shown that populations of *Aegilops tauschii* native to Armenia and the southwest part of the Caspian Sea belt are closest to the genome D found in hexaploid wheat (Dvorak et al., 1998), confirming this as an area where hexaploids originated (Kilian et al., 2009).

This origin of hexaploids appears to be independent from a possible earlier domestication event in southeastern Anatolia and northern Syria during the eighth millennium BC (Nesbitt, 2002). Genetic studies have shown that at least two *Aegilops tauschii* sources contributed germplasm to the genome D of *Triticum aestivum* (Giles and Brown, 2006). One gave rise to the lineage possessing the TAE1 allele and its derivatives, which came from the southern Caucasus and the southwest corner of the Caspian belt; the other resulted in the lineage with the TAE2 allele coming from southeast Turkey/northern Syria, where local *Aegilops tauschii* has a high frequency of the TAE2 allele.

In addition, recent finds from Aratashen-Shulaveri-Shomutepe sites suggest that a naked hexaploid wheat was in the process of replacing emmer wheat during occupation of the settlements. These finds support the genetic evidence suggesting that hexaploid wheat evolved independently in this region.

Domestication of Animals

Previous Theories

Similar to the theory about domestication of cereals, the Caucasus has long been considered a possible source for the domestication of animals. This theory was based on the abundance of remains from their wild ancestors (e.g., aurochs, moufflon, ibex, wild boar) (Kushnareva, 1997).

Current Research

The collections studied recently by Benecke (Lyonnet et al., 2012) consist of about 50,000 faunal remains from Neolithic layers at Arukhlo and Mentesh Tepe in the Kura basin and Kamiltepe on the Mil steppe. Morphologically, the sheep, goats, cattle, and pigs from all three sites represent animals that were in an advanced stage of domestication, obviously having been under human control for a long period of time.

The first successful DNA studies show a high variability in mitochondrial haplotypes in sheep and cattle from Aruchlo. This is in clear contrast to western Anatolia or southeast Europe, where a strongly reduced haplotype variability was observed in these species, indicating a rapid spread of animals from a small founder population in the areas of domestication (the bottleneck effect). The high genetic variability seen in Neolithic domestic animals from the southern Caucasus may indicate their close proximity to the primary areas of domestication (Lyonnet et al., 2012).

Phenomena such as admixture (hybridization between a domestic population and wild population of identical and/or sister species) may have occurred in the Southern Caucasus. In fact, during the early stage of migration of an agricultural society away from the domestication center, domestic populations are small relative to the surrounding wild populations, and repeated hybridizations between the two may lead to the domestic population becoming more genetically divergent from its original domestic source population (Larson and Burger, 2013).

Conclusion

Current research on the beginning of the Holocene in the Caucasus has led to the following conclusions:

(1) The transition between the Mesolithic and Neolithic remains poorly understood. For instance, in Armenia, there is indeed a long gap (*c*.7500–6000 BC) between Kmlo-2 (early Holocene) and Aratashen/Aknashen (Aratashen-Shulaveri-Shomutepe culture); ongoing excavations are just beginning to fill this gap. It should be noted that, to date, no transitional stage from the local Mesolithic to agricultural Neolithic in the Caucasus has been discovered.
(2) The cultures defined as Early Neolithic refer to different situations according to region:

- In the highlands of the central Caucasus, sites dated by ^{14}C to the ninth to eighth millennia BC (Paluri-Nagutni sites in Georgia; Kmlo-2 Phase III in Armenia) are characterized by an economy based exclusively on hunting and gathering and the presence of so-called hooked tools or Kmlo tools (Matskevich and Meshveliani, 2009; Arimura et al., 2010). The morphology of these tools suggests relations with pre-pottery Neolithic B cultures in southeastern Turkey (Çayönü, Cafer Hoyük) in the eighth millennium BC. However, in these regions, the pre-pottery Neolithic B is characterized by the "Big Arrowhead Industry" (Kozlowski, 1999) and the practices of agriculture and herding; none of these innovations appeared then in the southern Caucasus.
- The Early Neolithic of western Georgia, traditionally represented by the site of Anaseuli-1 (Nebieridze, 1978), has been recently radiocarbon dated to the sixth millennium BC. Obsidian was imported into western Georgia from the eastern part of the country occupied by the Aratashen-Shulaveri-Shomutepe farmers.
- The Neolithic level of Chokh in Dagestan probably belongs to the sixth millennium BC, based on its parallels in cultural material with the cultures of Aratashen-Shulaveri-Shomutepe and Sialk-1. Moreover, the presence of fully domesticated cereals and the absence of wild varieties found in this layer suggest an import. There is no support for the hypothesis of a local development of agriculture.

(3) The earliest unequivocal evidence for the introduction of agriculture and the Neolithic way of life in the Caucasus is dated to the very early sixth millennium BC in the Kura and Arax basins (Aratashen-Shulaveri-Shomutepe culture).

Based on several cultural elements (e.g., farming, herding, debitage by pressure-flaking with lever, imported Mesopotamian pottery), we can infer links between the Aratashen-Shulaveri-Shomutepe culture and Neolithic cultures in western Asia. However, other elements of the Aratashen-Shulaveri-Shomutepe culture, such as the absence of pottery in the lowest levels, an abundance of naked wheat, and the genetic variety of sheep and cattle, indicate the remarkable uniqueness of the southern Caucasian cultures compared to those in western Asia at the beginning of the sixth millennium BC.

The hypothesis of uniqueness can be explained in that local hunter-gatherers adopted the Neolithic way of life through contact with farming groups from western Asia, probably in the southwestern belt near the Caspian Sea where hexaploid wheat originated. Such close contacts may have begun at the end of the eighth or the beginning of the seventh millennium $_{BC}$, a time when pottery was still unknown in most parts of western Asia. This would explain the absence of pottery in the earliest phase of the Aratashen-Shulaveri-Shomutepe culture.

In conclusion, future studies concerning the origin of the Neolithic way of life or Neolithization process in the southern Caucasus should address two key issues. The first issue involves researching the origin of the Aratashen-Shulaveri-Shomutepe culture. Ongoing excavations in the Ararat valley and the Kura basin are revealing the basal

layers at sites such as Aknashen, Masis Blur, and Göy Tepe. This research will likely provide some insights on the earliest stage of this culture. Early discoveries in this area took place in October 2013 in Aknashen, Armenia, where a natural level of shallow water basin deposit 30 to 50 cm thick (Horizon VI) was unearthed under the Aknashen-Shulaveri-Shomutepe cultural layers (Horizons II–V). This natural deposit was above a cultural layer (Horizon VII) at least 1 m thick. Separated by a hiatus (Horizon VI) from the upper Aknashen-Shulaveri-Shomutepe layers (Horizons II–V), the material culture of Horizon VII has a particular character. Its cultural affinity and chronology will be clarified by future studies.

The second issue to be addressed involves the transition to the Neolithic. As mentioned earlier, the study of the Mesolithic in the southern Caucasus is not yet complete. Therefore, researching the transition from the Mesolithic to Neolithic in the southern Caucasus could directly resolve the question of when and how the Neolithization process started in this region.

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Christine Chataigner

Christine Chataigner, Archeorient – UMR 5133, CNRS – Université Lyon 2, France.

Ruben Badalyan

Ruben Badalyan, Institute of Archaeology and Ethnography, NAS Armenia, Yerevan, Armenia.

Makoto Arimura

Makoto Arimura, Kanazawa University, Japan.