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The Discovery of a Bifacial Industry in Vietnam

This study investigates the origin of bifacial lithic industry in the Lower Paleolithic of Southeast Asia. We describe stone tools from the stratified sites of Go Da and Roc Tung near the town of An Khê, Vietnam. The lithics represent a homogeneous industry, characterized by Lower Paleolithic primary and secondary reduction techniques. Cores and tools were made using pebbles, and some tools were manufactured on flakes. The tool-kit includes bifaces, picks, spurred implements, carinated end-scrapers, various types of side-scrapers, choppers and chopping tools, and denticulate and notched pieces. Bifaces and picks are the predominant tool types. Primary reduction was aimed at manufacturing simple pebble cores with cortex striking platforms, while radial and orthogonal cores occur less frequently. Tektites found with the lithics were dated by $^{40}K/^{38}Ar$-method to 806 ± 22 and 782 ± 20 ka BP. We propose to name this industry the An Khê culture. We suggest that the An Khê emerged through convergent evolution of the pebble-flake industry associated with the first wave of Homo erectus migration from Africa 1.8–1.6 Ma years ago, and is unrelated to the Acheulean tradition introduced by the second wave of migration to Eurasia.

Keywords: *Vietnam, Lower Paleolithic, An Khê culture, bifaces, convergent evolution.*

Introduction

In terms of both technology and typology, the Paleolithic of Southeast Asia (including Vietnam) is quite different from contemporaneous industries of the more westerly regions of Eurasia. The initial peopling of the region is believed to have occurred 1.8–1.6 Ma BP, with the first migrants consisting of *H. erectus* groups from Africa associated with the pebble-flake rather than Oldowan industry (Derevianko, 2015). This date estimate, however, is based solely on fossil remains, as no sites with lithics

have yet been found dating to this period. Moreover, Lower Paleolithic sites with reliable stratigraphy are few in this region. The age of the earliest stratified sites slightly predate 1 Ma. Several non-contemporaneous Lower Paleolithic industries are known in Southeast Asia, including the Tampanian, Anyathian, Pacitanian, and other industries.

After the initial peopling of the region by *H. erectus*, lithic industries were largely unaffected by subsequent migrations from western Eurasia. This does not imply, however, that Southeast Asian groups lived in isolation across this period. Small groups of immigrants might have reached East and Southeast Asia more than once, resulting in gene flow and interactions. Nevertheless, the lithic industries of these regions remained basically unaffected, and the industries can be regarded as autochthonous. The reason for this stability was not likely cultural stagnation, lack of innovative technologies, or cognitive deficiency (Movius, 1944, 1949; Clark, 1998; and others), but, on the contrary, environmental plasticity. Specifically, the tool industries of this region appear to have been an adaptation to the absence of large sources of high-quality raw materials, which prompted Lower Paleolithic humans to rely on organic materials such as bone, wood, and especially bamboo (Hutterer, 1985; Pope, 1984, 1985, 1988; Pope, Cronin, 1984; Lycett, 2007; and others).

Hallam Movius described two Lower Paleolithic traditions––Acheulean, which was based on the bifacial technology and distributed in the western part of the Old World (Africa and western Eurasia), and a second, pebble-based technology with choppers and chopping tools (East and Southeast Asia). Over the last 70 years, hundreds of Paleolithic sites have been discovered and studied in East and Southeast Asia, and the resulting dataset makes it possible to reassess lithic industries from eastern Eurasia. The idea of two coexisting culture provinces separated by a "Movius line" has been discussed at various conferences and in numerous publications. One of the first discussions was published by *Current Anthropology*, following a study by Seonbok Yi and Geoffrey Clark (1983). Like many later discussions, this initial debate largely focused on disproving Movius's hypothesis of a cultural boundary. Subsequent research has demonstrated clearly that both traditions, that based on bifaces and that focused on choppers and chopping tools, had been practiced in East and Southeast Asia in the past, establishing an early appearance of bifacial traditions in this region.

The Paleolithic industries of Vietnam

The first Paleolithic sites in Vietnam were discovered by Madeleine Colani. In the 1920s and early 1930s, she conducted excavations in the provinces of Hòa Bình, Ninh Bình, Thanh Hóa, and Quảng Bình. As a result, Colani (1927) identified an Upper Paleolithic culture termed Hoabinhian. Later on, Hans D. Kahlke (1965, 1973) found stone tools in association with bones of Pleistocene animals and remains of *H. erectus* in caves in northern Vietnam. In the 1960s, one of the prominent specialists in Paleolithic archaeology, Pavel Boriskovsky, conducted research in Vietnam. Apart from excavations, he also educated future archaeologists in this country. Eventually, in the 1960s, a Vietnamese school of experts in Paleolithic studies emerged.

The earliest Paleolithic sites documenting the initial peopling of Vietnam are attributable to the initial Middle Pleistocene (Boriskovsky, 1966, 1971; Kahlke, 1973; Ciochon, Olsen, 1986; Olsen, Ciochon, 1990; Davidson, Noble, 1992; Nguyễn Khắc Sử, 2007a, b; and others). In the cave sites of Tham Qujen and Tham Hai, located in Lạng Sơn Province bordering China, researchers recovered ten teeth of *H. erectus*, fragments of teeth belonging to extinct anthropoid apes, and remains of primarily extinct fauna species (*Ailuropoda*, *Stegodon*, *Pongo*, and others). These sites are dated to 475 ± 125 ka BP (Marwick, 2009).

In Vietnam, as elsewhere in Southeast Asia, following the appearance of *H. erectus*, technological characteristics of local industry (based largely on the use of wood, bone, and bamboo) was mostly unaffected by external influence. Bamboo may have played particularly important role in early human survival in Vietnam. Bamboo shoots would have been used for food; knives, points, etc. may have been manufactured of ripe bamboo stems. Organic materials were likely processed with crude stone implements such as choppers, chopping tools, side-scrapers, and knives with various modifications. Because of the persistent significance of soft materials in Southeast Asian tools, crude blanks, often described as "Paleolithic", actually occur at Neolithic and even Early Bronze Age sites.

In this regard, surface collections from Mount Do (Vietnam) are noteworthy. In 1960, during the excavations of a Bronze Age burial ground and a settlement located in the Thanh Hóa Province, archaeologists found crude stone artifacts lying on slopes of Mount Do. Boriskovsky participated in

this research as an advisor. Artifacts from Mount Do drew his attention by their archaic appearance, and he investigated this site for several seasons (1966, 1971; and others). Mount Do is located on the right bank of the Tu River, the tributary of the Ma River, 23 km from the seacoast. The mount is composed of Mesozoic basalt with quartz veins. Exposures of basalt bedrock are visible at a height of 20–40 m above the foot of the mount. Ancient people used the basalt scree as a source of raw material for tool-making. During the first years of research, ~1500 lithic artifacts were collected. Boriskovsky conducted statistical analysis of 825 of these finds. He identified 782 flakes, including 37 Levallois products. According to his research, the artifact assemblage yielded two typical Acheulean handaxes, one crude bifacial chopping tool, seven crude unifacial choppers, and 15 rectangular handaxes and cleavers including fragments (1966: 60). While having some doubts about the precise age of artifacts from Mount Do (Ibid.: 60–62), Boriskovsky inferred that the site belonged to the Lower Paleolithic—an attribution that was questioned by many researchers (Olsen, Ciochon, 1990; and others). In 1986, Vietnamese archaeologists discovered a Bronze Age workshop on Mount Do. Stone axes resembling Lower Paleolithic bifaces were apparently manufactured in this workshop (Nguyễn Khắc Sử, 2007b). Amazingly, even a highly experienced specialist in Paleolithic studies like Boriskovsky, was capable in misattributing these late bifacial tools (resembling handaxes in shape and technology) to the Lower Paleolithic. The key reason for Boriskovsky's mistake is that typologically similar types of tools were manufactured in South and East Asia for hundreds of millennia (Movius, 1958: 354).

Consequently, criteria used to assess African and Eurasian lithic industries often fail to detect the Middle Paleolithic in eastern Eurasia. East and Southeast Asian lithic industries evolved over the entire Pleistocene (more than one million years) without following cultural sequences seen in Africa or western Eurasia. Key developments absent from this region include the Levallois technique of primary reduction. In Vietnam, as in eastern Eurasia at large, dozens of archaeological cultures have nonetheless been described, using pebble, discoid, orthogonal, and other types of cores and a variety a pebble chopping tools. No valid or generally accepted criteria for distinguishing the Middle Paleolithic are yet available from this region. Again, it would be erroneous to speak of one and half million years of stagnation, as evidenced by the Lower Paleolithic sites with bifacial tools, such as handaxes, in China. Bifacial tools appeared in China about one million years ago, and were used over the entire Middle and the first half of the Upper Pleistocene. Having originated in China, this bifacial industry differed from the African and western Eurasian Acheulean, and its appearance in East Asia may be ascribed to convergent evolution (Derevianko, 2008, 2014; and others). Despite the stability of tool types in Southeast Asia across the Paleolithic, the discovery in Vietnam of bifacial Lower Paleolithic tools resembling Acheulean handaxes attests to the absence of cultural "stagnation" in Vietnam.

Recent discoveries of Lower Paleolithic sites with bifacial industries in Vietnam

Since 2009, the joint Russian Vietnamese archaeological expedition has excavated Paleolithic sites in Vietnam, led by A.P. Derevianko and Nguyen Khac Su. Initially, excavations were carried out in several caves with cultural horizons attributable to the Upper Pleistocene.

In 2014, Vietnamese archaeologists discovered Lower Paleolithic sites with bifacial tools near the town of An Khê, in central Vietnam. In 2015, the joint expedition began systematic excavations there (Nguyễn Khắc Sử, Nguyễn Gia Doi, 2015; Derevianko, Tsybankov, Nguyễn Giang Hai et al., 2016; Derevianko, Sử, Tsybankov et al., 2016; Derevianko et al., 2017a, b). Over the last four years, 23 Lower Paleolithic sites with bifaces have been discovered in the area of An Khê, clustered in seven loci (Fig. 1). At the locus termed Roc Tung, we found 12 sites on the left bank of the Ba River, on the shore of a water reservoir (Fig. 2, 3). Roc Lon 1 and Roc Giao 2 are located on the same shore. Roc Lon 2 and Roc Nep 1 and 2 are situated east of the Ba River, closer to mountains. Roc Giao 1 and Roc Huong lie far away from the reservoir, downstream the Ba. Go Da site was found downstream of the reservoir, on the right bank of the river, almost opposite Roc Huong (Fig. 4). Nui Dat 1, 2, and 3 are also located on the right bank of the Ba, on the gentle eastern slopes of small Mount Dat, in close proximity to the local hydroelectric power station.

At these sites, we recovered Lower Paleolithic pebble tools both on the modern ground surface and in test pits in an undisturbed context.

In 2015–2018, our team conducted systematic excavations at Roc Tung and Go Da. The most technologically and typologically representative

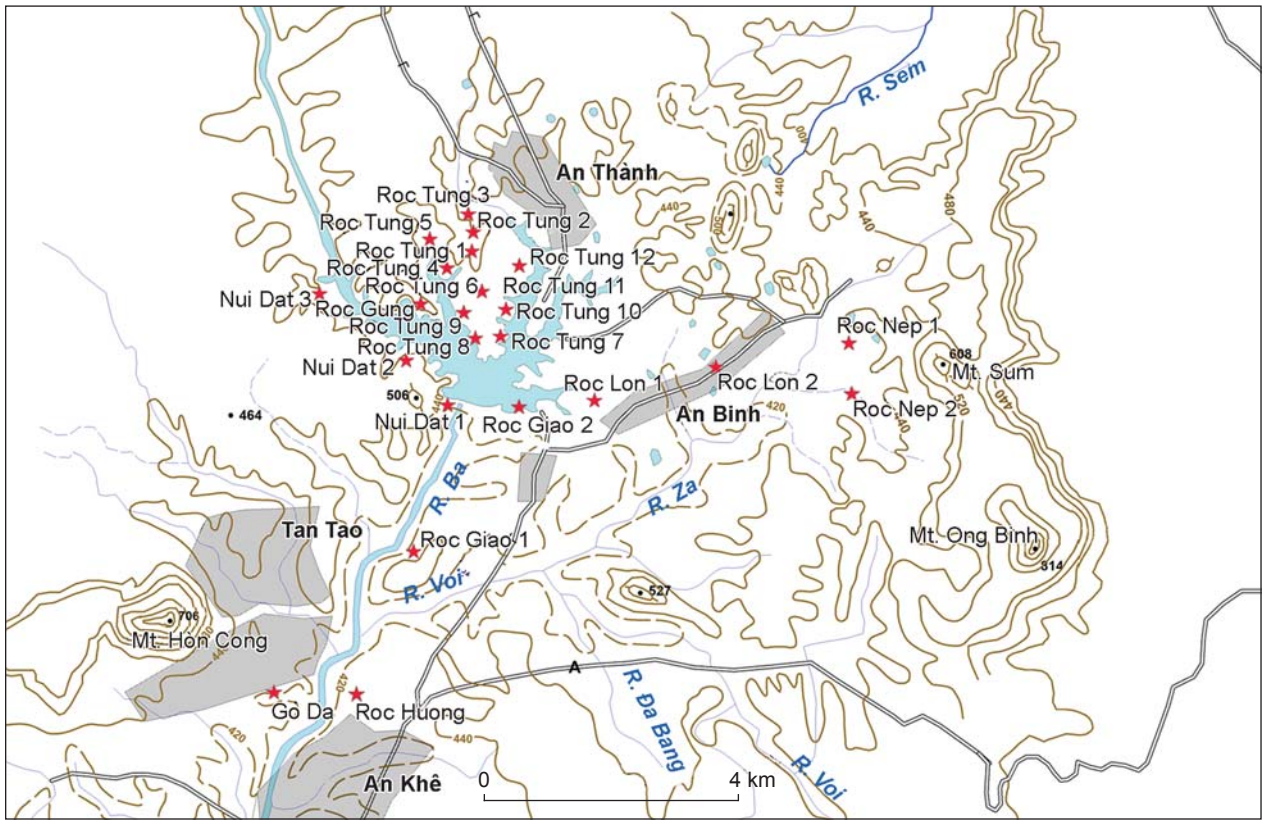

Fig. 1. Map showing the location of the An Khê Lower Paleolithic sites.

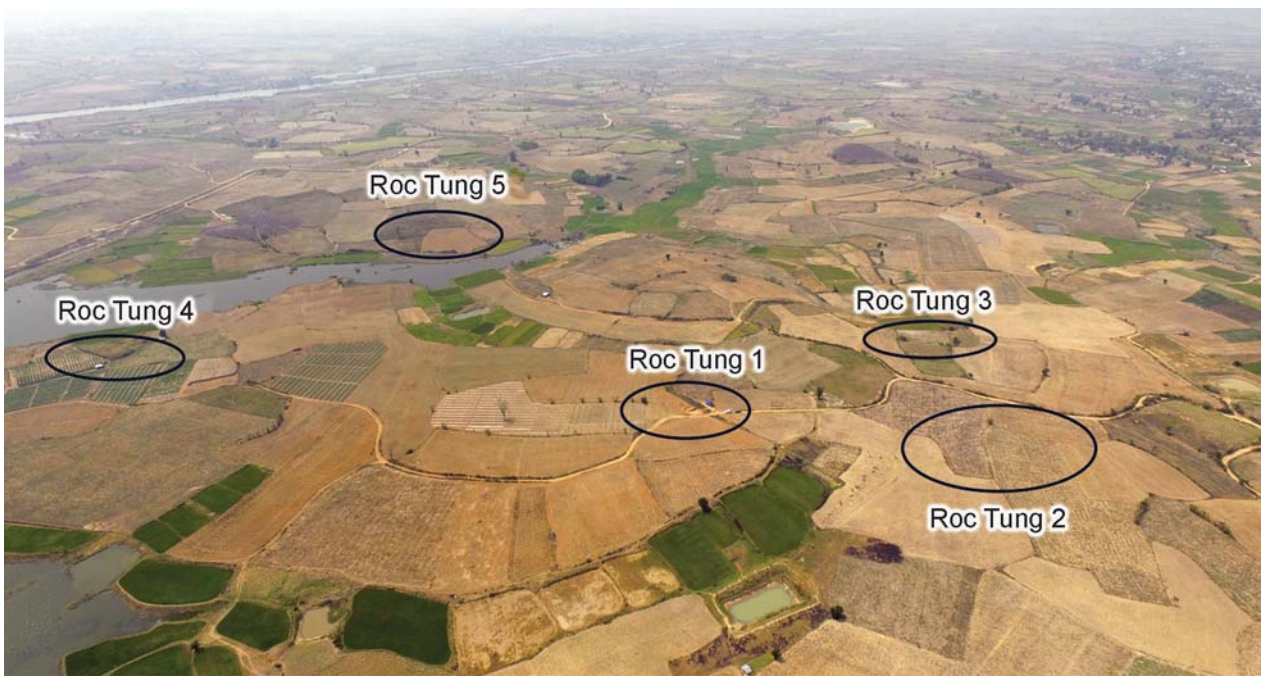

Fig. 2. Roc Tung 1–5 Lower Paleolithic sites.

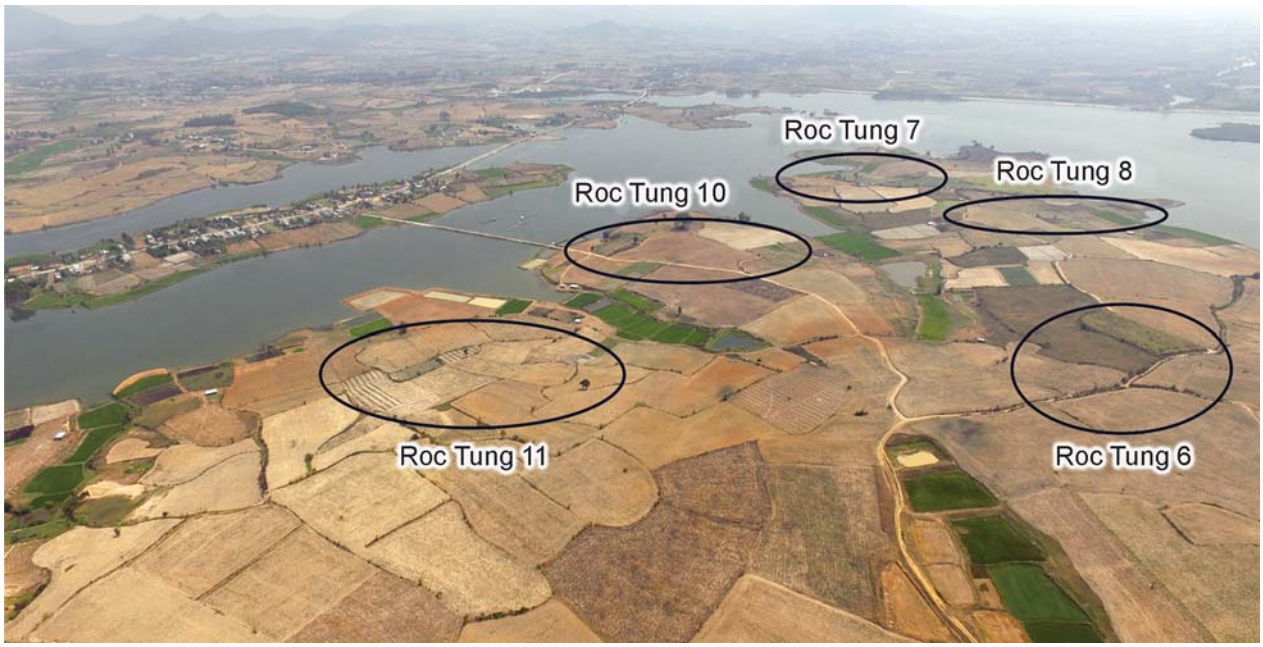

Fig. 3. Roc Tung 6–8, 10, and 11 Lower Paleolithic sites.

Fig. 4. Go Da and Roc Huong Lower Paleolithic sites.

assemblages of those yielding bifaces were collected at sites in Roc Tung. The sites are located on an elevated hilly plateau cut by numerous rivers, flowing primarily from west to east. The landscape is strongly affected by erosional activity. The bedrock is composed of basalt, acidic tuffs, and granite, while overlying sediments are primarily lacustrine and riverine, including alluvial fans. Soft sediments were accumulated mainly during the final Early and Middle Pleistocene. Before these were formed, the bedrock had been exposed to

prolonged weathering, following which a relatively thick weathering crust was developed. The upper stratum has been heavily disturbed by anthropogenic activities (plowing and construction of utility and irrigation structures) to a depth of 20–30 cm. In places where loose sediments had been disturbed (by water flows, erosion, or irrigation canals) to a depth of approximately 1 m, we recovered surface artifacts. Other sites in the Roc Tung cluster are scattered across an area of several square kilometers, and therefore cannot be regarded as one site with a single cultural horizon. In places where clusters of artifacts had been detected, we conducted test excavations 2 m^2 in area. At each of our test localities in the Roc Tung, we found artifacts *in situ* in similar contexts.

Because the sites in this area are unevenly spaced, the cluster's spatial definition must be considered tentative. Future excavations will hopefully make it possible to specify the true number of sites present on the landscape. Clearly, the area is too large to represent a single occupation of Lower Paleolithic humans. Pilot excavations demonstrated that cultural layers belonged to a single stratigraphic horizon, and all localities revealed similar lithics in terms of their technology and typology. Each of the sites has a small total area, and gives the appearance of a short-term camp in a place that was regularly revisited by ancient humans. Here we describe only excavated sites at Roc Tung and Go Da (for the detailed description of all sites see (Derevianko, in press)).

The Roc Tung 1 site (14°02′253″ N; 108°40′822″ E) is located on an elevated and relatively flat area of agricultural land. Fifty-two lithic artifacts were gathered from the ground surface: cores, pebbles and boulders with traces of modification, flakes, choppers, chopping tools, side-scrapers, unifacial point, bifaces, and spurred implements.

In 2015, upon collection of surface finds, we conducted excavations measuring 36 m^2 at an elevation of 456 m above sea level (hereinafter a.s.l.).

The stratigraphic sequence of the southern wall of excavation includes the following deposits:

The upper portion of overlying soft sediment is a spoil heap from an irrigation channel cutting through the undisturbed part of the modern ground surface. The thickness is 0.4–0.5 m. Three strata were identified there (Fig. 5).

Stratum 1. Modern soil buried under the spoil heap, and composed of light loam, gray in color. Thickness 0.1–0.2 m.

Stratum 2. Grayish-brown lightly carbonized loam with a minor admixture of grus (up to 5 %). Brownish-red lateritic inclusions occur in some places. The portion of the layer located south of excavation was destroyed by agricultural activities. Thickness 0.6–0.7 m.

Stratum 3. Brownish-red heavy eluvial loam (laterite). The sediments are highly carbonized, and gradually change color to grayish-brown toward the bottom. From the top downwards, lateritic and

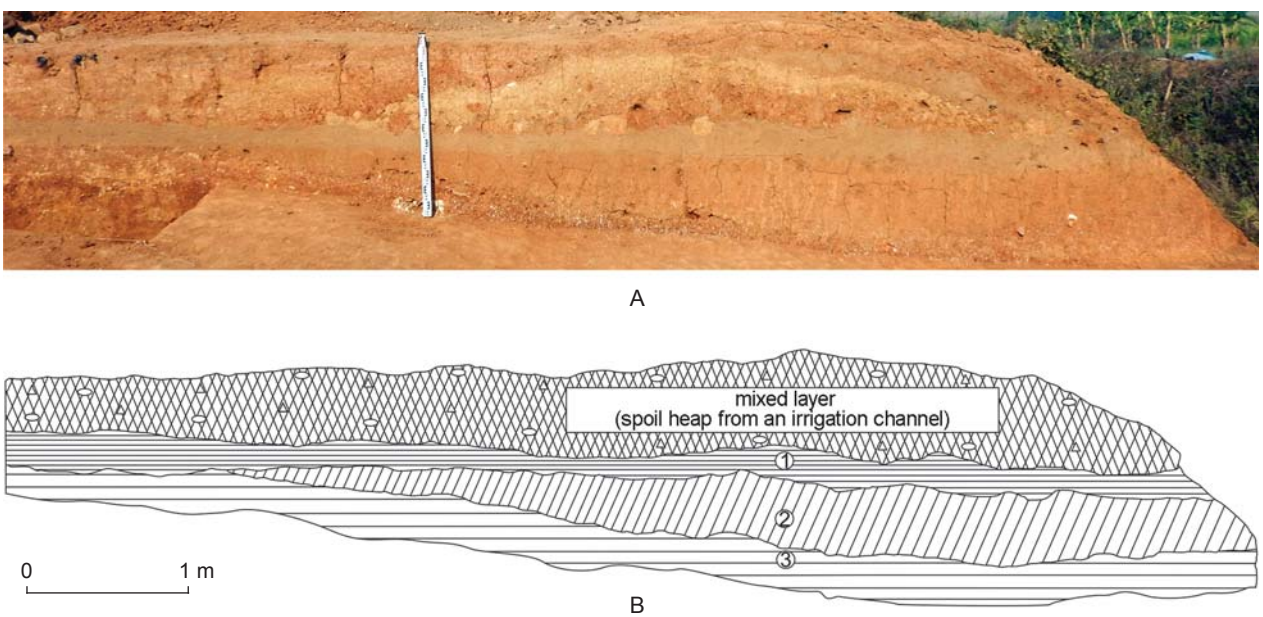

Fig. 5. Stratigraphy of Roc Tung 1.

carbonized sediments gradually mix with weathering crust. Visible thickness up to 0.55 m.

The lithic assemblage derived from the excavation consists of 70 artifacts, including pebbles with traces of test knapping (25 spec.), flakes (14 spec.), cores in various stages of reduction (18 spec.), and tools and tool blanks (13 spec.).

At Roc Tung 1, six test pits measuring 2 m^2 each were made. The pit closest to the central excavation was 25 m away, and the furthest 120 m southwest of the excavation. All the test pits display similar stratigraphy, and contain Lower Paleolithic artifacts. In test pit 2, we found two core artifacts. One of them is a single-platform core with one flake removal surface and a cortex striking platform. The other one is a single-platform nucleus with two adjacent flaking surfaces. A chopper-like side-scraper and a spurred tool were also recovered from the pit.

Roc Tung 2 was discovered 324 m northeast of Roc Tung 1 (14°02′253″ N; 108°40′929″ E). The site is located at an elevation of 452 m a.s.l. Twenty-two artifacts were collected from the ground surface. The assemblage consists of a core, pebbles with traces of test knapping (4 spec.), large pick-shaped chopping tools and their blanks (11 spec.), and flakes (6 spec.).

Not far from this site, 390 m northeast of Roc Tung 1, we discovered the site of Roc Tung 3. Here, three artifacts were collected from the ground surface and three artifacts were found in the test pit, in the stratigraphic context similar to that recorded at other sites.

Roc Tung 4 (14°02′053″ N; 108°40′584″ E) is one of the most informative sites in our study area. It is located at 438 m a.s.l., precisely 569 m southwest of Roc Tung 1. Fifty-six lithic artifacts were recovered from surface collections: cores (5 spec.), pebbles with traces of test knapping (17 spec.), and large laminar spalls and flakes (34 spec.).

In 2016, we conducted an excavation 1, 12 m^2 in area, along with six test pits (No. 1–6) measuring 2 m^2 each at Roc Tung 4. We observed the following stratigraphic sequence in the excavation and test pits:

Stratum 1. Modern soil consisting of two sublayers.

A. Light loam gray in color with a minor admixture of grus. Thickness 0.1–0.2 m.

B. Light loam light-grayish-brown in color with a minor admixture of grus (5–7 %). Thickness 0.20–0.25 m.

Stratum 2. Heavily carbonized lateritic loam with a high fraction of grus (30–40 %) reddish-brown in color. The color of sediments changes to grayish-brown toward the bottom. The upper portion of the stratum is a horizon of boulders and grus, where lithic artifacts were found. Visible thickness 0.5–0.6 m.

The lithic assemblage recovered from the excavation consists of 73 artifacts, including cores (8 spec.), pebbles with traces of test knapping (31 spec.), flakes (30 spec.), and tools and their blanks (4 spec.).

In 2017, we continued field studies at Roc Tung 4. Two excavations and four test pits (No. 7–10) measuring 2 m^2 each, were made. Test pit 8 was expanded into excavation 3 (Derevianko et al., 2017a), while we conducted excavation 2 (30 m^2) in the area adjoining the eastern wall of excavation 1, originally examined in 2016.

We observed the following stratigraphic column in excavation 2:

Stratum 1. Modern soil. Light loam gray in color with a minor admixture of grus. The horizon is heavily disturbed by modern agricultural activities. Thickness 0.10–0.25 m.

Stratum 2. Grayish-brown loam with a red tint. It contains a minor admixture of grus (up to 5 %). The sediments are lightly carbonized, and comprise some brownish-red lateritic inclusions. The stratum occurs sporadically. Its major part was possibly destroyed by agricultural activities. Thickness 0.10–0.15 m.

Stratum 3. Brownish-red, highly carbonized lateritic loam. In its upper part, the horizon of boulders and grus can be observed, and yields lithic artifacts. Visible thickness up to 0.4 m.

The artifact assemblage from the excavation comprises 80 pieces. It includes pebbles with traces of test knapping (26 spec.), core preforms (2 spec.), flakes (41 spec.), cores (3 spec.), and tools (8 spec.). Boulders and pebbles of fine-grained siliceous rock were used as raw materials.

Excavation 3 is located at 440 m a.s.l., on a gentle slope, 35 m northeast of excavation 2. Stratigraphic context is the same as in excavation 2. The cultural horizon yielded 383 lithic artifacts, including pebbles with traces of test knapping (101 spec.), core preforms (11 spec.), flakes (206 spec.), cores (30 spec.), tools (32 spec.), and tool blanks (3 spec.). The most common raw material was siliceous rock characterized by dense fine-grained structure, almost without internal defects. Quartzite was much more rarely used.

Roc Tung 5 (14°02′302″ N; 108°40′471″ E) is located at 443 m a.s.l., 632 m northwest of Roc Tung 1, on a gentle slope of the eastern coast of a small cove of the water reservoir. Artifacts collected from the site's surface number 15 in total: cores (3 spec.), pebbles with traces of test knapping (3 spec.), flakes (3 spec.), tools (5 spec.), and one tool blank.

Roc Tung 6 (14°01′782″ N; 108°40′927″ E) is located at 448 m a.s.l., 903 m southeast of Roc Tung 1, on a hill with slopes smoothed by agricultural activities. Judging by remnants of small hillocks, now covered with bushes, at least 1 m of the sediment initially present at the site has been removed through human action. Archaeological remains were found on the slope declining towards northeast.

Roc Tung 7 (14°01′421″ N; 108°41′116″ E) is located at 440 m a.s.l., 1600 m southeast of Roc Tung 1, on one of the small elevations gently sloping eastwards, with a 1.5 m deep rice platform. The rest of the slope is heavily deformed by agricultural activities and occupied by cultivated fields (Derevianko, Tsybankov, Nguyễn Giang Hai et al., 2016). Archaeological remains were recovered both from ground surface and from within sediment deposits.

We conducted excavation 1, 20 m^2 in area, approximately 30 m north of the hollowed rice field, and observed following stratigraphic sequence:

Stratum 1. Modern soil, light loam gray in color. This horizon is heavily disturbed by modern agricultural activities. Thickness 0.10–0.15 m.

Stratum 2. Brownish-red, strongly carbonized lateritic loam with a high fraction of grus (up to 30 %). The top part of the stratum consists of fine and medium-sized, heavily weathered quartzite pebbles, with archaeological remains. Visible thickness 0.20–0.25 m.

The artifact assemblage recovered from the excavation is made up of 150 pieces, including pebbles with traces of test knapping (52 spec.), core preforms (5 spec.), flakes (63 spec.), cores (11 spec.), and tools (19 spec.).

At Roc Tung sites 8–12, we collected surface finds and excavated test pits, which revealed similar stratigraphic composition to other sites.

A somewhat different stratigraphy can be observed at the sites located on the right bank of the Ba River, of which Go Da is the best studied site in this locality. The site is located (13°58′306″ N; 108°39′136″ E) 2 km from the central bridge across the river, at 440 m a.s.l., and approximately 50 m above the water's edge. The excavation was made 900 m west of Ba, on a hill composed of granite bedrock. A part of the site has been destroyed by modern quarrying. A deposit section approximately 41 m long remains undisturbed. This east-west oriented section declines in elevation towards the west. The base of the section consists of granite overlain with weathering crust between 20–30 cm thick. The weathering crust is covered by slope wash sediments forming an apron. These sediments are suggestive of significant environment and climate change—most probably, a strong cooling event. The slope wash sediments include coarse-grained sandy loam, angular grus, and granitic debris. The maximal thickness of the apron is observed in the eastern part of the deposit, the minimal thickness in the western part. In some places, we observed accumulations of coarse debris; the largest such accumulations are concentrated in the central part of the deposit.

The apron appears to have been formed primarily due to weathering of the granite bedrock and minor transport of coarse debris from the most elevated areas of the ground surface. Erosional processes accompanied formation of the apron, rendering its upper portion uneven, while its basal part evenly covers the bedrock and weathering crust. The stratum containing the main cultural horizon was produced by slope wash and erosion processes; herein lies its distinction from the cultural horizons on the left bank of the Ba River.

At Roc Tung and other sites on the left bank of the Ba, cultural horizons are located within a laterite overlying, and partially included in, the weathering crust on the granite bedrock. At Go Da, the cultural horizon was found directly in the weathering crust and slope wash sediments. No distinct red laterite layers (which would attest to very warm and humid conditions) are found at Go Da. When hominins settled in the An Khê region, the climate would have been cool and arid, prompting the intense deflation and erosion visible in the deposits on the right bank of the Ba River. Apparently, humans still lived there when the environment changed: when the climate became warmer and more humid, loose laterite deposits like those at Roc Tung would have begun to form. The dates of the two sites differ by nearly 30 thousand years.

The Go Da cultural horizon is covered by loose sediments with various origins. They were repeatedly redeposited with large time intervals in between deposition events. These sediments include weakly lithified lateritic, slope wash, aeolian, and clay-rich components. Thus, the sedimentation processes occurring on the right bank of the Ba appear to have differed significantly from those on the left bank.

It can be assumed that in the Early Pleistocene, the granite bedrock was exposed for a long time, causing a weathering crust to be formed by deflation. During the cooling event at the final stage of the Early Pleistocene, slope wash apron was formed from weathering crust (5–10 cm), large angular grus, and debris. We recovered lithic artifacts from the weathering crust and in the

lower portion of the apron. Laterite was subsequently formed in sediments overlying the apron; however, owing to redeposition and anthropogenic interference, this laterite horizon cannot be traced as clearly as at the Lower Paleolithic sites on the left bank of the Ba River. However, based on stratigraphic positioning, the Lower Paleolithic sites on the right bank are somewhat older than those on the left bank.

Bifacial industry from Lower Paleolithic sites in Vietnam

Over four years of investigations conducted at the Lower Paleolithic sites with bifaces near the town of An Khê, approximately 1200 lithic artifacts were found, including 872 pieces recovered from cultural horizons, and more than 300 pieces collected from the ground surface. All finds belong to the Lower Paleolithic and are very similar in terms of typology and techniques of primary and secondary reduction. Bifaces and picks represent the principal types of tools. The industry of this sort was discovered in Vietnam for the first time. We propose to name this industry the An Khê culture.

Lithic artifacts recovered from the Lower Paleolithic sites in the Ba River basin can be classified into eight main categories: (1) cores and bifaces (implements flaked on both sides) (11 spec.); (2) picks (56 spec.); (3) spurred tools (40 spec.); (4) carinated end-scrapers (4 spec.); (5) side-scrapers of various types (54 spec.); (6) choppers and chopping tools (70 spec.); (7) denticulate tools; (8) notched tools (Derevianko, Sử, Tsybankov et al., 2016). Cores and tools were mostly made on pebbles and boulders varying in size and shape, and on their fragments. Rare tools were fashioned on flakes, and unretouched flakes were occasionally utilized. Course-grained vein quartz was the main raw material in the Ba River basin; quartzite was very seldom used. Inhabitants of the sites appear to have collected the raw material in the river valley, where large stones had rolled down in the course of deflation and erosional processes.

At all the Lower Paleolithic sites studied, primary reduction was aimed at manufacturing simple pebble cores, with one or two cortex striking platforms. Assemblages contain a small number of cores with a striking platform created by the removal of one or two flakes, and radial nuclei. Some cores of the first two types demonstrate several flaking faces. Cores with cortex striking platforms in the studied assemblage include specimens where a flaking surface and striking platform form nearly a right angle (Fig. 6, *1*). Amorphous flakes of varying size were detached from such cores. In some cases, flaking surface and striking platform are arranged at an acute angle (Fig. 6, *2*). Judging by removal scars, large flakes with a salient bulb of percussion were detached from such cores.

Cores of the second type exhibit a striking platform prepared predominantly by a single removal (Fig. 6, *3*). Flakes were detached from two conjoining or opposite sides of the core's lateral surface (Fig. 6, *4*). In very rare cases, cores with two platforms and two flaking faces exhibit initial flaking surfaces that served as the platform for subsequent detachments (Fig. 6, *5*).

Radial cores are occasionally encountered in the lithic assemblage from the study sites (Fig. 6, *6*, *7*). These are normally round in shape and have a lenticular profile and cross-section. Most of them exhibit a striking platform prepared on the edge between the flaking surface and the back of the core. Large flakes were produced via centripetal removals. The preparation of such cores required considerable skill and knowledge of the properties of rocks (Derevianko, Sử, Tsybankov et al., 2016: 12).

Judging by the location of working edges, available choppers and chopping tools can be subdivided into transverse (Fig. 7, *1*) and longitudinal (Fig. 7, *2*) choppers. Some specimens exhibit a sharpened tip (Fig. 7, *3*, *4*). Some chopping implements show retouch on one surface of the working edge, others on both. Secondary reduction was focused largely on the blade; whereas other areas retained cortex.

Implements with a deliberately fashioned spur (or a "nose-shaped" point) (Fig. 7, *5*) constitute a special category of tool. Distinguishing these from bifaces and picks, the point on this tool type was produced by the detachment of large flakes, or by additional retouching and small spalls forming a kind of shoulder. Some tools in this category are quite large and weigh up to 4 kg.

Side-scrapers form a fairly high percentage of the tool assemblage. These implements can be classified according to longitudinal and transverse working edges. The specimens are further characterized by convex (Fig. 8, *1*), concave, undulating, or serrated (Fig. 8, *2*) working edge. Most side-scrapers were fashioned on pebbles (Fig. 8, *3*, *4*); some implements were made on large flakes or fragments of pebbles (Fig. 8, *5*, *6*). In distinction from choppers or chopping tools, side-scrapers were produced on flatter pebbles fashioned by two or three rows of large spalls, and subsequently trimmed with fine marginal retouch.

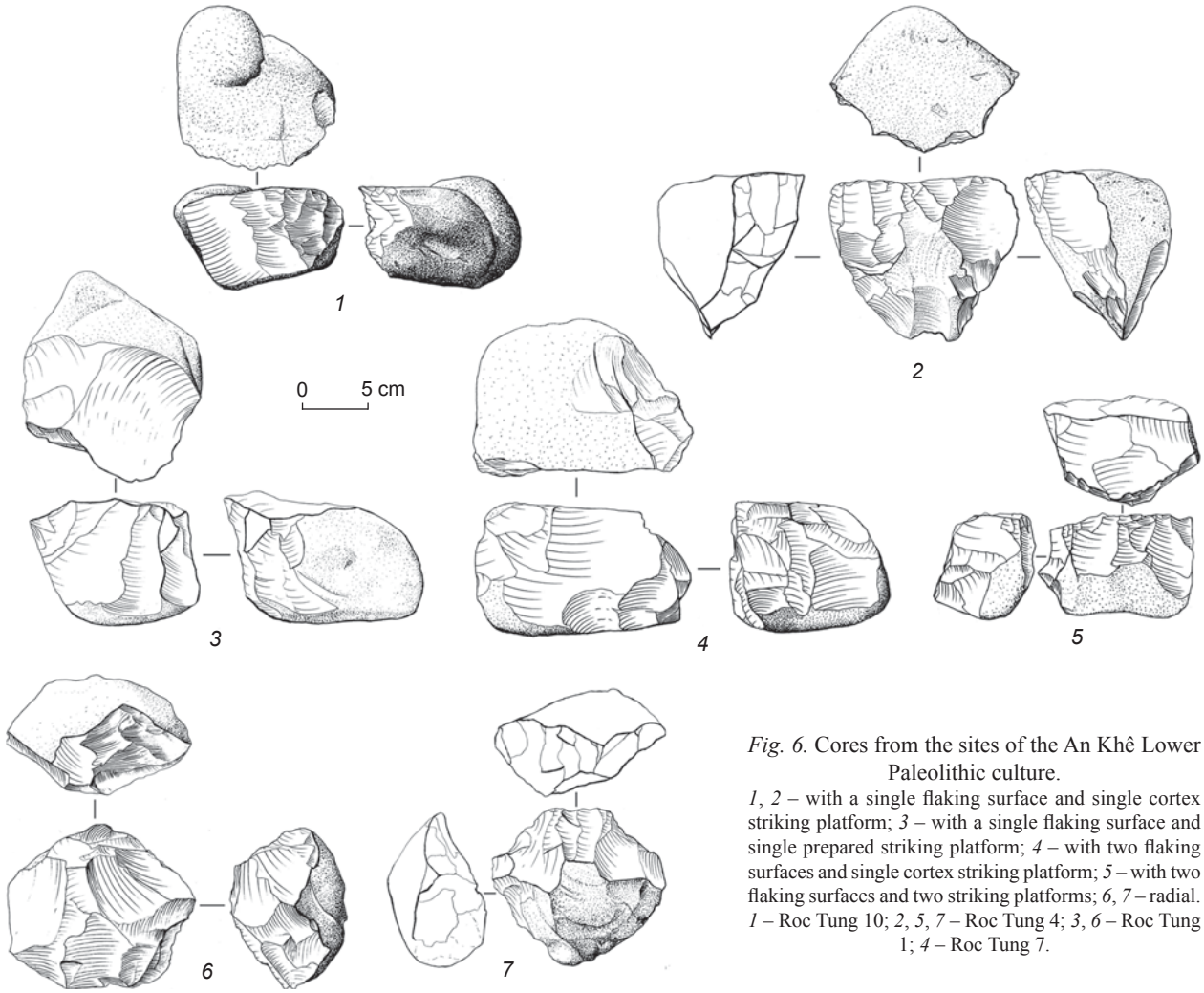

Fig. 6. Cores from the sites of the An Khê Lower Paleolithic culture.
1, *2* – with a single flaking surface and single cortex striking platform; *3* – with a single flaking surface and single prepared striking platform; *4* – with two flaking surfaces and single cortex striking platform; *5* – with two flaking surfaces and two striking platforms; *6*, *7* – radial. *1* – Roc Tung 10; *2*, *5*, *7* – Roc Tung 4; *3*, *6* – Roc Tung 1; *4* – Roc Tung 7.

Working edges were flaked on one or both sides. In all cases, the back of the tools retains cortex.

The tool kit also contains denticulate (Fig. 9, *1*, *2*) and notched implements. Most of them are smaller than choppers, chopping tools, or side-scrapers. The working edge is fashioned by large spalls removed from the longitudinal or transversal lateral margin. Some specimens exhibit alternate retouch that forms notches. Similarly to other tools, only the working edge was trimmed, whereas on other parts of the implements cortex was preserved.

Core-shaped scrapers and carinated end-scrapers (Fig. 9, *3*–*5*) form a small though notable tool grouping. These were produced mostly on elongated pebbles. One end of this tool type usually displays scars from small and narrow removals. Core-shaped scrapers are numerous at Lower Paleolithic sites scattered across a large territory, and comprise a special category of Lower Paleolithic tool. The earliest core-shaped scrapers were recovered from the pre-Acheulean horizons of Olduvai (Leakey, 1971). Carinated end-scrapers were recorded at some Lower Paleolithic sites with pebble-flake and Acheulean industries in Africa, Near East, Caucasus, Siberia (Karama site), and elsewhere (Clark, Kleindienst, 1974; Lyubin, Belyaeva, 2004; Amirkhanov, 2006; Derevianko et al., 2005). Their presence at Lower Paleolithic sites widely separated in time and space likely resulted from technological convergence, not from migrations (Derevianko, 2015).

Bifaces required the most energy expenditure and skill to produce. All implements in the analyzed assemblage were made on large, elongate, triangular pebbles with a lenticular profile and cross-section. The convergent tip of such tools exhibits large flake removals on both sides (Fig. 10). In some cases, the working edge was trimmed through the removal of smaller spalls, while the remainder of the tool

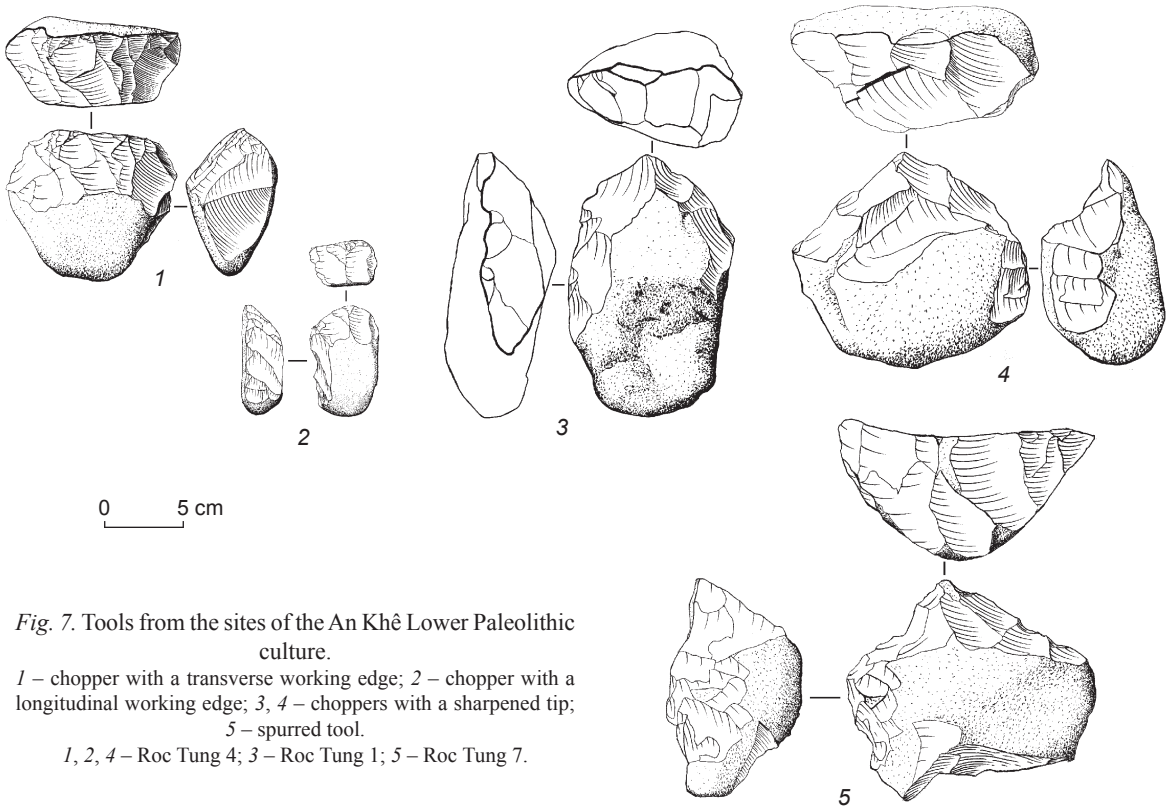

Fig. 7. Tools from the sites of the An Khê Lower Paleolithic culture.
1 – chopper with a transverse working edge; *2* – chopper with a longitudinal working edge; *3*, *4* – choppers with a sharpened tip; *5* – spurred tool.
1, *2*, *4* – Roc Tung 4; *3* – Roc Tung 1; *5* – Roc Tung 7.

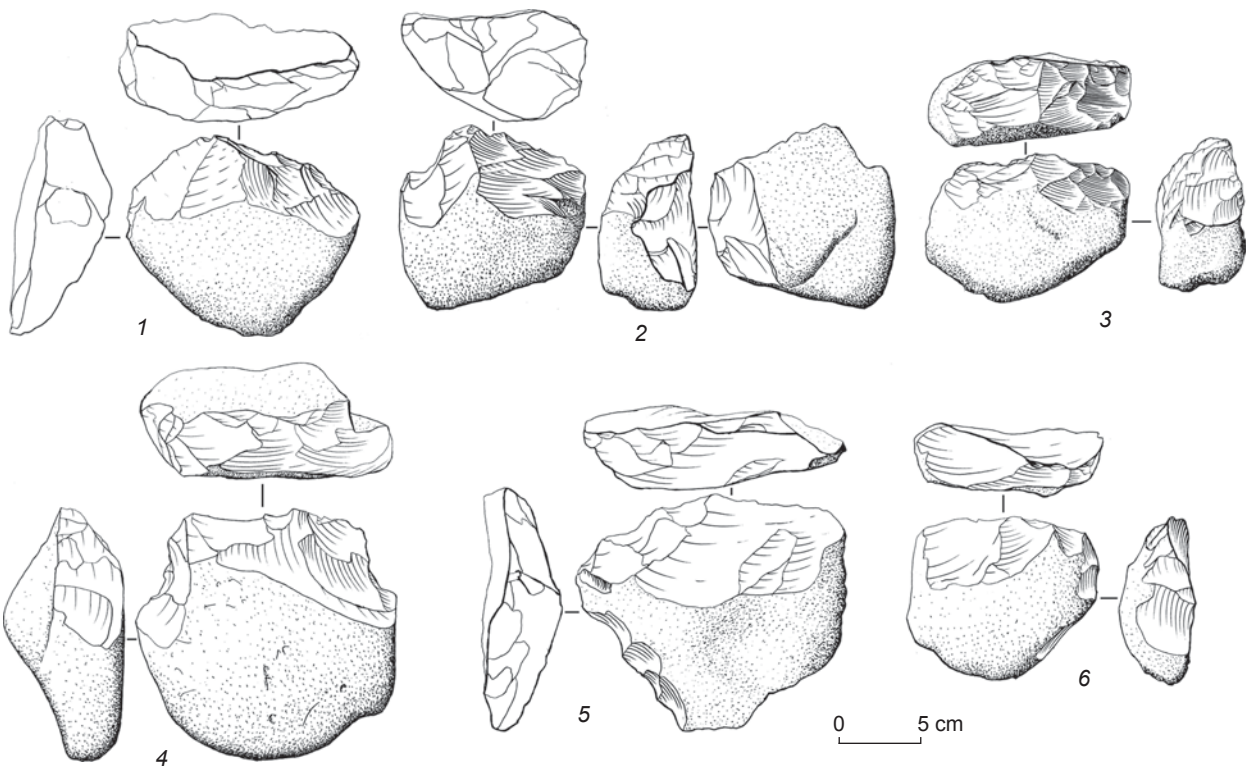

Fig. 8. Side-scrapers from the sites of the An Khê Lower Paleolithic culture.
1 – side-scraper with a convex working edge; *2* – side-scraper with an undulated working edge; *3*, *4* – side-scrapers on pebbles; *5*, *6* – side-scrapers on flakes.
1, *2*, *5*, *6* – Roc Tung 4; *3* – Roc Tung 1; *4* – Roc Tung 7.

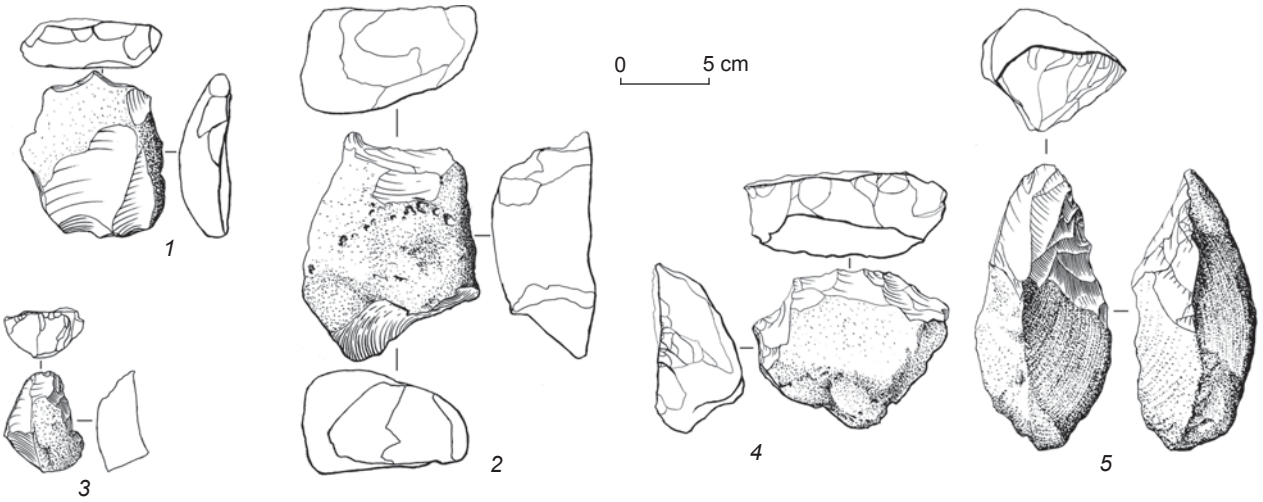

Fig. 9. Tools from the sites of the An Khê Lower Paleolithic culture.
1, *2* – denticulate tools; *3–5* – core-shaped scrapers.
1 – Roc Tung 4; *2–5* – Roc Tung 1.

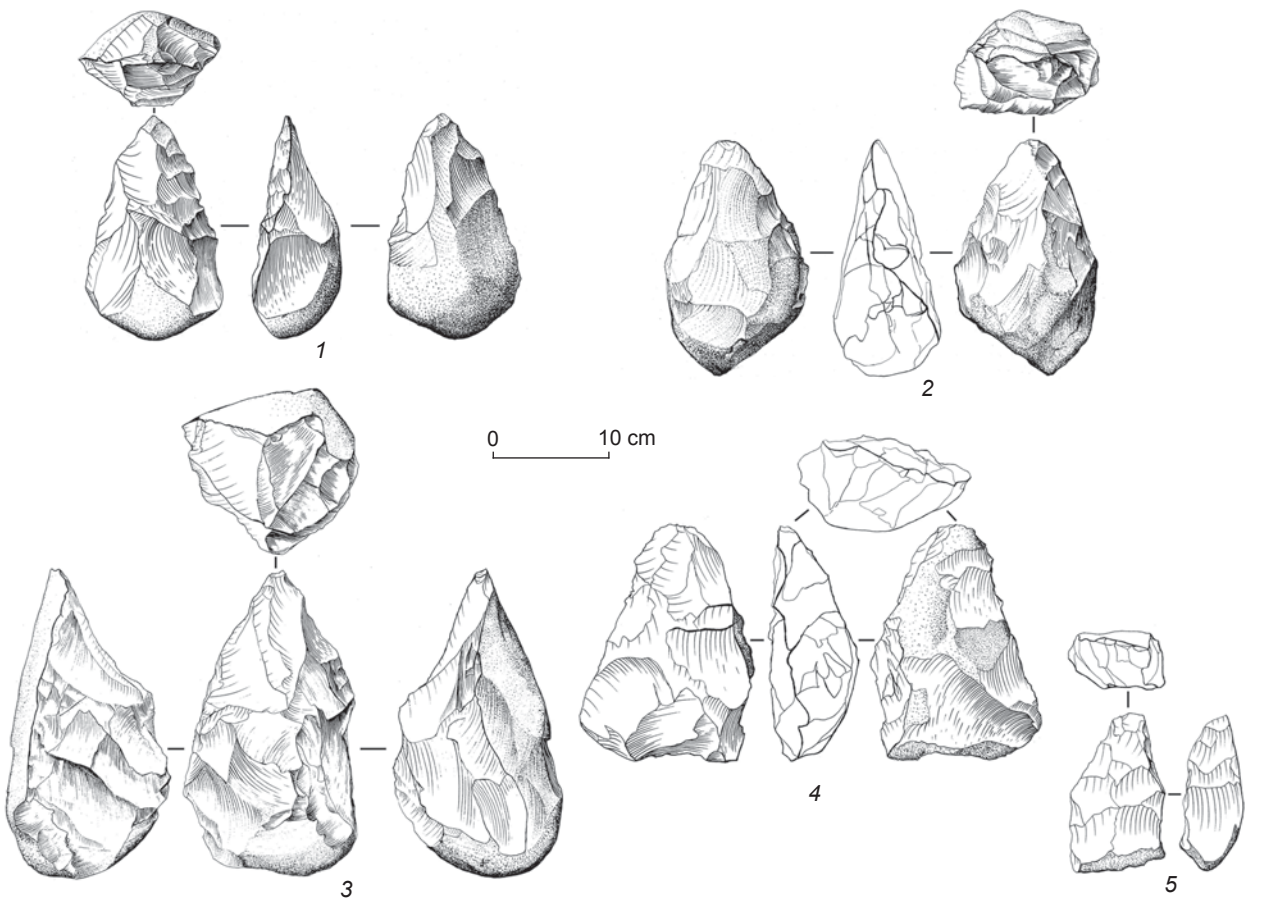

Fig. 10. Bifacially worked tools from the sites of the An Khê Lower Paleolithic culture.
1 – Roc Giao 1; *2* – Roc Lon 2; *3* – Roc Tung 10; *4* – Roc Tung 4 (excavation 3); *5* – Roc Tung 7 (excavation 1).

is covered with cortex. Some artifacts also show evidence of additional working near the "butt" of the biface. A series of symmetric, triangularly elongated bifaces with an unmodified back end contains two specimens that are worth particular mention. One of these was found in excavation 3 of Roc Tung 4 (Fig. 10, *4*). This biface was fashioned on a large elongated pebble. It has a straight base and slightly curved working edge. In terms of shape, it resembles a shark tooth. One surface of the tool is flat and completely covered with scars from centripetal removals; another surface is convex and almost completely treated with flake removals. Only a small area in the center retains cortex. Another biface, found in the excavation at Roc Tung 7, displays scars of partial trimming of flat surface by marginal retouch along the entire perimeter (Fig. 10, *5*).

Pick tools in the assemblage resemble bifaces in both shape and reduction technique. These were made mostly on large pebbles and boulders, and are normally large and heavy. Only the pointed working edge was subjected to secondary reduction, while the rest of the surface of such implements retains original cortex. The working edge of these tools was bifacially (Fig. 11, *1*, *3*) or unifacially (Fig. 11, *2*) processed. Regardless of the form of the blank, the section of the working blade was triangular, typical of picks. Unlike bifaces, picks have a distinct sharp-pointed and elongated tip; some tips are asymmetric (Fig. 11, *4*).

The lithic industry discovered on the left bank of the Ba was based on the exploitation of local raw material. Cores and tools were made on quartzite pebbles and boulders, and raw material of low quality was often used. Blanks were heavily cracked and coarse-grained, which hampered effective knapping. The recovery of numerous pebbles with traces of test knapping and unidentifiable fragments supports this inference. Blanks were detached from simple cores with a single flaking surface and one or two striking platforms, bearing scars of minimal preparation. Transversally-oriented detachments predominated in the assemblage. Heavily exhausted cores are absent; most cores exhibit scars of only one series of primary removals. Radial nuclei are similarly scarce, and flakes as potential blanks appear to have been of minor importance. Most flakes in the assemblage appear entirely without traces

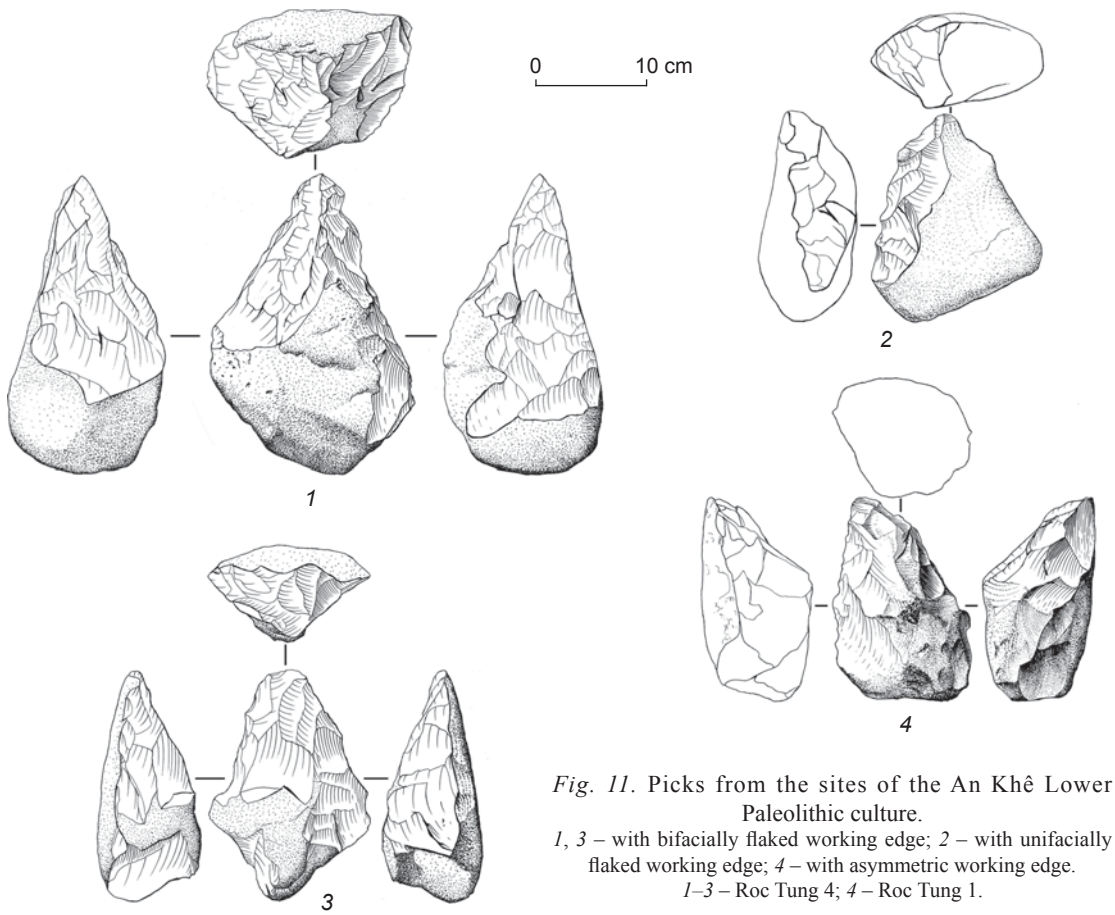

Fig. 11. Picks from the sites of the An Khê Lower Paleolithic culture.
1, *3* – with bifacially flaked working edge; *2* – with unifacially flaked working edge; *4* – with asymmetric working edge.
1–3 – Roc Tung 4; *4* – Roc Tung 1.

of secondary reduction. This industry, in general, can be classified as a pebble industry, since most tools were fashioned on pebbles; only some small-sized side-scrapers, denticulate and notched tools were manufactured on flakes. Picks, spurred implements, choppers, and chopping tool types predominate in the toolkit, while side-scrapers and notched tools are less frequent. One of the most critical features of this assemblage is the presence of bifacially worked tools that resemble Acheulean bifaces in terms of morphology and technique.

Given the technological traits of this industry and their stratigraphic location, this industry is undoubtedly Lower Paleolithic—an observation that we confirmed through geochronology. Along with lithic artifacts, we recovered around 200 tektites, melted and firmed glassy bodies formed by meteorite impacts. Two tektite samples from Go Da and Roc Tung 1 were analyzed in the Laboratory of Isotope Geochemistry and Geochronology in the Institute of Geology of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences (Moscow). The date of 806 ± 22 ka BP (lab code 15962) was obtained for the cultural layer at Go Da, while the Roc Tung 1 cultural layer was dated to 782 ± 20 ka BP (lab code 15963).

The discovery of a Lower Paleolithic (final Early Pleistocene) bifacial tradition in Vietnam strongly suggests that Southeast Asia was one of the regions where this industry originated.

Lower Paleolithic bifacial industries in East, Southeast, and South Asia

Hallam Movius separated the Lower Paleolithic industries into two zones: the western zone, where bifaces predominated (including Africa and Eurasia west of central India), and the eastern zone, where choppers and chopping tools were most common (territories east of central India). At the time his "Movius line" hypothesis was formed, he was nonetheless aware of bifaces found in Southeast Asia. Gustav von Koenigswald was the first to report on bifaces found in 1935 at Patjitan, in the southern part of Central Java. Later on, bifaces were discovered in Sumatra, Kalimantan, Bali, and other regions. Movius himself (1944, 1949) identified 153 handaxes in the Patjitan industry, where they made up 6.32 % of the tools. They were less numerous than choppers (17.8 %). The industry also contained chopping tools (3.68 %), hand adzes (3.59 %), and proto-handaxes (8.06 %), which are typologically closer to handaxes than to choppers or chopping tools (Ibid.).

Knowing about such bifaces in the Patjitan industry and those found at Tingtsun, China, Movius (1956, 1958) nonetheless argued that the Paleolithic of East and Southeast Asia was radically different from that of the remaining part of Eurasia. Two possible explanations can be posited for how he may have reconciled this discrepancy. The first is that Movius attributed the Patjitan industry to the Late Pleistocene. Indeed, the Tingtsun bifaces date to that stage. In Europe, this period corresponded to the post-Acheulean age, when the Mousterian was underway. The second reason may be that at the time when the study of the Paleolithic in eastern Eurasia had only begun, Movius felt that the lithic industries of that part of the world and those in the west had. developed along different trajectories.

Although the specific evidence for this division has changed, the totality of archaeological data accumulated over the last six decades supports the east-west division of the Paleolithic industries proposed by Movius—an idea that is further supported by the discovery of the bifacial industry in Vietnam.

The migration of *Homo erectus* associated with the Acheulean from Africa to Eurasia began ca 1.4 Ma BP. The earliest evidence for this movement comes from Ubeidia, Israel—the earliest Acheulean site in Eurasia (Bar-Yosef, Goren-Inbar, 1993). A number of Acheulean sites in Levant, dating to ca 1 Ma, may indicate continuity in the evolution of hominins in that region (Derevianko, in press), although this is only a hypothesis requiring further proof. The second migration wave of *Homo erectus* with the Acheulean industry from Africa to the Near East occurred during the MIS 20, as evidenced by the thoroughly studied site of Gesher Benot Ya'akov (Goren-Inbar, 1992, 2011; Goren-Inbar, Feibel, Verosub et al., 2000; Goren-Inbar, Sharon, 2006; Goren-Inbar, Grosman, Sharon, 2011; and others). What were the repercussions of this wave further east?

The important transit areas for the Acheuleans were the Arabian Peninsula and the Iranian Plateau. In Arabia, the Acheulean localities are primarily represented by surface sites (Petraglia, 2003; Amirkhanov, 2006; and others). The Arabian Acheulean is characterized by bifaces in tandem with implements made on flakes, choppers, and chopping tools. The vast majority of cores are unidirectional with subparallel flaking; cleavers are mostly absent. The northern Arabian Acheulean, unlike that of southern Arabia, includes a few cleavers. The Levallois reduction technique was

seldom if ever practiced either in the north or in the south of Arabia. The Acheulean appeared in Arabia ca 500–450 ka BP.

The comparison of technological and typological features of the Acheulean in southern Arabia and in the Near East suggests that bifaces are among the few common features of those industries. In the Near East, however, bifaces were made mostly on flakes, whereas in southern Arabia they were made on nodules and large cores. In Arabia, bifaces were prepared by the removal of variously sized flakes, whereas retouch was almost never practiced. The typical Levallois technique of primary reduction was not used in southern Arabia. In the Near East, its earliest example comes from Gesher Benot Ya'akov. Eventually, the Levallois technique became predominant at Acheulean sites.

In Iran, approximately 15 Acheulean sites have been discovered. Most of these are concentrated in the country's northwestern reaches, near the Levant and the Caucasus, and in the northeastern area, adjoining Turkmenistan (Biglari, Nokandeh, Heydari, 2000; Biglari, Heydari, Shidrang, 2004; Biglari, Shidrang, 2006; and others). Acheulean assemblages have been recovered mostly from surface sites, and consist of a few bifaces and cleaver-like implements. These suggest that the Levallois technique was rarely used. The earliest sites can be attributed to the period not earlier than 500–450 ka BP.

In Central Asia, the Late Acheulean industry has been identified in Kazakhstan, Turkmenistan, and Mongolia. The most distinct bifacial industry is associated with the final Lower and early Middle Paleolithic localities (Derevianko, 2014). In this vast region, assemblages with bifaces have been discovered from northwestern Kazakhstan (Mangyshlak Peninsula), in the Cis-Baikal, and in the Irtysh River basin. In Kazakhstan, the greatest number of bifacially worked tools have been recovered from the Mugodzhar Hills (Derevianko, 2014).

Across Central Asia, all Paleolithic assemblages containing bifacially worked tools are characterized by the Levallois primary reduction technique, and cleavers are absent. Bifacially worked tools, mostly fashioned on subtriangular pebbles, are few or isolated. Technologically and typologically, these bifacial tools cannot be regarded as a coherent group. All the Paleolithic localities in Central Asia are not older than 300–250 ka years.

The Indian subcontinent should be specified as a region where bifacially worked tools appeared very early. In South Asia, approximately 10 archaeological sites with bifaces dating from 1.2 to 0.6 Ma years old have been identified. This category of sites includes Isampur (Paddayya, 2001; Paddayya, Jhaldiyal, Petraglia, 2006; and others); Attirampakkam (Pappu, Akhilesh, 2006; Pappu et al., 2011; and others); Morgaon (> 780 ka BP); Singhi Talav (> 800 ka BP); and Bori (670 ± 30 ka BP) (Mishra et al., 1995; Paddayya, Jhaldiyal, Petraglia, 2006; Pappu, Akhilesh, 2006; Gaillard et al., 2009; and others). Assemblages from these sites include bifacially worked tools made on pebbles. The presence of Acheulean cleavers in this region is dubious, and one of the present authors believes that in India, as in East and Southeast Asia, the emergence of bifaces was due to convergent technological evolution (Derevianko, 2014).

The probable migration event associated with the Late Acheulean likely reached India ca 600–500 ka years ago, or possibly somewhat earlier. R. Dennell (2009: 375) claimed that the Acheuleans appeared in India and Pakistan no earlier than 700–600 ka BP. In India, several hundred Late Acheulean sites are known, spanning the time interval between 500–100 ka BP. A convergent, independent emergence of the bifacial technique in South Asia (ca 1 Ma) is suggested by the observation that in adjacent territories west of India (Arabia and Iran), the Acheulean industry appeared no earlier than 700 ka BP.

In summary, the first migration wave of *H. erectus* associated with the Acheulean appears to have moved from Africa eastwards ca 1.4 Ma BP, but had not spread beyond the Near East. The second such wave, originating from Africa at the boundary between the Early and the Middle Pleistocene (Gesher Benot Ya'aqov), marked a rapid advance of the Acheulean into Europe and Asia. This could be either a direct migration or a chain-like transmission of skills involved in the bifacial technology from one hominin group to another.

In Asia, first bifacially worked tools were discovered in China. Assemblages recovered from Pingliang and Yunxian contain solitary bifaces and cleavers (Le site…, 2008; Huang Weiwen, Hou Yamei, Seong Hyun-kyung, 2005). About 30 Paleolithic sites with so-called handaxes and cleavers attributable to the Lower, Middle, and Upper Pleistocene have been identified at this locality. Bifaces were most numerous in the Guangxi Zhuang Autonomous Region, in the Baise Basin, bordering Vietnam. Using 40Ar/39Ar dates on tektites from Baise localities, these sites with bifaces have been dated to ca 732 ± 39 and 803 ± 3 ka BP (Hou Yamei et al., 2000). The biface-bearing horizon contained tools with working edge flaked on both faces, including chopping tools with reduction extending to a

greater or lesser surface, resembling the earliest bifaces of Africa (Xie, 2002; Xie, Li, Huang, 2003).

The appearance in China of bifaces resembling Acheulean ones resulted from convergent evolution on a local basis. No other implements found in association with bifaces share common characteristics with the Acheulean industry, and no handaxes of such antiquity have been found west of China. The Baise handaxes are a striking example of convergence in the Lower Paleolithic. Moreover, although bifaces appeared in China at various stages of the Stone Age, these show no technological or typological continuity with the Baise handaxes. This pattern suggests that convergent cultural evolution led to the appearance of bifaces at later stages, when the adaptation strategies had changed. For instance, bifacially worked tools from Dingcun differ from Baise handaxes both typologically and technologically, and they are 500–600 ka years "younger" than Baise specimens.

The Baise industry is very similar to the industry of the An Khê culture in central Vietnam, and differs in key ways from the Acheulean in Africa and Europe. Localities with bifaces in southern China and Vietnam are also much older than Acheulean sites in transit territories between Africa (Turkmenistan, Mongolia, and Kazakhstan) and East and Southeast Asia. These industries are also quite dissimilar in terms of both technology and typology.

Dates based on tektites from sites with bifaces at Baise were questioned by certain experts (Koeberl et al., 2000). Critics suggested that most tektites had been redeposited, and that judging by ethnological evidence, natives of Southeast Asia had also regularly used them for making stone tools or as amulets. Our discovery of tektites *in situ* at Lower Paleolithic sites near An Khê would seem to render these objections moot. All tektites at our study localities were found in association with stone artifacts in the lower stratigraphic layer, within lateritic sediments containing products of bedrock erosion, or within the weathering crust. No anthropogenic or natural disturbances of the lower layer were observed at the places where tektites occurred. Tektites are very small, so it is hardly possible to manufacture artifacts on them. In our view, there are no justifiable reasons to challenge the synchronicity of tektites and bifaces at the Lower Paleolithic sites in north-central Vietnam.

On the basis of the argon analysis, as mentioned above, sites with bifaces near An Khê date to 806 ± 22 ka BP and 782 ± 20 ka BP (Derevianko et al., 2017b). Technologically and typologically they are similar to those at Baise. In our opinion, both result from convergent evolution.

It is not always easy to distinguish bifaces, picks, or chopping tools among other Lower Paleolithic implements recovered from the An Khê region, since these have much in common in terms of morphology, technique, and extent of secondary reduction. All these tools possibly had similar functions. Presumably, it was important for the toolmaker to obtain implements suitable for cutting and processing bamboo, crushing, scraping, etc. The shape of the implement was determined by the type of blank, and also by primary and secondary reduction. No bifaces flaked over the entire surface have been found in the An Khê region. The most common are artifacts of subtriangular shape

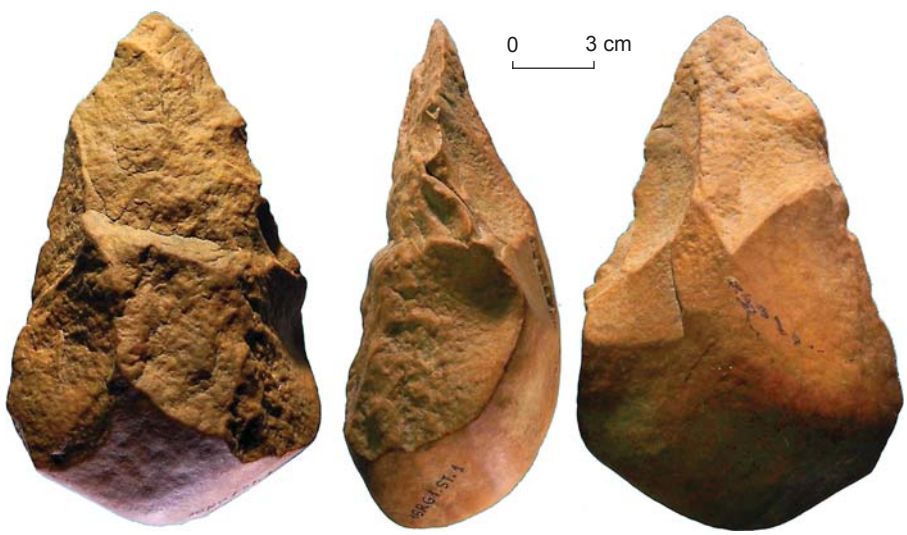

Fig. 12. Bifacial tool of the An Khê culture.

with one third or a half of surface flaked on both sides, and a deliberately prepared pointed tip. Describing these tools from Vietnam as bifaces (handaxes), we must keep in mind that they are not identical to the Acheulean bifaces from Africa or Europe (Fig. 12).

Conclusions

The absence of Acheulean sites dating to 700–800 ka BP anywhere from the Near East to Vietnam and China precludes the idea that the bifacial technique was introduced to eastern Eurasia by migrants of the second wave. The only feature linking the bifacial industries of Vietnam with the Acheulean is the presence of bifacially flaked tools. However, our research shows that the bifaces of the An Khê industry are very different from those of the European Acheulean, as well as from other artifacts of that industry. The absence of cleavers or the Levallois technique at An Khê sites provides every reason to believe that the bifacial technique emerged in Vietnam and China owing to convergent evolution. In East and Southeast Asia, we argue that this technique evolved from the local pebble-flake tradition, as evidenced by primary knapping, secondary reduction, and the entire technological and typological complex of the Lower Paleolithic.

Acknowledgement

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Technological Development of the Neolithic Pottery at Göytepe (West Azerbaijan)

The Neolithic settlement of Göytepe (6th millennium cal BC) is of great importance for studying all stages of the Neolithic pottery not only of Azerbaijan, but also that of the Southern Caucasus. Here, we analyze pottery assemblage from the 4th building level at this site as an example of Neolithic ceramics of the Kura River valley, Southern Caucasus. We focused on the technological and morphological development of pottery from 14 building levels at Göytepe. This paper presents the results of the extensive study of pottery samples found in the 4th building level during archaeological excavations in 2017. Each pottery group was described and compared according to its technical features. The obtained results were compared with previous studies of other contemporaneous sites, to discuss the origin and technological development of Neolithic pottery in the Southern Caucasus. The conclusion was made about the independent development of the Shulaveri-Shomu culture at its early stage, and about the influence of the intercultural contacts at later stages.

Keywords: *Southern Caucasus, Neolithic, Göytepe, applied decoration, polishing, slipping, bitumen.*

Introduction

In the Southern Caucasus, extensive research has already been carried out (in the mid-1960s to mid-1980s during the Soviet Period, and after the 2000s with new methods and approaches) at settlement mounds in both Azerbaijan and Georgia. Research into the Neolithic of the Caucasus began with the excavations of Kültepe I in 1951, near the city of Nakhchivan (Abibullaev, 1963). In Azerbaijan and Georgia, a group of settlement mounds along the Kura River is representative of an agricultural economy and way of life during the 6th millennium BC. When we take a look at the archaeological context of the region, early Neolithic sites include Shomutepe, Toyrepete, Jinnitepe, Huseyngulutepe (Narimanov, 1987), Garagalartepesi (Narimanov, Mahmudov, 1971), Göytepe (Guliyev, Huseynov, Almammadov et al., 2008; Guliyev, Nishiyaki, Huseinov et al., 2011; Guliyev, Nishiaki, 2014; Guliyev et al., 2015), Hacı Elamxanlitepe (Nishiaki et al., 2015b), Menteshtepe (Lyonnet, 2017), and Hasanlu I (Museibli, Agalarzadeh, Akhundova, 2012) in Azerbaijan; and Shulaveris-Gora (Kiguradze, 1986), Imiris-Gora (Kavtaradze, 1981), Chramis Didi-Gora (Dzhavakhishvili, Dzhaparidze, 1975), and Aruchlo (Hansen, Mirtskhulava, 2012) in Georgia. Also, Kamiltepe (Helwing, Aliyev, 2012), in Mil Plain; Ilanlitepe (Narimanov, 1969, 1987), Chalagantepe (Narimanov, 1987) in Karabakh steppe; and Aknashen (Badalyan et al., 2007) in the Ararat valley can be added to this list.

Each of these sites has valuable information about the beginning of agricultural ways of life in the Southern Caucasus. In this respect, Göytepe (40°58′ 11.84″ N, 45°42′17.81″ E, ca 430 m a.s.l.) (Kadowaki et al., 2015: 410) also has a very important position in Neolithic cultures. The settlement is situated in the middle stream of the Kura River (western Azerbaijan) and is one of the most important representatives of the ancient agricultural culture, having all the attributes of the Neolithic period.

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The site represents one of the largest mounds known in the region, measuring approximately 145 m in diameter (Guliyev et al., 2008: 17; 2010: 45; Guliyev, Nishiaki, 2014: 4; Nishiaki, Guliyev, Kadowaki, 2015a: 283). The excavations, over an area of 1000 m^2, revealed 11 m of stratified deposits corresponding to 14 archaeological levels, all of which are assignable to the Shulaveri-Shomu culture, without any breaks in occupation. The results of radiocarbon dating at the main trench of the site (Tokyo University) suggest that Göytepe was occupied during a period from the early to middle 6th millennium BC: more specifically ca 5650 to 5460 BC (Guliyev, 2010; Nishiyaki et al., 2015a: 289; in press; Kadowaki et al., 2017).

This study examines pottery assemblages from the 4th building level of square 2A (2A1-2A2), which is dated to ca 5505 to 5500 BC (Nishiaki et al., in press). First, the paper presents the general characteristics of the pottery over all the 14 building levels at Göytepe. Then, the pottery assemblages of the 4th building level are described according to the several groups defined by their decorative and technological attributes.

General characteristics of the pottery from 14 building levels at Göytepe

All of the Neolithic levels at Göytepe yielded ceramics (Guliyev, Nishiaki, 2012, 2014), but very few sherds were recovered in the earliest levels. All the ceramics are hand-made (Guliyev, Gusejnov, Almamedov, 2009; Guliyev et al., 2010), apparently from locally available materials. The petrographic analysis in the future will test this idea. The Göytepe pottery assemblage can be classified according to tempering materials.

Technical features

The earliest pottery assemblages are characterized by mineral-tempered pottery, which slightly diminished in the upper levels. Plant-tempered assemblages are systematically characterized by mixed fine and coarse straw. The most common mineral tempering consists of sand and basalt, while mica, calcite, and quartz are added more rarely. As to the plant-tempered fabrics, they often included minerals such as sand, sometimes basalt, and even obsidian. “Chamotte”, or grog, has also been observed. Only seven fragments are painted with monochrome bitumen around the necks of the vessels. As to applied or relief decorations, these mostly consist of single horizontal round, oval or oblong knobs, or circular or semi-circular patterns. In addition, U- or V-shaped reliefs, zigzag or wavy lines, and anthropomorphic relief depictions are also present (Alakbarov, 2015a: 167; 2015b: 215).

Six groups have been identified in previous studies on the basis of temper, surface treatments, and the presence or absence of decorations (Alakbarov, 2016a: 1695; Guliyev, Alakbarov, 2017: 11): group 1 – slipped, polished, and painted ware; group 2 – plain ware; group 3 – wet-wiped ware; group 4 – applied decoration ware; group 5 – bitumen-painted and bitumen-covered ware; and group 6 – impressed ware. These groups share all the characteristic features of the Neolithic pottery in the region.

Morphology

The most common shape attested at Göytepe is that of hole-mouthed jars; while deep and shallow bowls, basins, and trays occur in smaller numbers. Rim sherds have four basic profiles, such as thinned, rounded, flattened, and tapered. Almost half of the rim sherds were thinned. Tapered rims belonging to the 4th ware group are rare. All the bases are usually flattened, occasionally displaying traces of woven or mat impressions (about 150 of 12,000 sherds), especially in hole-mouthed jars. Generally, the bases are circular in shape, but some are oval. In hole-mouthed jars, the lower bodies were often curved inward near the bases, thus forming heel-like projections, called “elevated”, for thickening.

As regards prehension, two types of “devices” have been identified on top of hole-mouthed jars. First, the vast majority of these handles are made starting at the rim, which curves inwards with an attached band 3 or 5 cm wide. These seems to have been designed expressly for grasping and carrying the vessels. The other type of prehension is represented by horizontal lugs, oval in shape, that are applied on the exterior surfaces of the jars. As only sherds of this type of vessel have been found, we assume that two opposite lugs were placed on the lower part of the vessels (Alakbarov, 2016b: 60).

Characteristics of the pottery groups in the 4th building level

Earlier, the pottery assemblages of Göytepe were studied according to the 14 building levels. Some of the results have been published (Nishiaki et al., 2015b), while the others are in press. The reason for choosing the limited pottery assemblages from the 4th level is that these are different in terms of many features from the pottery of the same level in a different square, which was previously obtained. Thus, the decorations of several fragments in the 4th level are completely different from those previously discovered at the same level. Also, bituminous ceramics associated with the 5th level have not been found at this level of other squares. The

corpus of the pottery fragments that are here analyzed (443 spec.) is composed of one complete profile, rim sherds (70 spec.), body sherds (302 spec.), and fragments of bases (70 spec.). 74 % of the total fragments are mineral-tempered; 21.5 % are vegetable-tempered, and 4.5 % show organic and mineral temper.

Group 1: slipped, polished, and painted ware. The samples comprise 20.5 % of the assemblage. The paste is both mineral- and chaff-tempered. However, the most of the pottery by far features a straw- or vegetable-tempered paste, which is especially common for open shaped vessels. The frequency of small to medium vegetable temper in horizons 1–14 varies from low to heavy, and it is rarely mixed with mineral inclusions.

Minerals include quartz, sand, and basalt. Though sand is densely distributed, quartz and basalt inclusions are seldom present, and occur presumably naturally mixed to the clay. One hole-mouthed rim shows a distinctive type of paste. Occasionally, obsidian temper is found in group 1, together with small-sized, medium-distributed sand inclusions. This group is generally of better quality than other groups. Its appearance is of medium to fine quality.

Rims are always simple, sometimes made by a small coil added to the last band. Almost all of the pottery was made using band techniques, with bands 2.0–2.5 cm high, which are clearly visible by observing the junctions (Fig. 1, *c*)

All the samples show smoothed or burnished surfaces. In some sherds, both the internal and external surfaces were slipped in a red color and then burnished (Fig. 1, *a*). Coating with slip on both exterior and interior surface may have been used for reinforcement or waterproofing, and elaborately burnishing (polishing) used to give an esthetic appearance to the vessels (Alakbarov, 2015a). While covering by slipping (watery clay solution) in red and then burnishing is more common with the fine quality for open shaped bowls, trays, and basins at Göytepe, in some cases these techniques were applied coarsely for hole-mouthed jars that occurred at this level with stroke marks (Fig. 1, *b*). Considering the fact that many spatulas have been found at this level, we can assume that, after drying, the ceramics were polished or smoothed with spatulas.

From a total of 92 sherds, 22 sherds of hole-mouthed vessels appear coated with a thin wash paint or completely painted (Fig. 1, *c*). The paint, or so-called "washing", is generally colored with a red pigment, presumably obtained from red ocher (Fig. 2). Washing is only visible on closed vessels on the exterior surface or on both the exterior and interior surfaces. The most of the painted pottery by far is inorganically tempered, e.g. with basalt and sand inclusions.

While pottery assemblages are red, reddish-brown, or light red in color, their cross-section colors vary from buff-gray or buff to black-gray. Traces of mottling are also noticeable owing to firing at varying temperatures. For instance, in few sherds, the slip-color was red; but because of irregular firing, it turned to brownish. Generally, the firing is of relatively fair quality. These assemblages present rather thinner walls and finer paste than those in other groups. Especially, thin walls with an abundant quantity of chaff-temper are common. The sherds show some range of wall thickness between 0.4–1.2 cm. The

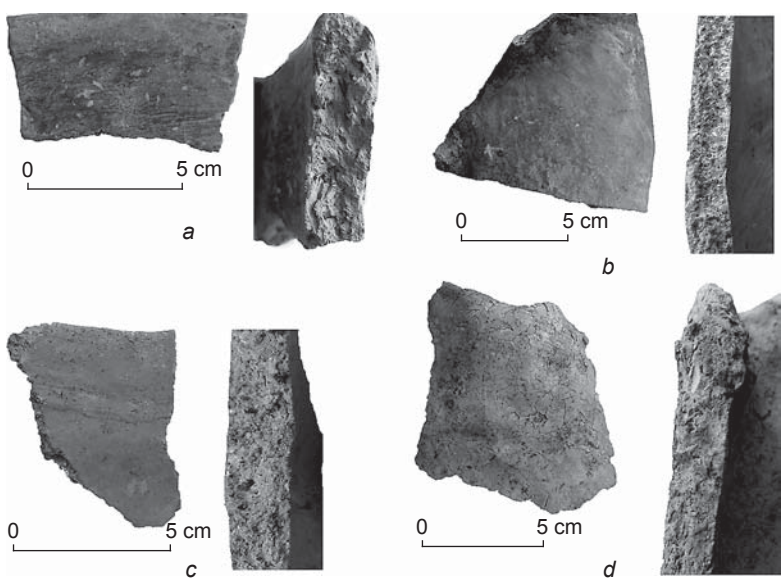

Fig. 1. Pottery of group 1.
a – red slipped and burnished pottery; *b* – rim fragment of coarsely burnished hole-mouthed jar; *c* – thin-wash-painted pottery; *d* – in-turned rim for grasping. Hereinafter photographs and drawings by the author.

Fig. 2. Red ocher for painting.

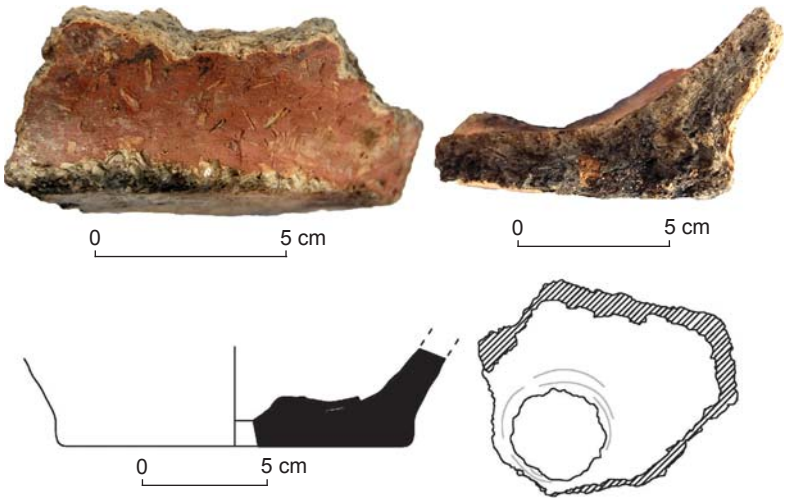

Fig. 3. Washed (completely red-painted) base fragment with "odd" inside.

mouth dimensions of the vessels are from 13 to 36 cm, a base of a vessel is ca 17 cm in diameter. The rims of most vegetable-tempered (perhaps with oval seeds) sherds are partially turned-in at the mouth, perhaps better to grasp the vessel with one hand (see Fig. 1, *d*).

Transitions to the base are often elevated, especially in closed vessels, and non-elevated (sharp) bases are encountered in open shaped ones. The slab technique is defined especially on the bottom parts.

One base sherd characterized by its temper made of small seeds is unusual within the Göytepe pottery assemblages. In the middle of the base on the inside, there is a ledge with broken top, and this seems to have been fused with the clay before firing (Fig. 3). Probably, it accidentally fell during the firing, or it is the remnant of the clay. It does not seem to be decorated deliberately.

Group 2: plain ware. Ceramic sherds from walls, rims, and bases are noticeable in this group, which forms 62 % of the bulk. The paste is mainly tempered with small, medium to coarse inorganic material. A large number of the ceramics are tempered with grit inclusions. The coarse-grained temper consists of minerals such as obsidian, mica, basalt, sand, and (in only a few cases) chamotte. Sand is dense with prevailing basalt, and the sherds with this fabric form a majority. Vegetable temper also occurs, and mixed mineral and vegetable temper occur in a few pieces. Mostly, the vegetable temper leaves both large and short imprints on the surfaces.

The pottery tends to be dark gray, brown, buff-gray, or buff. Cores are usually buff, gray, buff-gray, or black-gray. Mottled parts in a few fragments are the result of color change during firing. The great majority of the ceramics were fired well. Their appearance is of coarse to medium quality.

According to the diagnostic fragments, the shapes consist of hole-mouthed jars and basins. Rim diameters vary from 9 to 23 cm in closed vessels, but from 29 to 32 cm in open vessels. Base diameters are between 8 and 20 cm, and the majority are disk-shaped (Fig. 4). Generally, a matting impression is apparent in disk-shaped bases (Fig. 5); however, one example demonstrates mat impression with the wall opening sharply at the base. Some of the bases seem to be shaped on an irregular surface such as the ground etc., and are not further refined. The bases were manufactured with slab technique. The walls are rather thin, between 0.6 and 1.1 cm, and base is 0.4–1.3 cm wide.

In hole-mouthed vessels, breaks often occur a few cm above the base (see Fig. 4). This may indicate the use of molds to shape the lower parts of the vessels. So, it is likely that initially bases were shaped, and then the vessels were further modeled by adding slabs. The vast majority of the ceramics were mostly made in bands with coils attached to the rim, the joints of which are often visible in the breaks. The joints between two bands are often weak, and thus breakages frequently emerge at these points.

Group 3: wet-wiped ware. This group represents 14 % of the analyzed material. In many cases, the wiping appears on the outer and inner surfaces of sherds. The traces of wet-wiping are clearly visible on one surface or both. Most notably, one surface or both the inner and outer surfaces of the vessels appear to have been carefully smoothed horizontally or vertically by using some kind of leather while the vessel still was wet, the effects of this being still visible to the naked eye (Fig. 6). In contrast to the other groups, the paste of ceramics of group 3 is generally characterized only by grit-temper such as small- and medium-sized basalt and sand particles. One sherd is made of well-levigated fine clay without temper. The appearance is of medium to coarse quality.

The shapes attested are hole-mouthed jars, trays, and small bowls. Base pieces are appointed elevated according

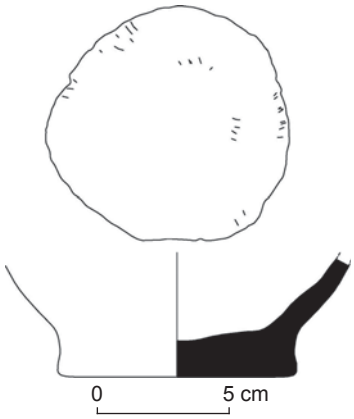

Fig. 4. Elevated base of a hole-mouthed jar.

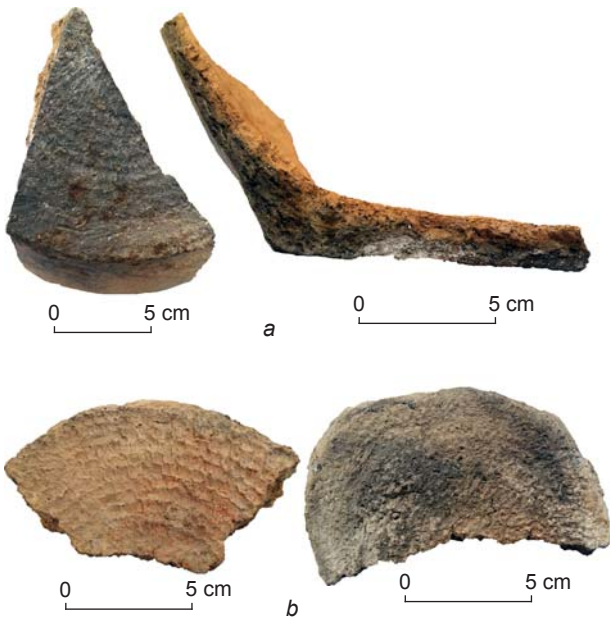

Fig. 5. External surface of a sharply opening base with matting impression, and its profile (*a*), external surface of an elevated base with matting impression (*b*).

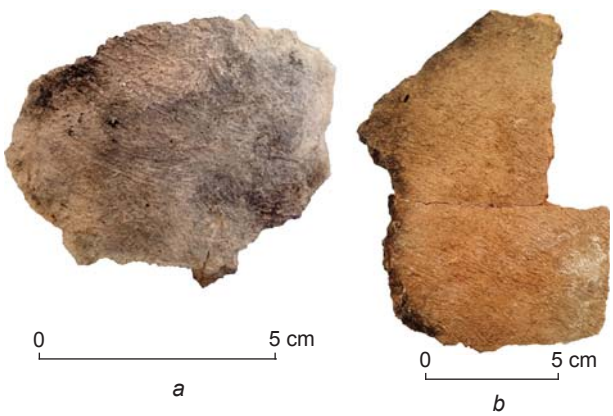

Fig. 6. Wet-smoothed or wiped fragments.

to obtained samples. One rim-to-base fragment was hand-molded, apparently made by modeling a single lump of clay (Fig. 7).

Pots were made in small or large bands 2.5–5.5 cm wide, the joints of which are easily visible at fractures. Base sherds show a thick layer of clay applied over the bottom surface, which denotes slab technique used for molding.

The surface color ranges from buff, buff-gray, black-gray, brown to gray, probably depending on firing conditions, and cross-sections vary from buff, buff-gray to gray. Firing is accurate. Occasionally, incompletely oxidized sherds also show mottled surfaces. Often heavy or slight traces of soot are visible on both inner and outer surfaces of the walls or on the outside and inside of the base pieces, which suggests their use as cooking vessels.

Group 4: applied decoration ware. Ceramics with applied decorations occur almost in all levels at Göytepe. In this particular level, applied decorations account for 3 % of the assemblage. The clay is more compact than in other groups. Judging by the temper visible in the section, we can say that the majority of the sherds are mineral-tempered, while only a small number of sherds are vegetable-tempered.

The majority of the sherds are heavily tempered with basalt and sand. Obsidian inclusions are also attested systematically in small and larger sizes. Joints between coils and bands are clearly detectable almost in all sherds. The coil joint is usually ca 1 cm wide in the rim part and ca 2–5 cm wide for the body.

Some pieces are scrambled and softened because they endured the heat of multiple cookings, and are reminiscent of the result of uneven firing. However, in fact, they were fired hard, and show many cracks, possibly because of intense firing. This pottery group is mostly darker in color on the surface of sherds (gray, buff-gray, dark-gray, brown), often with buff or gray-buff core. The inner and outer walls are covered by blackish or dark brown soot. Almost all the sherds have blackish soot on both interior and exterior surfaces of the walls, indicating that they were used mainly as cooking pots.

Appearance is medium to coarse quality. Hole-mouthed jars are common in this group. The rim's diameter varies between 12 and 30 cm.

The applied decorative motifs are usually found on the exterior surfaces of the hole-mouthed jars. The applied decorations consist of V-shaped motifs (Fig. 8, *a*), oblique lines (Fig. 8, *b*), or of oval or circular pellets, applied under the rims. The number of pellets is between one and four. The ends of oval ones are thinned as if they were triangular or rounded. One sherd has unusual features. Its rim was inverted inside (probably for grasping), and the applied pellet was made for ease of grasping, not for decoration (Fig. 9). Exceptionally,

one sherd presents oval applied decorations horizontally arranged 0.5 cm below the rim, 4.5 cm apart. Three sherds are totally new according to the positions of decorations:

1) four clay pellets, resembling a bunch of grapes, are applied together at a distance of 1.8 cm under the rim (see Fig. 8, *c*);

2) two oval decorations, situated vertically one below the other, resembling granular hanging from the cluster, are fixed 2 cm below the rim part (see Fig. 8, *d*);

3) unknown motif with an applied oblique line hanging from the rim (see Fig. 8, *b*).

In many cases, marks indicating thumb or fingerprints can be seen around the applied decorations, left during the modeling process.

Group 5: bitumen painted and bitumen covered ware. This ceramic group is not abundant and comprises 0.5 % of the assemblage. The sherds feature remains of bitumen lumps on the outer surfaces, which might have been used as a glue to fill cracked areas for reusing of vessel or for water-proofing (Fig. 10). Generally, at Göytepe, bitumen was used for many purposes, such as restoring and painting of vessels, as bitumen sources occur naturally near the site.

Only two small rim- and wall-fragments of thin-walled vessels of this type were found here. One piece is tempered with inorganic and organic particles of plentiful small cut vegetable materials and a few large basalt grains, while another sherd is tempered with small basalt grains. The appearance is medium to fine.

The surfaces are often red or buff, but the section is black-gray because of irregular oxidation. One sherd is slightly polished outside and inside. Its rim was covered with red wash.

Comparison

Though the pottery assemblages are not large at this level, we can compare them with those at contemporaneous sites in the Southern Caucasus. As applied decorations are typical of the grit-tempered ware of the Kura basin of the Shulaveri-Shomu culture, comparisons with group 4 can be drawn with the applied rounded and oval knobs under the hole-mouthed vessels' rims on exterior surfaces from Shomutepe, which are characteristic of grit-tempered ceramics (Narimanov 1987), Hasansu I (Museibli, Agalarzadeh, Akhundova,

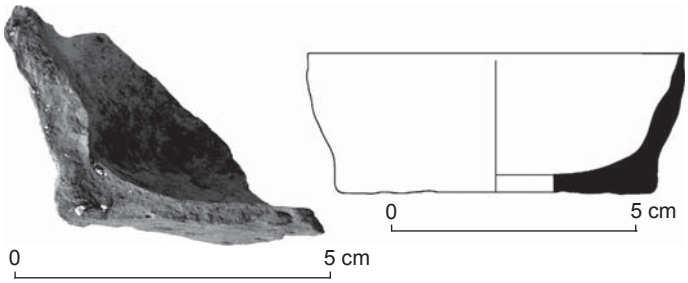

Fig. 7. Hand-molded rim-to-base fragment.

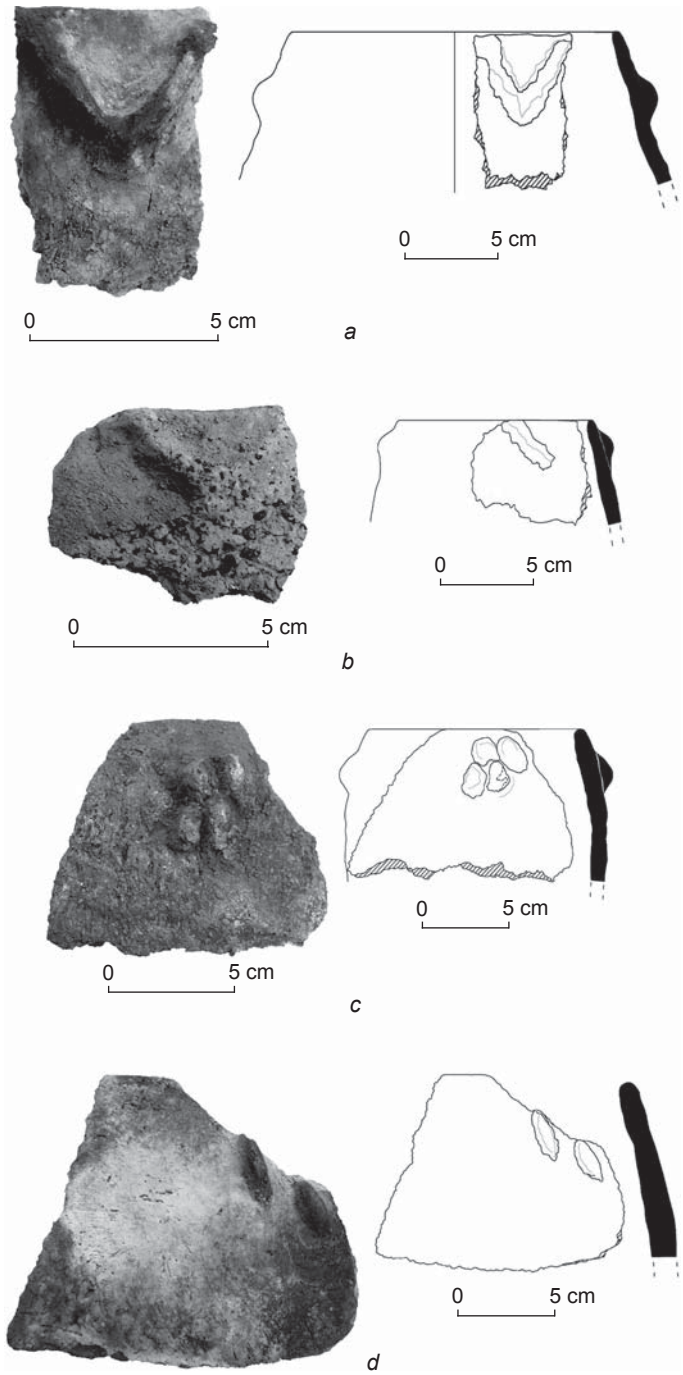

Fig. 8. Applied decorated pottery pieces.

Fig. 9. Rim inverted inside with applied pellet.

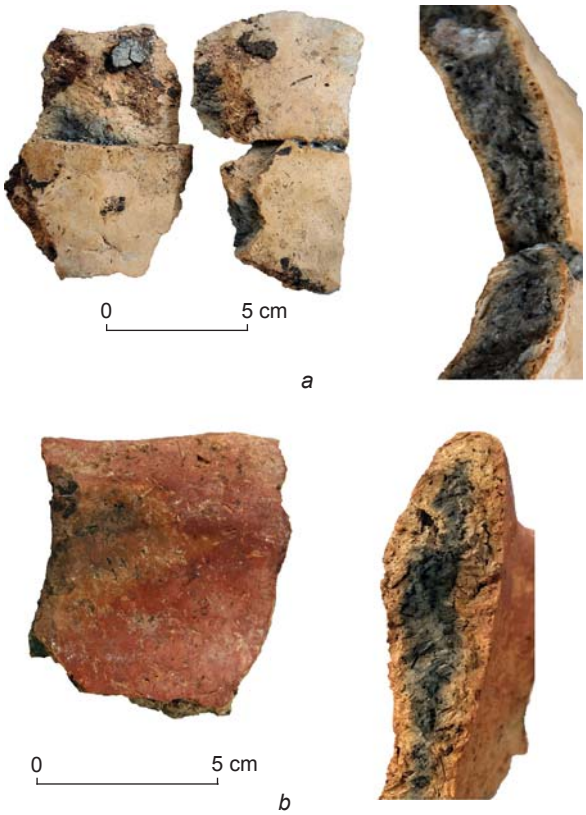

Fig. 10. Pottery-samples with bitumen.

2012), Shulaveris-Gora (Kiguradze, 2001), Imiris-Gora and Chramis Didi-Gora (Kiguradze, 1986), Aruchlo (Bastert-Lamprichs, 2012, 2017), and Aknashen (Chataigner, Badalyan, Arimura, 2014).

In addition, vegetable-tempered partly closed vessels, which seem to have been designed thus intentionally for carrying, are noticed at the Neolithic settlements in the middle Kura valley: Shomutepe (6th millennium BC) (Narimanov, 1986: 118; Akhundov, 2012: Pl. 138, *1*; 177; 192, *1*; 206, *7*; 207), Gargalartepesi (Narimanov, Mahmudov, 1971: 14; Narimanov, 1986: 27), Menteshtepe (ca 5800–5650 BC) (Lyonnet, 2017: 141–142); at the Neolithic sites of Karabakh steppe: Ilanlitepe (Narimanov, 1969: 397; 1987: 27, 49; Narimanov, Mahmudov, 1972: 14), Chalagantepe (Narimanov, 1986: 8); in Mil Plain sites, dated around MPS 4 (Helwing, Aliyev, 2017: Fig. 39), MPS 5 (D'Anna, 2017: Fig. 12, below), MPS 18 (Ricci, 2012: Fig. 178), MPS 103 (D'Anna, 2017: Fig. 12, above).

Also, several attributes, such as heel-shaped profiles of flat bases, the shapes of the most vessels, matting impressions on the exterior surfaces of the bases, manufacturing and surface treatments, are rather similar to those of the above-mentioned sites. Moreover, manufacturing processes, such as using bands, coils to build up the body parts, slab technique for making bottom parts, including red slipping, followed by polishing surface treatment in vegetable-tempered vessels, and decorating with applied motifs in grit-tempered vessels, are also similar to those found on Neolithic pottery at Menteshtepe, situated a few kilometers distant from Göytepe (Lyonnet et al., 2016; Lyonnet, 2017). Also, red slip and burnishing are of frequent occurrence at Neolithic sites in the Mil Plain (MPS 4, 5, 23, and 103) (Helwing, Aliyev, 2017: 41; D'Anna, 2017: 48, fig. 10).

Though basket impressions are not common in the Mil Plain, these are occasionally attested at both Kamiltepe and MPS 4 (D'Anna, 2017: 48). The bases of two of pithoi also bear woven impressions at MPS 103 (Ibid.: Fig. 11), which bear the same resemblances to Göytepe pottery. Common features, functioning as surface treatments and manufacturing of Mil Plain Neolithic pottery (D'Anna, 2012), are also similar to those found on Neolithic pottery at Göytepe. The resemblances suggest that Göytepe inhabitants had close relationships with the above-mentioned contemporaneous settlements.

Conclusions

Göytepe is one of the rare settlements that completely reflect the development process of the Early Neolithic pottery. Therefore the settlement is important for understanding this period in the Southern Caucasus. Göytepe pottery groups in the 4th level are testified by mineral and plant-tempered inclusions and are more or less varied in shapes, but manufacturing technique is almost uniform. As compared to the ceramics from the upper levels (ca 5500 to 5450 BC) found in previous years, pottery assemblages are more inorganic-tempered in the 4th building layer. Most of the pottery was formed by band technique to build the wall parts, and by slab technology to mold base parts. Small vessels were hand-molded without the use of band or slab.

Pottery appears to have been burnt in open fires, in an oxidizing atmosphere, and the firing was often unsteady. The lips (rims) are simple; only rounded and thinned rims have been recorded in this level.

Judging by wear-traces, such as soot and non-soot inside and outside, and shape analysis, pottery samples are likely to represent table (for eating and drinking in small bowls) and common wares (for storage in closed vessels and sharing practices in opened-shaped vessels) in group 1. Common and kitchen wares (cooking jars) are characteristic of groups 2 and 3. However, a great amount of pottery was used as kitchen ware, which is completely represented by hole-mouthed jars. Only one fragment shows different features without any traces of soot. Owing to lack of sherds, the function of group 5 is difficult to determine.

Pottery bearing basket imprints on the base is very common at Göytepe, which is characteristic of the Shulaveri-Shomu culture. However, basket impressions do not occur at the earlier Neolithic site of Mentesh, dated ca 5800–5650 BC (Lyonnet, 2017: 141). This is probably because this site belongs to an early stage of the Shulaveri-Shomu culture. The practice of putting matting under the vessels had probably not yet been mastered at the beginning of the pottery production. Thus, this is not encountered at this stage. It is recorded in the publications about Mentesh that group 1, with its peculiar temper and shape, does not correspond to those most often described for the Shulaveri-Shomu assemblage. But, during the investigations in the middle of 20th century, the researchers assigned chaff and seed inclusions to "vegetable-tempered" type. Seed inclusions are visible in group 1 from the 4th level of Göytepe, which is a few kilometers away from Mentesh. Also, some closed vessels described above are encountered at Göytepe and at Shomutepe (Akhundov, 2012: 142, pl. 138, *1*; 177; 192, *1*; 206, *7*; 207).

Thus, the results of the study have shown some specific attributes of pottery from the 4th building level at Göytepe. Almost all the ceramics from the Neolithic settlements of the Kura basin share similar features and belong to the Shulaveri-Shomu culture. When the Shomutepe culture emerged, it had a local, uniform character, and subsequently had a close relationship with the southeastern cultures of the Karabakh steppe.

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Reconstruction of Extreme Paleoclimatic Events in Northwestern Siberia Using Ancient Wood from Fort Nadym

This study addresses the occurrence of damage to the anatomical structure (frost rings, light rings, and fluctuations of the wood density) and missing tree rings in wood samples from Fort Nadym—a medieval fort in the subarctic zone of Western Siberia. The chronology of extreme climatic events was reconstructed for the 1170–1505 period. We used multiple criteria such as severity of events; coincidence of structural pathologies and missing annual rings across all species; coincidence of structural anomalies with missing rings in specific years and years of minimal growth in chronologies. These criteria have allowed us to identify eight significant climatic events for the study area. The comparison of information on those events with that relating to other regions has shown that the 1259 event, evidenced by various sources, was likely global. Two other events, 1342 and 1466, are registered in northwestern Siberia and North America, and are therefore inter-regional. The 1347 and 1440 events concerned only northwestern Siberia. These years coincide with those of documented volcanic eruptions, peaks of acidity and aerosol development in polar ice cores, as well as the historical accounts of severe cold, crop failure, etc. All these events had a strong impact on socio-economic processes in Western Siberia.

Keywords: *Frost rings, climatic extremes, archaeological wood, Fort Nadym, Western Siberia.*

Introduction

A significant part of the actual dendrochronological studies in Siberia aims at studying the set of annual ring parameters (width, density, isotope analysis, etc.) for recording the changes in the external environment in the past (Sidorova et al., 2013; Taynik et al., 2016; Wilson et al., 2016; Büntgen et al., 2016; and others). Generally, samples taken from living trees and wood remains on the ground surface and sedimentary deposits serve as materials for research purposes. At the same time, archaeological wood as a source of paleoclimatic information remains virtually unused, despite the examples of its successful application for solving environmental issues in the world practice (Baillie, 1982: 197–211; Becker, 1983; Cook, Kairiukstis, 1990: 28, 220; Zhang et al., 2003).

This study offers a reconstruction of the history of extreme events in northwestern Siberia, which is based

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on the analysis of specific xylem structure occurrences in the annual rings, as well as missing rings, in fossil wood from the archaeological site of Fort Nadym. The study makes it possible to obtain unique information on climate conditions of the summer months for the last millennium.

Material and methods

The research area is located near the confluence of the Ob River and the Ob Bay (the Gulf of the Kara Sea of the Arctic Ocean). The climate is continental (the annual temperature range is 36–40 °C). The average July temperatures are 11–14 °C, with possible extreme values of 27–30 °C. The sum of the temperatures in the vegetation season is 700–800 °C. From 300 to 400 mm precipitation p.a., 70 % belongs to the warm period. River valleys in the south are entirely occupied by woody vegetation, while the interfluves are dominated by non-forested areas with the inclusion of specific swamped thin forests and open woodlands. The height of the trunks of Siberian larch at the age of 100 years usually does not exceed 5–6 m, and the diameter 10–15 cm (Gvozdetsky, Mikhailov, 1978: 196).

Transverse wood cuts taken in 2011–2012 at the archaeological site of Fort Nadym (Fig. 1) were the materials for this study. The frozen cultural layer ensured perfect preservation of organic materials, primarily of wood. In total, 107 samples of Siberian larch (*Larix sibirica* Ledeb.), 89 of Siberian spruce (*Picea obovata* Ledeb.), and 75 of Siberian pine (*Pinus sibirica* Du Tour) were selected.

For verifying the parameters of tree-ring chronologies based on archaeological wood samples, we selected the cores from living trees. There is no coniferous forest in the immediate vicinity of Fort Nadym (Omurova et al., 2013). For this reason, samples (34 pieces) were taken in larch open woodlands on the left bedrock bank of the Nadym River, 20 km southwest of the archaeological site (the site of Nad, Fig. 1). The cores were taken using the standard methodology at the height of 1.3 m from the day surface, which made it possible to reduce the number of anomalies in the structure of annual rings in the samples, emerging under the impact of micro local (orographic) conditions of tree growth and weak surface frosts (Gurskaya, Shiyatov, 2006).

The width of annual rings was measured using a semi-automatic LINTAB 5 unit (with resolution up to 0.01 mm). The series were dated using a combination of graphic cross dating (Douglass, 1919: 57) and cross-correlation analysis using the specialized DPL (Holmes, 1983) and TSAP V3.5 (Rinn, 1996: 3–250) software for dendrochronological research. The final results are three tree-ring chronologies for archaeological wood of Siberian larch (Larix_Nad), Siberian spruce (Picea_Nad),

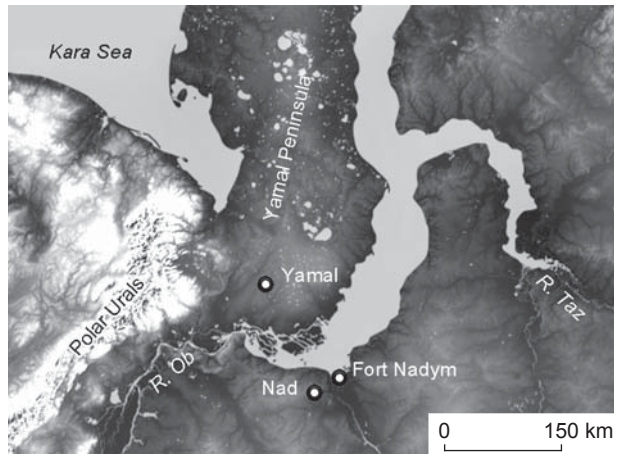

Fig. 1. Location of the archaeological site of Fort Nadym and locations of Nad and Yamal tree-ring chronologies.

and Siberian pine (Pinus_Nad) (Omurova et al., 2013), as well as one chronology for living trees of Siberian larch (Nad). The chronologies were standardized by the sliding spline comprising 2/3 of each series length using the ARSTAN software (Cook, Krusic, 2008). For calendar binding of the chronologies for each tree species (pine, spruce, and larch), the chronologies were cross-dated with the Yamal tree-ring chronology (Khantemirov et al., 2011).

Anomalies in the structure of annual tree rings were detected by visual inspection of samples using a Stemi 2000C (Carl Zeiss) microscope at 40–50x magnification and were recorded by marking the damaged rings. For establishing the calendar date and eliminating the error associated with missing rings, the repeated measurement of the sample section containing the anomaly was performed, followed by its cross-dating. Anomalies of the structure and missing rings, which fell on the first 20 years (growing period) of the tree, were discarded from this study. During this period, trees could be damaged even with slight frosts because of thin heat-insulating layer of the bark (Bykov, 2000).

We took into account the following types of anomalies: frost ring (f) – a distorted structure of cells damaged by frost during the growth season when the xylem is being formed; wood fluctuation (fl) – a layer of cells within the annual ring, which differs from the neighboring cells in size, shape, and thickness of the cell wall, and light ring (l) – a zone of late wood of the annual ring with markedly weak lignification (Barinov, Myglan, Taynik, 2017). Information on the missing annual rings (m) identified during the cross-dating was analyzed separately. This anomaly is a one-year ring, which is completely absent on the radial cut due to the cessation of the activity in the cambial layer. In addition, it should be taken into account that in contrast to the irregular structures listed

above, which indicate extreme weather events within the vegetation period, missing rings are an integral indicator of the temperature regime of the vegetation season as a whole (Vaganov, Shiyatov, Mazepa, 1996: 124).

The chronology of extreme climatic events was constructed for the period from 1170 to 1505, when EPS ≥ 0.85 (the sensitivity of the tree-ring chronology to changes in external factors, depends on the number of samples analyzed and shows how a particular limited sampling reflects the signal of the population or some general totality). At the first stage, the years of extreme climatic events were identified. The criterion was the coincidence of the dates indicating the formation of two or more structure anomalies and missing rings for the analyzed sample. At the second stage, the strength of extreme events was estimated based on the following parameters: severity of the event—the cases when the percentage of the detected anomalies and missing rings to the total number of samples exceeded the average value in the sampling; synchronism of emergence of structure anomalies and missing annual rings in all studied tree species; years that accounted for both structure anomalies and missing rings; and years of minimal growth in chronologies (when the values of growth indices fell outside of the double standard deviation).

For identifying extreme events that encompassed the territory of the region under past researches, the dates we obtained were compared to climatic extremes in the Yamal tree-ring chronology (Fig. 1) (Khantemirov et al., 2011). For a global scale, the dates obtained were compared to climatic extremes in the tree-ring chronologies of remote areas (Barinov, Myglan, Taynik, 2017; Salzer, Hughes, 2010). Historical sources (Borisenko, Pasetsky, 1983: 127–179; Barash, 1989: 65–176; and others) and data on the traces of volcanic eruptions in ice cores (Clausen et al., 1997; Zielinski et al., 1994) were used for verifying the inter-regional events.

Results and discussion

As a result of laboratory studies, 124 structural anomalies and 126 missing rings were found on the samples of archaeological wood, while 48 structural anomalies and 66 missing rings were discovered on the cores from the living trees (Table 1). A significant part of the anomalies in the structure of annual rings is represented by frost damage and intra-annual density fluctuations (IADFs). The most sensitive species in the collection of samples of archaeological wood were spruce (with an anomalies-occurrence frequency of 0.6) and larch (frequency of 0.8). However, when compared to the chronology based on the living trees (Nad, Table 1), it is evident that the frequency of occurrence of anomalies and missing rings was more than two times higher in the archaeological wood. This might have been caused by the fact that in many cases it was impossible to determine which part of the trunk the archaeological sample was taken from. The cores from the living trees were selected at the same height from the surface of the ground (1.3 m). In addition, it cannot be ruled out that driftwood, which originated in more southern (warmer) regions, could have been used during the construction of Fort Nadym. The greater number of coincidences between the dates of formation of anomalies and missing rings in archaeological wood compared to the living trees speaks in favor of that suggestion (Table 1). Probably, in the severe climate near Fort Nadym, frosts occur quite often, but they are local in nature and damage only individual trees. In southern areas, trees react only to severe frosts, which occur less frequently, but cover a large area and damage a significant number of trees.

For assessing the similarity in the response of archaeological wood and living trees to the changes in environmental parameters, the calculation of the number of anomalies and missing rings depending on

Table 1. **Description of tree-ring chronologies**

Tree-ring chronology	Duration		Number of samples	Anomalies in the structure of annual ring						Missing rings		
	Length, years	Interval, years		f	l	fl	In total	Emergence frequency	Number of correspondences	In total	Emergence frequency	Number of correspondences
Picea_Nad	387	1120–1507	89	35	2	20	57	0.6	81 (65)	15	0.2	114 (90)
Pinus_Nad	549	1010–1559	75	18	0	14	32	0.4		29	0.4	
Larix_Nad	541	1075–1616	107	22	1	12	35	0.3		82	0.8	
Nad	314	1697–2011	34	31	0	17	48	1.5	19 (39)	66	2	52 (79)

Note. Symbol f designates a frost ring; l is a light ring; fl is fluctuation of wood; emergence frequency shows the number of anomalies or missing annual rings per one sample; number of correspondences is the number of anomalies and missing annual rings per one year in two or more instances; number in parenthesis indicates the percentage of all recorded instances.

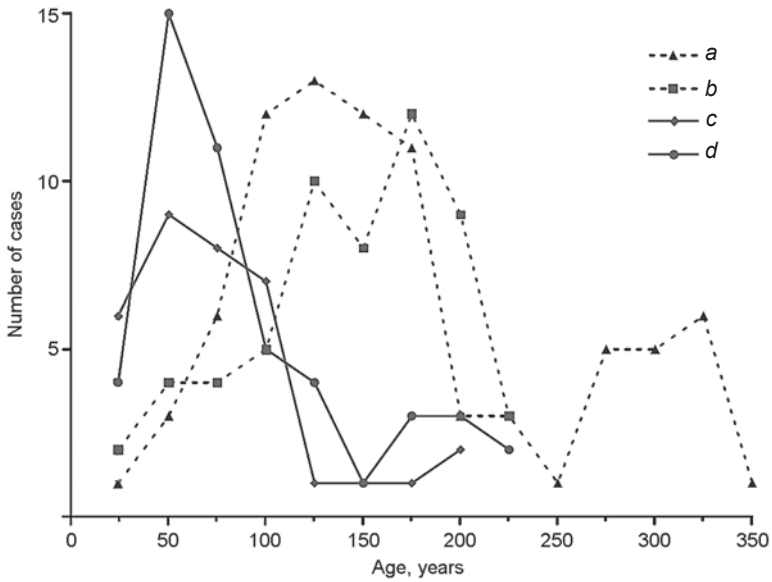

Fig. 2. Distribution of anomalies and missing rings in archaeological wood and living larch trees depending on their age.
a – missing rings in archaeological wood; *b* – missing rings in living trees; c – anomalies in the structure of annual rings in archaeological wood; *d* – anomalies in the structure of annual rings in the living trees.

the age of the samples (according to 25-year intervals) was made for the common species of larch (Fig. 2). The obtained results show the uniformity of the response of woody vegetation in the past and present, thereby confirming the suitability of the archaeological wood for constructing the chronology of extreme events for the study period.

According to the methodology for the reconstruction of extreme paleoclimatic events, we first marked the years when two or more structure anomalies and missing rings were formed in the samples of archaeological wood (Table 2). Nine dates of extreme events (1201, 1343, 1358, 1362, 1371, 1398, 1409, 1417, and 1444) were identified by anomalies in the structure of the annual rings, accounting for 28 (22 %) out of 124 anomalies detected (Table 2). Five events can be traced only according to one of the three tree species (two events for spruce, two events for pine, and one event for larch); four events can be traced according to two species (one for spruce and pine, two for spruce and larch, and one for pine and larch). A typical feature of the archaeological materials from Fort Nadym is the presence of a significant number of IADFs (Fig. 3), which coincided according to the time of formation with frost rings and light rings. As with high-mountain areas (Barinov, Myglan, Taynik et al., 2015; Barinov, Myglan, Nazarov et al., 2016), this indicates a common cause for the emergence of anomalies in the structure of annual rings, associated with decrease in summer temperatures.

According to the missing annual rings, 14 extreme climatic events (1239, 1291, 1300, 1330, 1342, 1352, 1379, 1387, 1401, 1402, 1412, 1420, 1459, and 1481) have been identified, which accounts for 54 (42 %) out of 126 missing rings (Table 2). In six cases, the missing rings were observed in the samples of only one species (larch); in five cases in two species (one in spruce and pine, two in spruce and larch, and two in pine and larch), and in three cases in all three species. Probably, 1342, 1352, and 1412 must have been extremely unfavorable, which led to the simultaneous absence of annual rings, regardless of different response to the changes in environmental conditions in different tree species.

According to the anomalies and missing rings, 16 dates of extreme climatic events have been identified (1259, 1333, 1347, 1354, 1366, 1374, 1383, 1386, 1392, 1426, 1433, 1440, 1448, 1453, 1455, and 1466). They account for 53 (43 %) out of 126 anomalies and 60 (48 %) out of 124 missing rings (Table 2). In three cases, the anomalies and missing rings were observed in the samples of only one species (one in each of the species); in seven cases in two species (five in spruce and larch, two in pine and larch), and in six cases in all three species. In the climatic context, this combination of anomalies and missing rings within one year indicates a short vegetation period with severe frosts, which should have resulted in sharp decrease of wood growth (Khantemirov, 2009). For testing this assumption, the 41-year intervals containing the year of the extreme climatic event, were singled out and superimposed on each other using the method of superimposed periods (Fig. 4). The obtained results showed that in the case of extreme events identified only from the anomalies, the influence of climatic factors leading to the occurrence of structure anomalies was leveled by climatic conditions during the season and did not have a significant impact on annual growth (Fig. 4, *a*). In the case of extreme events identified from the anomalies and missing rings, a sharp synchronous decrease in growth was observed despite a different species composition (Fig. 4, *b*).

The minimal growth indicator allowed us to identify 15 dates (Table 2): nine dates only for one species (five for spruce and four for larch), six dates (1259, 1263, 1347, 1354, 1366, and 1459) for two species (two for spruce and larch, two for spruce and pine, and two for pine and larch). It is remarkable that there were no cases when the growth minimums were observed simultaneously in all three tree species. The comparison of this data with the information on the extreme events has shown that four of the minimums, which we have

Table 2. **Dates of structure anomalies and missing annual rings**

Year	Picea_Nad	Pinus_Nad	Larix_Nad	Parameters				Year	Picea_Nad	Pinus_Nad	Larix_Nad	Parameters			
				I	II	III	IV					I	II	III	IV
1201	–	2fl	–	+	–	–	–	1383	2f	–	2m	–	–	+	–
1239	1m, min	1m	–	–	–	–	+	1386	–	1m	1f	–	–	+	–
1240	min	–	–	–	–	–	+	1387	1m	–	4m	–	–	–	–
1259	"	**1f, 1fl, 2m**	**min**	+	–	+	+	1392	1f, 1m	–	1f, 3m	–	–	+	–
1263	"	min	–	–	–	–	+	1398	2f	–	–	–	–	–	–
1264	"	–	–	–	–	–	+	1401	–	–	2m	–	–	–	–
1265	"	–	–	–	–	–	+	1402	–	1m	8m	+	–	–	–
1291	–	–	2m, min	–	–	–	+	1409	1f, 4fl	–	1fl	–	–	–	–
1300	–	–	2m	–	–	–	–	1412	1m	2m	3m	–	+	–	–
1330	–	–	2m	–	–	+	–	1417	–	2f	–	–	–	–	–
1333	–	–	2fl, 3m, min	–	–	+	+	1420	–	–	2m	–	–	–	–
1342	**1m**	**2m**	**3m, min**	+	+	–	+	1426	1f, 1m	2f	1m	–	–	+	–
1343	–	–	2f	–	–	–	–	1433	2f, 1m	–	–	–	–	–	–
1347	**1fl, 1m**	**2m, min**	**2m, min**	–	+	+	+	**1440**	**4f, 8fl, 1l, 2m**	**1fl**	**1fl**	+	+	+	–
1352	1m	2m	3m	–	+	–	–	1444	1f, 1fl	–	–	–	–	–	–
1354	**1m, min**	**4m, min**	**2f, 5m**	+	+	+	+	**1448**	**1fl**	**3m**	**2fl, 6m**	+	+	+	–
1358	–	1f, 1fl	1f, 1fl	–	–	–	–	1453	1f	–	4m, min	–	–	–	+
1362	1f	–	2f, 1fl	–	–	–	–	1455	1f	–	1f, 1m	–	–	–	–
1366	**–**	**1fl, 4m, min**	**8m, min**	+	–	+	+	1459	min	–	5m, min	+	–	–	+
1371	2fl	1f, 1fl	–	–	–	+	–	**1466**	**4f, 2fl, 1l, min**	**2f, 2fl**	**1f, 1fl, 1m**	+	+	+	+
1374	1l	–	1m	–	–	+	–	1481	–	1m	1m	+	–	–	–
1379	1m	–	2m	–	–	–	–								

Note. For the designations of structure anomalies, see the note to Table 1; m – missing ring; min – growth minimum; I – cases when percentage of the number of structure anomalies and missing rings to the total number of samples in the chronologies containing this year exceeds the average value in the sample; II – dates when the anomalies and missing rings are observed in all three tree species; III – years in which both anomalies and missing rings occurred; IV – growth minimums. Bold font marks the dates of expressed extreme events.

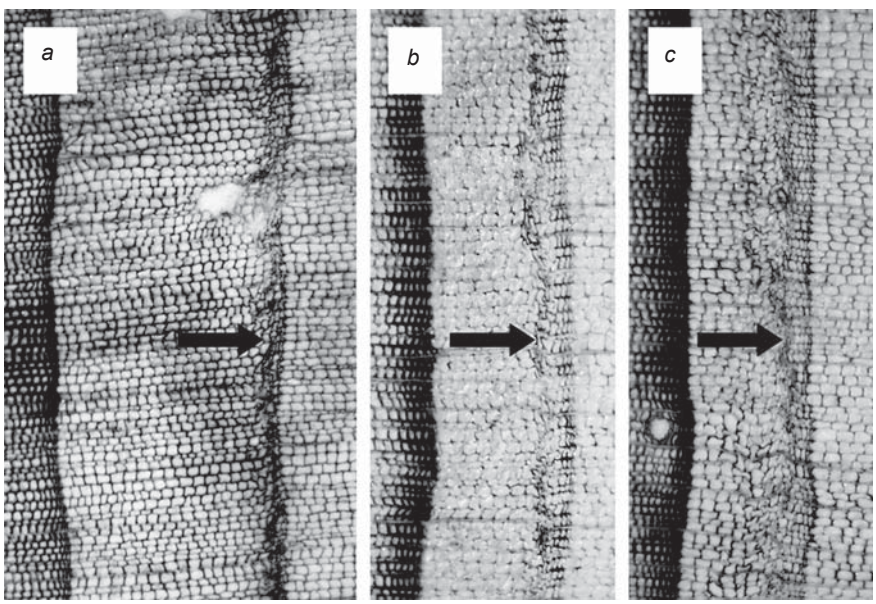

Fig. 3. Intra-annual density fluctuation for 1440.
a – Siberian pine (sample ng291, ring 106); *b* – Siberian spruce (sample ng144, ring 108); *c* – Siberian larch (sample ng413, ring 188). The arrows indicate the fluctuations within the annual ring.

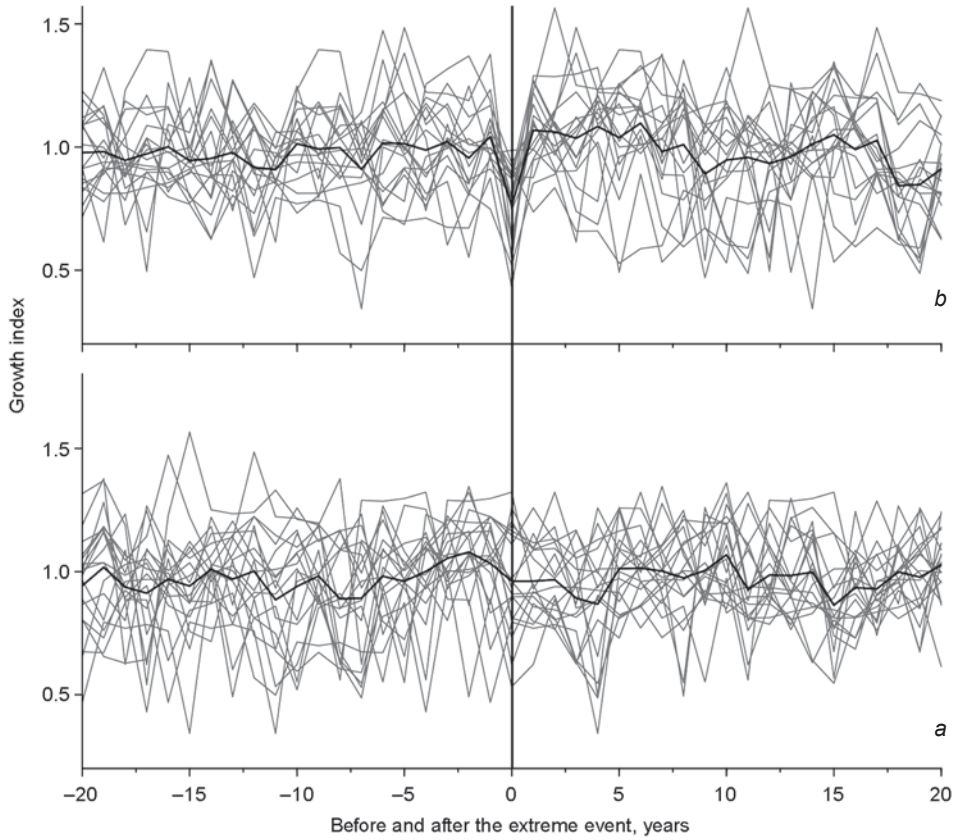

Fig. 4. Tree growth response to extreme climatic events identified from structure anomalies and missing rings. *a* – events identified only from structure anomalies; *b* – events identified from structure anomalies and missing rings. The horizontal line shows the average value of the increase in the width of annual rings; the vertical line shows the year when the extreme event occurred.

identified, fell on the years of missing rings, seven on the dates of the emergence of anomalies and missing rings, and four minimums did not coincide with anomalies and missing rings.

The severity of the extreme event was calculated for estimating the percentage of damaged trees. The years when the value of this index exceeded the arithmetic average (1201, 1259, 1342, 1354, 1366, 1402, 1440, 1448, 1459, 1466, and 1481) (Table 2) were singled out from the sampling. It is notable that structure anomalies and missing rings dated to the above years can also be observed in the trees of over 200 years of age (in which a thick layer of bark should have already protected the dividing cells of the cambium from the damage caused by low temperatures). This indirectly indicates the strength of the impact of the extreme events.

The analysis of four parameters that showed the severity of extreme climatic events has revealed 29 events, which correspond to at least one parameter (Table 2) during the period from 1170 to 1505. However, only in six cases (1259, 1342, 1347, 1366, 1440, and 1448) there is a coincidence of three, and in two cases (1354, 1466) of four parameters. Thus, the strongest climatic extremes in the area of Fort Nadym fell precisely at those years.

The estimation of how effectively the established parameters indicated strong extreme events was performed by calculating the ratio of the number of the extreme events (1259, 1342, 1347, 1354, 1366, 1440, 1448, and 1466) to the total number of events detected according to each individual parameter. The estimation has shown that seven of eleven identified dates (64 %) corresponded to the first parameter (expressiveness of the extreme event), and six of nine dates (67 %) matched the second parameter (synchronicity in formation of structure anomalies and missing annual rings in all tree species analyzed). Seven of 16 dates (44 %) were associated to the third parameter (years with both structure anomalies and missing rings), and six of 15 dates (40 %) were connected to the fourth parameter (years of minimal growth in chronologies). As we can see, the use of only one parameter for establishing extreme climatic events is not sufficient for performing a correct reconstruction. Only an integrated approach based on the analysis of several parameters allows obtaining objective information about strong extreme events in the past.

Comparison of the results with the evidence from direct and indirect sources

To establish the regional extent of the identified extreme climatic events, they were compared to the information revealed by the Yamal tree-ring chronology (Khantemirov et al., 2011) for the territory 170 km northwest of Fort Nadym. Five common dates of a regional scale have been identified in the interval from 1170 to 1505 (1259, 1342, 1347, 1440, and 1466). Despite the fact that the identified events of 1354, 1366, and 1448 were observed according to three and four parameters, their regional nature was not confirmed; they were local and were manifested only in the area of Fort Nadym. In this case, the analysis has clearly revealed that the use of the territorial criterion (the comparison of data on conjugated (neighboring) areas) makes it possible to identify regional events and exclude local events (traceable only in one tree-ring chronology) from the analysis.

The subsequent comparison of five dates common for the northwestern Siberia (1259, 1342, 1347, 1440, and 1466) with published data about extreme climatic events for the Northern Hemisphere has shown that the events of 1347 and 1440 did not manifest beyond the Yamal Peninsula; the extreme events of 1342 and 1466 were observed only in the HI5 tree ring chronology for North America (Salzer, Hughes, 2010). The event of 1259 can be traced in the Central Altai (Jelo tree-ring chronology) (Barinov, Myglan, Taynik, 2017) and North America (HI5 tree-ring chronology). Thus, three extreme climatic events could be identified by the work carried out for the northwestern Siberia, which manifested simultaneously on two continents and influenced the natural processes in the Northern Hemisphere.

The causes of such climatic extremes, which could explain the depression of wood growth, should be probably explained by temperature drops resulting from the darkening of the atmosphere due to the entry of volcanic eruptions into the upper layers. The lack of heat caused by the shortage of solar radiation is a limiting factor in the life of woody plants (it causes growth decrease) (Zielinski, 2000; Robertson et al., 2009; Toohey et al., 2016; and others). To verify our information on four strong extreme events for the period from 1170 to 1505, we involved the evidence on the traces of volcanic eruptions and enhanced it with historical data.

The extreme event of 1259 coincides with the surge in the sulfate content recorded in all ice cores of Greenland and Antarctica, which was caused by the major eruption of the Samalas volcano. Tephra (the emissions) spread from the crater around the entire world (Clausen et al., 1997; Guillet et al., 2017). According to the historical data, frost, atmospheric pollution, crop failures, and epidemics occurred in 1258–1259 in Europe and Central Asia (Stothers, 2000). Very strong frosts were recorded in the Veliky Novgorod lands in May 1259 (Borisenko, Pasetsky, 1983: 137). A surge in the sulfate content in the GISP2, GRIP, and BIPOLAR ice cores (Salzer, Hughes, 2010) coincides with the event of 1342. The winter of 1342 in Western Europe and in Russia was very severe, and the spring was cold. In Novgorod, there was an epizootic and crop failure due to excessive moisture. As a result, a hunger period developed throughout Europe. A decade of years with bad harvests began in Russia in 1342 (Barash, 1989: 106–107). A surge in the sulfate content in GISP2 and GRIP ice cores (Salzer, Hughes, 2010) corresponds to the event of 1466. Thus, all dates of regional extreme events that we have identified are consistent with information on volcanic eruptions, sulfate profiles of ice cores, and evidence of historical sources on unfavorable weather conditions.

At the same time, if we compare historical information about social processes to the mentioned dates of extreme natural events in the region under study, we cannot observe a direct correlation. However, it is not accidental that a series of military campaigns of the Novgorod and Moscow princes to the lower reaches of the Ob River (the Yugra Volost) in Western Siberia started exactly after the extreme event of 1440 (Polnoye sobraniye…, 1982: 90–98). It can be assumed that climatic changes caused by natural events affected the economy of the Russian population of the European Northeast—the zone of risk farming, which provoked military activity aimed at obtaining control and use of outside resource territories, for example, northwestern Siberia.

Conclusions

The results have shown that archaeological wood has a significant capacity both for constructing tree-ring chronologies and for identifying extreme climatic events on the basis of the distribution of structure anomalies and missing rings. Thus, an integrated approach based on the analysis of several parameters has made it possible to identify strong extreme climatic events near Fort Nadym, which occurred in 1259, 1342, 1347, 1366, 1440, 1448, 1354, and 1466. The comparison of these dates with the chronologies of Yamal (Khantemirov et al., 2011), HI15 (Salzer, Hughes, 2010), and Jelo (Barinov, Myglan, Taynik, 2017) has made it possible to identify the events of global (1259), inter-regional (1342, 1466), and regional (1347, 1440) scales.

The verification has shown that traces of volcanic eruptions in ice cores or known dates of large volcanic eruptions, as well as information of historical sources about severe colds, frosts, crop failures, etc., correspond to the mentioned years. It can be assumed that the identified extreme climatic events could have acted more

than once as trigger effects of social processes. Possibly, due to this reason, a series of military campaigns of the Novgorod and Moscow princes started to the lower reaches of the Ob River (the Yugra Volost) after the extreme event of 1440.

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On the Construction Features of Wheeled Vehicles in Iran and Mesopotamia (Third to First Millennia BC)

Reinforcing metal elements in early Eurasian wheels are described. A typology of wheel constructions is proposed, and stages of their evolution and diffusion in socially and ethnically diverse societies are reconstructed. In Sumer and southwestern Iran, early (3d millennium BC) evidence of the use of wheeled transport includes remains of wagons in burials, and representations on vessels and cylinder seals, as well as clay and metal models. The early reinforcing details were bronze nails pinned along the treads of solid-disk wheels. Thick leather straps on treads served for binding wheels, prevented wear, and made riding more comfortable. Chariots marked the high social status of their owners, and were used for military, hunting, and ritual purposes. Around 2000 BC, metal tread-bands with additional plates were introduced in Susiana and Central Asia. In the Early Iron Age, after a 1000-year long break, studded treads reappeared, but on spoked wheels. This construction occurs across a huge territory from the Balkans and Aegean to Bactria. A review of materials from the Bronze Age kurgan burials in the Eastern European steppes reveals no evidence of the use of metal details in the Pit-Grave, Novotitorovka, Catacomb, or Sintashta cultures, indirectly suggesting a multiplicity of wheel-manufacturing traditions.

Keywords: *Bronze Age, Iron Age, Iran, Mesopotamia, wheeled vehicles, metal reinforcing details, technological traditions.*

Introduction

There has been much discussion of the development of wheeled transport in the scientific literature (Nagel, 1966; Kovalevskaya, 1977; Littauer, Crouwel, 1979; Nefedkin, 2001; and others). The military aspect of the history of chariot use by Indo-European peoples is studied in the monograph by D. Anthony (2010). Fundamental issues of the origin and distribution of wheeled transport are discussed. For instance, the association of the wheeled vehicles with the dispersion of Indo-European peoples from their nomadic ancestral homeland became the central theme in a number of studies by E.E. Kuzmina (1994, 2008) and in the collective monograph "The Mystery of the Ethnic History of the Earliest Eurasian Steppe Nomads" (Tainstvo…, 2014). The collection of papers "Origin and Spread of Chariots" (Proiskhozhdeniye…, 2008) discusses the time and place of horse domestication and the appearance of two-wheeled vehicles as an important element of the warfare, social-political history, and ideology of ancient Eurasian societies.

The present article was prompted by a representation of a vehicle drawn by a pair of oxen among the petroglyphs of the Chatur Bkhu Nash grotto in Northern India (Novozhenov, 2012: 113, fig. 57; p. 374, 379): in particular, of a detail in the form of short radial lines extending away from the outer outline of the wheel (Fig. 1, *3*). Obviously, an ancient artist had tried to render some characteristic constructive detail. In search of matches, we considered archaeological materials of the Bronze and Iron Ages

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from various regions. Finds from Iran and Mesopotamia and the South Russian steppes are considered primarily, but comparative materials from later periods and more remote areas are also involved. We are interested in the construction of wheels using metal details. On the basis of these data, we have attempted to outline the stages of evolution and distribution of technological traditions in socially and ethnically diverse societies.

Materials

There is a variety of ancient evidence of the use of wheeled vehicles, including those with metal reinforcing details, in the territory of Sumer and culturally related Susiana. The available Near Eastern materials pertain to the period from the turn of the 4th to 3rd millennia BC up to the 2nd millennium BC inclusive.

We will give a brief overview of early wheeled vehicles, remains of which have been discovered in Susa and Kish burials (the middle of the 3rd millennium BC). These have wheels with metal fasteners in the form of rows of nails pinned along the treads. In burial B 280 of the cemetery on the Donjon hill in Susa (Mecquenem, 1943: 122–124, pl. 10) charred remains of a four-wheeled vehicle were found. The wheels are of different sizes: one pair is 83 cm in diameter, and the other pair is 64.4 cm (Fig. 1, *5*, *6*). Since the vehicle was placed in the burial in a disassembled condition, it is unclear whether the wheels belonged to the same carriage, or to two different ones. Metal nails 4.5–5.0 cm long affixed thick leather straps on the treads. 91 and 86 nails were discovered on the big wheels, and 64 nails on each of the small ones. Chariot-remains were found on another Susa hill, in the Ville Royale, area 1, burial 555. The wheel, deformed into the shape of an oval 77 × 68 cm, also has metal nails along the edge (Tallon, 1987: Vol. 1, p. 303, fig. 44). Chronologically, these finds correspond to the burials containing vehicles in the Royal cemetery of Ur of the Early Dynastic epoch (hereinafter—ED) III (Ibid.: Vol. 1, p. 301); however, no metal reinforcement of wheels has been recorded there (Woolley, 1934: 64, 108–109, pl. 30). Two-wheeled and four-wheeled vehicles were found in three burials of cemetery Y (ED) in Kish; therewith in burial 529, both types were discovered. On the wheels of the vehicle from burial 354 (Langdon, Watelin, 1934: 13, fig. 3, *30–34*), leather strap protectors attached by 55 nails were observed (Fig. 1, *8*).

There are known images of wheeled carriages on various objects, the earliest of which pertain to ED (early-middle 3rd millennium BC). These are drawings on vessels of scarlet ware type from Khafaje (eastern Iraq) and Susa (southwestern Iran) (Delougaz, 1952: 70, pl. 62; Carter, 1985: 45). This type of painting reliably dates the materials to ED I (2900–2750 BC) and the beginning of ED II (2750–2600 BC) (Van De Mieroop, 2016: 41, 42). The vessel from Khafaje shows a representation of an onager-drawn heavy vehicle with four solid-disk wheels (Fig. 1, *1*, *2*). The most interesting detail is a fringe-like toothed framing along the circumferences of the wheels, which probably depicts a reinforcing construction made of straps, attached to the tread by metal nails. Judging by the presence of a quiver with arrows, the vehicle was used for military or hunting purposes. The construction of the wheels can also be judged by the images on the famous "standard" from the Royal cemetery of Ur dated to the middle of the 3rd millennium BC. These have the appearance of solid disks and are made of three solid planks, including the middle plank with a hub at the center, and two outermost ones in the form of segments; the parts are secured together by short cross-members (Hansen, 2003). A scarlet ware vessel from Susa (burial 322 of the cemetery on the Donjon hill (Carter, 1985: 45) has a representation of a vehicle drawn by an ox. Short radial dashes (probably projecting nails of the band) (Fig. 1, *4*) are shown along the wheel's periphery (Mühl, 2014). In general, the composition is very similar to the image of vehicle in the Chatur Bkhu Nash grotto.

Images of wheels with additional details can also be seen on cylinder seals and their sealings. The sealing on a vessel from Uruk (the first half of the 3rd millennium BC) represents a solemn procession (Boehmer, 1985: 104, fig. 6.7, No. 58). The leader carries a round object (a tambourine?), and an axe is depicted in the rider's hand. A toothed framing, the same as that on the vessels from Khafaje and Susa, is shown along the periphery of the wheels (Fig. 1, *7*).

One more group of images involves models of ED chariots. In a number of cases, these have wheels with profiled treads, which render in clay projecting nail heads. Thus, two models from Nippur have wheels with toothed edges (Legrain, 1930: Pl. 45, 46) (Fig. 1, *11*, *12*). Another clay model originating from urban layers of Kish has the same wheels. The composite model consists of a two-wheeled carriage, a figurine of a standing driver (Fig. 1, *10*), and several equids (Langdon, Watelin, 1934: Pl. 14, *1*). A well-preserved copper model of a quadriga was found in the Shar temple at Tell Agrab (Delougaz, Lloyd, 1942: 257, fig. 200). The wheels are solid, three-part, with toothed edges, which render the nails of bands (Fig. 1, *13*). The vehicle is light, open, without a body. It could move quickly through the use of four animals. Possibly it is a war chariot, or a carriage for ritual competitive games.

Images of chariots are present in stone carvings. A fragment of a chlorite vase from the Sin temple in Khafaje contains representation of a two-wheeled light vehicle with its driver holding in his hand a long object (an axe handle? a club?) (Frankfort, 1935: 48, fig. 55) (Fig. 1, *9*).

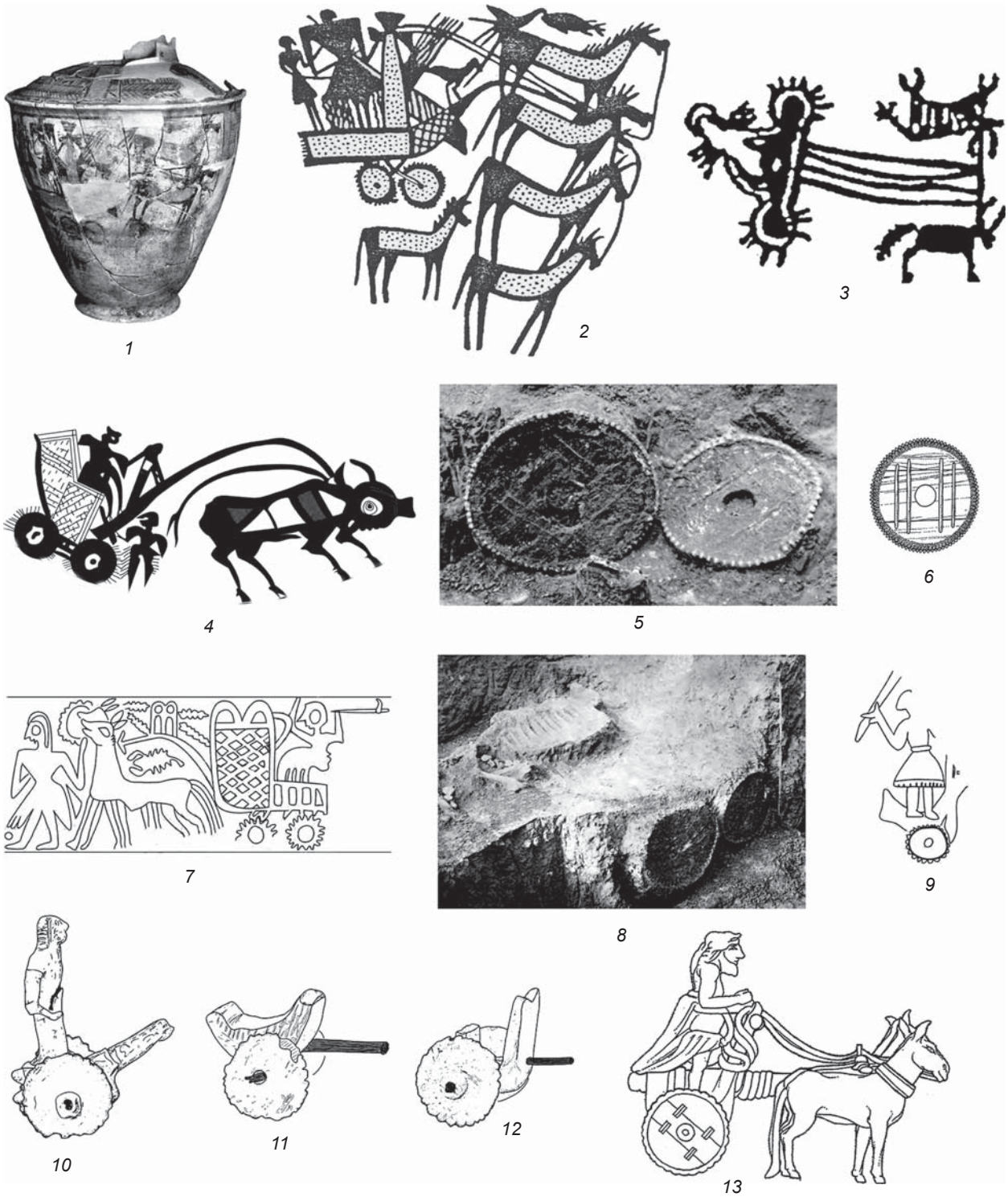

Fig. 1. Near-Eastern wheeled vehicles of the 3rd millennium BC with wheel fasteners in the form of a row of nails, found in the funerary complexes and pictorial sources.

1, *2* – image on a scarlet ware vessel from Khafaje, ED I–II; *3* – drawing on petroglyphs of the Chatur Bkhu Nash grotto in Northern India; *4* – image on a scarlet ware vessel from Susa, the cemetery on the Donjon hill, burial 322; *5*, *6* – wheels from burial B 280 of the cemetery on the Donjon hill in Susa; *7* – sealing on a vessel from Uruk; *8* – vehicle from burial 354 of the cemetery Y in Kish; *9* – image on a carved chlorite vase from Khafaje; *10* – terracotta model from Kish; *11*, *12* – terracotta models from Nippur; *13* – copper model from Tell Agrab.

A review of Near Eastern materials of the 3rd millennium BC suggests some technical characteristics of vehicles with metal fasteners on wheels in the form of rows of nails. These are heavy body frame and massive solid wheels, fitted onto an immovable axis. The resistance to rotation and friction factor of the wheels were great, requiring frequent lubrication. Vehicles skidded when moving through the mud, but during dry seasons, they could have moved rather quickly across the plains of Mesopotamia. Nails pinned along the treads often fastened leather straps that served for binding three massive planks of composite wheels and preventing wheel wear. Chariots were complex and expensive structures, which, together with the necessity of managing draught animals, meant that they could belong only to people of high social status.

Assemblages from the Ur, Kish, and Susa cemeteries show an important role for heavy wagons with solid-disk wheels in a funeral ritual. They could have been used to deliver loads to the place of burial (Anthony, 2010: 403). Vehicles are mentioned in Sumerian texts (gišGIGIR). In a number of cases, these are chariots intended for cult goals, which belonged to a deity or a king. For instance, a text dated to the end of the 3rd millennium BC "The Death of Ur-Nammu and His Descent to the Underworld" describes the arrival of the king in Kur (kingdom of the dead) in a chariot; draught animals (equids – ANŠE) are also placed in the grave. The king offers the chariot with an ox-team as a sacrifice to the deity (Littauer, Crouwel, 1979: 45).

There was much concern with reducing the mass and increasing the speed and maneuverability of the vehicles. A solution was found for changing the construction: carriages became two-wheeled and turned into war chariots. This class of vehicles is represented by models from Nippur, Kish, Tell Agrab, and by a carved image from Khafaje.

Now for some observations on the types of vehicles with metal details, known from archaeological materials. At the end of the 4th millennium BC, Susa was the center of the early state formation Susiana, located in the territory of modern Khuzestan. The region was included in "greater Sumer" and was under the control of Sumerian city-states (Potts, 2015: 81, 82). In the period of late Uruk, Susiana left the Sumerian civilization. The Susa III stage (the Proto-Elamite period) corresponds to the beginning of the ED in Southern Mesopotamia (3100–2700 BC). At this time, the cultural traditions of the Iranian Plateau prevailed in the region. The appearance of its own Proto-Elamite writing system is one of the identifying characteristics of the culture. The tablets have not been deciphered, but their language is different from the Sumerian (Potts, 2012: 601). The subsequent development of Susiana is related to Elam, and ca 2300 BC the region was integrated into the empire of Sargon of Akkad. A lot of vehicles dating to the end of the 3rd to the 2nd millennia BC are known in the Near East, but these do not have wheel fasteners in the form of nails (Littauer, Crouwel, 1979: 48–98). During this time, a new type of wheel-reinforcing element was introduced, in the form of metal tread-bands with additional side plates overlapping the wheel surfaces (Ibid.: 39). These are represented in burials of the early 2nd millennium BC in Susa. The treads consist of several arched sections with three pairs of side plates each (Fig. 2, *1*, *2*). They were found in burial A 89 on the Donjon hill (stored in the Tehran museum) (Tallon, 1987: Vol. 1, p. 302, fig. 46) and in the burial within area 1 in the Ville Royale (stored in the Louvre) (Ibid.: 337, No. 1304).

Full analogs of the new-type tread-bands are the finds from the Gonur-Depe cemetery in Turkmenistan, dated to the late third or early second millennium BC. In burials 3900 and 3200, well-preserved vehicles were discovered, with the wheels reinforced by metal tread-bands with side plates (Sarianidi, Dubova, 2010) (Fig. 2, *3–5*). This fact reflects close relations between the two regions at the turn of the 3rd and 2nd millennia BC, and points to similar processes in the formation of local elites.

There is a fairly large number of materials concerning wheeled vehicles from the Late Bronze Age (the 16th–12th centuries BC) in the Near East and Egypt. The domestication of horse, which quickly became the main draught animal, took place in the 2nd millennium BC; during the same period, light war chariots of a new construction, on spoked wheels, appeared, which was a revolution in warfare (Nefedkin, 2001: 58–60).

According to S. Piggott, this was not a result of internal evolution from an onager-drawn heavy vehicle with solid-disk wheels, but was borrowed *in toto* from groups of illiterate nomadic non-urban population that inhabited the distribution area of wild horses, to the north of highly developed civilizations of the Near East.

These societies, some of which pertained to the Indo-European language family, used light horse-drawn vehicles with spoked wheels (Piggott, 1978: 42). The quick mass spread of war chariots makes it possible to relate them to the appearance of newly-arrived ethnic groups (Hurrians, Kassites) and to the existence of the state of Mitanni, and to consider them in terms of the broad Indo-European issue (Moorey, 1986).

The construction of wheels fastened by straps and nails is not present in materials of the 2nd millennium BC. It may appear that it had outlived its usefulness because of its imperfection, and had disappeared in a new ethnic environment. However, this is not the case. In the Early Iron Age, such fasteners reappeared (Mühl, 2014) but on spoked wheels of new design. Finds of this type are known from the Balkans and the Aegean to Bactria. We shall mention a sealing from Anatolia (Gordion, ca 800 BC) showing a hunting scene (Fig. 2, *9*). A golden

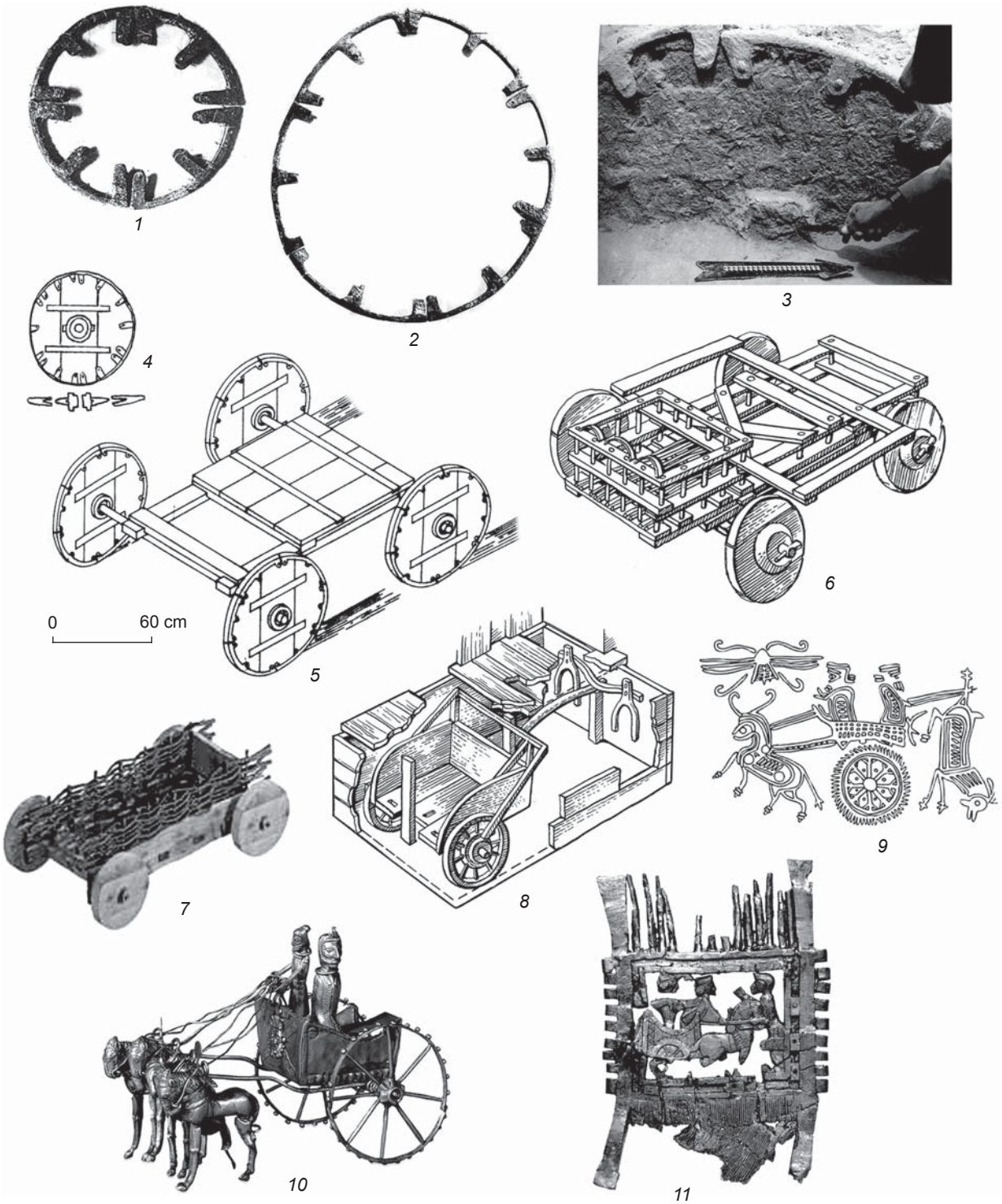

Fig. 2. Fasteners of wheels in the form of metal tread-bands from burials of the 2nd millennium BC in the Near East and Central Asia (*1–5*), vehicles without metal fasteners from the Bronze Age sites of Eastern Europe (*6–8*), and images of vehicles with wheel-fasteners in the form of a row of nails of the 1st millennium BC (*9–11*).

1 – Susa, the cemetery on the Donjon hill, burial A 89; *2* – Susa, Ville Royale, the burial in area 1; *3* – Gonur-Depe cemetery, burial 3900; *4*, *5* – Gonur-Depe cemetery, burial 3200, reconstruction; *6* – Ostanniy kurgan cemetery in the Kuban region; *7* – Ulan IV kurgan cemetery in the lower Don region; *8* – Sintashta kurgan cemetery in the Southern Urals, burial chamber 30; *9* – sealing from Gordion; *10* – golden figurine from the Oxus treasure; *11* – wooden comb from Taksai-1 kurgan cemetery.

figurine from the Oxus treasure, an Achaemenian jewelry masterpiece, depicts in detail a four-horsed war chariot. Large wheels with eight spokes have metal tread-bands, big nail heads project on the treads (Littauer, Crouwel, 1979: Fig. 82) (Fig. 2, *10*). S. Mühl provides data on war chariots from the first millennium BC with such fasteners; in particular, a catalog of images on the reliefs of the Nineveh palace-complexes (2014: 167, 168).

Of great interest are new finds from Western Kazakhstan. A charred wooden comb with an openwork carved image of a chariot was found in the burial mound Taksai-1, in a burial of a noble woman (6th to 5th centuries BC). Spoked wheels have cogs along the circumference—reinforcing details in the form of nails (Altynbekov, Novozhenov, 2014: Fig. 1) (Fig. 2, *11*).

Discussion

Let us return to the Bronze Age. Was the use of metal reinforcing details in wheels a pervasive practice at that time? Let us consider materials from Eastern Europe. Around 3000 BC, wheeled vehicles gained widespread use in the South Russian steppes. Such finds are known from the Cis-Urals in the east to the lower reaches of the Danube in the west. Their greatest concentration is observed in the steppe Kuban region, and a somewhat lower one in the Lower Dnieper and Dniester regions. Modern methods of mound excavation have enabled recording of numerous cases of the placement of vehicles in the burial chambers (Rogudeev, 2008: 75–85).

Vehicles from approximately 220 burials belonging to various territorial versions of the Pit-Grave and Novotitorovka cultures, pertaining to the turn of the early and middle periods of the Bronze Age (the end of the 4th to the first quarter of the 3rd millennium BC), are carts with solid three-part wheels. For instance, burials from the Ostanniy kurgan cemetery in the Eastern Azov region had immovable axes and solid-disk wheels, each made of three thick planks with a massive hob, which resembles Near-Eastern finds. The construction of the body was much more complicated: it was based on a frame made of massive longitudinals and lighter cross-members. Using numerous vertical posts, flooring boards were secured onto it, sometimes in tiers, which ensured both the lightness and the strength of the structure (Fig. 2, *6*). The dimensions of the body are 2.20 × 1.15 m, the diameter of wheels is about 70 cm (Gey, 2000: 180–184).

Vehicles of the Catacomb culture of the Middle Bronze Age (the second to third quarters of the 3rd millennium BC; currently, about 120 burials are known) have a similar construction. The basic innovation is the use of a large cross-piece of bars connecting the body corners diagonally. The vehicles also have solid-disk wheels composed of three parts (Ulan IV kurgan cemetery in the lower Don region) (Shishlina, Kovalev, Ibragimova, 2013) (Fig. 2, *7*).

Notably, with a considerable series of vehicles from the burials of steppe cultures, the use of metal reinforcing or connecting details was never observed, either for complete vehicles or for bodies or separate wheels, irrespective of the state of preservation or the type of construction. All connections were made using wooden nails, pins, and posts inserted in drilled- or hollowed-out holes or bores. While the assumption about using an incomplete construction or even its dummy with respect to certain simplified versions of the body is permissible, it is virtually impossible in case of wheels, since many of these show wear traces near the hub.

The issue about using special tread-bands for damping the motion or additional fastening of the wheel's disk parts still remains unclear. In well-preserved wheels, the thickness in the central portion reaches 6–7 cm, sometimes 10–12 cm, and decreases towards the edges to 2–4 cm, which seems to be illogical as regards ensuring the roadworthiness of the carriage. Only individual and, frankly speaking, ambiguous observations count in favor of the existence of laid-on tread-bands. Noteworthy are the cases of finding black or white borders along the edges of wheels lying flat in the Novotitorovka burials of the Kuban region (Ostanniy, 1/150; Plastunovskiy I, 2/13); distinct thickening, up to 12 cm, along the treads of wheels from the cenotaph excavated near the Plastunovskaya Cossack village in 1977 (Nekhaev, 1977); and a clay wheel model with a thickening along the edge from the catacomb burial of the Darya cemetery, in the lower Manych basin (Larenok, 1997: Pl. 97).

Discovery of the Sintashta kurgan cemetery of the 2nd millennium BC in the Southern Urals became a notable event in the history of the study of the Late Bronze Age (Gening, Zdanovich, Gening, 1992: 215, fig. 116). Technically sophisticated war chariots have been found in the burial chambers (Fig. 2, *8*). They each have a plank body and two wheels with eight or nine spokes. A yoke designed for two horses (their skeletons have been found in the burials) was fastened to a curved draft tongue. Reconstruction of connection between the axis and the draft tongue using holding bars disposed outside along the body is questionable. Nothing similar has been found in any other burial grounds. Small size, lightness, and mobility made these chariots excellent transport vehicles for military or hunting purposes, which allowed the Aryan tribes rapidly to overcome the immense distances within Eurasian steppes and forest-steppes. As in the Near East, chariots marked the high social status of buried warriors. However, no evidence of studded treads has been found here either.

Conclusions

Two main types of wheeled-vehicle construction can be distinguished in the Eurasia of the Bronze Age in terms of the availability and special features of metal reinforcing details. The early type of fastening the solid-disk wheels using strap protectors and nails is recorded in Sumer and southwestern Iran at the beginning of the 3d millennium BC in the form of remains of chariots in burials, images on vessels and cylinder seals, and clay and metal models. The next stage of development of the Mesopotamian-South Iranian technical concepts is represented by the flat metal tread-bands known at the turn of the 2nd and 3rd millennia BC in Susiana and Central Asia. The chronology and geography of the finds suggest that the metal reinforcing details of vehicles were an achievement of the advanced agricultural civilizations of the Near East, and were widespread among the early state formations. The relative accessibility of copper/bronze raw materials played a large part in this.

In the Early Iron Age, after a 1000-year-long break, studded treads reappeared, but on a new-type of spoked wheel. Such finds are known in a huge territory from the Balkans and the Aegean to Bactria and the steppes of Kazakhstan, which is a rare example of revival of previously invented construction in another ethnic and cultural environment.

Both early heavy vehicles with solid-disk wheels and light chariots of the 1st millennium BC were owned by people of high social status, and were used for military, hunting, and ritual purposes.

The review of a considerable body of materials from the Bronze Age mound burials in the Eastern European steppes confirms that metal construction details were not used in the vehicles of nomadic stock-raising cultures such as Pit-Grave, Novotitorovka, Catacomb, and Sintashta. This is indirect evidence of the multiplicity of wheel-manufacturing traditions.

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The Adaptation of the Seima-Turbino Tradition to the Bronze Age Cultures in the South of the West Siberian Plain

This article presents the results of a study of bronze-casting artifacts found at the Middle Bronze Age settlements of the Middle Irtysh region. Seima-Turbino-type clay bronze-casting molds from the sites of Chernoozerye VI, Abramovo-10, and Vengerovo-2 are described with regard to construction, composition of molding mixture, and types of cast. Special attention is paid to the archaeological context. At Abramovo-10, the casting area was located between the houses; at Vengerovo-2, in a special structure with furnaces and utility pits. Similar types of casting areas, furnaces, and reusable molds attest to the unification of the casting process and a sophisticated tradition practiced by the indigenous Krotovo people, who, judging by the molds and casts, manufactured the Seima-Turbino-type bronze weapons themselves. The Irtysh, with its tributaries, was a transportation route along which the tradition spread. Initially, Seima-Turbino bronze artifacts were imported; but eventually they were replicated by local casters, who, in certain respects, adhered to their own metallurgical traditions.

Keywords: *Seima-Turbino bronzes, Krotovo culture, Irtysh region, settlements, molds.*

Introduction

Despite a significant number of studies of the Seima-Turbino bronzes, certain issues are still unclear. The sites with the Seima-Turbino bronze artifacts have been recorded from a vast region; but no distinct archaeological culture has been identified, because neither have any boundaries of their occurrence been established, nor any settlements with traces of their manufacturing been found, and every burial site shows specific features. E.N. Chernykh and S.V. Kuzminykh (1989) proposed a term "Seima-Turbino transcultural phenomenon" for the sites containing such artifacts. Up to now, the dispersal of the Seima-Turbino objects has been attributed to migrants who moved from east to west, in the direction opposite to that of the representatives of the Andronovo timber-grave tradition (Chernykh, Navarrete, 2011: 20–21).

During the last decade, the total number of the Seima-Turbino objects has grown, as new artifacts have been found in the Irtysh basin. In this region, the cemeteries of the Odinovo and Krotovo cultures (Preobrazhenka-6 (Molodin, 2013), Sopka-2/4B, C (Molodin, Grishin, 2016: 81–82, fig. 137, 139, 1, 25), Tartas-1 (Molodin et al., 2009), and Rostovka (Matyushchenko, Sinitsyna, 1988)) have revealed five burials containing not only standard Seima-Turbino objects, but also casting molds. However, local manufacture of the Seima-Turbino bronzes was not confirmed until the traces of such manufacture were found at the settlements.

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Casting molds and manufacturing areas at Krotovo settlements

Casting molds were found at several settlements of the Krotovo culture: Chernoozerye VI (Kondratiev, 1974: 18; Stefanova, 1988: Fig. 6, *3*), Vengerovo-2 (Molodin, Mylnikova, Durakov et al., 2015: 323–324, fig. 1, *2*), and Abramovo-10 (Fig. 1). These finds are significant for establishing reliable correlations between the Seima-Turbino bronzes and particular areas and cultures.

The settlement of Chernoozerye VI is situated on a fluvial terrace on the left bank of the Irtysh River, 1 km to the northeast from the village of Chernoozerye in the Sargatsky District, Omsk Region. The site yielded a spear mold-fragment: a part of a ceramic mold with a cavity and parting. The fragment was found in the casting workshop's waste, at the edge of the terrace (Kondratiev, 1974: 18). Since the site is multilayered (Stefanova, Stefanov, 2007), the mold can be attributed to the Krotovo culture.

The settlement of Abramovo-10 yielded two fragments of clay celt-casting molds. The site is located on the second fluvial terrace on the left bank of the Om River, 5 km southwest of Kuibyshev, in the Kuibyshevsky District of the Novosibirsk Region (Molodin, 1985: 35) (Fig. 1). One of the finds is a fragment of the middle portion of a mold retaining the cavity side-wall and the parting (Fig. 2, *1*). The mold was made of a mixture of clay with well-calibrated medium-sized sand. The mold was made using a bottom board, which left an impression on the surface of the parting of the mold. Judging by the mold cavity's shape, the celt had a hexagonal cross-section in its middle part, and was wedge-shaped in side view (Fig. 2, *2*). The mold also showed traces of stiffening ribs at the line of convergence of the lateral and front faces of the celt. Judging by the size and converging of walls of the mold cavity and the parting of the mold, the celt's

Fig. 1. Krotovo settlements yielding Seima-Turbino bronze-casting molds.
1 – Chernoozerye VI; *2* – Vengerovo-2; *3* – Abramovo-10; *4* – Stary Tartas-1.

height did not exceed 8.7 cm. The external surface of the mold showed two deeply cut oblique lines, adjoining the parting, that served as guide-marks during the centering of the mold when connecting the mold's halves. Such cuts were typical of the Krotovo molds. These were noted on the molds from Tartas-1 and Sopka-2 (Ibid.: Fig. 28, *1*, *5*) and on the molds of other contemporaneous cultures of Siberia (Koksharov, Chemyakin, 1991: 46–47, fig. 2, *1*, *d*; 3, *1*, *c*, *f*).

Another fragment is a part of the upper mold-half with a sprue and a cavity (Fig. 3, *1*). The mold was made of a mixture of clay with well-calibrated sand and crushed calcined bones. The mold's cavity retains a fragment of the relief ornamentation: a band of oblique lines between two horizontal lines forming a kind of staircase. This ornamental pattern is typical of the Seima-Turbino celts (Chernykh, Kuzminykh, 1989: 46).

The above-mentioned mold fragments were found in the bronze-casting area between the houses at the settlement of Abramovo-10. The area contained a hearth (Fig. 3, *2*) and a utility pit. The hearth (structure B) was a rectangular pit 2.0 × 0.89 m in size and 0.47 m deep, oriented with its long axis along the NW-SE line (Sobolev, 1984). The vertical walls and the bottom of the pit were coated with a layer of fired clay up to 0.14 m thick. The filling consisted of dark gray loam with inclusions of soot, ash, and pieces of calcined clay. In the immediate vicinity of the hearth and in its filling, fragments of at least seven crucibles were found (Fig. 3, *3*, *4*), one of which we restored (Fig. 3, *3*). The utility pit (No. 124) was located 0.8 m to the northeast from the hearth. It is ovoid, with vertical walls and a plain bottom; the size is 1.7 × 0.9 m, and the depth 0.24 m. The filling revealed fragments of pottery and bones, and slagged fragments of crucible.

One of the most impressive finds is a fragment of a celt casting mold of the Seima-Turbino type, from the settlement of Vengerovo-2 (Molodin et al., 2015: Fig. 1), located at the edge of the second fluvial terrace on the left bank of the Tartas River, in the Vengerovsky District, Novosibirsk Region (Molodin, Polosmak, 1978; Troitskaya, Molodin, Sobolev, 1980). This object was found at floor level in dwelling 7 (Molodin et al., 2015: 323–324, fig. 1, *2*) (Fig. 4). It was a fragment of a stone mold for celt-casting (Fig. 5). The mold was made of dark gray soft marl (class 2 in the Mohs scale of hardness). Only a part of the mold cavity and a parting of mold halves survived. Judging by the traces on the mold, all its main cavities were initially outlined on the leveled blank surface, and were then cut with a knife with the technique similar to wood carving. For example, the surfaces of all depressions forming the relief ornamentation show traces of bilateral trimming made with the tip of the blade. The back of the mold half was first given a rounded shape with a knife, and then additionally fashioned with a coarse-grained abrader. This technique of mold

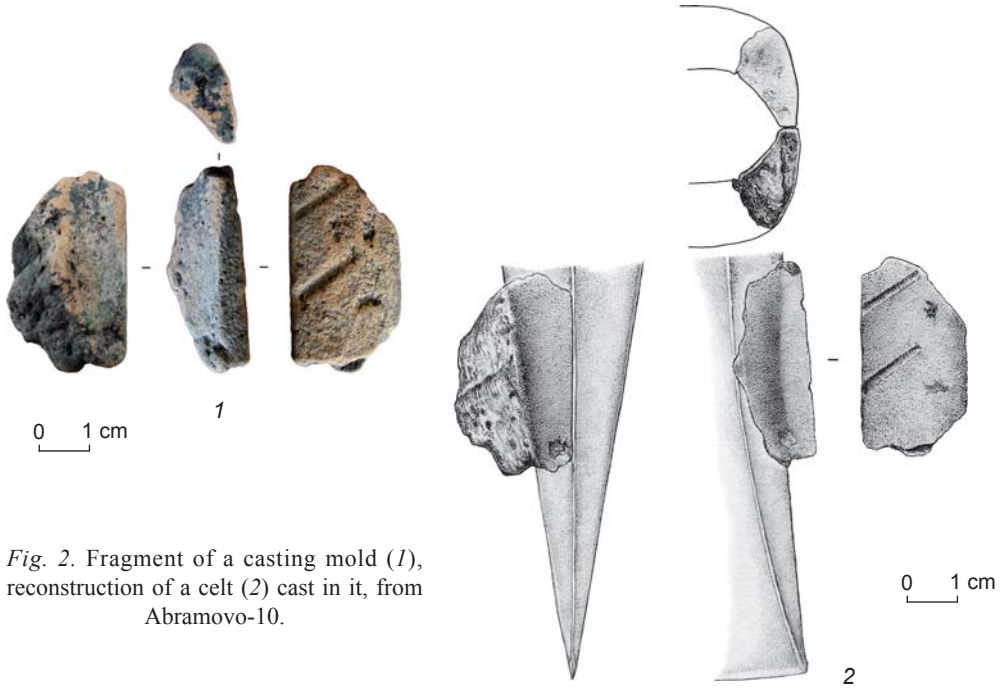


Fig. 2. Fragment of a casting mold (*1*), reconstruction of a celt (*2*) cast in it, from Abramovo-10.

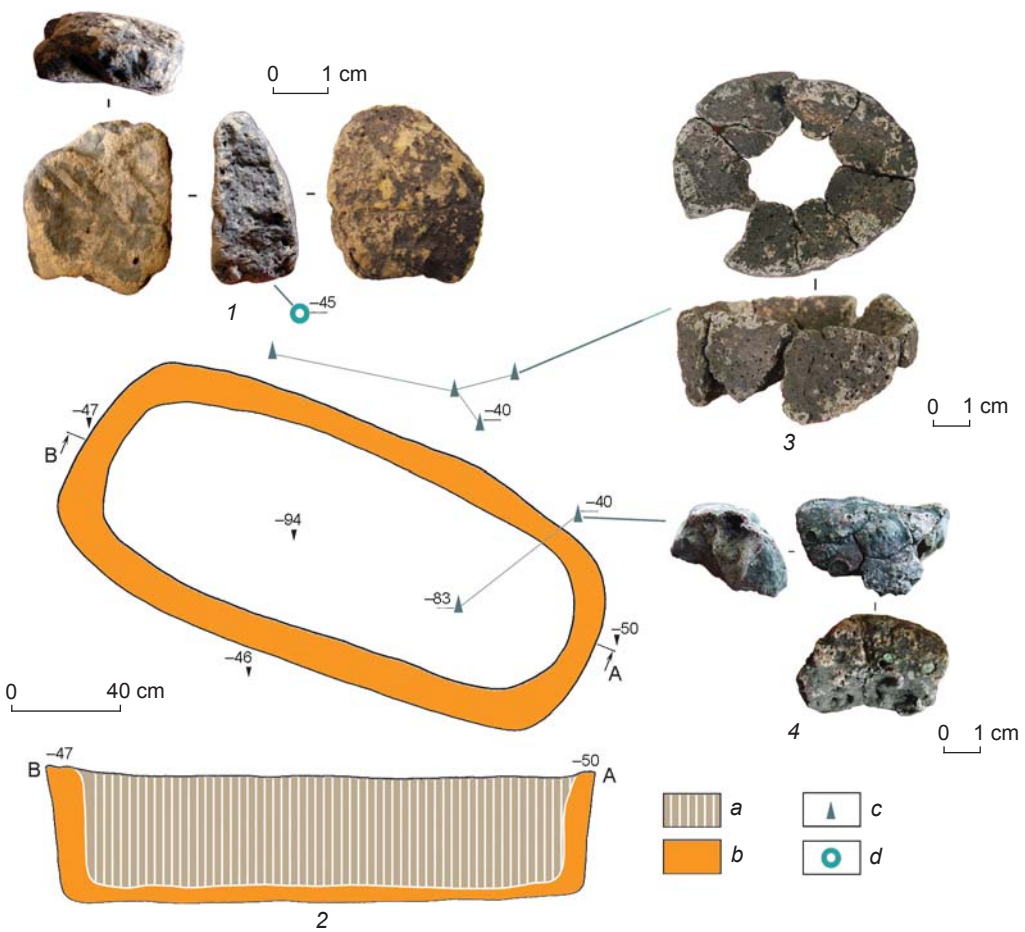
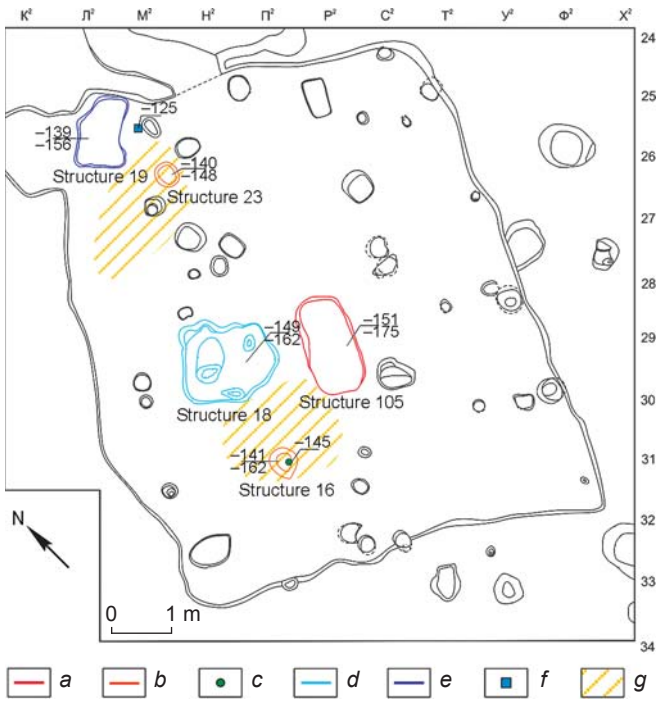


Fig. 3. Fragment of a casting mold (*1*), plan and section of the hearth (structure B) (*2*), and crucibles (*3*, *4*) from Abramovo-10.

a – dark gray loam with ash and soot inclusions; *b* – calcined clay; *c* – fragment of a crucible; *d* – fragment of a casting mold.

1



2

Fig. 4. General view (*1*) and plan (*2*) of dwelling No. 7 at Vengerovo-2.

a – hearth; *b* – furnaces; *c* – bronze drop; *d* – ash storage pit; *e* – utility pit; *f* – celt-casting stone mold; *g* – technical ceramics dispersal areas.

manufacture is typical of the Seima-Turbino casting tradition. Signs of its use were traced on several objects made of soft stone; for example, on a talc mold from burial No. 282 at Sopka-2/4B, C (Molodin, Grishin, 2016: Fig. 397) and on a limestone mold from a concentration of artifacts associated with grave 21 at the cemetery of Rostovka, in Omsk (Matyushchenko, Sinitsyna, 1988: 30–31, fig. 36, 37).

The negative of the casting chamber makes it possible to reconstruct the object cast in it (Fig. 6). The celt had a hexagonal cross-section in its middle portion; its body was wedge-shaped in side view; its cutting edge was slightly wider than the main body; and the socket was flattened into an oval. Judging by the inclination of the mold cavity wall relative to the parting of the mold, the celt height did not exceed 12.5–12.7 cm. The socket edge was ornamented with a pair of thin relief fillets and a belt of shaded isosceles triangles. The lateral side of the celt, which survived in the mold, was ornamented with two deeply incised lines, forming an isosceles triangle oriented with its base towards the parting of the mold. The front surface of the celt is separated from the

Fig. 5. Fragment of a casting mold from dwelling No. 7 at Vengerovo-2.

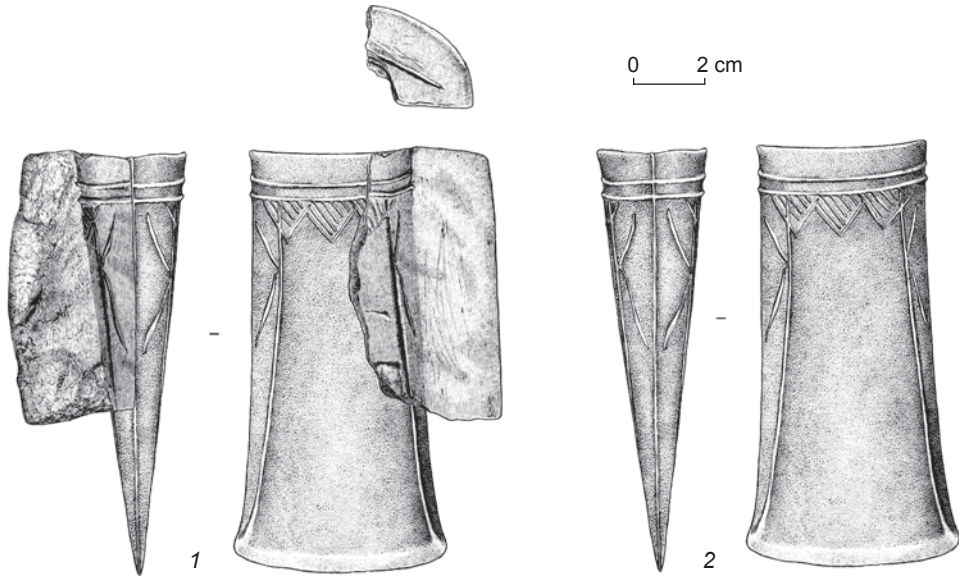


Fig. 6. Reconstruction of a celt cast from dwelling No. 7, Vengerovo-2.

lateral surfaces with an incised line simulating a stiffening rib, which feature is typical of the Seima-Turbino celts (Chernykh, Kuzminykh, 1989). In terms of construction and ornamentation, the Vengerovo-2 find is close to the celts of the Seima-Turbino-type (Kosarev, 1970: 124, fig. 1, 6, 7). According to the classification by Chernykh and Kuzminykh (1989: 46–55, fig. 10, *7*, *8*; 15, *1*; 16, *4*), the object belongs to category K-12 or K-18.

The mold seems to have disintegrated owing to thermal effects. Its cavity has use-wear traces in the form of a dark gray layer of copper-scale. Experiments have shown that the stone mold can withstand more than 100 castings (Beltikova, 1993: 65; Coghlan, 1951: 73), which means that it could have been used in serial production. The bronze-casting workshop where the object was found reveals traces of long-lasting large-scale production. The production area occupies a major part of dwelling No. 7 (see Fig. 4, *2*) and consists of a multifunctional hearth (Fig. 7), two specialized furnaces (Fig. 8, 9), and two ash utility and bone storage pits (Fig. 10).

The hearth (structure No. 105) was a rectangular pit located in the center of the dwelling, 1.65 × 0.87 m in size and up to 0.21 m deep, filled with ash, burnt sandy loam, pieces of calcined bones, fragments of pottery, and pieces of burnt clay, containing a flake from some working tool and an abrader on a potsherd (see Fig. 7). Judging by the filling and the finds revealed from it, the hearth was used for cooking, heating, and lighting, as well as for production purposes. The hearth is shallower as compared to the similar central hearths in other

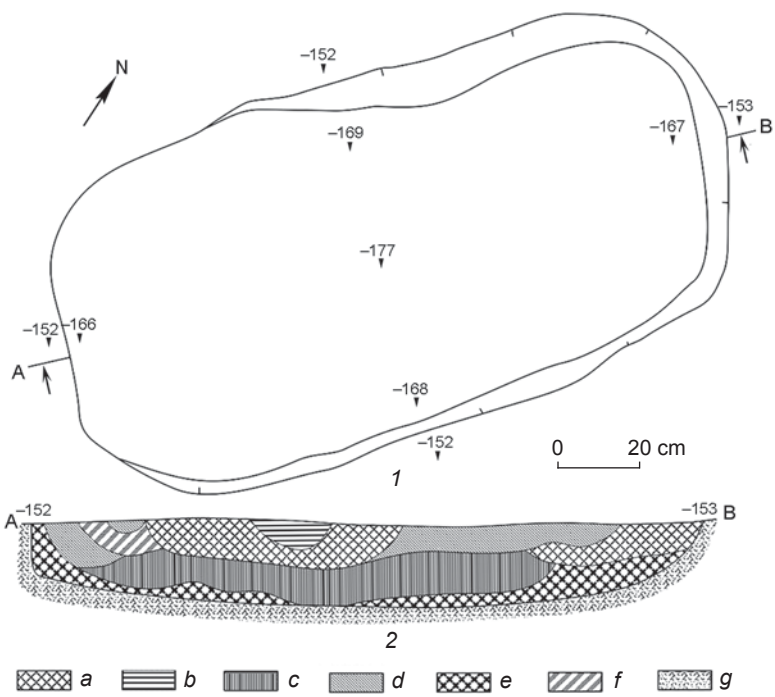
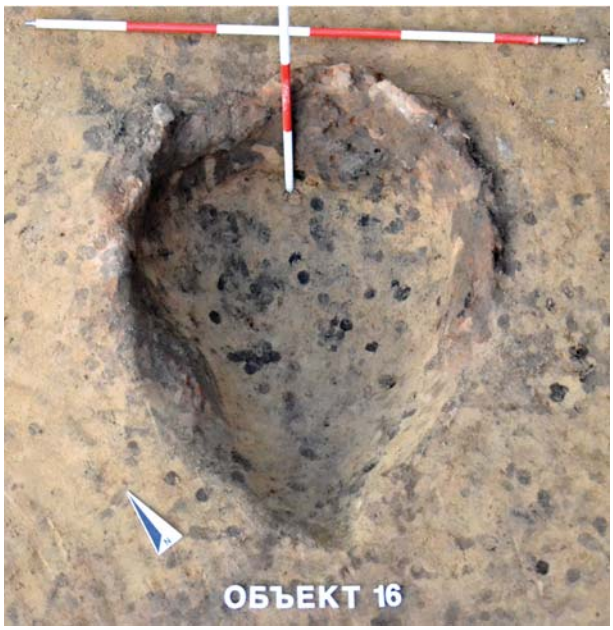


Fig. 7. Plan (*1*) and section (*2*) of the hearth (structure No. 105) at dwelling No. 7, Vengerovo-2.

a – blackish-gray mixed sandy loam with inclusions of burnt clay; *b* – grayish-black mixed sandy loam; *c* – reddish-orange calcined sandy loam; *d* – light gray sandy loam; *e* – yellowish-gray mixed sandy loam; *f* – gray ashy sandy loam; *g* – virgin soil.



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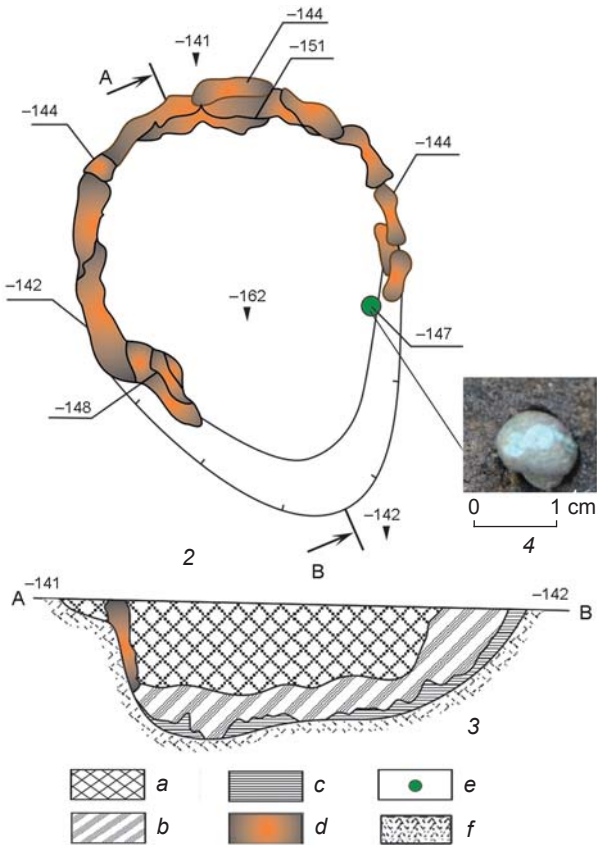

Fig. 8. General view (*1*), plan (*2*), and section (*3*) of furnace (structure No. 16) in dwelling No. 7 at Vengerovo-2, and a bronze drop from the furnace (*4*).
a – grayish-yellow mixed sandy loam; *b* – dark gray sandy loam with calcined inclusions; *c* – grayish-yellow mixed and dense sandy loam; *d* – clay coating; *e* – bronze drop; *f* – virgin soil.

1

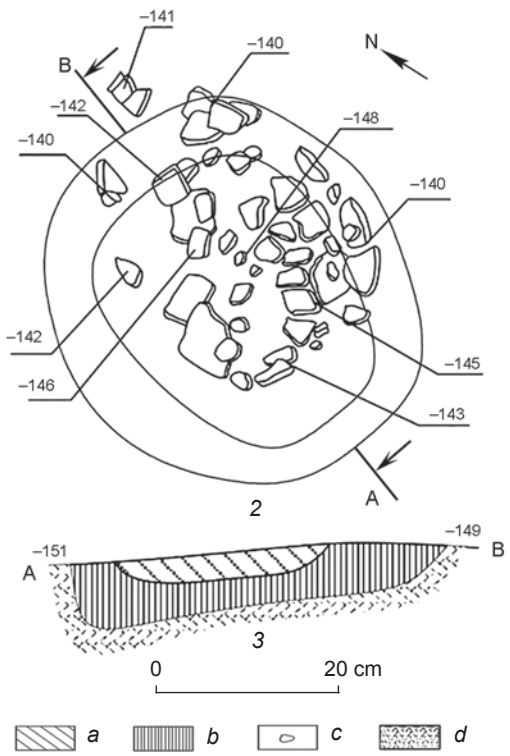

Fig. 9. General view (*1*), plan (*2*), and section (*3*) of the furnace (structure No. 23) in dwelling No. 7, Vengerovo-2.
a – grayish-black sandy loam; *b* – yellowish-gray mixed sandy loam; *c* – ceramic fragment; *d* – virgin soil.

dwellings, and yields a smaller number of artifacts. According to stratigraphic features, only the western part of the hearth was used at the latest stage of its use.

1 m to the southwest of the central hearth, a special furnace was located, with the walls and floor coated with a clay layer (structure No. 16) (see Fig. 8). The furnace is a drop-shaped small pit (0.54 × 0.46 m, 0.16 m deep) oriented along the N-S line, with a minor eastward deviation. The northern, western, and eastern walls of the pit are vertical, the southern wall is sloping, the floor goes down gently from the south to the north. Clay coating (up to 3 cm thick) covers the walls and the floor except for the southern wall, which expands beyond a conventional circle (0.17 × 0.04 m). The northern wall was burnt more heavily than other wall portions. Near the southern end of the pit, bellows seem to have been mounted. These delivered the air stream, which reached the opposite wall, creating the area of highest temperature. The filling of the furnace pit yielded pieces of burnt clay and charcoal, as well as a bronze drop (see Fig. 8, *3*). The practice of artificial air-delivery in Krotovo metallurgy is confirmed by the occurrence of nozzles in the graves of the Sopka-2/4B, C (Molodin, Grishin, 2016: 247, fig. 394). Furnaces of this sort have been reported from Preobrazhenka-3 (Molodin, 1985: 75) and other Krotovo sites.

Another furnace (structure No. 23) was located 1.5 m to the north of the abovementioned structure (see Fig. 9). It was a rounded pit, 0.4 × 0.38 m in size and 0.07 m deep. Its northern, western, and eastern walls were almost vertical, while the southern wall was sloping; the floor was uneven and slightly dipping to 5 cm from south to north. The floor and walls were paved with potsherds. A small fragment of a mold core for casting a socketed tool was found in the furnace filling. This furnace is almost identical to that described above. The only distinct feature is the pavement of the furnace inner surfaces with potsherds. A similar method of wall- and floor-pavement was noted in the furnace structure in dwelling No. 10 (Molodin et al., 2017: 371). This technique was typical of the Krotovo and Odinovo cultures (Molodin, Nesterova, Mylnikova, 2014: Fig. 4).

The bronze-casting area also contained pits for ash utilization and bone storage. One of these pits (structure No. 18) was irregularly pentagonal in shape, with uneven sloping walls and rounded corners. The pit's size was 1.55 × 1.25–1.4 m, its depth was 0.13–0.17 m. The floor was uneven, with a raised central part and a deepened western part. The pit was filled with ashy, sandy loam.

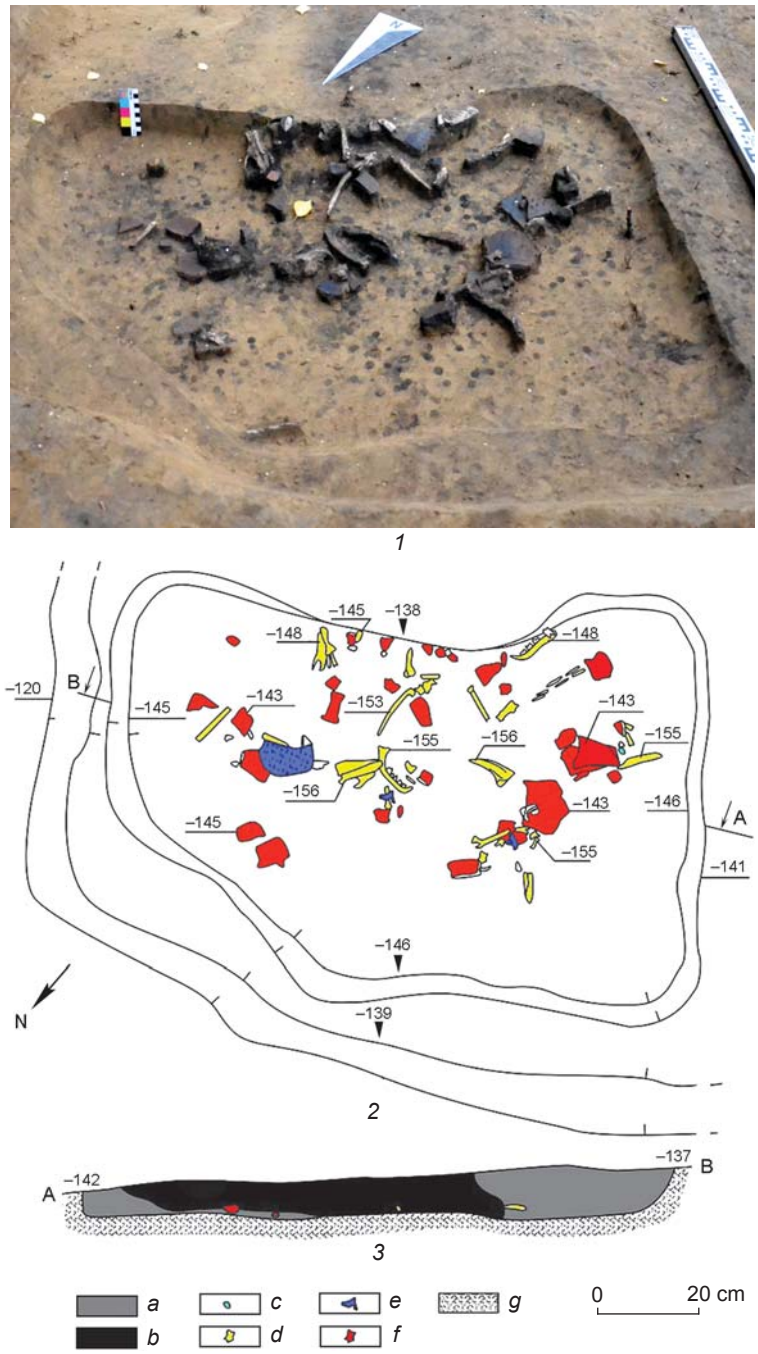

Fig. 10. General view (*1*), plan (*2*), and section (*3*) of the utility pit (structure No. 19) in dwelling No. 7, Vengerovo-2.
a – dark gray mixed sandy loam with inclusions of yellow loam; *b* – black calcined sandy loam; *c* – stone; *d* – animal bone fragment; *e* – fish bones and scales; *f* – ceramic fragment; *g* – virgin soil.

The other pit (structure No. 19) was sub-rectangular in shape, with a convex northern wall and a concave southern wall (see Fig. 10). The size of the pit was 1.20 × 0.69–0.85 m, its depth 0.06–0.1 m. The filling of the pit contained 57 pottery fragments: rims of at least four vessels; animal-bones, including those from fox (skulls, mandibles, and femurs) and horse (anterior splint bone); an operculum, scales and bones of a fish; and a pebble flake.

Traces of bronze-casting production were noted in almost all of the ten studied dwellings at Vengerovo-2. However, in terms of arrangement of the working areas, the number of furnaces, and the features of the recovered artifacts, dwelling No. 7 was the only specializing in bronze-casting.

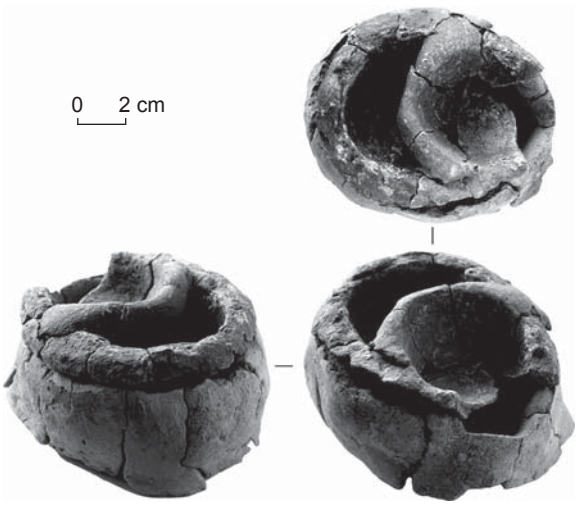

Fig. 11. Crucible from dwelling No. 3 at Vengerovo-2.

Conclusions

The currently available information on the Seima-Turbino bronzes (Kuzminykh, 2011) suggests that the Middle Irtysh basin is one of the regions most rich in such artifacts. Evidence of secondary metal-working at the Krotovo settlements of Vengerovo-2 and Abramovo-10, located more than 100 km from each other, points to the unification of the manufacturing process. These sites revealed similar types of casting areas, furnaces, and utility and waste pits, which were constructed following the standard technical tradition inherited from the preceding Odinovo culture of the Baraba forest-steppe (Stary Tartas-5 contained a furnace with one of the walls paved with large fragments of the ceramic vessel's body (Molodin, Nesterova, Mylnikova, 2014)); similar crucibles (Fig. 11) demonstrating local traditions (Molodin, Durakov, Mylnikova et al., 2012; Durakov, Kobeleva, 2017: 23–24); and clear features of serial production (reusable molds designed for mass production, exceeding the needs of the site's population).

Traces of the well-developed bronze-casting production at the Middle Irtysh settlements point to the conclusion that the Seima-Turbino artifacts, which can be regarded an epochal phenomenon in this region, were undoubtedly manufactured by the indigenous Krotovo people, rather than by migrants. This inference is supported by the Seima-Turbino bronze artifacts discovered at the sites of the period under study. For instance, at Stary Tartas-1, in the cultural layer containing Odinovo and Krotovo ceramics (Molodin, Mylnikova, Grishin, 2005), two bronze celts were found, definitely belonging to the Seima-Turbino tradition. One of the celts, retaining a fragment of a wooden haft in the socket (Fig. 12, *1*, *2*), was attributed to category K-4 or

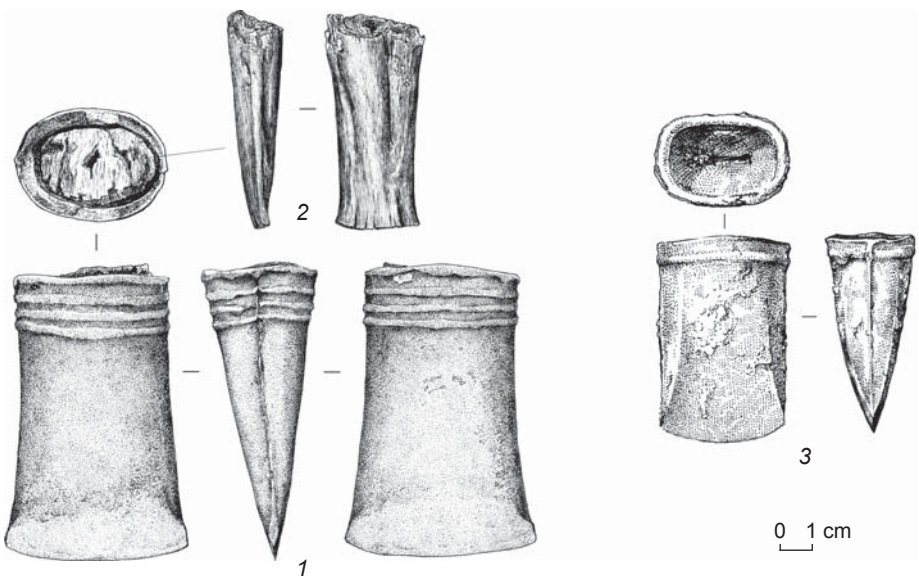

Fig. 12. Celts (*1*, *3*) and fragment of a wooden haft (*2*) from Stary Tartas-1.

K-6 according to Chernykh and Kuzminykh's classification (Molodin, Durakov, Sofeikov et al., 2012). The other celt, found in 2017 (Fig. 12, *3*), is attributable to the same category. Unlike the first celt, this one is smaller, and displays the marked stiffening ribs and a relief fillet along the upper edge.

The Irtysh River and its tributaries apparently played an important role in the penetration, dispersal, and adaptation of the Seima-Turbino tradition. The tradition seems to have originated in the Upper Irtysh region. Indirect support for this assumption may be the discovery of artifacts of the Seima-Turbino-type in Xingjian (Molodin, 2017; Molodin, Komissarov, Wang Peng, 2017; Mei, 2009: Fig. 3, *1–3*).

The Seima-Turbino artifacts, representing the best examples of the time's advanced technologies, were imported to the Middle Irtysh region and became available to the local artisans of the Odinovo and Krotovo cultures. Indigenous metallurgists, using their own metallurgical traditions, began to produce similar items. Owing to the absence of ore reserves in the region, the West Siberian population imported raw materials from the deposits of the modern Eastern Kazakhstan, Rudny Altai, and possibly some southerner parts of Central Asia.

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A Half of a Metal Bipartite Mold of the Seima-Turbino Period from the Upper Irtysh Region

We describe a rare find—part of a Middle Bronze Age bipartite metal chill mold from the Upper Irtysh region, used for casting three socketed javelin heads of the Seima-Turbino type. The use of metal molds (chill molds) for bronze-casting is a sophisticated technique, which is rather rare even at the present time. Having originated in the Bronze Age, it was subsequently abandoned for a long time. Chill molds indicate an advanced and efficient bronze-casting. In terms of the gate system, the specimen is a hinged vertically split chill mold. In Eurasia, the technique of casting javelin heads in chill molds was practiced until the Early Iron Age. In Western Siberia, it originated no later than the Middle Bronze Age. At that time, bronze-casting in molds made of metal, stone, clay, or organic materials was highly developed. Apparently, the Upper Irtysh basin, including western Altai, was the region from whence prototypical metal molds had spread and were subsequently replicated in less valuable and less technologically efficient materials such as clay.

Keywords: *Upper Irtysh, Seima-Turbino, bronze casting, metal molds (chill molds).*

Introduction

The material of which a mold is made determines the method of casting. There were four main methods in the Bronze Age: casting into stone; clay, or clay-earthen mold; investment casting; or permanent casting using metal molds (chill molds). Chill mold is a detachable mold of metal, which is capable of withstanding the whole number of castings (from a hundred to several thousand). First metal molds appeared already in the Middle Bronze Age. Bronze molds for making celts and axes are known from various regions of Eurasia (Grishin, 1971: 11–14; Chernetsov, Moshinskaya, Talitskaya, 1953: 123–127; Soloviev, 2003: 40, fig. 33; Wang, Ottaway, 2004: 37). Metal casting molds were also widely used in the Early Iron Age, but exclusively for casting arrowheads of the pre-Scythian and Scythian types in the 8th–4th centuries BC (Fig. 1). Such objects have been found in various regions of Eurasia, but their main number occurred on the territory of the forest-steppe Ukraine*.

A discussion on the functional purpose of metal molds still continues in archaeological literature. There are two points of view. Some scholars believe that such molds were in fact chill molds, that is, metal was directly poured into them; according to other scholars, they were used as press molds for obtaining wax castings (Wang, Ottaway, 2004: 37). In the description of the Novocherkassk hoard (the forest-steppe Ukraine) in the middle of the last century, A.A. Iessen suggested that bronze chill mold from that hoard (Fig. 1, *1*) was intended for casting arrowheads or their wax models (1953: 50).

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Fig. 1. Chill molds for casting arrowheads of the Early Iron Age from the forest-steppe Ukraine.
1 – part of chill mold from the Novocherkassk hoard; *2* – part of a composite mold from the western fortification of the Belsk fortified settlement.

Fig. 2. Chill mold from Mosul (northern Iraq).
1 – parts of the mold; *2* – mold assembly.

After analyzing the complete mold from Mosul (northern Iraq) (Fig. 2), L. Underwood concluded that it was a press mold for making wax models of arrowheads (1958: 17–22). B.A. Shramko consistently and categorically challenged this point of view: "The assumption of L. Underwood that the good preservation of the Mosul mold resulted from its use only for obtaining intermediate wax models of arrowheads is unconvincing. Such models are not needed for manufacturing bronze arrowheads. Casting of wax models in a chill mold could not improve the manufacturing process of bronze arrowheads in this mold and make the mold's use feasible" (2002: 165).

From the area beyond the Urals, a metal chill mold for three javelin heads, from the Upper Irtysh region (Fig. 3, *1*, *2*), belongs to the number of these few artifacts, as do chill molds from the Itkul fortified settlement (Chelyabinsk Region, Verkhneufaleisky District, the village of Dautovo, the northern shore of Lake Itkul) (Beltikova, 1993: 54, fig. 6; 7, *1–13*).

In general, chill casting in Eurasia in the era of metal was discrete. After the Early Iron Age, this technology had been lost for a long time and was revived only in the 17th century (Magnitsky, Piraynen, 1996: 8).

Description of the find

Metal composition of the chill mold under discussion was determined by the method of elemental analysis using a Hitachi TM 3000 electron microscope with a Brucer Quantax 70 energy-dispersive device (operator M.M. Ignatov). Measurements were carried out on one of the lower (shortened) gates and on the inner surface of the mold (see *Table*, samples 1 and 2 respectively). At the area of the gate that was not covered with oxides, the copper content reached 65.47 %, and on the inner surface of the mold with abundant oxides, black spots, and impregnations of some substance, the copper content was only 42.21 %. It can be concluded from this data that the object was made primarily of copper alloy, which is still used for manufacturing chill molds (Ivanov, Karpenko, 1999: 182).

The size of the chill mold from the Upper Irtysh region is 9 × 4 × 3 cm;

Results of energy-dispersive analysis of metal composition

Chemical element	Sample 1	Sample 2
Cu	65.47	42.21
C	5.53	24.18
O	6.44	21.06
Si	0	4.4
S	1.5	2.6
Sn	6.96	2.16
Ca	0	1.36
Al	0	0.74
Fe	0	0.37
Cl	14.09	0.36
Ph	0	0.33
Mg	0	0.24

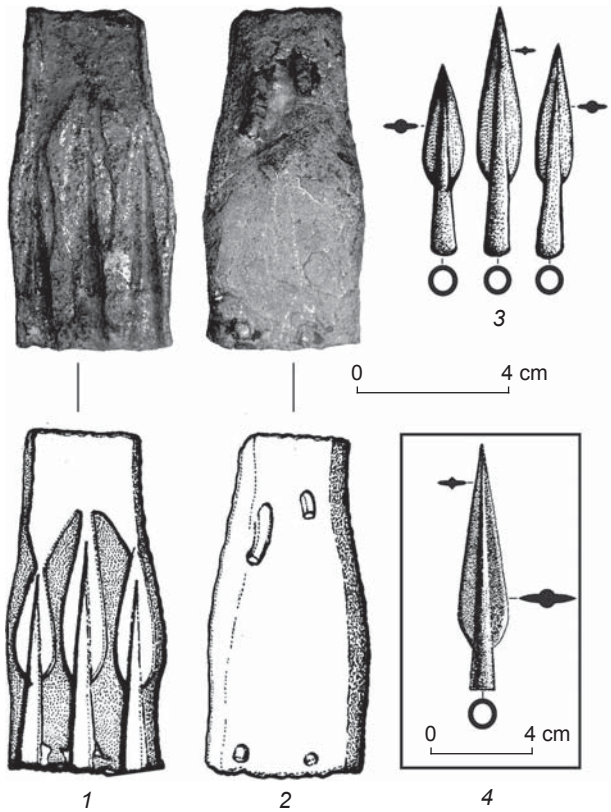

Fig. 3. Part of metal chill mold from the Upper Irtysh region (*1*, *2*), drawings of the impressions of the arrowheads made using this mold (*3*), and bronze point from Sopka-2 site in the Baraba forest-steppe region (*4*) (Molodin, 1985: 59, fig. 28, *1*).

the thickness of the walls varies from 2 to 4 mm, and the weight is 119.5 g. Accordingly, the weight of the complete set of the casting piece must have been 239 g. The traces of its own casting (four gates on the outer side) have been preserved on the chill mold. Judging by their location, during manufacture of the chill mold, metal was poured from the opposite side relative to its mouth, which was subsequently used for casting a number of javelin heads. The gates at the bottom of the chill mold were cut down almost completely, and have been partially preserved at the top (Fig. 3, *2*). The location of these remains of the gates makes it possible to determine the type of the gate system in the metal mold from the Upper Irtysh region. Such molds were typically used for pouring metal in several (four) independent gates (Magnitsky, Piraynen, 1996: 109, fig. 4, *12*, *f*).

Since there are no special pins and the corresponding grooves on the working surface of the mold, which are necessary for accurate alignment of the parts while pouring metal into the chill mold, their function was possibly performed by four outwardly projecting rod-like gates remaining from the previous technological operation (mold casting). The presence of these details on the outer surface of the chill mold did not imply a special clamping holder for tightening the mold, which is present in the casting set from Mosul (see Fig. 2).

The gating system of the half of the bipartite mold from the Upper Irtysh region is represented by the pouring basin measuring 2.7 × 2.5 × 0.8 cm with three gates for distributing metal to each of the three mold cavities (see Fig. 3, *1*). The casting cores for production of socketed bases for javelin heads were located in the lower part of the chill mold. They must have been immovably fixed in a special tray, as is the case with the mold from Mosul (see Fig. 2). The size of the casting cores of the Upper Irtysh chill mold for casting javelin heads of various sizes must have ranged from 5.0 to 5.5 cm.

In terms of its structural features, the chill mold from the Upper Irtysh region shows certain similarities to the Early Scythian metal molds for casting arrowheads from the Novocherkassk hoard and Mosul, dated to not later than the first third of the first millennium BC.

Discussion

The chill mold usually consists of two halves, which are fixed with locking pins (see Fig. 1), and are locked before pouring metal. These implements are absent from the half of the metal mold from the Upper Irtysh region probably because of its archaism (see Fig. 3, *1*). The later (Early Scythian and Scythian) chill molds known from the northern Balkans, Greece, northern Black Sea region, forest-steppe Ukraine, northern Iraq, and southern Urals already have such a detail needed for their rigid fixation (Woolley, 1921: 89; Iessen, 1953: 50, fig. 1, 7; Zelenin, 2011: 231–232; Shramko, 2002: 163, fig. 1, 2; Shtitelman, 1947: 161, fig. 1, 4; Furmanska, 1958: 42, pl. 1, 6; Robinson, 1941: 410–411, tab. CXXVI, 2139; Romsauer, 2004: 401, tab. I, *1*).

The casting core had to be placed into the chill mold while casting socketed points. A number of metal cores for point-casting are known from the Scythian period (second third of the first millennium BC) in the northern Black Sea region, forest-steppe Ukraine, and southern Urals (Shtitelman, 1947: 161, fig. 1, *1*; Murzin et al., 1997: 11, fig. 11, *1*, *8*; Olgovsky, 2011: 137, fig. 54, *4*, 149, fig. 62; Furmanska, 1958: 43, pl. I, *5*; Krutilov, 2006). In that regard, it should be emphasized that the materials from the Early Iron Age contain only individual molds with a single casting core, while several cores rigidly fixed on a special pallet-tray occurred in the Middle Bronze Age (for example, in the chill mold from the Upper Irtysh region). Later, such a detail appeared in metal molds of the Early Scythian time in the Novocherkassk hoard and Mosul (see Fig. 1, *1*; 2). Notably, this structural feature

of the chill mold is its distinguishing mark as compared to metal molds for casting arrowheads after wax models in the Scythian period. It should also be noted that metal (copper) casting cores were also used in stone molds as, for example, is the case in the Itkul fortified settlement in the southern Urals (Beltikova, 1993: 54). The location of a series of casting cores at the bottom of the chill molds from the Upper Irtysh region and Mosul is the evidence of pouring metal into the mold under gravity. At present, while casting into chill mold under pressure, the core is located in the upper part of the mold.

Another evidence for the use of metal molds as chill molds is the presence of non-stick coating on the internal surfaces, which protected the mold from sharp thermal shock while pouring metal, and adhesion between the casting and the mold. Crystallization rate of the alloy is very high when casting into a metal (bronze or copper) mold. Soot or talc might have been used as non-stick materials. In the old times, all stone casting molds were covered with such substances. The presence of dark, possibly non-stick coating has been observed on a bronze bipartite mold for casting Scythian arrowheads from Simferopol in the Crimea (Zelenin, 2011: 231–232).

Refractory coating is necessary for protecting the chill mold from abrupt exposure to high temperatures while pouring metal. Such protective layer also makes it possible to preserve the working surface of the mold from melting and binding with metal of the casting. At present, graphite powder mixed with boiled oil or its substitutes is a part of the refractory coating intended for copper alloys (Magnitsky, Piraynen, 1996: 192). The thickness of this layer largely determines the cooling rate of the casting inside the mold. The impression made by modeling rubber from the working surface of the half of the metal casting chill found in the Upper Irtysh region made it possible to establish the presence of the black-gray powdery substance on the surface, which might have been refractory coating. Energy-dispersive analysis of this substance has shown that organogenic chemical elements of its compound included phosphorus (0.33 %). For the application of such refractory coating in modern conditions, the chill mold must be heated to 150–280 °C. Subsequently, it should be heated again to the operating temperature, which depends on the composition of the alloy to be filled, on the thickness of the walls of the casting, and on its size.

Depending on configuration of the molded products, chill molds can be integral (one-piece) and detachable. The latter are divided into the flap-type chill molds and chill molds with parallel detachment of sections. Detachable metal molds are used for casting complex objects with parts, which makes it difficult to remove the casting from the chill mold by simple shaking out (Zotov, 1988: 271, fig. 142, *b*). Judging by these structural and functional principles, the chill mold from the Upper Irtysh region is a hinged, vertically split chill mold. A sufficiently large casting container was located in the upper part of the mold. Its volume was clearly associated with the need to fill a significant amount of liquid metal intended for manufacturing several javelin heads. The shape of the chill mold from the Upper Irtysh region is also noteworthy. Chill molds for individual casting of arrowheads of the Early Scythian and Scythian periods have completely different outlines. The earliest casting molds of that time were cylindrical. Further, bottle-shaped molds started to appear along with cylindrical molds with the gradual transition to conical molds.

While casting into a chill mold, the metal cools faster than it is the case with the molds made of other materials; therefore, the chokes of its gating system have a considerably larger cross-section (Ibid.: 272). However, this feature is not typical of the chill mold from the Upper Irtysh region. Its gates, like the gates on the half of the mold from the Novocherkassk hoard, are directly combined with the sockets of future castings of points. Perhaps this morphological feature of the prominent socket, significantly protruding beyond the surface of the blade, was largely caused by the technology of casting production, and not only by considerations of the structural rigidity of the product. It should also be noted that high rate of metal cooling in the chill mold contributes to the formation of dense castings with fine-grained structure. This significantly increases the durability and ductility of the metal in the resulting products. Such mechanical qualities are extremely important for the points of projectile weapons. These technological features once again indicate their inseparable connection with typological features of the finished products.

The progressive nature of chill casting in the Middle Bronze Age is confirmed by a number of advantages of chill molds, known from modern practice, as compared to casting equipment made of other materials, including stone or clay (Ibid.: 27; Ivanov, Karpenko, 1999: 180, 182; Magnitsky, Piraynen, 1996: 190). First, this is greater strength of metal mold, which makes it possible to treat its working surface with greater care. Second, casting into a chill mold provides higher quality of the resulting casting. Third, it becomes possible to achieve significantly better results for traditional casting industry in terms of mass production, since owing to high thermal conductivity of the metal mold, the casting hardens faster, which increases the speed and productivity of the casting process. Fourth, chill casting requires minimal mechanical treatment of the surfaces of the finished casting. At the same time, it is necessary to mention the disadvantages of using chill molds in casting industry, which include high costs and labor intensity of manufacture, poor filling of thin-walled castings, and possibility of cracks on finished products (Zotov, 1988: 271; Ivanov, Karpenko, 1999: 180; Magnitsky, Piraynen, 1996: 191). However,

for the technology and scale of casting in the Middle Bronze Age, the advantages of using chill molds for the replication of metal points were clearly more important than their disadvantages, especially since in its essence chill casting was a labor- and material-saving efficient technology. Complexity of manufacture and high cost of chill molds make this technology effective only in the mass production of castings, and the points were ideal objects for that.

The configuration of the working cavities in the chill mold from the Upper Irtysh region is quite informative for the cultural and chronological attribution of both the mold and possible castings (see Fig. 3, *3*). The impression from the working surface of the mold half made it possible to obtain the models of three socketed points of various sizes. The length of the pieces varied from 6 to 7 cm; the width of the blades ranged from 1.0 to 1.2 cm, and the width of the sockets was 0.9 cm. The massiveness of these objects allowed their identification as javelin heads. A ceramic mold for casting a similar point (see Fig. 3, *4*) is known from the accompanying inventory in one of the Krotovo burials (burial mound 14, grave 2) at the Sopka-2 necropolis in the forest-steppe Ob-Irtysh interfluve (Molodin, 1985: 59, fig. 28, *1*). In terms of morphology, these objects are close to the spearheads of the Seima-Turbino appearance (Ibid.: 60). Such scaled replication of the overall shape and proportions of the latter spearheads in javelin heads can be associated with a priority of the missile weaponry over light weaponry (bow) in the Middle Bronze Age.

Structurally, all javelin heads that were cast in the mold from the Upper Irtysh region are of socketed type. In this respect, it should be noted that tanged arrowheads were widespread along with socketed arrowheads to the east of the Volga, including the forest-steppe and steppe Ob-Irtysh interfluve, in the Late Bronze Age (Ibid.: 125, fig. 63, *5*; Borodovsky, Sofeikov, Kolontsov, 2002), whereas in the northern Black Sea region in the Early Scythian period, only socketed arrowheads were used. Obviously, this was caused by the technological factor and the structural features of the casting molds. As opposed to socketed objects, tanged objects were cast in molds without casting cores.

Noteworthy are clearly different sizes of javelin heads produced simultaneously in the chill mold from the Upper Irtysh region (see Fig. 3, *3*), which contradicts the speculative typological theories about their possible changes over a certain period. On the one hand, the greater size of the central cavity as compared to the two lateral cavities might have well been exclusively caused by the technological features. It was located under the very center of the casting bowl and might have served as the central gate absorbing the bulk of the metal in the beginning of its pouring. On the other hand, the absence of differences in the sizes of the points cast in the chill mold from the Novocherkassk hoard (see Fig. 1, *1*) suggests that the Upper Irtysh casting mold was intended for manufacture of products with different features and, consequently, the synchronism of such objects' functioning.

Conclusions

Discovery of early metal molds (chill molds) is very important for reconstructing the process of technological development and organization of the casting industry in the Middle Bronze Age on the territory of the southwestern Siberia and adjacent regions. Primarily because the gradual emergence of the casting technology at the artisanal level started precisely in the middle of the second millennium BC (Magnitsky, Piraynen, 1996: 4). A technological mark of qualitative changes is the emergence and proliferation of specialized and more productive casting equipment, such as reusable metal molds (chill molds) (Zotov, 1988: 270). Casting into chill molds is the most efficient method. Metal casting molds certainly became a revolutionary technological innovation in the Middle Bronze Age. The emergence of chill molds for casting arrowheads fully met the need for mass production of such products in the conditions of the increasing mobility of the population and intensified conflicts between the ancient groups.

Notably, casting in metal molds has always been a special type of foundry technologies (Ibid.; Magnitsky, Piraynen, 1996: 182). Even today, it is optimal for manufacturing commonly used products. Conversely, chill casting is not only impractical (Magnitsky, Piraynen, 1996: 182), but also too advanced for art casting (Zotov, 1988: 270). Judging by the part of chill mold found in the Upper Irtysh region, this advanced technological tradition appeared in the southwestern Siberia and in a number of adjacent territories already in the Middle Bronze Age. The basic conditions for mass replication of metal products, including weaponry, and main principles of production specialization reflected in casting equipment were emerging in exactly that period.

However, such a connection is far from always being unambiguous at the archaeological level. Thus, only in Olbia, casting chill mold equipment, such as two cores from the Western *temenos*, was associated with production complexes. One core was found in the filling of pit 33 together with the fragments of smelting ladles, nozzles and plugs for them, pieces of bronze-casting and silicate slag, and defective products (Krutilov, 2006: 213). Fragments of foundry crucibles, 79 fragments of gates, and a large amount of bronze slag was found in *botros* pit 12, in addition to a casting core (Ibid.: 214). Unfortunately, a significant collection of fragments of chill molds from the extensive area (over 4875 hectares) of the Belsk fortified settlement originated from various

parts of this huge site, and the real context of their discovery is unknown. Moreover, many such finds are not directly associated with settlements, as for example the parts of metal molds from the Novocherkassk hoard and the "hoard" of a caster from the vicinity of the Belsk fortified settlement (Zelenin, 2010: 207, 208).

It should be noted that the most efficient metal chill molds have not yet been found in the burials of the Middle Bronze Age in the forest-steppe Ob-Irtysh interfluve with the accompanying goods showing the signs of "production specialization" (Molodin, 1985: 58, 59). This fact can be interpreted as yet another argument in favor of the "secondary" nature of bronze casting in the southwestern Siberia in the second millennium BC as compared to more southern adjacent territories. One of such territories is the Upper Irtysh region. Obviously, this region was one of the key areas of penetrating the most advanced casting equipment to the north. This equipment was needed for mass replication of objects, which in local conditions were cast in single units, mostly in more accessible clay molds.

As far as the circumstances of discovering the chill mold from the Upper Irtysh region are concerned, it should be noted that the vast majority of all known metal molds for manufacturing Early Scythian and Scythian arrowheads from the forest-steppe Ukraine are random finds. In the southwestern Siberia, in some cases, this also applies to clay molds of the Seima-Turbino period (Umna-6) (Borodovsky, 1999).

The accidental nature of the discovery of the Upper Irtysh chill mold does not detract from the historical significance of this important object, primarily because at all times chill casting was not only an exclusively specialized casting process, but also it was quite rare in terms of territorial distribution (Zotov, 1988: 270). After it had appeared in Eurasia in the Metal Ages, it was completely lost for a long period. Thus, any facts of finding the early chill molds are extremely interesting and important for reconstructing the discreteness of development of the ancient Eurasian foundry. In addition, this is one of reliable criteria for the technological level of bronze-casting production of a specific period. Equally important is the fact that the complexity and high cost of chill molds is closely associated with production specialization and professional equipment within the framework of the transcultural Seima-Turbino phenomenon. The energy-dispersive analysis of the composition of metal of which the chill mold from the Upper Irtysh region was made, revealed the presence of tin (from 2.16 to 6.96 %), which is quite consistent with the recipes of the Samus-Seima bronze products. In general, such casting equipment was unique and quite rare for its time. This is clearly evidenced by the scarcity of such finds on the territory of Eurasia of the Bronze Age.

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Zotino III: An Early Iron Age Metallurgical Center in the Trans-Urals

In 1974 and 1977, an archaeological expedition from Ural State University excavated part (441 m^2) of a fortified Early Iron Age manufacturing site on the Bagaryak River, near Zotino, in the forest zone of the Trans-Urals foothills. The site, with a total area of 3800 m^2, is located on a 40–43 m high cliff. Its northeastern inland side is protected by a low stone and earthen rampart, preserved to a height of 0.7 m, and is delimited by a shallow outer drainage ditch, with a single entrance ~2 m wide. Under the wall, there is a thin layer of buried soil with fragments of the Itkul ceramics. Inside the wall, carbonaceous sandy loam, pieces of calx, and charred remains of wooden structures were found. Our reconstruction suggests that the original 2 m wide wall consisted of two rows of logs and a built-in subsquare tower ~3.0 m by 2.6 m. The base of the walls and tower were strengthened with rubble, and its outer face was enforced with limestone slabs. Near the rampart and along the northwestern edge of the site's inner space, remains of three adobe platforms for processing copper and iron were identified, as well as two dug-in hearths, a utility pit and, apparently, remains of an adobe melting furnace. This is the easternmost and latest (400–100 BC) seasonal fortified metallurgical center of the Itkul culture—an autochthonous culture of the forest zone of the Trans-Urals. In the forest-steppe to the east and south of it, on the lower reaches of the Sinara and Karabolka rivers, the westernmost fortresses built by the Gorokhovo herders (500–100 BC) are situated—the likely source of the Itkul fortification tradition.

Keywords: *Forest zone, Trans-Urals, Early Iron Age, metallurgy, fortification.*

Introduction

The fortified settlement of Zotino III is located on the left bank of the Bagaryak River (right tributary of the Sinara River), two kilometers east of the village of Zotino (Kaslinsky District, Chelyabinsk Region), at the border of the eastern slope of the Urals and the Trans-Urals forest foothills (Fig. 1, 2). The site lies on the summit of a high (ca 40–43 m) rocky promontory. The famous Zotino karst cave and the grotto of the same name with an Upper Paleolithic site are on the southeastern side, in the lower part of the cliff.

The area of the fortification is subtrapezoidal, sloping, with a height difference reaching 8 m. It is oriented along the SW-NE line and is bounded by steep and vertical cliffs on three sides. On the northeastern inland side, it is enclosed by an arcuate rampart and outer ditch with a passage about 2 m wide (Fig. 3, *I*). The length of the rampart is 73–75 m; its width is 4.0–4.5 m, and its height reaches 0.75 m. The width of the ditch is 2.5 m; the depth is 0.2–0.3 m. The surface of the promontory is open and sodded. At the edges of the site, the cultural layer tapers out and rock outcrops are visible. The site has a length of 80 m, and a width of 50–66 m, occupying an area of 3800 m^2.

In 1770, I.I. Lepekhin, the Head of the Second Orenburg Physical Expedition of the Russian Academy of Sciences, visited the mountain and made a description of Zotino Cave (Prodolzheniye…, 1822: 210). The fortified settlement was discovered in 1911

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by V.Y. Tolmachev, receiving the name of "Zotinskoye Levoberezhnoye". In 1912, the Ural local historian V.P. Biryukov discovered two more fortified settlements opposite the village of Zotino, and gave them the names of "Zotinskoye Verkhneye Pravoberezhnoye" and "Zotinskoye Nizhneye Pravoberezhnoye". He reported this in a letter to V.Y. Tolmachev (State Archive of the Sverdlovsk Region, F. 139, item 3, fol. 37).

In 1974, the archaeologist V.T. Petrin with the participation of the biologist N.G. Smirnov excavated the Zotino grotto and its pre-entry area. Upper Paleolithic materials were found in all five layers of the site, but mostly concentrated close to the lower clay horizon. Fragments of hand-molded pottery of the Early Iron Age and fragments of modern pottery were found in the highly mixed upper humic layer (Petrin, 1974; Petrin, Smirnov, 1977: 56, 61–67). At that time, V.T. Petrin and T.N. Nokhrina made an exploratory ditch (12 × 3 m), oriented along the SW-NE line, and two exploratory pits above the cave, in the northern corner of the fortified settlement that they called "Nizhnezotinskoye" (Fig. 3, *I*). The report of 1974 does not contain information about those excavations. The collection of finds (No. 1371, collection of the Basic Research Laboratory at the Ural Federal University) contains a copper or bronze knife, fragment of the tip of an iron knife, stone disc with a spiral solar ornamental decoration and hole in the center (Fig. 4, *4*, *8*, *15*), two objects of unidentified purpose made of non-ferrous metal and iron, two bone artifacts, and 38 pottery fragments. All these items belong to the Itkul culture of the Early Iron Age. The pottery is represented by the fragments of vessels of two groups: all-purpose vessels decorated with a comb stamp ("the Itkul first type"), and production undecorated vessels.

In 1976, the author of this article discovered another fortified settlement of the Early Iron Age in the vicinity of Zotino, and a second defense system was found at the Zotinskoye Nizhneye Pravoberezhnoye site. These sites received new names with Roman numerals: Zotino I–IV (see Fig. 2, *2–5*). In 1976–1978 and 1980, excavations were made at these sites and at the neighboring Kolpakovo fortified settlement. The results of research at Zotino I (Krasny Kamen) and IV have been fully described (Borzunov, 1981, 1993); the information about the other sites has been presented briefly (Borzunov, 1977, 1978, 2008a, b).

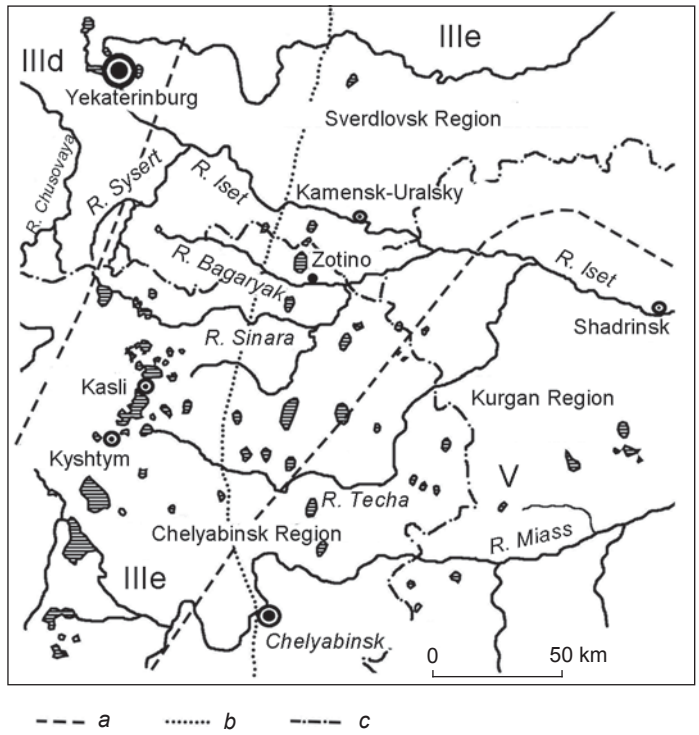

Fig. 1. Present-day natural and climatic zones in the research area (Gorchakovsky, 1968: Fig. 35).

III – forest, taiga: IIId – southern taiga, IIIe – pre-forest steppe pine and birch forests; V – forest steppe.

a – boundaries of zones and subzones; *b* – eastern boundary of the Ural Mountains; *c* – boundaries of the regions.

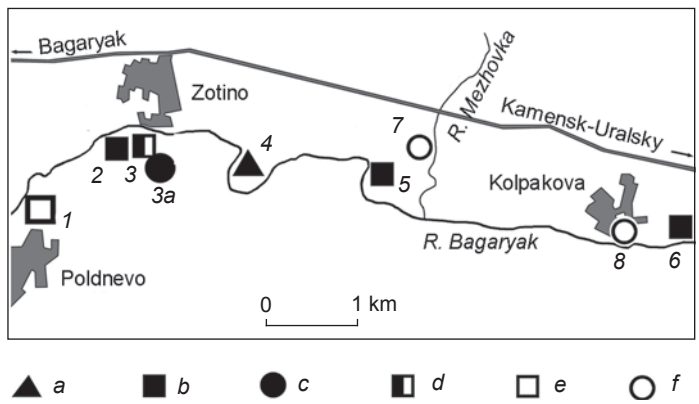

Fig. 2. Fortifications of the Iron Age and settlements of the Late Bronze Age in the vicinity of the villages of Zotino, Poldnevskoye, and Kolpakovo.

1 – Poldnevskoye; *2* – Zotino I (Zotinskoye Verkhneye Pravoberezhnoye, Krasny Kamen); *3*, *3a* – Zotino II (Zotinskoye Nizhneye Pravoberezhnoye, 1st and 2nd areas, respectively; *4* – Zotino IV; *5* – Zotino III (Zotinskoye Levoberezhnoye, Nizhnezotinskoye, Lepekhinskoye, Vesek); *6* – Kolpakovo fortified settlement; *7* – Mezhovka; *8* – Kolpakovo (unfortified settlement).

a–d – fortified settlements and fortified dwellings with pottery: *a* – Gamayun-type, *b* – Gamayun- and Itkul-type, *c* – Gorokhovo-type, *d* – Gamayun-, Itkul-, and Vorobyevo-Gorokhovo-type; *e* – unattributed fortified settlement; *f* – settlements (unfortified) of the Bronze Age.

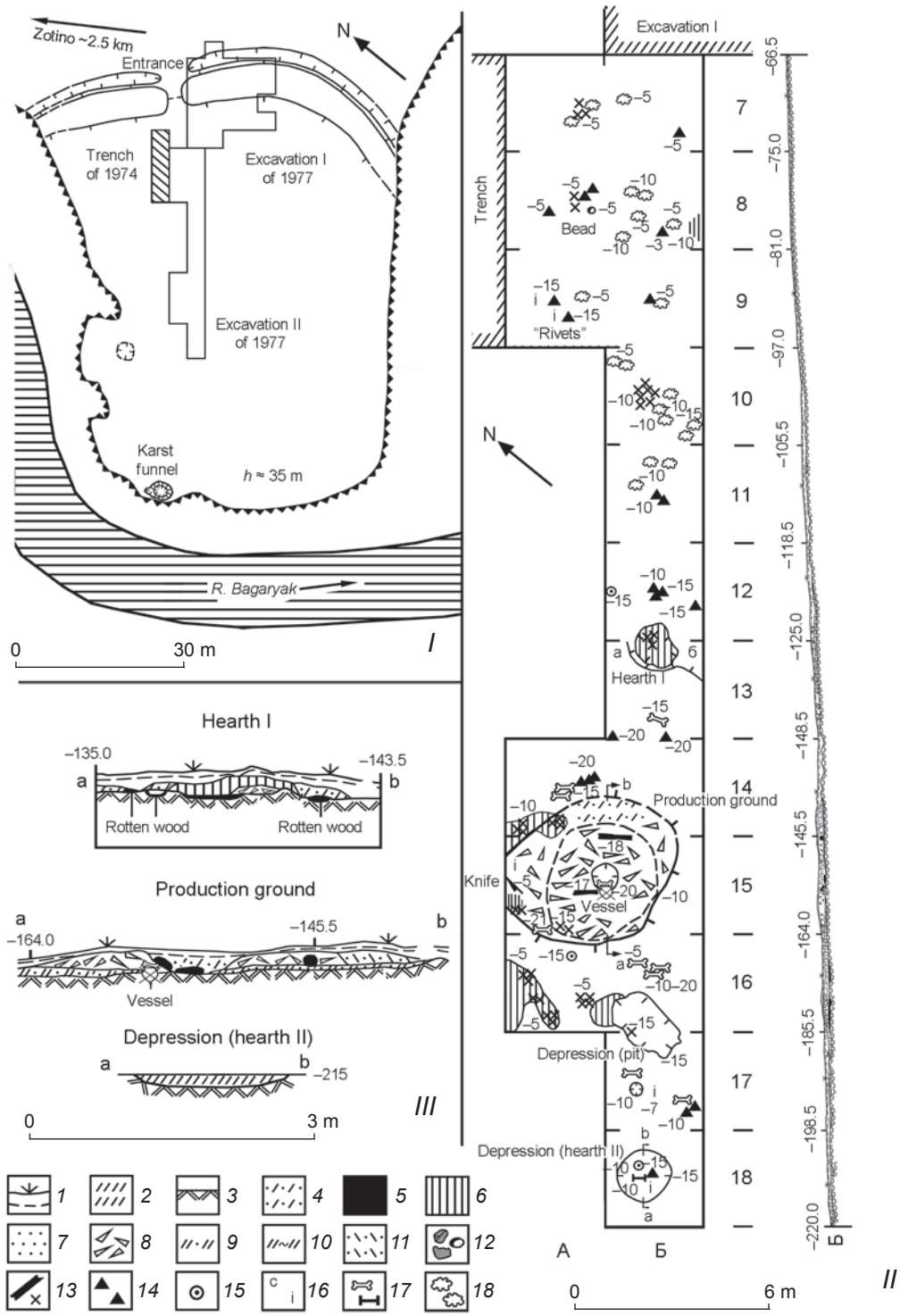

Fig. 3. Zotino III fortified settlement.

I – site plan; *II* – plan and section of excavation II of 1977; *III* – sections of archaeological structures.

Depth marks on the plan indicate the distance from the present-day surface; depth marks on the sections indicate the distances from the zero point.

1 – sod and upper dark gray (black) podzol; *2* – light gray sandy loam with inclusions of ash; *3* – rock formations (natural layer); *4* – light brown sandy loam; *5* – black carbonaceous layer; *6* – calcined yellow and reddish sandy loam; *7* – light yellow sandy loam; *8* – calcined red clay coating; *9* – dark gray sandy loam (ancient buried podzol); *10* – sandy loam of dark ashy color with inclusions of ash and charcoal; *11* – yellow-brown sandy loam; *12* – stones, rubble, pieces of limestone; *13* – charred logs, poles, and large charcoal; *14* – pottery fragments; *15* – ceramic disc with a hole in the center ("handwheel", "spindle whorl"); *16* – objects of copper (c) and iron (i); *17* – animal bones (unburned and charred); *18* – slag.

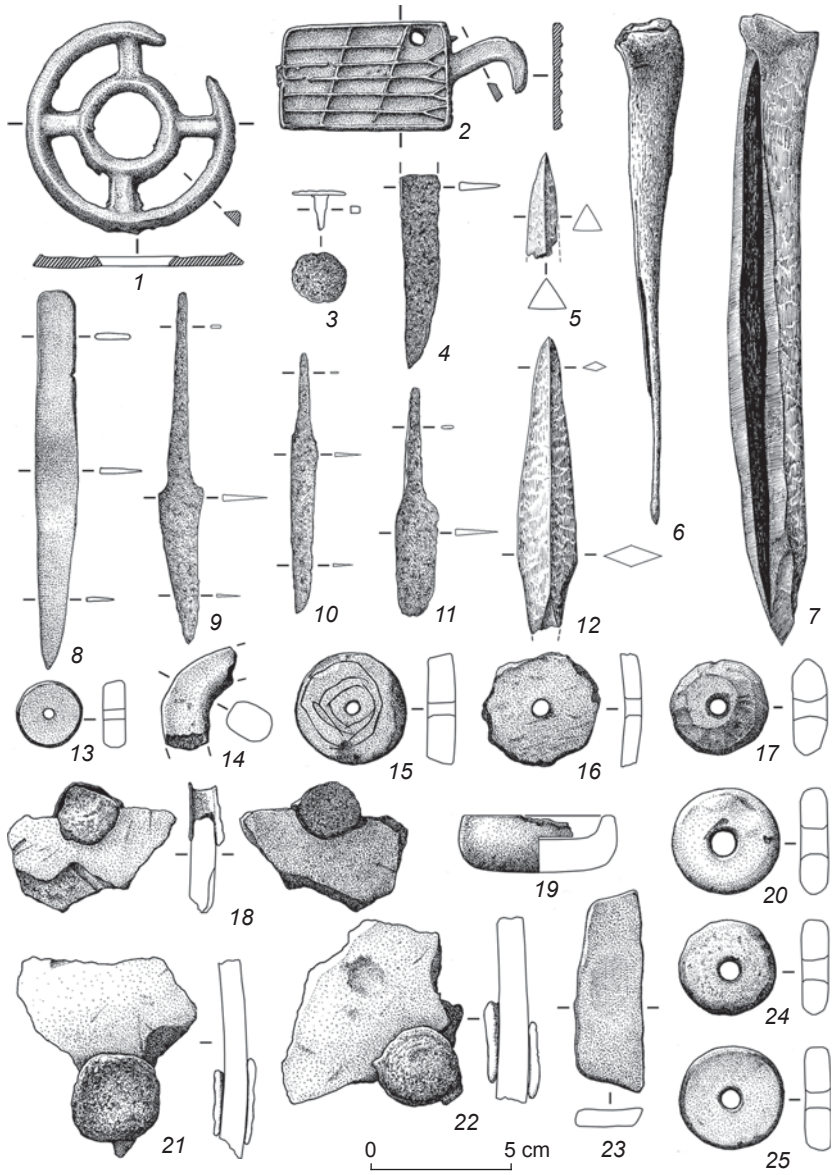

Fig. 4. The Itkul assemblage from the Zotino III fortified settlement: materials from the excavations by V.T. Petrin in 1974 (*4*, *8*, *15*) and V.A. Borzunov in 1977 (*1–3*, *5–7*, *9–14*, *16–25*). Drawings by V.I. Stefanov.
1, *2* – copper; *3*, *4*, *9–11* – iron; *5–7*, *12* – bone; *8* – copper or bronze; *13*, *15*, *17* – talc stone; *14*, *16*, *20*, *24*, *25* – ceramic; *19*, *23* – stone; *18*, *21*, *22* – iron, ceramic.

In 1977, the author of the present article made two adjacent excavations at the Zotino III fortified settlement over a total area of 405 m^2: one (I) on the eastern section of the defense system and the adjacent sections of the settlement area; the other (II) along the northwestern edge of the site. Both excavations were oriented along the SW-NE line. The second excavation was adjacent to the exploration trench of 1974 (see Fig. 3, *I*).

Defense system of the fortified settlement

The rampart and remains of the defense wall. The investigated section of the slightly spread-out, stony mound with a maximum height of 0.7 m rested on a horizon of partially destroyed buried soil 10–25 cm thick, which included layers of dark gray and light brown sandy loam with fragments of Itkul pottery. The mound was covered with black podzol 5–30 cm thick together with rubble and large pieces of limestone. A thin (3 cm) layer of sod lay on top. The body of the rampart was composed of large gravel (the layer was 5–60 cm thick), sandy loam of dark ashy color with the inclusions of ash and charcoal (8–15 cm), and yellow-brown sandy loam (10–15 cm). The remains of charred wooden structures were found in these strata, mainly in the ashy sandy loam. Spots of calcined yellow and red sandy loam (grids Б–Е/3) were visible over these remains. Fragments of Itkul pottery, which was identical to the finds from the lower horizon, were found in the mound at different depths, but slag was not detected. The total thickness of the cultural layers ranged from 0.3 to 0.9 m. The natural soil consisted of rock formations and monolithic rock (Fig. 5).

At the entrance to the fortification (grids Б/2–3), the rampart narrowed sharply. Two fragments of the neck of a vessel similar to the Vorobyevo pottery were found there in the northwestern wall of grid Б/2, at a depth of 17 cm. A pottery fragment which was discovered in grid Б/3 (depth of 25–30 cm) might have belonged to the same vessel. Animal bones were deposited at the edges of the spread-out mound in grids Б–В/3; a piece of slag was found in the southern corner of grid Е/3 (depth of 45 cm). In the upper layers of the rampart, present-day objects were found, including an iron rectangular plate (grid Е/10, depth of 10 cm), four-sided forged nail (В/3, depth of 25 cm), and dark red cubic plastic bead (grid Д/2, depth of 15 cm).

Fragments of charred birch logs 10–20 cm in diameter and pieces of birch-bark were found in grids В–Д/3 at a depth of 20–45 cm from the surface of the rampart. The logs lay in two or three rows almost parallel to the mound of the rampart. The width of the scattering of the logs was 1–2 m.

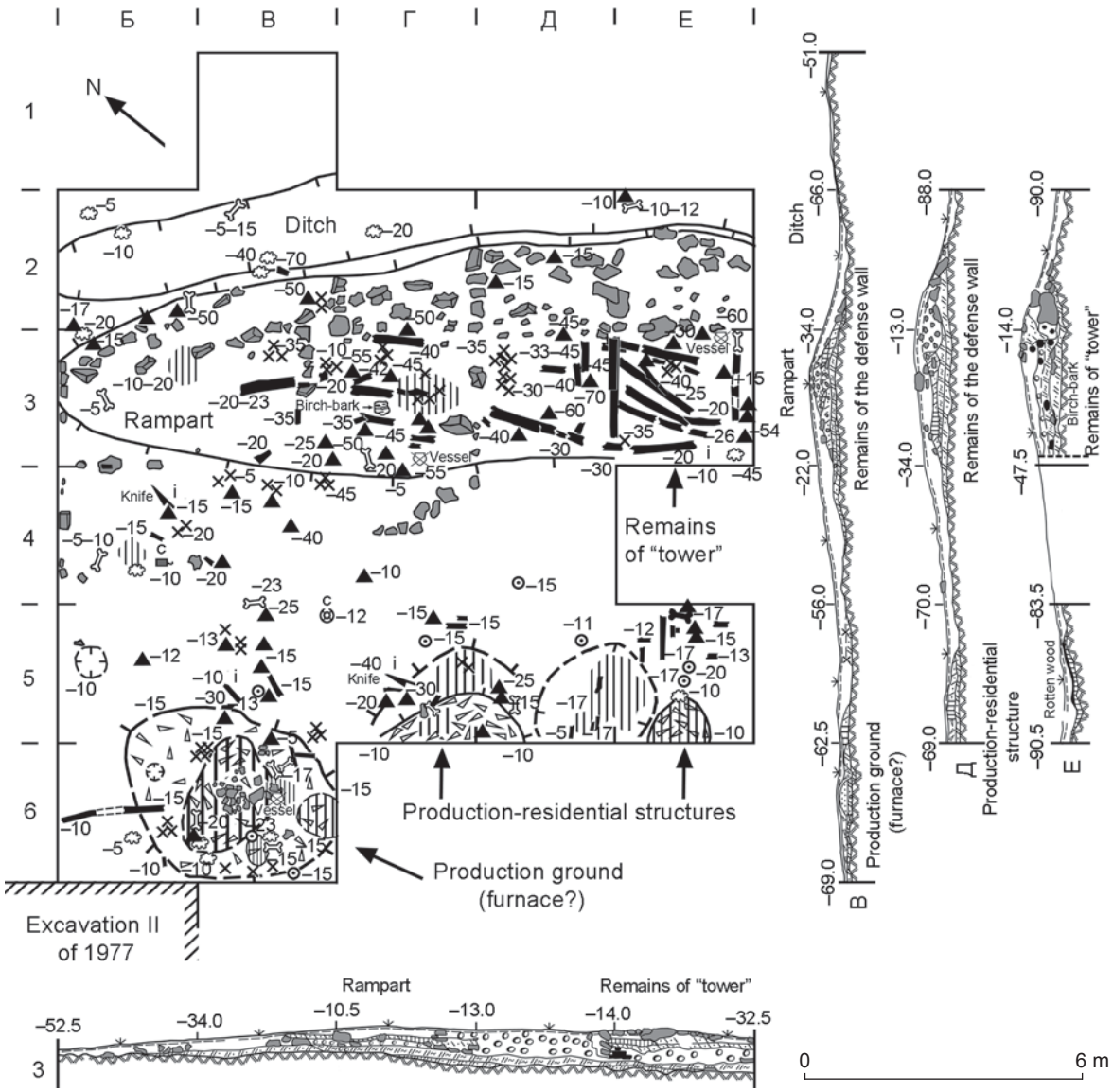

Fig. 5. Plan and sections of excavation I of 1977 at the Zotino III fortified settlement (depth marks on the plan indicate the distance from the present-day surface; depth marks on the sections indicate the distances from the zero point). Legend same as for Fig. 3.

Tower-like structure. An original object was found in the filling of the rampart, in grids Д–Е/3 12 m to the southeast of the entrance to the fortified settlement (Fig. 5). It was a cage-like structure built of logs 12–18 cm in diameter, subsquare in plan view, and measuring about 3.0 × 2.6 m. This structure was built into the line of defensive wall, and might have slightly protruded in the inland direction. The logs of the three lower layers have been found, and the method of their placement has been identified: one layer on top of another in a structure like a well. The ends of the logs at the corners protruded 10 cm beyond each other. They might have been specially cut for that (in a dovetail notch). When erecting more late, more perfected, and the most stable cribworks, the ends of the logs would also protrude; for that, notches of various shapes were hewn out (a saddle-notch facing upwards or downwards with three varieties: flat-bottomed notches on the top and bottom of the log, a saddle notch facing upwards, and a cribwork of alternating thick and thin logs). The space of the tower-like structure was filled with crushed stone including the fragments of charred logs from the upper layers, and was covered with yellow-brown sandy loam, calcined yellow-pink sandy loam, and pieces of limestone. The remains of the collapsed "tower" in grid E/3 contained fragments of Itkul pottery (depth of 15–55 cm), and a fragment of a three-edged bone arrowhead (depth of 35 cm) (see Fig. 4, *5*). The fragments of a crushed Itkul vessel (depth of 60 cm) were

found under the eastern corner of the structure in the layer of the early settlement.

Crepidoma of the rampart, walls, and "towers". From the inland side, the base of the walls and of the tower-like structure was reinforced with a banking of coarse crushed stone and slanting limestone slabs. The slabs were located in a band running parallel to the outer edge of the embankment and extending from the entrance towards the eastern part of the rampart (1.0–2.4 m) (see Fig. 5).

Ditch. A small section of the ditch, which was adjacent to the inland edge of the rampart on the outside, was studied in the grids Б–Е/2 and В/1. Its width (1–2 m) and depth (0.2–0.4 m) increased in the southeastern direction from the entrance to the fortification. The ditch was segment-shaped in cross-section. Natural rock formed its base. The ditch was filled with black podzol, covered with sod with rare inclusions of slag, animal bones, and fragments of Itkul pottery (see Fig. 5).

Area of the fortified settlement and its structures

Production and production-residential structures, which were located in two isolated groups, have been identified on the cleared interior space of the fortified settlement.

Stratigraphy of the main part of the fortification. A layer of dark gray podzol (3–10 cm) with charcoal, slag, and pottery fragments lay under the sod layer (1–3 cm) outside the structures. In the remaining areas under the sod and podzol (2–5 cm), components of two types were found: 1) hearths and pits 10–20 cm deep in rocky ground and filled with calcined or ashy sandy loam; 2) production adobe platforms 15–25 cm high, under which the remains of the early cultural horizon were detected. That horizon was represented by thin (2–5 cm) layers of buried sandy loam (of light yellow color and in some places of calcined yellow and red-yellow color), containing animal bones and fragments of Itkul pottery. The total thickness of the cultural horizon at the site ranged from 10 to 45 cm. The natural layer was calcareous rock (see Fig. 3, *II*, *III*; 5).

The first group of structures was located in the northeastern part of the settlement, in the immediate vicinity of the rampart (excavation I, grids В–Е/5, В/6), at a distance of 3–5 m from it. One structure was cleared almost completely, and three were cleared partially (see Fig. 5).

A production ground has been identified five-six meters to the south of the entrance to the fortification, in grids Б–В/5–6. The remains of the structure were an adobe platform, oval in plan view and segment-shaped in cross-section, oriented in the meridional direction and measuring 4.9 × 3.6 m with a height of 0.04–0.25 m. The depth from the present-day surface, where the structure was visible, was 15–30 cm; the size of the bottom part was 0.8 × 0.4 m. A large (2.5 × 1.8 m) cup-shaped depression (0.12–0.15 m), filled with calcined pinkish and yellow-brown sandy loam with inclusions of charcoal, was in the center. A cluster of stones (1.5 × 1.0 m) was unearthed within its boundaries at a depth of 10–25 cm. Bones of animals and a collapsed Itkul undecorated production vessel were found near it, at a depth of 15–17 cm. The explored depression resembled a hearth pit, but most of all, that of the inner chamber of a multifunctional (metallurgical and blacksmith) melting furnace (cf.: (Borzunov, 1981: 113, 116, fig. 1, *b*)). To the south of the furnace, on the adobe platform, spots of calcined loam were found. Pieces of slag, a fragment of the wall of a production vessel with an iron "rivet", three ceramic discs with holes in the center, and a round stone cup (see Fig. 4, *19*, *20*) were discovered within the structure and around it, in addition to fragments of Itkul vessels and animal bones. The closest parallels to that cup are stone portable altars and clay hand-molded ritual censers from the Sarmatian burial mounds of the Southern Urals (Moshkova, 1963: Pl. 11, *21*, *22–24*; Smirnov, 1975: Fig. 19, *7*; 23, *9*; 1989: 168, 174, pl. 69, *15*, *62*, *63*). Fragments of charred poles 10–20 cm in diameter were found in the remains of the adobe structure. Animal bones were deposited in the layer of dark gray sandy loam under the platform (grid В/6, depth of 20 cm).

An oval depression (0.8 × 0.7 cm) filled with gray sandy loam was found 1.3 m to the north of that object, in the grid Б/5 (depth of 10–16 cm). Two adobe platforms and a pit between them were partially unearthed in grids Г–Е/5. The upper level where these structures were detected was 10.6, and 12.0 cm. The platforms consisted of calcined pinkish-red coating. The northeastern platform was segment-shaped in plan view and measured 3.1 × 1.0 m; on the northeastern side, it was outlined by calcined yellow-brown and pinkish sandy loam with the inclusion of charcoal. The southwestern platform was semi-oval (1.3 × 0.9 m). The pit was rounded; it was 2.3 m in diameter and 0.25 m deep. Its rock base was covered with light gray, sometimes pinkish sandy loam, 5–7 cm thick. A thin (3 cm) interlayer of rotten wood was found in the northeastern part of the depression. All objects were covered by a horizon of dark gray podzol with sod (6–12 cm). Fragments of Itkul pottery, including a large production vessel, iron knife, bone arrowhead, and five "disc-handwheels" (four ceramic and one made of talc stone (see Fig. 4, *9*, *12*, *17*, *25*)) were found in the pit, on the platforms, and around them, at a depth ranging from 13 to 40 cm. Fragments of charred poles 7–15 cm in diameter lay near the adobe platforms.

Finds were more numerous and diverse between the rampart and the components of the first group, and included broken dishware, animal bones, pieces of slag, a bone perforator, iron knife, two copper objects with

casting defects—a rectangular plate with ornamental decoration and an openwork wheel-like plaque (see Fig. 4, *1*, *2*, *6*, *10*).

The second group of structures was located in the western part of the settlement (excavation II, grids А/14–16, Б/12–18), at a distance of 17–18 m from the first group, and consisted of an adobe platform, two hearths, and a pit (see Fig. 3 , *II*, *III*).

The production ground in grids А–Б/14–16 was built on the ancient soil layer (buried dark gray sandy loam 3–8 cm thick) and covered with a thin (3–5 cm) sod horizon with dark gray podzol. The natural layer was rock. The production ground was made of adobe; it was calcined, oval in plan view, lenticular in cross-section, measuring 6.0 × 4.2 × 0.23 m, and was oriented along the WNW-ESE line. Two charred logs 84 and 195 cm long and 18–20 cm in diameter were found in a coating at a depth of 17–18 cm. Interlayers of calcined loam were observed on the northern and western sides of the area. The horizon below the platform was also calcined. A round depression (0.8 m in diameter, 0.18 m in depth) filled with light brown sandy loam was located in the center of the structure. Two limestone tiles lay on the bottom. The bottom part of an Itkul production vessel with an animal bone inside was found under the tiles in the layer of buried soil (depth of 19–20 cm). Fragments of Itkul pottery, animal bones, a fragment of an iron knife, ceramic "disc-handwheels" (an intact disc made of a vessel wall and a fragment of a clay hand-molded disc (see Fig. 4, *11*, *14*, *24*)) were found on the territory of the structure and around it.

Hearth I in grid Б/12 was covered by dark gray podzol and sod. The depth where the hearth was observed was 8–28 cm. The hearth was of irregular oval shape (1.4 × 1.2 m), and was slightly deepened into rocky ground on its western edge. The hearth was filled with calcined light brown (sometimes pinkish and yellow-brown) loam with charcoal. The bottom was covered with a thin (3–4 cm) carbonaceous layer. Rotten wood was found at the edges of the calcined soil. A lens of light yellow sandy loam was discovered under the central part of the hearth. Fragments of a large Itkul production vessel, ceramic "disc-handwheel", and bone dagger-like point were found 1.5–2.0 m to the northeast of the hearth (see Fig. 4, *7*, *16*).

Hearth II in grid Б/18 was cup-shaped (1.8 × 1.8 × × 0.15 m); it was dug in rock, was filled with light gray carbonaceous sandy loam with the inclusions of calcified bone, and was covered with dark gray podzol and sod (15 cm). The filling contained three fragments of undecorated Itkul pottery, a "handwheel" of talc stone (see Fig. 4, *13*), and a small iron plate.

A subrectangular (2.2 × 1.2 m) pit (depth of 0.13 m) oriented in the meridional direction, was cleared between hearth II and the production ground in grids Б/16–17. The bottom was uneven and bumpy; the pit was filled with light brown sandy loam. Pieces of calx and charcoal spots were present on the northwestern side of the pit. This pit could have been used for economic or production purposes.

Fragments of Itkul pottery, a whetstone, and an iron nail-like object with a round cap, apparently an awl or pin (see Fig. 4, *3*, *23*), were found between the pit and hearth II in grid Б/17.

Space between the two groups of structures. Numerous pieces of iron slag and fragments of Itkul pottery were found under the sod in grids А/7–9, Б/7–11, located in a thin (5–18 cm) layer of dark gray podzol covering a layer of natural rock (see Fig. 3, *II*). A small spherical (0.5 cm) cornelian bead (grid А/8, depth of 7 cm) and three wall fragments of production vessels with iron "rivets" (grid А/9, depth of 15 cm) (see Fig. 4, *18*, *21*, *22*) were also found in this area.

Finds

The material complex of the site has been analyzed in a special article (Borzunov, 2018). The current publication will list the main categories of the inventory (see Fig. 4) and other finds. Itkul pottery of the first type, a bone three-edged arrowhead, and animal bones were found in the layer of the early settlement under the rampart; Itkul dishware, including production pottery was discovered in the mound, and animal bones and slag were found in the ditch. Fragments of Itkul dishware (of the first type) and production pottery, a ritual (?) flat-bottomed cup of talc stone, ceramic and clay discs with holes in the center (probably elements of a bow-type device for procuring fire), a bone perforator, dagger-like blade, copper or bronze wheel-like cast product (personal adornment or psalium), and rectangular ornamented buckle with a hook, heavily worn iron knives and shards with iron "rivets" of indeterminate purpose, as well as animal bones and slag, were found on the ground of the fortified settlement. Part of the Itkul pottery and animal bones lay underneath the adobe platforms. An imported antique bead made of orange carnelian was found near the rampart. Animal bones belonged to wild and domestic animals: wolf, bear, roe deer, elk, large and small cattle, and horse (definition by P.A. Kosintsev). The remains of domestic animals prevailed (227 bones from 18 individual animals as compared to 71 bones from 16 individual animals). The majority of bones in the collection belonged to horses (159 bones from eight individual animals) and roe deer (52 bones from 10 individual animals) (Borzunov, 1982: 106, tab. 5; Kosintsev, 1986: 81, 83, 89, tab. 1, *19*). The Gamayun (7th–4th centuries BC), Vorobyevo, and Gorokhovo (6th–2nd centuries BC) pottery of the Early Iron Age, as well as medieval Bakal pottery were represented by isolated finds. The Itkul assemblage was dated to the 4th–2nd centuries BC.

Discussion

This settlement of the Early Iron Age was founded on a previously uninhabited site. It was used for a short period of time, without an artificial defensive system. This is evidenced by the presence, under the rampart, of a thin soil layer with rare fragments of Itkul pottery, including production pottery, and by animal bones and the fragment of an arrowhead.

Soon, the early settlement turned into a specialized metallurgical center of the Itkul culture, and was fenced off with a defensive system on the inland side, at the base of the promontory. Fortifications consisted of a two-row wall ca 2 m wide, filled with crushed stone in its lower part, and fortified with limestone blocks on the outside. Judging by the remains of birch-bark, the wall was built of birch logs. Yet, the possibility of using pine typical of the relict pine woods on the opposite bank of the river cannot be excluded. Theoretically, it can be assumed that the inner belt of the defensive wall was lower than the outer belt serving as a pedestal for a platform made of poles, on which guards were periodically on duty. Notably, the protective wall was not of a stockade type (vertical structure), but of a horizontal placement of logs. The erection of palisades on rocks was extremely difficult or even impossible. This distinguishes the Itkul and Gamayun fortifications of the mountainous Trans-Urals from the southern taiga and forest-steppe fortified settlements of the Tobol-Irtysh region, where defensive systems were built on sandy soils.

The inland wall of the Zotino III fortified settlement was quite ordinary: it was arcuate in plan view and had one passageway. The only unusual feature was a subsquare cage-like structure, slightly protruding from the outer layer of logs of the wall. It may be interpreted as the simplest defensive and watch tower. Bastion-tower structures along the perimeter of walls were typical of the Vorobyevo, Sargatka, and especially Gorokhovo fortifications. They occur in single numbers in the Gamayun and Itkul fortifications, and have been found only on the Bagaryak River (Zotino II fortified settlement, 1st system, and possibly the Dalneye Bagaryak fortified settlement). The roots of this specific element go back to the defense architecture of the Chalcolithic to Bronze Age of Central Asia and the Middle East. Bastion and tower structures became widespread among the forest-steppe population inhabiting the Tobol-Irtysh region in the Early Iron Age from the 6th–4th centuries BC to the 1st–3rd centuries AD, and resulted from the southern semi-nomadic Ugrians' borrowing this innovation from the Iranian-speaking tribes of the Aral Sea region (Chirikrabat, Dzhetyasar, and Kyuzeligyr cultures, Khwarezm) (Stoyanov, 1989: 99; Borzunov, 2002: 94–95; 2014: 401).

The outer ditch of the Zotino III fortified settlement was narrow and shallow, with a rocky base. Most likely, it was a drainage ditch, which played practically no defensive role. Over time, people started to throw pieces of slag, animal bones, and broken pottery into the ditch. A pattern has been established: the thicker and higher the adjacent section of the rampart was, the wider and deeper was the ditch. This indicates that stones for the crepidoma of the mound were taken from the ditch. The layer of the early Itkul settlement on both sides of the embankment was completely cut off in the process of digging that ditch and constructing the defensive wall. Most of the perimeter of the promontory apparently did not have artificial defensive structures, and was protected only in a natural way by the very steep or vertical slopes of the cliff.

All unearthed peripheral areas of the Itkul fortified center contained remains and structures associated with the production and processing of non-ferrous and ferrous metals, including slag, crucible ceramics, iron and copper products, adobe platforms for metalworking, as well as production and residential structures. Most of the slag occurred between the unearthed adobe platforms; slag was not found in the rampart. It is known that the Itkul production grounds were located next to metallurgical furnaces. Judging by the similar Itkul settlement of Serny Klyuch on the upper reaches of the Ufa River, where the remains of 19 adobe melting furnaces and two adobe platforms for metalworking were discovered (Borzunov, 1998), it can be assumed that all central areas at Zotino III were occupied by metallurgical structures, such as production grounds, blacksmiths' workshops, and furnaces. One object similar to a furnace was found near the entrance, in grid Б–В/5–6. However, collapsed adobe furnaces with frames made of birch poles, similar to the one discovered at the nearby fortified settlement of Krasny Kamen (Borzunov, 1977), were not found. The remains of oval adobe platforms look more similar to those excavated at the Serny Klyuch site.

It is unlikely that all the fortified settlements which have been studied in the vicinity of the village of Zotino functioned simultaneously. Judging by the pottery and material complex, the earliest of these sites was the Gamayun Zotino IV site, which existed in the 7th to early 6th century BC. The Gamayun Zotino II site (1st area) with peripheral Itkul components was dated to the 6th–5th centuries BC. The subsequent Zotino I site (Krasny Kamen) with the Gamayun, Itkul, Iset, and Vorobyevo-Gorokhovo pottery was dated to the 5th–4th centuries BC. The latest sites (4th–2nd centuries BC) are the Itkul Zotino III fortified settlement and the 2nd area of the Zotino II site with the Gorokhovo pottery.

The Zotino III fortified settlement was a typical seasonal fortified center of the Trans-Urals metallurgists, and one of the easternmost outposts of the mountainous Ural Itkul population. Downstream on the Bagaryak River, only one site with Itkul pottery of the first type occurs—the Kolpakovo fortified settlement, founded

on the ruins of the Gamayun fortification (excavations by K.V. Salnikov in 1953 and V.A. Borzunov in 1978). Further to the east and southeast, along the lower reaches of the Sinara River and at the Karabolka River, they were offset by the westernmost fortified settlements of the Gorokhovo culture of the 5th–2nd centuries BC.

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Middle and Late Bronze Age House-Building in the Steppe and Forest-Steppe Altai

This article integrates information on the house-building practices of people represented by the Andronovo, Cherkaskul, Sargary-Alekseyevka, Irmen, Korchazhka, as well as the "Burla" cultures. A graphic reconstruction of the dwellings has been made, and a prototypical model of the structures is described with regard to the Middle and Late Bronze Age steppe and forest steppe Altai. This is a rectangular or subsquare single- or two-chamber post-frame construction, with a corridor-like entrance extending beyond the foundation pit. Diachronic and cultural variations of this prototype are listed. Andronovo dwellings were heavy or light, large or medium-large, based on a post-frame, or possibly log construction with a flat, gable, or truncated-pyramidal roof. A typical representation of Bronze Age dwellings is the light Cherkaskul house with gable roof at Kalinovka II. The "Burla" dwellings are either post-frame semi-dugouts or houses of heavy construction with various sizes and conical or truncated-pyramidal roofs. Numerous Sargary-Alekseyevka dwellings are large or medium-sized, heavy semi-dugouts with frames of posts and truncated-pyramidal roofs. The Irmen dwellings are similar to them. There are few investigated Korchazhka dwellings, and their design is difficult to reconstruct.

Keywords: *Middle Bronze Age, Late Bronze Age, Altai, housebuilding, reconstructions.*

Introduction

Many studies have addressed the problems of house-building in the Bronze Age in southwestern Siberia (Matveev, Sidorov, 1985; Ovcharenko, Mylnikova, Durakov, 2005; Chicha…, 2009: 20–30; Berlina, 2013; Mylnikov, 2014; Mylnikov, Mylnikova, 2015; and others). Specialists have managed to develop and test the methodology for reconstructing ancient structures. However, the materials from the steppe and forest-steppe Altai have not yet become the object of a detailed special study. No studies have appeared since the publication of the overview by V.A. Borzunov, Y.F. Kiryushin, and V.I. Matyushchenko (1993) as well as chapters of the collective monograph (Ocherki…, 1995, 133–137, 143–146, 160–176) written by the same authors, although over 50 buildings of the Bronze Age are known up to date, including 38 buildings of the middle and late stages of the Bronze Age. Structures of every archaeological culture present in the region have been excavated. There is a need to analyze and generalize the available evidence, establish its place and role in the circle of antiquities in southwestern Siberia, and enter a qualitatively new level—the level of reconstructions.

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Analysis of the evidence

For systematization of buildings on the basis of the actual evidence, a set of their most significant features was established at two different but interrelated levels. The features objectively recorded during archaeological excavations include: 1) the building pit (number of chambers, size, shape, and structural elements outside the walls); 2) pits from the posts (location relative to the building pit, sizes, and structural features); and 3) objects (hearths, pits, ditches, depressions, and their location relative to the building pit). The features associated with the interpretation of excavation materials include: 1) frame of the structure (supporting elements such as posts or cribwork, and their location relative to the building pit); 2) walls (material, method of attachment to the frame, deepening, and additional heat insulation); and 3) roofing (material, method of attachment, and additional heat insulation). This classification has resulted in identifying the groups of structures reflecting specific features of buildings for each of the archaeological cultures present in the region.

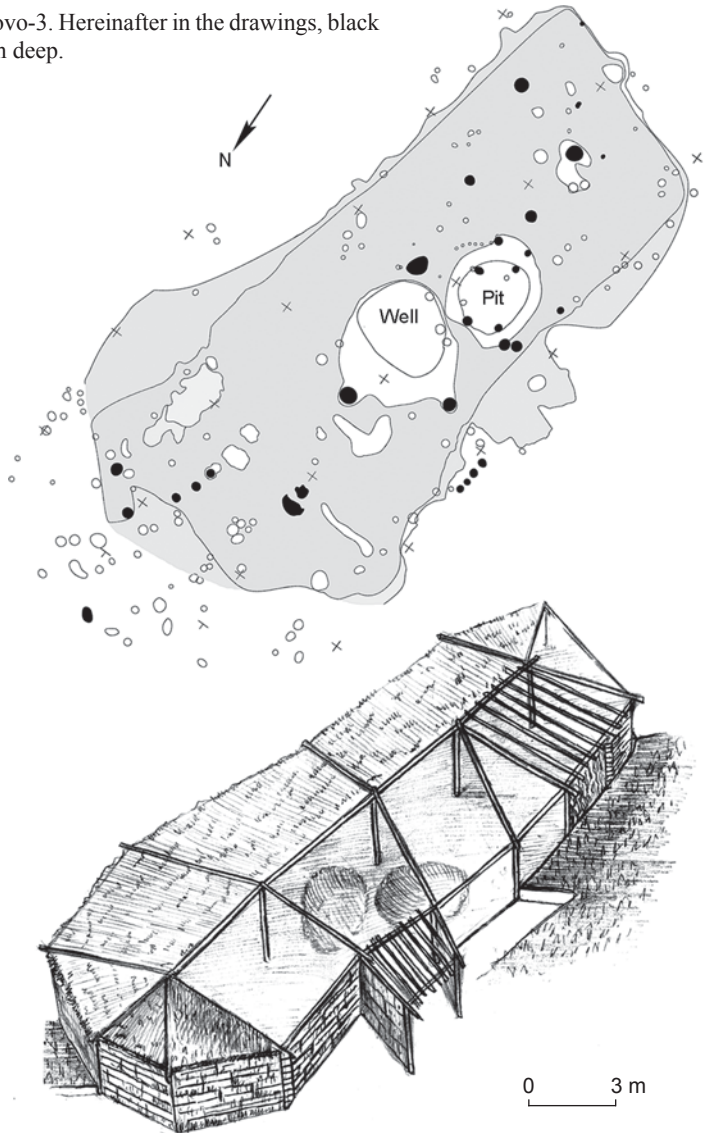
Middle Bronze Age. On the territory of the steppe and forest-steppe Altai, this period is represented exclusively by sites with the *Andronovo* cultural layer (Kiryushin, Shamshin, 1992: 210–211, 220; Abdulganeev et al., 2003: 57; Udodov, 1994: 9; Fedoruk, Papin, Rednikov, Fedoruk, 2015). The studied buildings are of various types: they are single-chamber semi-dugouts (deepened 0.2–0.3 m into the natural soil) at the settlements of Zharkovo-3 and Lyapustin Mys, and a two-chamber ground structure (deepened 0.10–0.15 m into the natural soil) at the site of Pereyezd. Two buildings (at Zharkovo-3 and Pereyezd) are large (150 and 180 m^2 respectively) and have sub-rectangular pits; the third building (at Lyapustin Mys) is small (44–50 m^2) and subsquare. The bottom of the building pits is flat. In two cases (Zharkovo-3 and Lyapustin Mys), corridor-like entrances have been observed. Post pits have not been found at the settlement of Lyapustin Mys, which, together with the small area of the building pit, suggests a log construction. The presence of post pits 0.1–0.5 m in diameter and 0.1–0.5 m in depth, confined to the edges and center of the building pit, at the settlement of Pereyezd and Zharkovo-3 indicates a post-frame structure. The frame could have consisted of a row of high posts along the long axis of the building pit and less high posts along its perimeter. The posts could have been connected by poles. The walls and roof of the buildings were of a light or heavy type. At the settlement of Zharkovo-3 (a building of the light type), the walls could have been palisade or wattle, possibly plastered with clay and insulated with a sod layer on the outside for retaining warmth. A row of post pits passing along the central axis of the building pit indicates the presence of a gable roof (Fig. 1). In this case, it could have been constructed of thin poles, which were covered with reeds for heat insulation. At the settlement of Pereyezd (a building of the heavy type), the walls were inclined and rested on the frame, while the roof had the form of truncated pyramid or was single-sloped (Udodov, 1994: 9).

Light buildings occur widely at the Andronovo sites in the forest-steppe zone of the Urals, North Kazakhstan, and in some areas of Central and Eastern Kazakhstan (Kuzmina, 1994: 77). A certain similarity (post-frame structure, rectangular shape, walls and roof of the light type, and gable roof) can be observed with the houses of the Timber-Grave culture at I Beregovo settlement (Gorbunov, 1989: 68–70, pl. X, 2). Buildings of the heavy type, apparently similar to the structure from the site of Pereyezd, are better known from the materials of the subsequent period in Kazakhstan (Sargary, Suuk-Bulak) (Margulan et al., 1966: 255, fig. 126; Margulan, 1979: 305, fig. 220; Zdanovich, 1983: 71) and the Tobol region (Kamyshnoye, Yazevo, Sadchikovskoye, and Zamarevskoye Selishche) (Potemkina, 1985: 327–330).

Late Bronze Age. The materials of the Sargary-Alekseyevka culture dominate in Kulunda and Rudny Altai. In Northern Kulunda, Irmen assemblages and sites of the "Burla type" are present, and in Eastern Kulunda, the Cherkaskul materials at the settlements of Kalinovka II and Chernaya Kurya III. The sites of the Irmen culture dominate in the Ob region; Korchazhka sites are also common. At present, the buildings of all these groups have been excavated. Dwelling No. 2 at Kalinovka II is associated with *Cherkaskul* pottery (Ivanov, 2000: 73–83), which marks the period preceding the appearance of the Sargary-Alekseyevka materials at the site, and can be considered to be the earliest structure of that period. The building is small (about 32 m^2), one-chambered, of sub-rectangular shape, with an entrance-corridor in the middle part of the short western wall. The building pit was deepened into the natural soil by 0.12–0.15 m. Thirty six pits from pointed stakes hammered into the natural soil (mainly vertically) have been found in the building pit. The floor was even. There were only three posts at various walls. The total depth of the building pit did not exceed 0.45 m from the old ground surface, which makes it possible to identify the structure as a ground building. According to G.E. Ivanov, the dwelling had wattle walls and a roof of the light type. Additional heat insulation of the walls with sod, and the roofs with reeds could have been used (Ibid.).

The reconstruction of Ivanov seems to be correct. Obviously, the building belonged to the post-frame structures of the light type: a frame of stakes and posts was constructed along the edges of a shallow building pit; the space between them was filled with wattle plastered with clay (Fig. 2). On the outside, the walls could have been insulated with a sod layer. The roof in this case was light, either gable or flat, built of thin poles and reed mats.

Fig. 1. Plan and reconstruction of structure No. 2 at Zharkovo-3. Hereinafter in the drawings, black fills show pits over 0.2 m deep.



According to its main morphological features (small size, sub-rectangular shape, entrance in the center of the short wall, ground type, frame of posts, presence of hearths including a central hearth, and gable roof), the structure is similar to the buildings of the Cherkaskul culture (Obydennov, Shorin, 1995: 8–9). At the same time, its obvious similarity to the Andronovo building from the settlement of Zharkovo-3 (post-frame structure, rectangular form of the building pit, walls and roof of the light type, and gable roof) could have been caused by the small chronological gap between the Andronovo and Cherkaskul populations of the village and their continuity.

The settlement of Burla-3 (the sites of the "*Burla* type") seems to be a sufficiently early site of the Late Bronze Age. The structures which have been studied there are not homogeneous; two types of buildings stand out. The first type is represented by two ground post-frame structures. The buildings were located close to each other, had subsquare shape, small size (33–42 m^2), and corridor-like entrances. The floor was at the level of the natural soil. According to some evidence, post pits along the perimeter of the building pit were connected by narrow ditches. The walls were vertical, and the roof was most likely cone-shaped (Udodov, 1994: 12).

The second type consists of four semi-subterranean structures of medium and large size (Ibid.; Fedoruk, Papin, Rednikov, 2015a;

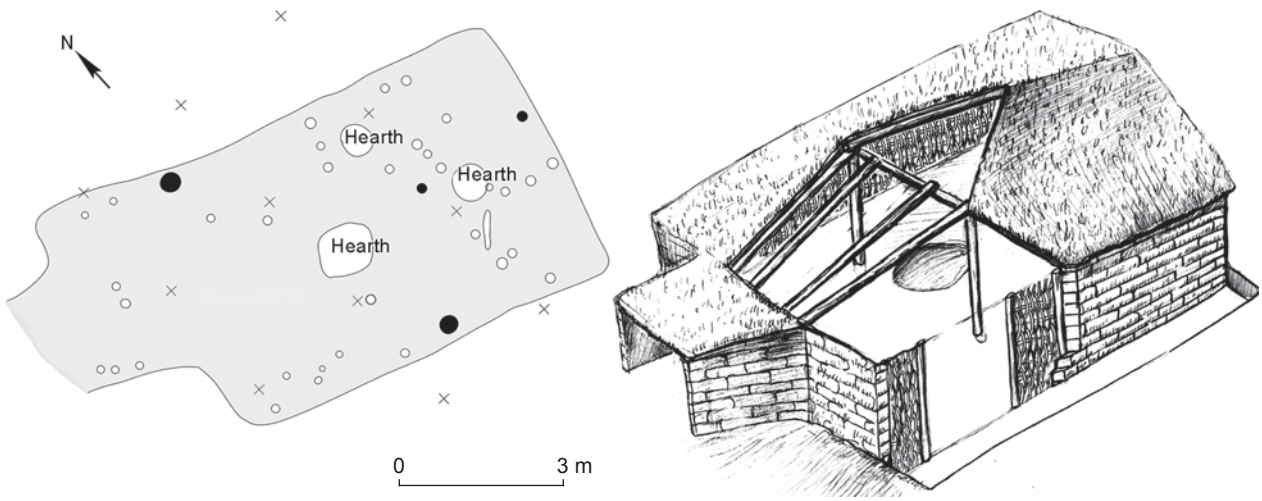


Fig. 2. Plan and reconstruction of dwelling No. 2 at Kalinovka II.

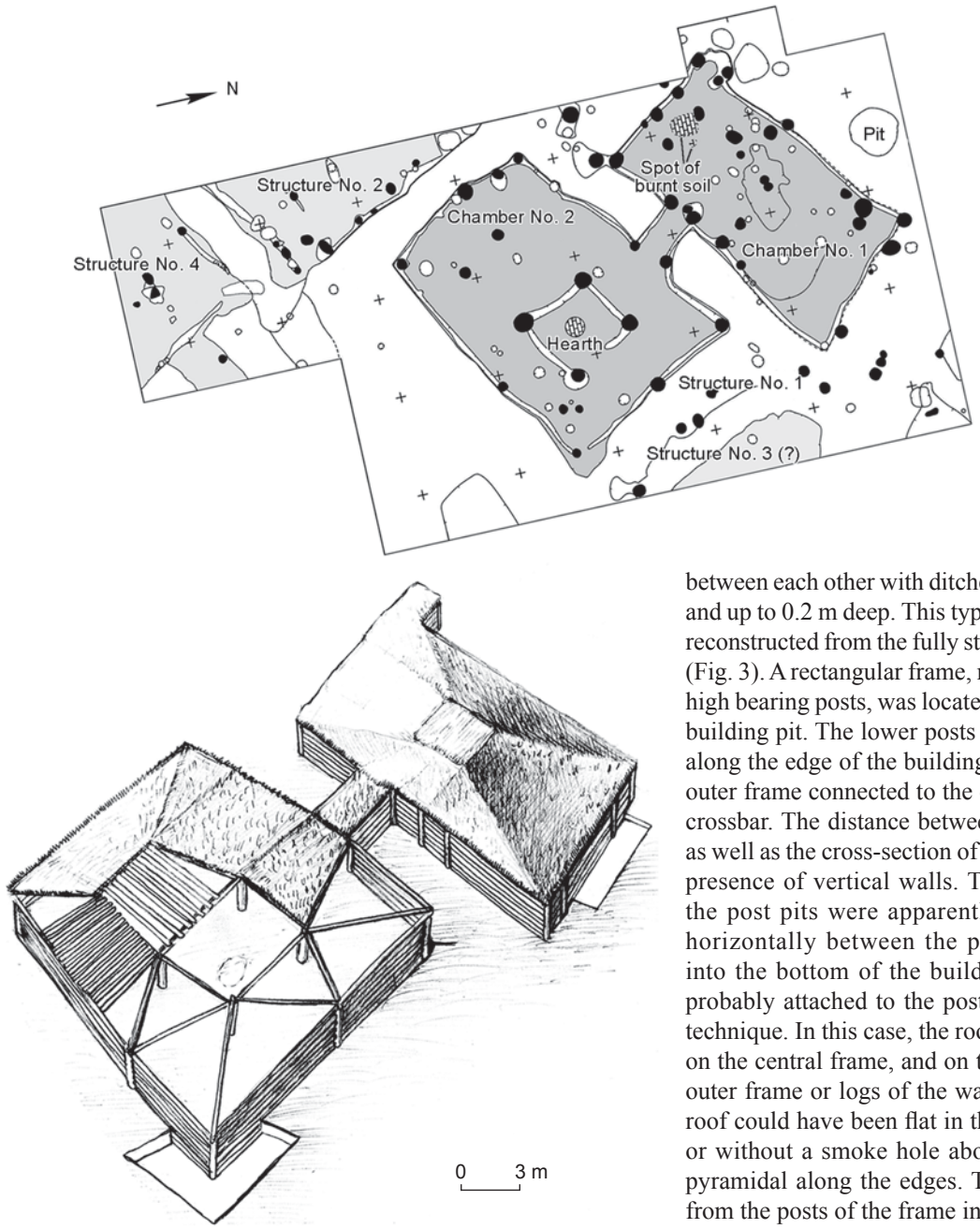


Fig. 3. Plan and reconstruction of structure No. 1 at Burla-3.

Fedoruk, Papin, Rednikov, Fedoruk, Demin, 2015). The distance between the walls of the buildings was 1–2 m. Building pits with an area of 60 to 200 m^2 were deepened into the natural soil by 0.2–0.4 m; they had sub-rectangular shape and an even floor. In one case there was a corridor-passageway between the chambers; in the other case there was a corridor-shaped entrance in the corner of the building pit. Post pits were lined up according to a clear system: the deepest ones were arranged in rows along the walls and in the center. They were connected between each other with ditches 0.10–0.15 m wide and up to 0.2 m deep. This type of structure can be reconstructed from the fully studied building No. 1 (Fig. 3). A rectangular frame, resting on four or six high bearing posts, was located in the center of the building pit. The lower posts could have been set along the edge of the building pit, which held the outer frame connected to the central frame with a crossbar. The distance between the building pits, as well as the cross-section of the pits, indicate the presence of vertical walls. The ditches between the post pits were apparently left by logs laid horizontally between the posts and deepened into the bottom of the building pit. They were probably attached to the posts using the mortise technique. In this case, the roof rested on one side on the central frame, and on the other side on the outer frame or logs of the walls. In this case, the roof could have been flat in the central part (with or without a smoke hole above the hearth), and pyramidal along the edges. The sizes of the pits from the posts of the frame indicate the heaviness of the roof. A layer of sod might have been placed on top of the poles for heat insulation.

Outside the region, similar structures find a wide range of parallels. The Sargary-Alekseyevka buildings of Kazakhstan and the Irmen buildings of the Ob region are the closest territorially and chronologically. They are similar in terms of their post-frame structure, semi-dugout type, presence of two chambers with a passageway-corridor, and possibly the common approaches to constructing walls and roofs. Specific feature of the Burla buildings is the density of their location and the presence of narrow ditches connecting the posts of the frame. Among contemporaneous sites, such ditches are known only from the ground structures

at the summer settlements of Menovnoye and Poboka (Eastern Kazakhstan) (Tkachev et al., 2000).

The most numerous buildings in the western part of the steppe and forest-steppe Altai were the buildings of the *Sargary-Alekseyevka* culture, amounting to 15 structures (Demin, Sitnikov, 1999: 25–26; Ivanov, 2000: 25, 35–36, 62–63, 72–85; 2004: 49; 2005: 53; 2016; Papin, Fedoruk, Shamshin, 2014; Sitnikov, 2015: 113–114; Fedoruk, Papin, Rednikov, 2015b). They are similar to each other by a number of structural features of the building pit and frame. The building pits have sub-rectangular shape, vertical walls, and an even floor, and are deepened into the natural soil by 0.2–0.8 m. The system of post pits and their sizes indicate a post-frame structure and the heavy type of buildings. In some cases, entrance-corridors have been observed (Zharkovo-3, Rublevo VI, and Chekanovskiy Log-1). At the same time, specific features of the buildings are also obvious. Thus, building No. 1 at Zharkovo-3 is a single-chamber semi-dugout deepened by 0.3–0.7 m into the ancient surface (with an area of about 260 m^2) (Fig. 4). The frame consisted of interconnected central and outer frames based on vertical posts. The walls could have been constructed from horizontally laid poles, fastened between two rows of vertical posts along the edges of the building pit (the inserting technique). The absence of post pits in the northern corner of the building pit may indicate the use of growing trees as posts in this part of the building, or log walls fastened in the technique of interlocked corner joint (with the saddle notch facing upwards or downwards, or using some other method of interlocking). Traces of additional heat insulation of the walls by a mound of earth mixed with ashes have been found. A corridor-like entrance was presumably located in the western corner of the building. A heavy roof rested upon the frames and walls. Sod could also have been used for heat insulation.

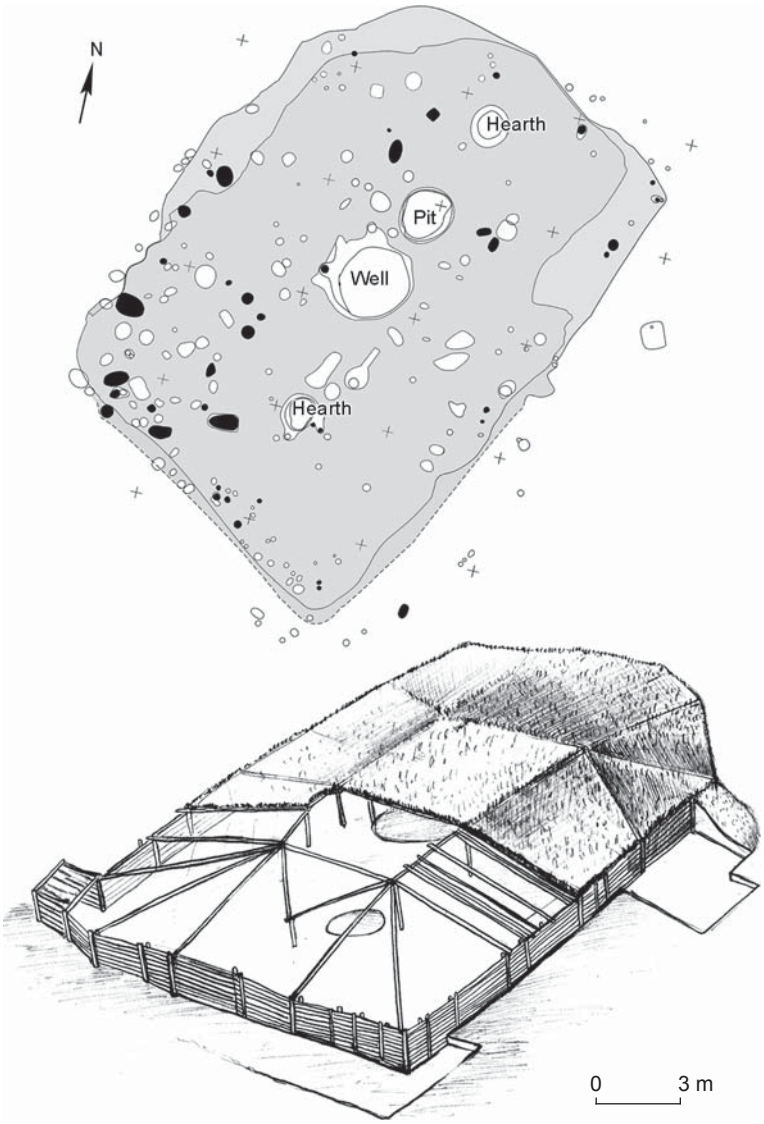


Fig. 4. Plan and reconstruction of structure No. 1 at Zharkovo-3.

Building No. 1 from Rublevo VI looked different (Fig. 5). It was a large (120–200 m^2) and deep semi-dugout consisting of two chambers connected by a passageway. Chamber No. 1 (45–80 m^2) was deepened by 0.5–0.9 m from the old ground surface. The absence of posts along the walls of the building pit (combined with a black humus band along its inner perimeter) and their presence in the central part (along the long axis) makes it possible to assume a cribwork structure with a gable roof, which rested on the central frame and upper layers of the cribwork. A mound of earth mixed with ashes was made on the outer side of the walls for heat insulation. Obviously, the chamber rose not very high above the ancient surface. There was a corridor-entrance in the northern corner of the building pit; a corridor-shaped passageway to the second chamber was in the central part of the opposite wall. The second chamber was larger (65–120 m^2) and deeper (up to 1.0 m from the old ground surface) than the first one. The frame and roof were the same as those of building No. 1 at Zharkovo-3. The walls could have consisted of horizontal rows of poles fastened between the posts of the frame. A mound of earth mixed with ashes was placed on the outer side of the walls. Apparently, this chamber, just like the first one, did not rise very high above the old ground surface.

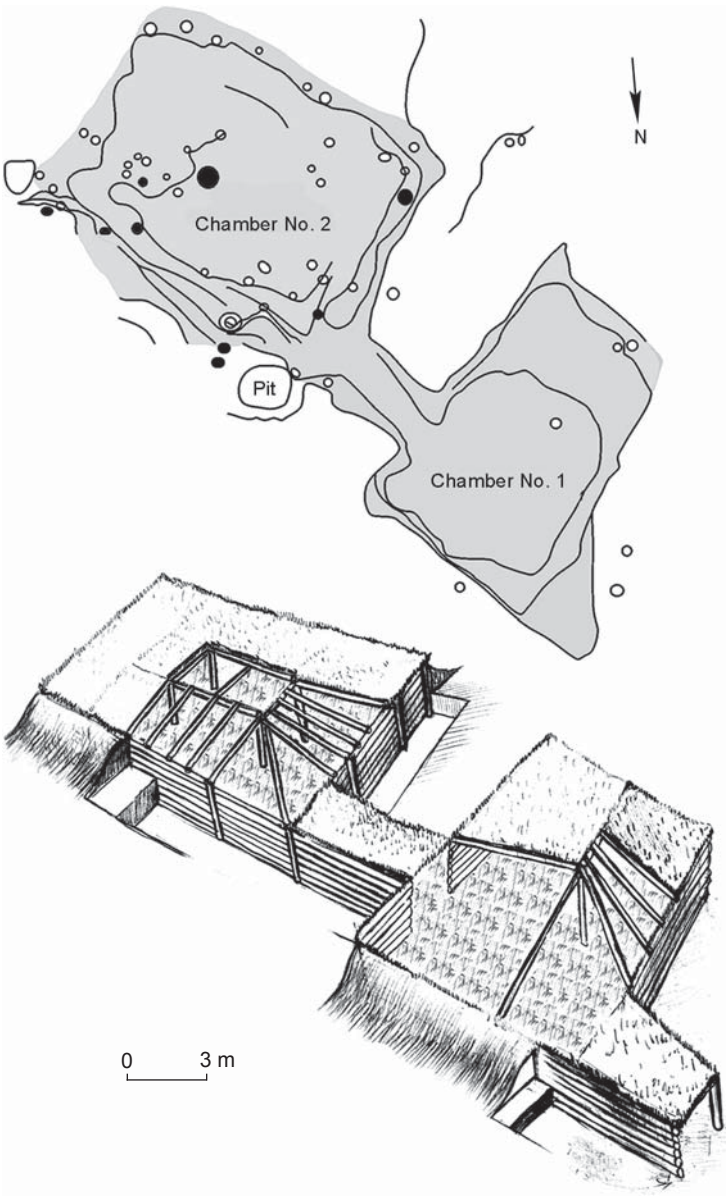


Fig. 5. Plan and reconstruction of structure No. 1 at Rublevo VI.

The Sargary-Alekseyevka buildings of the Altai find numerous parallels on the territory of Kazakhstan. The post-frame structure was a widespread phenomenon (the settlements of Sargary, Trushnikovo, Malokrasnoyarka, Barashki-1, Shortandy-Bulak, and Suuk-Bulak), while cribwork houses occurred quite rarely (dwelling No. 2 at Ust-Narym) (Margulan, 1979: 198–203, 224; Margulan et al., 1966: 255, fig. 126; Tkacheva, 1997: 8). It is possible to draw a parallel with the Irmen materials from the Novosibirsk region of the Ob and Baraba. Thus, building No. 1 at Zharkovo-3 corresponds to large post-frame semi-dugouts, while chamber No. 1 of building No. 1 at Rublevo VI corresponds to cribwork structures (Matveev, Sidorov, 1985: 31–47). Chamber No. 2 of the latter building is comparable to the Irmen post-frame semi-dugouts, but is smaller. The combination of different structures in a single building confirms the syncretic character of the traditions of the population inhabiting that region.

The structures of the *Irmen* culture in the Altai are represented by eight buildings. Judging by the available evidence, their area varied from 20 (Rechkunovo-3) to 150 m^2 (Malyi Gonbinskiy Kordon-1, settlement 3). The building pits were deepened into the natural soil by 0.1–0.8 m, which indicates the existence of structures of ground, semi-underground, and underground types. The buildings had distinctive entrance-corridors. The location of post pits mainly along the perimeter and in the center of the chambers indicates a post-frame structure (Shamshin, 1988: 9; Kiryushin, Shamshin, 1992: 212; Ocherki..., 1995: 172). An exception is the dwelling from the settlement of Krestyanskoye-9, where their absence (Ivanov, 1990: 87) suggests the presence of cribwork.

The structures of the *Korchazhka* culture in the Ob region are represented by three semi-dugouts (Korchazhka I and V) and two ground structures (Kostenkova Izbushka) (Shamshin, 1988: 8; Kiryushin, Shamshin, 1992: 211, 221; Ocherki…, 1995: 145). These buildings have never been fully described, and thus it is not possible to analyze them.

The types of buildings considered in this article reflect the level of development of house-building traditions and specific nature of ethnic and cultural interaction in the region in the middle and late stages of the Bronze Age. Specific features of individual structures were probably determined by their functional purpose, as well as availability of local sources of building material. These factors were universal and were associated with the economic and cultural type of specific groups of population, but consideration of this problem is beyond the scope of the present article.

Conclusions

Summarizing the evidence examined, it is possible to construct a conventional model of the structure that prevailed in the house-building concepts of the population of the steppe and forest-steppe Altai in the Middle and Late Bronze Age. It is a post-frame building with one or rarely two chambers, with rectangular or subsquare shape

and the entrance in the form of a corridor protruding beyond the building pit. Buildings of heavy and light types, large and medium size, post-frame or possibly cribwork structures, with flat, gable, or truncated-pyramidal roofs were typical of the Andronovo period. In the Late Bronze Age, the tradition of constructing light buildings with a gable roof is embodied in the Cherkaskul dwelling (Kalinovka II), although its specific feature is the use of stakes for constructing the frame and the ground type of structure. Buildings of the heavy type became common for the majority of cultures of the Late Bronze Age in the region, and include the buildings from the settlement of Burla-3: post-frame semi-dugouts or ground structures of various sizes, with the roof in the form of a cone or truncated pyramid. Specific features of these structures include the density of their location and presence of ditches connecting the supporting posts, probably indicating the attachment of the walls using the mortise technique to the frame posts. The Sargary-Alekseyevka buildings show adherence to the general model. They are semi-dugouts of the heavy type of large and medium size with a frame of posts and truncated-pyramidal roof. The combination of cribwork and a post-frame structure in a single building (Rublevo VI) points to the multicomponent composition of the population. The Irmen buildings are similar to those of Sargary-Alekseyevka, which can be explained by active ethnic and cultural contacts of the steppe population and the Ob region population.

The Andronovo, Sargary-Alekseyevka, and Irmen buildings present in the region find wide parallels on the adjacent territories. The similarity is manifested in the basic approaches to the structure, such as the post-frame type, depth of the building pits, mainly vertical walls, and gable or pyramidal roof. However, there were some differences primarily associated with the availability of local building materials. This is most clearly demonstrated by the Andronovo and Sargary-Alekseyevka buildings. If stone was often used on the territory of Kazakhstan, wood was the most common material in the region under consideration. Dwelling No. 2 at Kalinovka II, on the one hand, is close to the Cherkaskul structures of the Trans-Urals, but on the other hand, it fits neatly into the Andronovo tradition of light buildings.

Thus, the dominating trend in house-building among the population of the steppe and forest-steppe Altai in the Middle and Late Bronze Age was the further development of the Andronovo tradition, which became interrupted only during the transition to the Iron Age, due to the emergence of new groups of population. This is consistent with the common trend for southwestern Siberia and Kazakhstan. The "Burla" buildings look quite distinctive. Their specific features may have been associated with traditions brought from western Central Asia.

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Artistic Metalwork Found Near the Tomskaya Pisanitsa

This article describes rare metalwork items found in the 1970s, 1990s, and 2010s near the Tomskaya Pisanitsa rock art site—a zoomorphic figurine, two anthropomorphic masks, and an ornithomorphic pendant. Parallels among the ritual and funerary artifacts from southern and Western Siberia are discussed. The figurine, representing a horse or an onager resembles certain examples of ritual artistic metalwork of the Tagar and Kizhirovo cultures (500–300 BC). Anthropomorphic masks represent the Tomsk-Narym variant of late Kulaika metalwork (100 BC to 500 AD) but may be as late as the sixth century, being associated with the post-Kulaika early medieval tradition. The ornithomorphic figurine, dating to 500–700 AD, belongs to the early medieval trans-cultural tradition that originated from late Kulaika art. The Tomskaya Pisanitsa site resembles the Early Iron Age and early medieval sanctuaries of Western and southern Siberia, with votive hoards of artifacts, including artistic metalwork. Such sites are part of the Northern Asian tradition of offerings made near rock art galleries. Hypotheses are brought forward concerning the attitudes of the late Kulaika people to rock art sites in the first half of the first millennium AD.

Keywords: *Artistic metalwork, Early Iron Age, Early Middle Ages, sanctuaries, rock art, Tomskaya Pisanitsa.*

Introduction

In July 2015, during the clearing of one of the crevices above the rock planes of the Tom rock art site ("Tomskaya Pisanitsa"), a participant of the petroglyphic expedition A.S. Tekhterekov discovered a cast figure of a horse or onager. Three more objects of artistic metalwork (two anthropomorphic masks and an ornithomorphic pendant) have been discovered in various years in the vicinity of the site. Out of these finds, only the representation of the bird has been partially published (Kovtun, 2001: 45), while the rest of the objects for various reasons have remained unknown to the scholarly community. The analysis of these objects allows us to re-address the issue of cultic practices at the largest petroglyphic site of the Lower Tom region.

Description of the objects of artistic metalwork

Plaque in the form of an onager/horse figurine. The plaque was found in the lower part of the crevice-watercourse, which stretched from the northwest to southeast, above the plane with the rock representations of the second group

Fig. 1. Tomskaya Pisanitsa.
1 – plane with rock art representations; *2* – place where the figurine of the horse/onager was found.

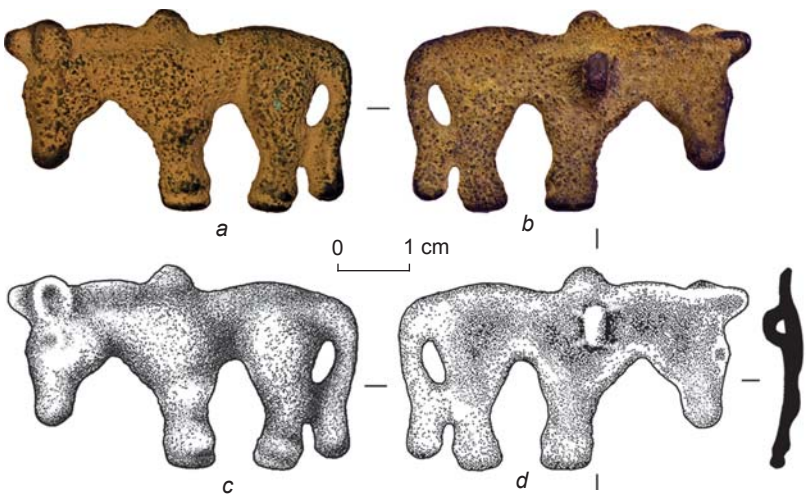

Fig. 2. Pendant in the form of a horse/onager figurine.
a, *b* – photo; *c*, *d* – drawing; *a*, *c* – front side, *b*, *d* – back side.

(Fig. 1). The object lay in a mass of loose deposits of gravel and earth, and most likely was moved relative to its original location. The plaque is a relief figure of a horse or onager, turned to the left, with the neck extended forward and head lowered down (Fig. 2). A loop for a horizontal belt is on the reverse side. The size of the object is 46 × 27 × 10 mm; the weight is 16.88 g. The entire surface is covered with patina. The elemental composition was determined by the X-ray fluorescence method, using the ArtTAX (Brüker) spectrometer, at the Department of Scientific and Technical Expertise of the State Hermitage (expert S.V. Khavrin): copper – over 97 %, arsenic – 0.5–1.0 %, lead – 0.2–0.6 %, nickel – 0.1–0.5 %, iron – 0.1–0.5 %, and trace amounts of tin. The object was essentially made of pure copper.

The forms are rendered in a realistic manner. Bangs are shown above the forehead. Oval-triangular ears are set vertically; the right ear slightly protrudes forward. The eye is rendered with an oval. The nostrils and mouth are not very prominent due to patina. The head is delimited from the neck by a higher relief of the cheekbones. The withers are rendered in the form of a pronounced hump. The scapula is shown in higher relief than the trunk and thigh which is separated from the abdomen by an indentation. The legs are robust and short. A long tail is bent down and is adjacent to the shanks of the hind legs.

Anthropomorphic mask with a pointed upper part. It was found in the 1970s at the site above the rock with the representations of the second group (according to the oral report of V.V. Bobrov). The finder is unknown, just as the real context of the discovery. The mask was made in the technique of flat planar casting. The size of the object is 55 × 18 × 2 mm; the weight is 9.58 g. The shape of the object is close to ellipsoidal, with a sharp ending of the upper part and elongated rectangular base, the edges of which were not processed after casting. The image was applied to the outer "convex" side (Fig. 3).

The facial features and elements of headdress are shown with slightly deepened contours. The transverse divider between the face and the headdress is missing as well as any relief designations of the nose and chin. The pointed top of the object has a diamond-like outline by means of a

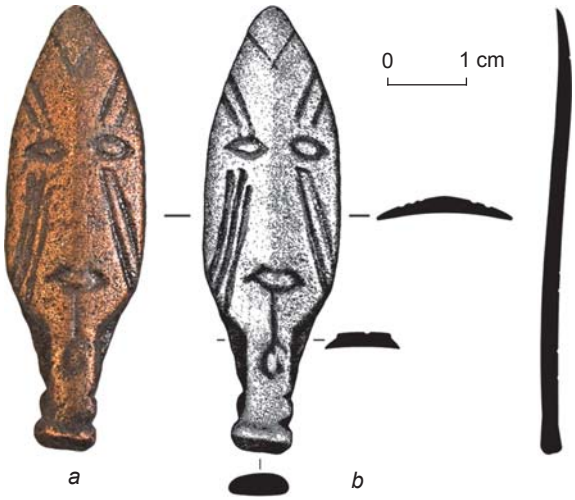

Fig. 3. Anthropomorphic mask with pointed top.
a – photo; *b* – drawing.

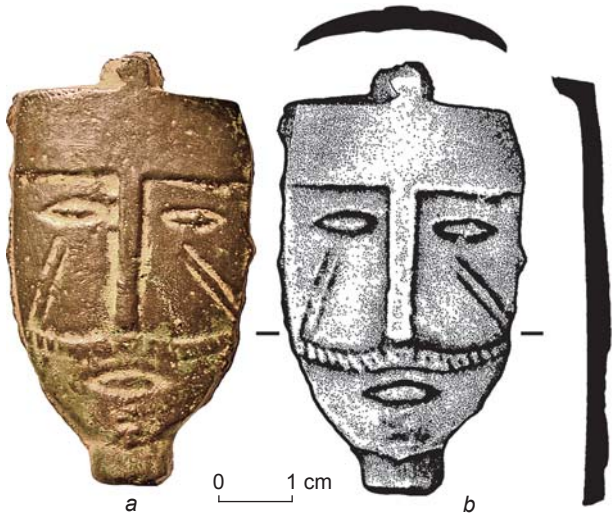

Fig. 4. Anthropomorphic mask with truncated top.
a – photo; *b* – drawing.

V-shaped mark. The eyes and mouth are depicted in the form of isomorphic horizontal ellipses with unfilled inner space. Paired short lines directed from the edges of the mask to its center are above the eyes. Three slightly curved lines run diagonally down from the right eye, and two almost straight lines run diagonally from the left eye. A vertical line with a looped end is drawn from the mouth to the middle of the neck. Two small notches were symmetrically made on the side faces in the lower part of the bottom, probably for attaching the object to some base. The bottom is marked with a small bas-relief band.

Anthropomorphic mask with truncated upper part. It was discovered in the 1990s on the right bank of the Pisanaya River, not far from its mouth, that is, in the immediate vicinity of the first group of drawings (oral report of G.S. Martynova). The object has been relatively well preserved; most of its surface is covered with noble patina. The mask was made in the technique of flat casting. Unpolished casting burrs can be seen around the outline. The size of the object is 59 × 33 × × 2 mm; the weight is 27.3 g. The shape of the object is semioval, with a truncated upper part. A neck-base of subrectangular shape is at the bottom. A small subrectangular protrusion is located symmetrical to the base, on the upper cut of the mask. The representation was made on the outer "convex" side (Fig. 4).

The eyes and mouth are shown as isomorphic horizontal ellipses with unfilled inner space. Pairs of diagonal lines run downward from the eyes. The line of the headdress or eyebrows, nose or helmet nose-guard, and a mustache are rendered in bas-relief.

Ornithomorphic pendant. It was found in 1991 at the foot of the rock near the drawings of the second group by

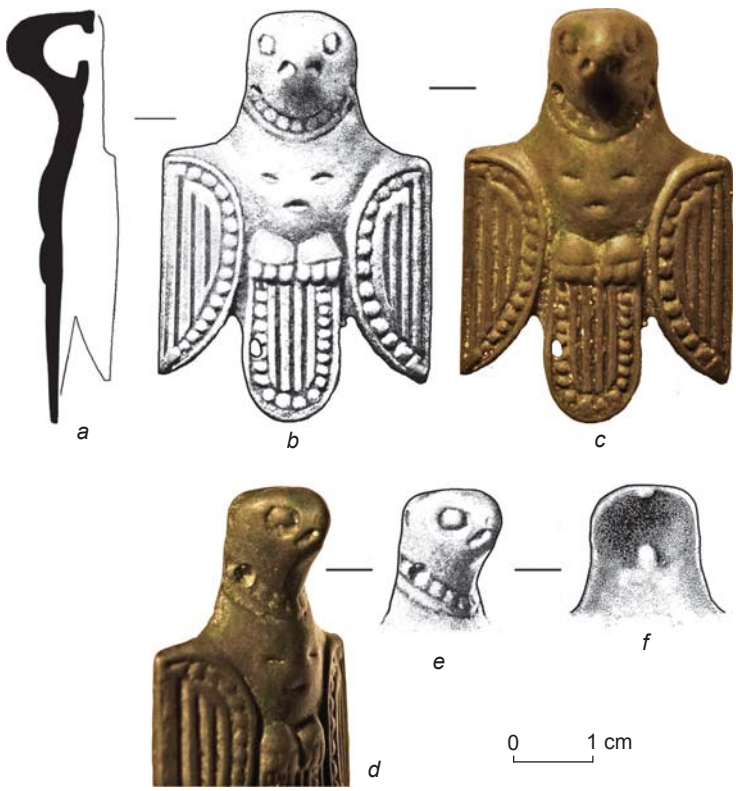

Fig. 5. Ornithomorphic pendant.
a, *b*, *e*, *f* – drawing; *c*, *d* – photo; *a* – longitudinal cross-section at the center; *b*, *c* – face view; *d*, *e* – profile view of the upper part; *f* – back side of the upper part.

an employee of the Museum-Reserve (according to the oral report of G.S. Martynova). The pendant represents a realistic image of a bird of prey (falcon or eagle) in a so-called heraldic posture. The size of the object is 50 × 33 × × 22 mm; the weight is 18.67 g. The object was made in the technique of flat planar casting. It is well preserved; the entire surface is covered with noble patina (Fig. 5). The front side of the pendant is convex; the back side is slightly concave, without representations; the remains of a loop for passing a strap through have survived in the upper part of the back side. A patinated conical depression is on the right in the area of the bird's neck; the origin and purpose of this depression remain unclear.

The head is prominently emphasized; depressions on the head mark round eyes and a curved beak. A long neck is decorated with a semicircular "necklace". The wings are bent down; together with an elongated semioval tail they are marked with bands and a small pearl-like pattern; their inner space is filled with vertical bands. Paws with clasped claws are prominently emphasized above the tail. On the chest of the bird, a stylized mask is shown with three lenticular depressions.

Cultural and chronological attribution of the objects, based on their stylistic parallels

The cultural and chronological attribution of archaeological objects found out of context is most often based on the method of analogy, and is often hypothetical. However, the circle of stylistically close objects for the objects under consideration can be determined quite clearly. Apparently, the earliest of our objects is a zoomorphic plaque-pendant in the form of a horse/onager figurine. According to the specialists, this image emerged in southern Siberia during the Scythian period, and is associated with the culture of steppe tribes (Molodin, Bobrov, Ravnushkin, 1980: 46). The image of a standing horse or onager in the south Siberian artistic metalwork of that time was used to decorate the handles of cauldrons, high reliefs, and pommels on the handles of knives of the Tagar culture (Amzarakov, 2012; Zavitukhina, 1983: 64). A series of three-dimensional figurines of an onager with bent legs, "lying" on bronze mirrors, is known from the Achinsk-Mariinsk forest-steppe and to the north of it, from the materials of Aidashin Cave (Molodin, Bobrov, Ravnushkin, 1980: Pl. XI, *5*; XII) and the Ishim hoard (Plotnikov, 1987: Fig. 1, *1–11*). A similar object was found in the Minusinsk Basin (Zavitukhina, 1983: 64, fig. 156). It has been suggested dating such figurines to the transitional Tagar-Tashtyk period (Molodin, Bobrov, Ravnushkin, 1980: 45–46).

Cast figurines of horses from the Stepanovka and the Shelomok hoard in the Tomsk region of the Ob are the most similar (almost identical) to the zoomorphic plaque-pendant (Pletneva, 1976: Fig. 27, *15*; 2012: 18–20). In addition to their three-dimensional nature, the common feature of all the objects is the presence of fastening devices—loops (on the finds from the Shelomok hoard and from the vicinity of the Tomskaya Pisanitsa) and a small rod with a head (on the figure from Stepanovka). When analyzing the Stepanovka find, Pletneva showed its typological similarity to the figurines of the 5th–4th centuries BC from the Tagar cemetery of Malaya Inya (the southern part of the Krasnoyarsk Territory) (Chlenova, 1967: Pl. 25, *21*) and the sanctuary on Lysaya Gora on the Yaya River (northern foothills of the Kuznetsk Alatau) (Ibid.: Pl. 34, *6*; Martynov, 1976: Fig. 1, *63*). These parallels are also valid for the figurine from the vicinity of the Tomskaya Pisanitsa. Taking the above into consideration, the time when this zoomorphic image was created falls within the 5th–4th centuries BC. A later placement of the object on the rock is possible. Culturally, the object is close to the Tagar antiquities from the Achinsk-Mariinsk forest-steppe or the Kizhirovo (Shelomok) assemblages of the Tomsk region of the Ob, genetically associated with the Tagar world.

Both anthropomorphic masks are examples of anthropomorphic casting which emerged at the late stage of the Kulaika historical community, in the southeastern part of its habitation area (according to Y.P. Chemyakin, the Tomsk-Narym version of the Kulaika artistic metalwork) (Chemyakin, 2013). According to the typology of Z.N. Trufanova, oval masks with a pointed top constitute the second iconographic type of anthropomorphic images of the Kulaika planar casting, while truncated-oval masks constitute the fourth type (2003: 16). Such a typical Late Kulaika trait as "negligence" of execution expressed in unpolished edges and other minor defects (Polosmak, Shumakova, 1991: 7–8) can be observed in both objects.

The "sharp-headed" representation from the vicinity of the Tomskaya Pisanitsa in the context of the second iconographic type has a strong resemblance to the "helmet-headed" Parabel mask from the Middle Ob region, dated to the last third of the first millennium BC (Chindina, 1984: 75, 106) or to the turn of the eras (Borodovsky, 2015: 94). Two Late Kulaika masks from the collection of random finds of the Novosibirsk Museum of Local History (Polosmak, Shumakova, 1991: Fig. 8, *5*, *6*) are even more similar to this object. Iconographically, they have in common: "sharp headedness", roundness of forms, presence of a pronounced neck-base, dashed decoration of the assumed headdress area, and ellipsoidal outlines of the eyes and mouth. Curved lines-"tattoos" under the eyes are noteworthy. Specific features of the mask from the vicinity of the Tomskaya Pisanitsa include its miniature scale, emphasized stylized nature, absence of dividing

lines between the face and headdress area, as well as absence of images of nose and chin.

Our objects show very great similarity to the pointed mask from the mound of barrow 60 of the Timiryazevo I burial ground, dated by O.B. Belikova and L.M. Pletneva to the 5th–6th centuries AD and attributed to the beginning of the Early Middle Ages (1983: Fig. 12, *7*). The authors correlate this period in the Tom region of the Ob to the end of the merging of the local population with the Kulaika population (Ibid.: 127), which theoretically confirms the connection of the masks of this type with the Late Kulaika pictorial tradition. Finally, we should note the differences between the finds from near the Tomskaya Pisanitsa and the rhomboid anthropomorphic masks forming the early medieval trans-cultural material complex of Western Siberia (Borodovsky, 2015): roundness of outlines, and absence of bas-relief elements and fastening protrusions on the ends (Ibid.: Fig. 1, *3*, *4*).

The face with the truncated upper part finds numerous parallels in the materials from cultic places and hoards of the Tomsk-Narym region of the Ob and the Middle Tom region. Noteworthy are also the objects from the Kulaika and Parabel cultic places (Chindina, 1984: Fig. 17, *3*, *4*; 35, *3*), as well as the Ishimka (Plotnikov, 1987: Fig. 1, *1*) and Elykaevo (Mogilnikov, 1968: Fig. 3, *9*) hoards. L.A. Chindina established the emergence and existence of such objects during the Sarov stage (1984: 122), but she also allowed for the medieval dating of some of them, for example, of the masks from the Lisiy Mys and the Elykaevo hoard (Chindina, 1991: Fig. 20, *8*, *9*). In the latter case, this does not contradict the medieval attribution of the Elykaevo collection, which was previously proposed by V.A. Mogilnikov (1968: 268).

However, there are two points of view concerning the dating of the so-called "mixed" hoards of Western Siberia, which include masks similar to those under consideration. The first point of view is proposed in the studies of V.A. Mogilnikov (1968) and Y.A. Plotnikov (1987: 125), who date such accumulations of objects to the medieval period, because of the presence of iron weaponry. Another point of view belongs to Y.V. Shirin, who suggested limiting the upper date of the "mixed" hoards to the 5th century AD, and to correlate them with the Late Kulaika tradition of the votive "burials" of objects in cultic places, based on the morphology of iron weaponry of the Fominskoye culture and the absence of medieval belt sets (1993: 159–161; 2003: 120). Such a suggestion seems to be more convincing, and if it is true, the "medieval" age of some anthropomorphic masks should be reconsidered for the earlier dating. However, the literature has repeatedly noted the genetically conditioned closeness of the Late Kulaika and early medieval (Relka) metal artwork, the differentiation of which is often possible only in context (Chindina, 1991: 61–63, 66–68). Taking this into account, it would be logical to date the masks under consideration to a wide chronological range from the turn of the eras up to the sixth century, with a Late- or post-Kulaika affiliation.

The stylistic canon, according to which the ornithomorphic pendant was made, also emerged in the Late Kulaika period (Chindina, 1984: 72–74; Trufanova, 2003: 19). In the Early Middle Ages, this image received wide trans-cultural proliferation in the Urals and in Western Siberia, including the Relka and Upper Ob cultures of the Upper and Middle Ob region (Chindina, 1991: 58–59, fig. 22, *2*; Troitskaya, Novikov, 1998: Fig. 19). Regarding the Middle Tom region and the Kuznetsk Depression, the latest dating of such images does not go beyond the limits of the 6th–7th centuries AD (Kuznetsov, 2013). Apparently, the pendant from the vicinity of the Tomskaya Pisanitsa should be dated to that same period.

Finds in the context of cultic places of the Early Iron Age and the Early Middle Ages in Western Siberia

The discovered objects belong to chronologically different periods. The earliest image has a Tagar or Kizhirovo appearance and is dated to the mid–second half of the first millennium BC, while the rest of the objects are associated with the Late or post-Kulaika cultic casting and belong to the first half of the first millennium AD, possibly the 6th–7th centuries AD. Once again, the objects do not form a single local cluster, as is the case at the Parabel or Ishimka cultic sites. Their "burial" is associated with locations separated by tens of meters. Most likely, we are dealing with the remains of several hoards of different periods or with placement of individual objects. Unfortunately, the full archaeological context of these remarkable finds remains unknown. At the same time, the concentration of "exclusive" objects over a relatively small area requires an explanation. It would be quite logical to suggest that the finds belong to a cultic place, by analogy with the well-known cultic sites of the Early Iron Age and the Early Middle Ages (Kulaiskaya Gora, Parabel, Ishimka, and others).

It is common knowledge that cultic places in the Urals–Western Siberian region are confined to remarkable and unusual elements of the terrain. In the forest zone of the Urals, such places are caves, rocks, mountains, hills, islands on lakes, or marshes (Kultoviye pamyatniki…, 2004: 315–316). In Western and southern Siberia, they are most frequently hills, which dominate the terrain (the Kulaiskaya Gora and the Parabel cultic place in the Middle Ob region, the ritual complex at the mouth of the Kirgizka River, and the

cultic sites at the settlement of Shelomok in the Tomsk region of the Ob (Pletneva, 2012: 168), Lysaya Gora in the Tom-Yaya interfluve), and rarer variants—islands and caves (the Ishimka hoard in the Tom-Chulym interfluve (Plotnikov, 1987), and Aidashinskaya Cave in the Achinsk-Mariinsk forest-steppe (Molodin, Bobrov, Ravnushkin, 1980; Molodin, 2006: 43–59)). The Tomskaya Pisanitsa fully corresponds to these requirements—a picturesque cliff hanging over the Tom and Pisanaya Rivers forms the base of a high hill. Together, the geomorphological features and the finds of artistic metalwork make it similar to other cultic places of the Early Iron Age and the beginning of the Early Middle Ages in Western Siberia. It is most likely that the horse/onager figurine is associated with the cultic practices of the pre-Kulaika, Scythian population of the Tom region, while the remaining objects are associated with the late Kulaika or post-Kulaika period of the sanctuary's functioning.

Finds as a manifestation of the tradition of setting up altars at petroglyphic sites

The term "sacrificial place"/"altar" for the archaeological materials discovered near rock art sites was first used by O.N. Bader in the 1950s (see: (Mazin, 1994: 67)). A little later, a similar idea was formulated by A.P. Okladnikov in his analysis of the rock art sites of Suruktakh Khaya in Yakutia and Narin-Khunduy in Trans-Baikal region (Okladnikov, Zaporozhskaya, 1969: 6, 40; 1972: 9–10). Okladnikov established the criteria for such cultic sites: duration of functioning, presence of sacred objects (devices for obtaining fire, arrowheads, etc.), and traces of ritual sacrifices, which have parallels in ethnography (Okladnikov, Zaporozhskaya, 1970: 114; 1972: 35–41, 78–81).

A.V. Tivanenko considered the rock art sites as an element of cultic places associated with worshiping the spirits of the land. He saw the localization of archaeological materials from various chronological periods near the planes (under them, over them, in crevices, etc.) as being signs of a sanctuary (Tivanenko, 1989: 5, 6; 1990: 92–94, 97). A.I. Mazin identified two types of altars at the rock art sites of the Amur River region: ground altars (typical of the forest zone) and altars inside special stone enclosures (common in the steppe and forest-steppe Eastern Trans-Baikal). He established four main types of cultic practices: making drawings and purification by fire, after which the rock became untouchable; making additional drawings; offering of improvised things in the case of accidentally approaching the petroglyphs; and offering things during a special visit (Mazin, 1994: 67–71). The proposed model, in our view, is largely universal. The available data indicate wide proliferation of such practices on the territory of Northern Asia in ancient times, the Middle Ages, and ethnographic modernity.

The Urals. The study of the archaeological context of the Ural rock art sites has been carried out since the 1940s (Bader, 1954: 254). The most studied complex is the Vishera painted rock where over 6000 various artifacts have been discovered on an area of 140 m^2 (Kultoviye pamyatniki…, 2004: 315–316). Cultic places are known at the Alapaevsk, Irbit, Tagil, and Turinsk painted rocks, as well as the Balakino, Pershino, Shaitan, and Shitovskoye rock art sites, Balaban I rock, etc. (Shirokov, Chairkin, 2011: 17, 30, 35, 38, 41, 87, 102, 116; Dubrovsky, Grachev, 2010: 115, 124, 138).

Eastern Siberia. In the Amur Region, Mazin has discovered ancient altars at 37 out of 52 examined rock art sites (1994: 36). In the Cis-Baikal region, A.V. Tivanenko has conducted successful excavations at the foot of 40 petroglyphic sites (1994: 20). N.N. Kochmar has reported about 56 altars associated with 19 rock art sites of Yakutia (1994: 146). In the Angara basin, already in the 1930s, Okladnikov identified a cultic place at a rock art site on the Kamenka River, the cultural layer of which included fragments of pottery, bone and bronze arrowheads, and a bronze Tagar mirror (1966: 103). The Ust-Taseyevo cultic complex, explored in the 1990s by Y.A. Grevtsov, is unique not only for the Angara region, but also for all of Siberia. Its materials go back from the Early Iron Age to the ethnographic period with the predominance of objects made in the Scytho-Siberian animal style (Drozdov, Grevtsov, Zaika, 2011).

Southern Siberia. Only one such location is known on the Yenisei River, despite numerous petroglyphic complexes in the region. This is the burial of the mid first millennium BC, found in 2004 during the clearing of debris from the Shalabolino rock art site (Zaika, Drozdov, 2005: 113). In the Altai Mountains, archaeological materials are known from the excavations near petroglyphs at Kyzyk-Telan, Ayrydash, near the village of Kokorya, and at Kalbak-Tash (Surazakov, 1988: 74; Kubarev, Matochkin, 1992: 24, 25). The cultic complex in the grotto of Kuylyu, on the Kucherla River, is unique; its cultural deposits partially covered the drawings located on vertical planes. The materials of the Afanasievo period, Scythian period, the Middle Ages, and the ethnographic period have been discovered at this site (Molodin, Efremova, 2010: 199).

Until recently, such information was fragmentary for the rock art sites of the Lower Tom River. Accumulations of bones, charcoal, and pottery on the slopes of the Tomskaya Pisanitsa (Martynov, 1970: 27–28), or a bronze arrowhead accidentally found in a crevice at the same site (Kovtun, 2001: 46) were considered cultic altars. In 2008–2012, the Dolgaya-1 site was excavated

at the Novoromanovo rock art site; a part of the materials from Dolgaya-1 can be reliably linked to the cultic practices of the Bronze Age and the transitional period to the Iron Age (Kovtun, Marochkin, 2014). Objects of cultic artistic metalwork have not yet been found at this site in spite of abundant pottery of the Early Iron Age and the Early Middle Ages (the latter circumstance can be explained by a variety of reasons, including the fact that, unlike the Tomskaya Pisanitsa, the Novoromanovo rock art site is located on a low, annually flooded base).

It seems quite logical that the objects of artistic casting discovered at the Tomskaya Pisanitsa are the manifestation of the trans-epochal and trans-cultural tradition of sacrifice at rock representations, typical of Northern Asia. Apparently, we should speak about a combination of traditional forms of sacralization based on the practice of burying things in cultic places. It is possible to distinguish between these traditions only conditionally. It cannot be ruled out that the petroglyphs, which were originally made as one of the ritual practices within the cult of "special" places, turned into an independent factor of sacralization of such places.

Conclusions

The earliest images of the rock art sites of the Lower Tom River are proposed to be dated to the Neolithic (Okladnikov, Martynov, 1972) or the Samus period of the Bronze Age (Kovtun, 1993; 2001; Molodin, 2016: 42, 50). A layer of drawings of the Late Bronze Age has been identified (Kovtun, 2001: 52, 66; Kovtun, Rusakova, 2005). This means that some Lower Tom rock art sites had existed for several millennia by the beginning of the Iron Age.

Materials of the Scythian period from the Kuznetsk Depression characterize it as a "neutral" zone, which was being actively inhabited by the Bolshaya Rechka population and was simultaneously influenced by the Yenisei population (Bobrov, 2013: 285). As a scenario of their interaction, Bobrov allowed for the movement of small groups. In the context of this scenario, we consider it quite likely that not only the Tagar but also the Kizhirovo (Shelomok) population penetrated into the Middle Tom region, especially since there was a common river route. The archaeological confirmation is our image of the horse/onager (hypothetically, a sacrifice to the cultic place at the Tomskaya Pisanitsa).

At the end of the first millennium BC, the late Kulaika population came to the Middle Tom region, as is evidenced by the presence of the corresponding cultic and burial complexes, and settlement pottery (Pankratova, Marochkin, Yurakova, 2014). According to Shirin, the Kulaika component actively participated in the processes of cultural genesis on the southern periphery of the late Kulaika community, including the Tom region, which ultimately led to formation of the Fominskoye culture of the 2nd–4th centuries AD (2003: 158–159).

One of the possible variants of sacralization of the Lower Tom rock art sites by the Kulaika population was creating their own rock representations – and the presence of such representations has been repeatedly suggested by specialists (Chernetsov, 1971: 105; Bobrov, 1978; Lomteva, 1993; Trufanova, 2003; Rusakova, 2015), although it still remains a subject of discussion (see review in (Kovtun, Marochkin, 2014)). The use of the objects of planar casting for organizing plot-based compositions, that is, a kind of imitation or replacement of static rock planes, might have been another way of sacralization. This interesting suggestion belongs to Bobrov (2008). Finally, the third variant, which does not exclude the first two, was the introduction of some ancient rock art sites into the system of cultic places with the typical tradition of votive "burials" of objects. Participation of the Kulaika cultural substratum in the formation of early medieval cultures of the Upper and Middle Ob regions suggests that this tradition could have been preserved in the second half of the first millennium AD.

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Cultural Ties Across Taiga and Steppe: Material Culture from the Medieval Lower Angara River and Prospikhinskaya Shivera IV

This study examines the cultural ties of the early 2nd millennium AD inhabitants of Prospikhinskaya Shivera IV, on the Lower Angara River in Siberia. Artifacts dated to the 11th and 12th centuries, including a double-edged saber, iron hinged belt tips, and two metal belt sets with rectangular and ovate iron overlays demonstrate connections with the Yenisei Kyrgyz culture. In the 13th century, the Lower Angara taiga dwellers were particularly influenced by the Mongol Empire, as evidenced by belt sets with metal plaque-like hooks, plate-metal bracelets, question-mark shaped earrings, wide, flat arrowheads, jointed bits with circular cheek-pieces, coin-shaped amulets, and beads of glass, faience, and ceramic material. Throughout most of the Middle Ages, cultural ties between the Angara population and Western Siberia were stable and continuous, as evidenced by Western Siberian bronze ornaments—openwork palmate pendants; arch-shaped dangle pendants; bell-shaped openwork pendants; a flat pendant in the shape of a bird; cylindrical, embossed beads; and tripartite arched and quatrefoil sewn decorations. Other markers of Western Siberian ties include Srostki-type openwork and wheel-shaped pendants, round decorative overlays, a belt set with heart-shaped ornamental plates, combs, bow plates, specific types of arrowheads, and pottery. These imports notwithstanding, the principal components of the Lower Angara medieval culture were autochthonous, originating from earlier prototypes.

Keywords: *Middle Siberia, Angara, southern taiga, Middle Ages, cultural contacts, imports, ornaments, weapons.*

Introduction

Over the past two decades, large-scale archaeological studies have been carried out in the southern taiga zone of the Lower Angara River (Fig. 1), significantly expanding the knowledge base for understanding the region's medieval history. A complex of settlements and monuments was discovered near the town of Lesosibirsk, in the valley of the Yenisei River, near its intersection with the Angara. On the basis of a number of fortified settlements belonging to the 11th–14th centuries, the ceramic sequence of this period has been well studied (Mandryka, Biryuleva, Senotrusova, 2013). Researchers have also investigated 130 burials from the early second millennium in the Lower Angara region*, making it possible to reconstruct funerary rites and understand the Lesosibirsk archaeological culture in great detail (Boguchanskaya arkheologicheskaya ekspeditsiya, 2015: 528–529; Senotrusova, Mandryka, Poshekhonova, 2014; Mandryka, Senotrusova, 2018). A considerable number of imported objects and/or their imitations were found in the Lower Angara burials. The comparative assemblages

*The Lower Angara region is defined in this article as the valley of the Angara River from the mouth of the Ilim River to its intersection with the Yenisei and adjacent territories. The region is fully subsumed within the southern taiga zone of Middle Siberia (Parmuzin, 1964: 33).

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accumulated to date allow us to draw inferences regarding the direction, intensity, and nature of cultural ties of the local population in the Late Middle Ages. Artifacts from the necropolis of Prospikhinskaya Shivera IV play a particularly important role in this regard. This site is the largest well-studied burial ground of the taiga zone of Middle Siberia, which allows us to use it as a baseline for understanding the medieval period material culture in the region. The collection obtained from excavations of the necropolis contains over 2800 objects. Additional materials from other burial grounds and individual graves (Sergushkin-3, Ust-Taseyeva, Skorodumny Byk, Kaponir, etc.) supplement the available information, but do not significantly alter the overall material record.

Cultural influences

In the studies of medieval cultures from the taiga zone of Eurasia, technological and cultural innovations are often associated with the steppe belt, since state entities, which included and influenced peripheral forest regions, were centered primarily in the steppes during the Middle Ages. Consequently, political and cultural developments in the Eurasian steppes had important impacts on the taiga population.

Influence of the steppe cultures. By the beginning of the second millennium AD, the southern taiga of Middle Siberia was a part of the sphere of influence of the Kyrgyz Khaganate. Rashid al-Din mentioned this fact, pointing out that the northern border of the state of the Yenisei Kyrgyz reached the mouth of the Angara River (1952: 102). A number of scholars directly linked medieval burials found in the Angara region, based on the practice of secondary cremation, with Turkic-speaking peoples, or specifically with the "Yenisei Kyrgyz people" (Volokitin, Ineshin, 1991: 146; Leontiev, 1999: 21) and their Krasnoyarsk-Kansk cultural variant (Klyashtorny, Savinov, 2005: 271). At the same time, direct archaeological evidence for Kyrgyz influence on the taiga population is not extensive. In the assemblage at Prospikhinskaya Shivera IV, we identified only a small number of objects that can be directly associated with the Yenisei Kyrgyz culture. These objects include a double-edged saber (Fig. 2, *1*), iron hinged belt tips (Fig. 2, *4*, *5*, *9*), and elements of two belt sets with rectangular and ovate iron overlays (Fig. 2, *6–8*). These artifacts have parallels in the Malinovka subset of the Askiz culture. Several objects of Kyrgyz appearance were also recovered at the Dolonovka burial at the site of Koda-2, including three-bladed arrowheads (Fig. 2, *2*, *3*) and belt iron overlays with a shield form, decorated with triangular scales (Fig. 2, *10*, *11*) (Volokitin, Ineshin, 1991; Basova, 2016).

The next pulse of cultural influence came from the south, or rather southeast, and was associated with the

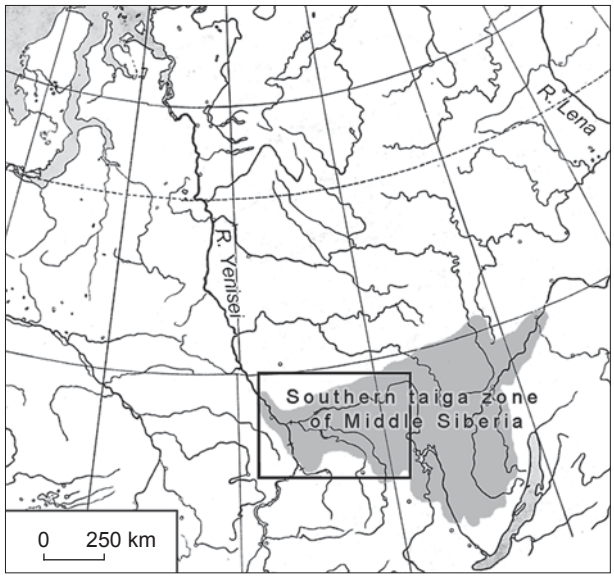

Fig. 1. Location of the research area.

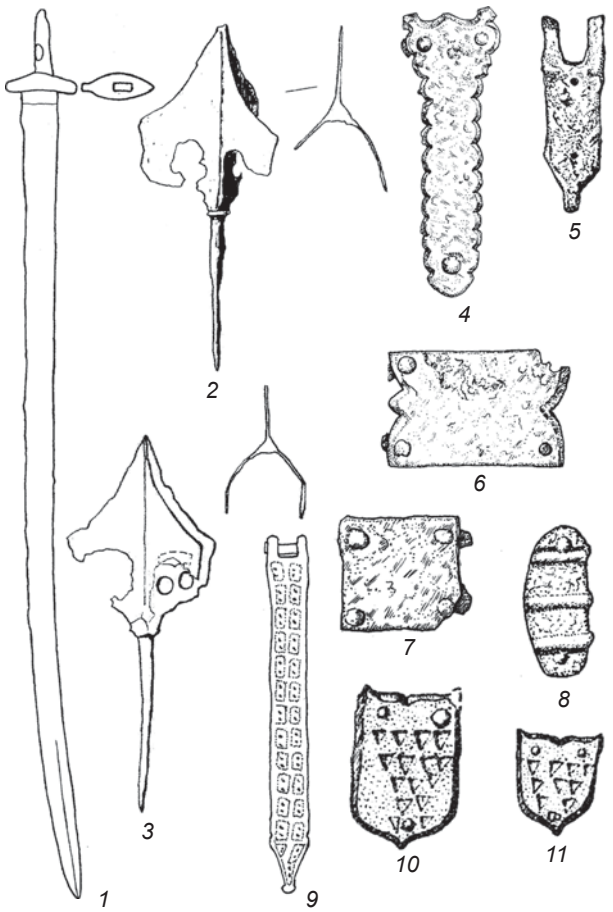

Fig. 2. Iron objects of Kyrgyz appearance from the southern taiga zone of Middle Siberia.
1, *4–9* – from Prospikhinskaya Shivera IV; *2*, *3*, *10*, *11* – from the burial in the area of the Dolonovka stretch of the Bratsk water reservoir.

conquests of the Chingissid Mongols. The accession of southern Siberia, including the Kyrgyz Khaganate, into the Mongol Empire must have influenced its northern taiga neighbors. According to historical records, this process began formally in 1207, and the Yenisei Kyrgyz were ultimately defeated in 1218 after the punitive expedition by Jochi (Bartold, 1963: 507). In 1227, southern Siberia and adjacent northern lands became a part of the "Ulus" (nation) of the Great Khan. In 1260, after the victory of Kublai over Ariq Böke, the Altai-Sayan highlands became a possession of the Yuan dynasty (Savinov, 1990: 129). Probably the only historical source from the Mongolian period that directly mentions Angara is the legendary tale of a trip by three noblemen down this river during the reign of Surhuktani (Rashid al-Din, 1952: 102). Despite the mythical nature of the events described, the mere mention of the Angara in the Mongolian sources is noteworthy.

New goods became widespread on the Lower Angara in the Mongolian period, such as question-mark shaped earrings (Fig. 3, *28*, *29*), wide, flat arrowheads (Fig. 3, *24*), jointed bits with circular cheek-pieces (Fig. 3, *23*), coin-shaped amulets (Fig. 3, *27*), plate-metal bracelets (Fig. 3, *25*, *26*), glass, faience, and ceramic beads; as well as metal elements of composite belts with plaque-like attachment hooks (Fig. 3, *1–22*), which are particularly noteworthy. The "Mongolian" style of belts already emerged in the Chingissid period. Its main elements were large, plaque-like belt attachments with a loop, two-part buckles, densely set miniature overlays (lunulae), and large subrectangular belt tips; a distinctive feature of such belts was the absence of hanging straps or overlays with slits (Kramarovsky, 2001: 69). Belts played an important role in the life of Mongolian soldiers; servings as markers of social status, valor, and nobility.

From the Angara River region, elements from seven composite belts are known, originating from closed burial contexts. These were cast of complex brass alloys with a predominance of lead and tin-lead bronzes. Elements of such belts were apparently made by the artisans at one time, to serve as part of a single complete set. High-quality and technologically complex metal alloys suggest that these belts were produced in artisanal centers and reached Siberia from a single workshop (or several workshops in close coordination) working under the orders of local elites. The closest known parallels to the Angara belts can be found in the Krasnoyarsk forest-steppe and southern

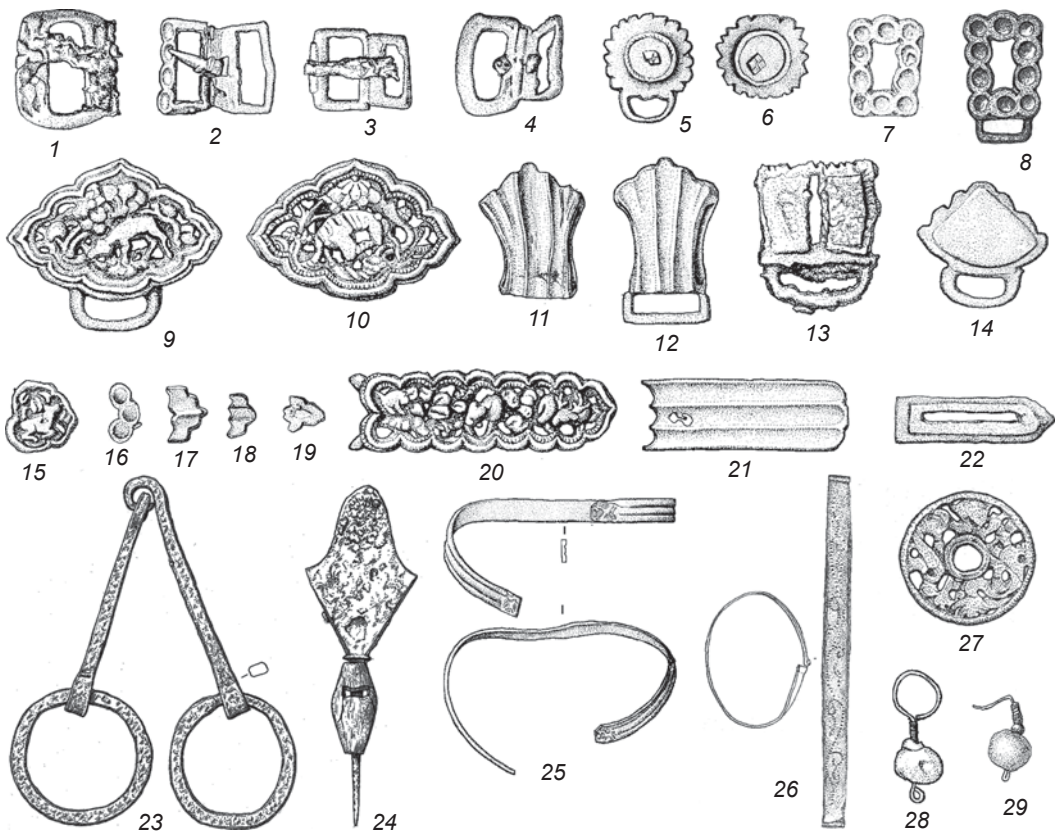

Fig. 3. Objects of Mongolian appearance from Prospikhinskaya Shivera IV in the southern taiga zone of Middle Siberia.
1–4 – bronze, iron; *5–22*, *25–27* – bronze; *23* – iron; *24* – iron, horn; *28*, *29* – bronze, glass.

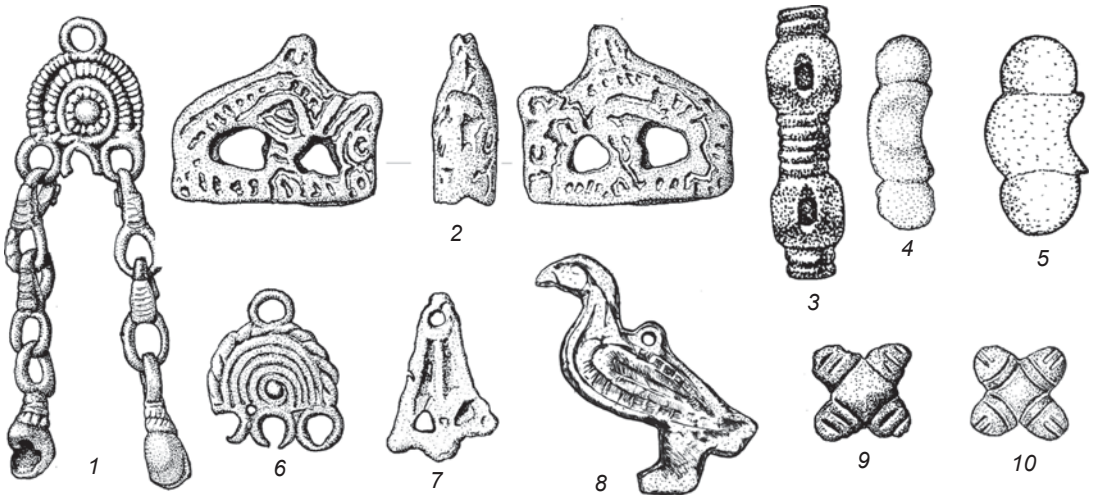

Fig. 4. Lower Ob bronze objects from Prospikhinskaya Shivera IV.

regions of Western Siberia (Senotrusova, Mandryka, Tishkin, 2015: 122, 123).

The belts recovered from the Angara region were prestige objects. They are distinguished by high quality of manufacturing and sophistication of their aesthetic composition. This is particularly true of a belt showing an image of a fallow deer under a sprawling tree (Fig. 3, *9*, *10*). Such finds occur quite rare in the territory of Eurasia, and serve as important evidence of the influence of Mongolian culture. Some scholars consider belts with similar representations as belonging to the category of ceremonial hunting belts, which were used in the 1240s–1270s to mid 14th century (Kramarovsky, 2001: 56, 65).

Influence of Western Siberian cultures. The medieval inhabitants of the Lower Angara taiga had stable cultural ties with the population of Western Siberia. Various bronze adornments came to Middle Siberia from the Lower Ob region. The collection from Prospikhinskaya Shivera IV contains openwork palmate pendants, arch-shaped dangle pendants, bell-shaped openwork pendants (Fig. 4, *1*, *2*, *6*, *7*), a flat pendant in the shape of a bird (Fig. 4, *8*), embossed cylindrical beads (Fig. 4, *3*), and other objects (Senotrusova, Mandryka, 2013). These discoveries show many parallels among the materials from the sites of the Lower Ob region, including the burial grounds of Barsovsky IV, Saygatinsky I–IV, Kinyaminsky I, II, and from a number of fortified and non-fortified settlements (Fedorova et al., 1991: 138; Semenova, 2001: 62, 65, 71, 72; 2008; Zykov, 2012: 206, fig. 67).

Various pendants are represented by only single finds, while tripartite arched and quatrefoil sewn decorations (Fig. 4, *4*, *5*, *9*, *10*) were widely used for decoration. At Prospikhinskaya Shivera IV alone, 135 tripartite and 347 quatrefoil decorations have been found. These artifacts are also known from other sites of the Lower Angara region, and appear in the burials at the mouth of the Koda River and the Chadobets River, as well as at Sergushkin-3, Otiko-1, Koda-2, Okunevka, and Ust-Kova sites (Leontiev, Ermolaev, 1992: 18; Privalikhin, Fokin, 2009: Fig. 5–11; Basova, 2010: 488; German, Leontiev, 2011: 383; Dolganov, 2011: 397; Berezin, 2002: 33; Tomilova et al., 2014: Fig. 2). Such objects were, in fact, the most common adornments in the 11th–14th centuries in the Lower Angara region. Evidence for the production of such tripartite and quatrefoil sewn decorations in northwestern Siberia is attested to by the Tazovsky jewelry workshop (Khlobystin, Ovsyannikov, 1973). Judging by these objects, the flow of adornments from the northern regions of Western Siberia to the basin of the Lower Angara River appears to have been continual throughout the Late Middle Ages. At the same time, it cannot be ruled out that the simplest tripartite and quatrefoil plates might have been cast locally, in imitation of imported examples.

It should be expected that objects produced in the Angara region will also be discovered in the archaeological record of Western Siberia, but this will require additional research. At present, we may only point to an iron Y-shaped object, an accidental find from the locality of Barsova Gora (Chemyakin, 2008: Fig. 5, *8*). Objects of this form, and of similar sizes, were widely used by the inhabitants of the Middle Siberian taiga region and may serve as an indicator of local material culture (Mandryka, 2006: 153). Other artifacts are typical both for the Lower Angara and the Lower Ob population, including, for example, end piece bow plates. These were made of antler, with a split base, and a cutout for the string on the end. Bows with similar plate attachments were widely used on the Angara and the Yenisei, and are also known from Western Siberian assemblages from the fortified settlements of Zelenaya

Gorka, Bukhta Nakhodka, and Yarte VI (Smirnov et al., 1957: 233; Kardash, 2011: 27; Plekhanov, 2014: Pl. 5, *29*). Similar chisel-like arrowheads with extended spikes, and narrow comb/hairpins, dated to the Late Middle Ages have been found in the Angara and Lower Ob regions. The presence of identical household items in areas which are sufficiently distant from each other may be used to infer not only stable exchange ties, but also a certain cultural proximity of the populations inhabiting these regions.

Objects from the steppe, forest-steppe, and south-taiga regions of the West Siberian Plain (Altai, Novosibirsk region of the Ob, Baraba, Tomsk region of the Ob) also reached the Angara region. Such objects include openwork pendants of the "Srostki" type (Fig. 5, *2*) found in burials at Koda-2 (Basova, 2016: 103, fig. 2, *5*) and at Prospikhinskaya Shivera IV. D.G. Savinov pointed out that these adornments were typical of the Srostki culture of the 9th–10th centuries (1987: 88). Such pendants were likely parts of fasteners, and were widespread in the area between the Ob and Irtysh rivers and the adjacent territories in the 10th–12th centuries (Arslanova, 2013: 108). This category of objects includes a round wheel-shaped openwork pendant (Fig. 5, *1*) from the burial ground of Prospikhinskaya Shivera IV, which is almost identical to the finds from the basins of the Middle Tara River (Kryuchnoye-6 burial ground) (Molodin et al., 2012: 86) and the Lower Tom River (Basandaika cemetery) (Basandaika, 1947: 28, 30). Another openwork pendant has parallels in the Tomsk region of the Ob (Fig. 5, *4*).

Numerous parallels of similar two-part fasteners from the Lower Angara region (Fig. 5, *5*, *13*) are known from the medieval materials of the Upper Irtysh region, the foothills of the Altai, the Tomsk and Novosibirsk Ob regions, and the Chulym region (Senotrusova, Mandryka, 2015). Spiral earrings (Fig. 5, *6*, *7*) made of wire and rectangular in cross-section, which were found at Prospikhinskaya Shivera IV and in the burial at the Koda-2 site (Basova, 2016: Fig. 2), may also be attributed to southwestern Siberia. The same earrings appear in the 11th–12th century complexes from Berezovy Ostrov-1, in the Novosibirsk region of the Ob (Adamov, 2000: 59, fig. 108). The same group of finds includes large quatrefoil sewn plates with openwork "petals" (Fig. 5, *3*). Similar objects are known from the Ilovka cemetery at the Chulym River, burial grounds at the mouth of the Malaya Kirgizka River, and the Tashara-Karyer-2, Sanatorny-1, and Osinka sites (Belikova, 1996: Fig. 102, *6*; Pletneva, 1997: Fig. 163, *9*; Savinov, Novikov, Roslyakov, 2008: 61, 167, fig. 34).

Prospikhinskaya Shivera IV has yielded elements of several belt sets similar to Western Siberian belt sets. These include ring-shaped, convex bronze overlays (Fig. 5, *18*), which were attached to the belt using one or two iron rivets, and round silver overlays. Similar

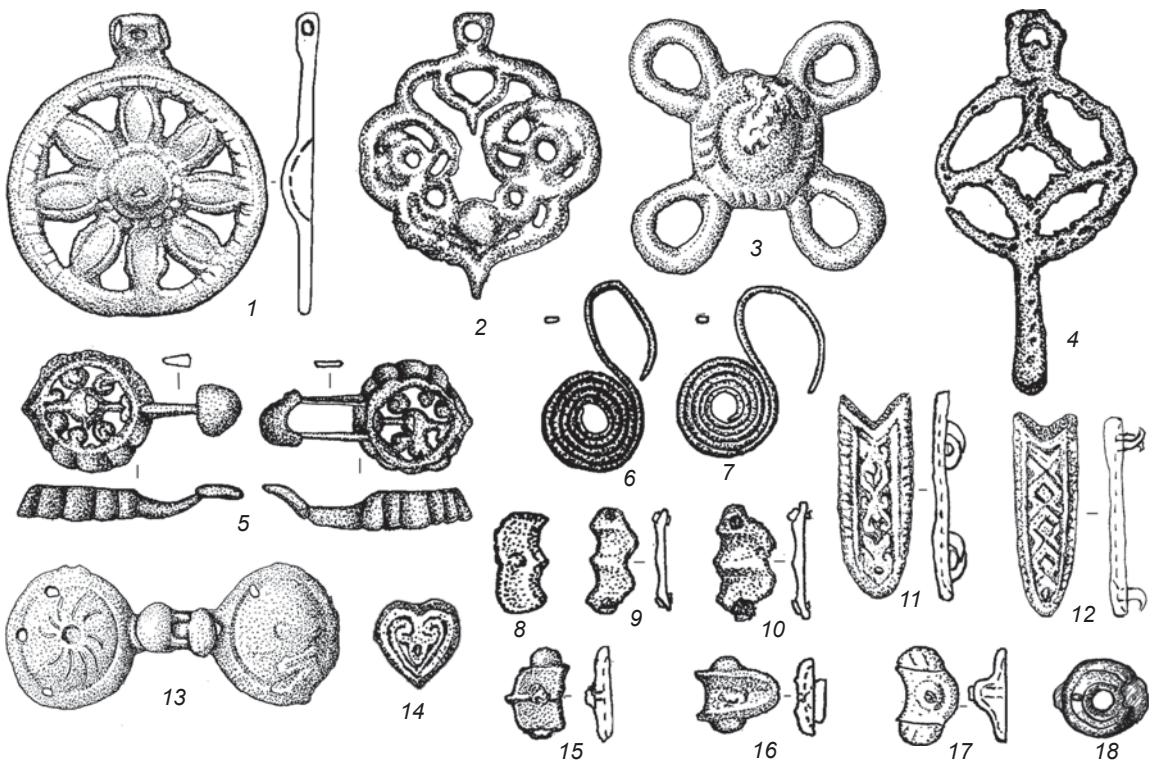

Fig. 5. Western Siberian bronze objects from Prospikhinskaya Shivera IV.

artifacts come from the burials of the late 11th to early 13th century at the Osinki burial ground in the Upper Ob region (Savinov, Novikov, Roslyakov, 2008: 61). Identical overlays are also known from the Middle Chulym region and the Altai from the burial ground of Teleutsky Vzvoz-1 dating to the Mongolian period (Belikova, 1996: Fig. 99, *25*; Tishkin, Gorbunov, Kazakov, 2002: Fig. 39, *24–26*), while bronze overlays are known from the Tashara-Karyer-2 cemetery in the Upper Ob region (Savinov, Novikov, Roslyakov, 2008: 317). The Prospikhinskaya Shivera IV collection contains miniature tripartite bronze belt overlays of various shapes (Fig. 5, *9*, *10*, *15–17*), similar to those from Yelovka in the Upper Ob region (Matyushchenko, Startseva, 1970: Pl. VI), and miniature bronze wing-like overlays (Fig. 5, *8*) similar to those from Kaltyshino I in the Kuznetsk Depression (Savinov, 1997: Fig. 7).

Finally, the Prospikhinskaya Shivera IV assemblage contains evidence of mediated cultural ties between the Lower Angara region and Volga Bulgaria. Heart-shaped belt decorations/overlays, and pentagonal belt tips with floral decorations were recovered from burial 50 (Fig. 5, *11*, *12*, *14*). Such belt elements were widespread in the territory of the Volga Bulgaria and along the Kama trade route. The Bulgarian origin of the belt set is also confirmed by the analysis of the artifacts' alloy composition (Gunenko, Senotrusova, 2013: 72). Another similar belt set is known in Siberia: it was found at the Kipa III burial ground in the taiga Irtysh region (Konikov, 1993: 36).

Conclusions

These data indicate that the people of the Lesosibirsk culture of the southern taiga in the Lower Angara region were enmeshed within a complex system of intercultural ties in antiquity. They maintained contacts with the population of the steppe regions throughout the entire Late Middle Ages, connections that reflect the involvement of northern peoples with the political interests of state entities that dominated the steppe belt of Eurasia at that time.

The influence of the Yenisei Kyrgyz people on the taiga population of Middle Siberia has been greatly exaggerated in the academic literature. Objects of the Tyukhtyak appearance are unknown on the Angara and Yenisei regions. We identified a small number of Kyrgyz objects, but only during the 11th–12th centuries. This likely reflects the formation of the Krasnoyarsk-Kansk variant of the Kyrgyz culture, when the Kyrgyz people migrating from Tuva to the north appropriated forest-steppe areas and had contacts with the taiga tribes (Savinov, 1989: 146). Evidence of a direct presence of these nomads on the banks of the Angara River has yet to be found, and not a single burial containing exclusively Kyrgyz objects is currently known. Apparently, the appropriation of the southern taiga territories was temporally restricted, and perhaps more formal than actual (Senotrusova, 2015).

Across history, much of the interest by pastoral nomads in the taiga regions was stimulated by their interest in obtaining furs, which were highly valued in the Middle Ages. In addition, during the Mongolian period, these "forest peoples" could be recruited into the army or the administrative apparatus of the Mongol Empire. This pattern is confirmed in the Angara archaeological record by the presence of prestigious objects, such as belt sets with plaque-like saber hooks in the southern taiga burial assemblages. Belt sets were objects of high social status, and signified social engagement with overarching structures (Kramarovsky, 2001: 67). The southern taiga zone of Middle Siberia was included into the orbit of political and cultural influence first of the Mongolian state, and somewhat later of the Yuan Dynasty. At the same time, this period seems to have witnessed few changes in the economic system or funeral rites; the traditional way of life continued to dominate among the population inhabiting the southern taiga region during the Late Middle Ages.

For many centuries, cultural ties between Middle and Western Siberia appear to have been continuous and resilient. The cultural proximity of ancient populations inhabiting these regions is supported not only by the occurrence of the common types of adornments made of non-ferrous metals, but also by the similarity of the ornamental décor on pottery of the Lesosibirsk style and Western Siberian vessels dating to the Late Middle Ages (Mandryka, Biryuleva, Senotrusova, 2013).

Generally, the burial assemblages from Prospikhinskaya Shivera IV and other burial complexes of the Lower Angara region reflect a wide range of intercultural ties linking the local population inhabiting this region with outside groups during the Late Middle Ages. These finds indicate that taiga inhabitants took an active part in the key historical and cultural developments that took place at this time across northern and central Eurasia.

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Bronze Plaques from Northern Kyrgyzstan with Representations of Horsemen

We describe bronze plaques representing armed horsemen, found in the Issyk-Kul Basin and in the Chuya valley, northern Kyrgyzstan, and owned by public and private museums in Bishkek. Similar plaques from southern Siberia and Central Asia have been described by many Russian, Kazakhstan, Kyrgyzstan, and Mongolian historians and archaeologists. A formal classification of the plaques is proposed, and their chronology, cultural attribution, and function are assessed. Such items, associated with early medieval Turkic-speaking nomads of Tian Shan and Semirechye, are similar to those worn by the Yenisei Kyrgyz of the Minusinsk Basin in southern Siberia, by the Kimek of the steppe Altai and the Upper Irtysh in Kazakhstan, by the Karluk of southwestern Central Asia, and by other Turkic tribes inhabiting areas from the Urals to Mongolia.

Keywords: *Kyrgyzstan, Issyk-Kul Basin, Chuya valley, medieval nomads, ancient Turks, bronze plaques.*

Introduction

In the past, bronze plaques each representing a horseman, with weapons in his hands or on his belt, and sitting on a fully caparisoned horse, have been frequently found in the vast steppe expanses from the Trans-Baikal region in the east to the Southern Urals in the west, and from the Minusinsk Basin in the north to Central Asia and Tibet in the south. Currently, we have identified such plaques, originating from the Issyk-Kul Basin and from the Chuya valley, in the collections of archaeological finds owned by the museum of the Kyrgyz-Russian Slavic University, and by the private museum *Raritet* in Bishkek. These finds provide important evidence of the proliferation of such arts-and-crafts items during the final period of the Early Middle Ages, at the end of the 1st millennium AD, in Tian Shan and Semirechye, within the Central Asian historical and cultural region.

The earliest information about bronze plaques representing horsemen with weapons in their hands or on their belts is contained in the writings of European scientists and explorers of the 18th century. One of the first brief descriptions of such a find, recovered by tomb raiders from an ancient grave in Western Siberia, was given by J. Bell, a Scottish doctor in the Russian civil service and a member of a Russian embassy to China at the beginning of the 18th century (Zinner, 1968: 51–52). Another plaque, representing a horseman riding with a bow in his hand, from an excavated grave in the Ob-Irtysh interfluve, was purchased by scientists of the Great Northern Expedition from tomb raiders (Miller, 1999: Fig. 24, *3*). A drawing of a plaque with a representation of a horseman (wearing a helmet and a suit of armor, with a shield on his back, and with a spear in his hands and a sword in its sheath), originating from looting excavations of the Irtysh basin mounds, was published in the article by

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P.G. Demidov "regarding some Tatar antiquities", in the English journal *Archaeology* in 1773 (Molodin, Hudiakov, Borisenko, 2002: Fig. 5, *3*). One such find from southern Siberia was first described at the end of the 19th century in the catalogue of the Minusink Museum (Klements, 1886: Pl. VIII, 21). Subsequently, one bronze plaque depicting a horseman was discovered in the Trans-Baikal region (Mikhno, Petri, 1929: 323, 326; Okladnikov, 1951: 143–144), and two were found at the Srostki cemetery, in the Upper Ob region (Gryaznov, 1930: 9; Gorbunov, 2003: Fig. 36, *1*, *2*). Plaques with horsemen looking backwards and shooting arrows were found in one of the Kyrgyz mounds at Kopeny Chaatas, in the Minusinsk Basin (Evtyukhova, Kiselev, 1940: 50). Researchers attributed these finds to the Yenisei Kyrgyz culture (the end of the 1st millennium AD). Analyzing the images, they noted the influence of Iranian and Chinese art. According to the reconstruction proposed by scientists, these plaques were included in a multi-figure composition, adorning a pommel and reproducing a hunting scene, wherein a mounted archer was chased by a large predatory feline mammal, most probably a tiger (Evtyukhova, 1948: 52, fig. 80; Kiselev, 1949: 352, 358). One bronze plaque with representation of a horseman was found in the South Gobi Aimak in Mongolia in 1961 (Volkov, 1965: 287). Since the middle of the 1980s, the researchers of western Central Asia have published information about individual finds from this region: a schematically rendered blank of such item from Khujand in 1985 (Drevnosti…, 1985: 327), and a plaque from Chach in 1999 (Buryakov, Filanovich, 1999: 86). In 2011, information about two finds from Mongolia was published (Erdenechuulun, Erdenebaatar, 2011: 74, 419). One plaque, depicting a galloping horseman with a bow and an arrow in his hand, originating from the Issyk-Kul Basin, was examined by Kyrgyzstan researchers (Stavskaya et al., 2013: 52). In 2014, a plaque with a similar shape, found at the Sidak fortified settlement, near Turkistan City in the Turkistan Region of Kazakhstan, was described (Smagulov, 2014: 208). According to E.A. Smagulov, this find confirms that such items were manufactured in the urban craft centers of western Central Asia in the 7th–8th centuries, but they could have existed in the 9th century too. He associates representations of horsemen with the cult of the legendary hero Siyavush (Ibid.: 210–213).

In the past, the majority of such finds, except for the Kopeny ones, were accidentally found in the Minusinsk Basin, in the steppe Altai, and in the Upper Irtysh region (Borisenko, Hudiakov, 2008: 43–50). In the 1970s, a bronze plaque depicting a mounted archer was found at the Gilevo XII cemetery in mound 1, in a paired burial of an adult man with a horse and a child (Mogilnikov, 2002: 31, fig. 82, *16)*. Of great importance for determination of chronology, cultural attribution, and functional purpose of such plaques are similar finds from a child's burial at the Birsk cemetery, in the Southern Urals, and a child's burial at Kondratyevka IV, in the Upper Irtysh region (Mazhitov, Sultanova, 1994: 113; Sungatov, Yusupov, 2006: 247–252; Alekhin, 1998: 20). Judging by the finds discovered in a Kimek child's burial, such plaques were part of headwear adornments. At the Sidak fortified settlement, in the Turkestan oasis, a flat bronze figurine of a horseman was found during excavations at a medieval citadel (Smagulov, 2014: 209).

Bronze plaques representing horsemen were repeatedly used to characterize cultural relations and to study the warfare of the Altai-Sayan nomads in the Early Middle Ages. D.G. Savinov identified such plaques among similar items of the Srostki and Kimek cultures (1976: 97). Y.A. Plotnikov compared such finds from southern Siberia and Central Asia, and pointed to the presence of similar representations in the Sogdian and East Turkestan frescoes. He made a reasonable assumption that these plaques were manufactured by Sogdian craftsmen for Turkic nomads (Plotnikov, 1982). Bronze reliefs with representations of horsemen from Kopeny Chaatas were briefly described by L.R. Kyzlasov and G.G. Korol. They noted that representations of rams along with the figures of horsemen in the Kopeny compositions have a "firm local basis" among the zoomorphic images of the art of the medieval population in the Minusinsk Basin (Kyzlasov, Korol, 1990: 83). In another study, Korol has distinguished several groups of such bronze plaques within the Eurasian steppe belt (2008: 123–136). During the target study of bronze plaques with representations of horsemen, we classified these finds according to formal features, traced the distribution area of various types of such items within the Altai-Sayan, eastern and western Central Asia, and proposed an attempt to reconstruct their function in the cultures of medieval nomadic ethnic groups (Borisenko, Hudiakov, 2008). Now, however, some more bronze pendant plaques representing horsemen, which deserve special attention, have been discovered in Kyrgyzstan.

Plaques from Northern Kyrgyzstan

Over the last few years, when studying arms collections in state historical and local history museums, folk and private museums in cities and villages of the Republic of Kyrgyzstan, with the assistance of our Kyrgyzstan colleagues, we have managed to reveal several earlier unknown bronze plaques representing armed horsemen.

Analysis of the collection of archaeological finds of the Kyrgyz-Russian Slavic University in Bishkek in 2012–2013 has revealed a rare bronze plaque depicting a mounted archer, who is shooting an arrow backwards (Hudiakov, 2014: 43–44). According to corrected information, it was found in the Issyk-Kul Basin, in

Kyrgyzstan (Stavskaya et al., 2013: 52). The plaque depicts a horseman riding at full speed (Fig. 1, *4*). An arched stripe is shown on his head. It is rather difficult to determine whether it renders hair, or headgear partly resembling a kalpak or a bashlyk. The horseman's face is not detailed. His left arm is stretched out, and holds the middle portion of a composite bow with convex shoulders and smoothly curved ends. His right arm, with which the horseman is probably stretching the bow, is bent at the elbow. In the middle of the bow, the arrowhead point protrudes over the wooden core. The leg of the mounted archer is shown bent at the knee and pressed to the horse's belly, with the foot emphasized. The horseman is probably controlling the horse using his legs, having dropped the reins to free his hands. The horse is shown running from right to left. It has large ears, an elongated muzzle, and a raised neck. Forelegs with emphasized sharpened hooves are bent at the carpal joints and raised. The horse's body is elongated in a breakneck gallop. A massive belly and a croup are shown. The hind legs and tail are absent. Probably, they did not survive and were broken off when using the plaque. The reins dropped by the horseman are shown on the head and neck of the horse, and a billet is shown on the croup. The remaining portion of the plaque is 3.3 cm high and 4 cm long (Ibid.; Hudiakov, 2014: 43–44).

Though the figurine from the Issyk-Kul Basin is depicted rather schematically, it is possible to trace a certain resemblance to similar plaques from Kyrgyz mound No. 6 at Kopeny Chaatas, in the Minusinsk Basin (Evtyukhova, Kiselev, 1940: 50, pl. VII, *a*, *b*; VIII, *a*; fig. 54). According to the researchers who studied these finds, a heroic hunting scene rendered in Kopeny reliefs originates from the representations of royal hunting in the art of Sasanian Iran. They also pointed to the influence of the Chinese art and similar subjects in the art of the ancient Turks in the first Turkic Khaganate epoch (Evtyukhova, 1948: 47–52; Kiselev, 1949: 352, 354–356). Judging by the fact that the Issyk-Kul find renders the appearance of a mounted archer, who is riding and shooting backwards, rather schematically, this plaque is a local replica of a known Sasanian depiction, developed in the course of mastering this composition in Chinese art, and subsequently reworked by the Yenisei Kyrgyz. Most probably, the Karluk, Turkic-speaking nomads of Tian Shan and Semirechye during the ending period of the Early Middle Ages, as well as the nomads of the Altai-Sayan, assimilated this typical subject of heroic hunting, and represented it in their metal artworks.

In 2016, we studied three bronze plaques depicting horsemen, from the collection of the private museum *Raritet* in Bishkek. According to the staff of this museum, these finds originate from the Chuya valley of Kyrgyzstan. The first plaque represents a horseman riding from left to right (Fig. 1, *1*; 2, *1*). He is presented in profile; however, his body is turned frontally. The mounted warrior's large head is emphasized, but the facial features are not shown. His left arm is bent at the elbow. It touches the horse's neck. The right arm is not emphasized. His left leg is bent at the knee, and hangs down to the horse's belly; it is probably jackbooted and, judging from certain depicted details, covered from the knee up by the hem of a robe with a wide stripe along the edge. A quiver adapter, widened towards the bottom, is depicted below the horseman's waist. It is shown in the inclined position, most likely suspended from the belt. A semi-oval projection is depicted behind the horseman's back, above the horse's croup. Possibly, this is the upper end of the bow case. The head and neck of the horse are somewhat raised. A large head plume with a widened top is depicted. Slackened reins hang from the horse's head down to the horseman's knee. A triangular projection is shown below the horse's head. Possibly, this depicts a tassel under the neck (*nauz*). The left foreleg of the horse is raised, and bent at the carpal joint. The lower part is broken off. The right foreleg and hind leg of the horse are shown in a standing position, with the hooves emphasized. Left hind leg is broken off. The lower part of the horse's belly is shown unusually low, almost at the level of the stifle joint of the hind leg. Probably, the lower edge of

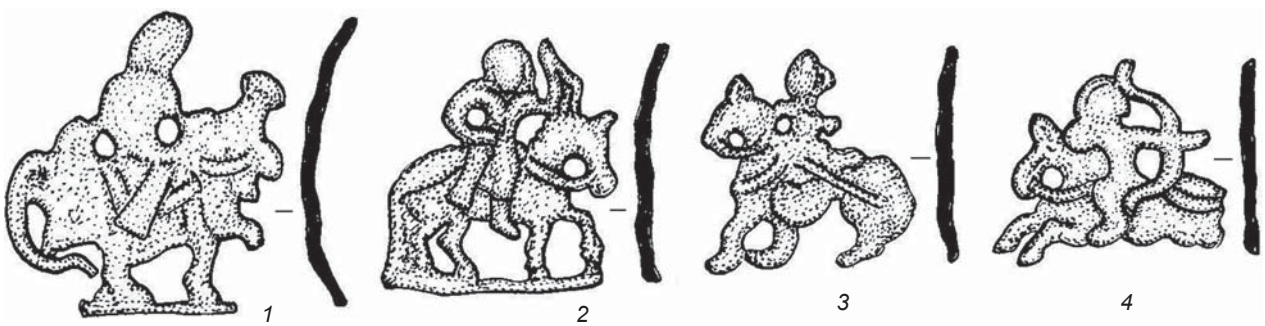

Fig. 1. Bronze plaques with representations of horsemen, from northern Kyrgyzstan.
1–3 – plaques from the Chuya valley (the *Rarity* museum); *4* – plaque from the Issyk-Kul Basin (the Historical Archaeological Museum of the Kyrgyz-Russian Slavic University).

Fig. 2. Plaques from the Chuya valley.

the horse blanket is rendered in such a way. Also, a long thin tail, curved forward owing to damage, is depicted. Between the hooves of the horse's forelegs and hind legs, there is a narrow horizontal stripe, typical of one of the earlier distinguished groups of ancient Turkic bronze plaques. The item is 4.8 × 4.2 cm in size. The greatest resemblance in representation of certain details can be observed between this plaque and a find from the Birsk cemetery in the Southern Urals (Borisenko, Hudiakov, 2008: 45, fig. 1, *5*). Some similar features are observed in similar plaques, both with and without horizontal stripe, from the Minusinsk Basin and Mongolia (Ibid.: Fig. 1, *3*; 2, *1*, *3*; 7, *3*).

The second plaque from the Chuya valley renders a figure of a horseman riding from left to right (Fig. 1, *2*; 2, *2*). He is sitting on a bridled and saddled horse, with his head and the lower part of his body turned frontally. The right arm of the horseman is bent at the elbow, his palm rests on the throat of the quiver. In his left hand, he holds a composite bow with a drawn bow-string, half of which projects above the horse's neck. The right leg of the warrior is slightly bent at the knee, the foot hangs below the horse's belly. Outer garments similar to a robe, with an axial slit in the front and edges below the knees, seem to be shown on the horseman. The horse is depicted with a steeply curved neck, a large head, and a sharpened ear. The chest is emphasized. The mane is rendered with triangular teeth. The left foreleg, with an emphasized hoof, is bent at the carpal, while the right one stands vertically. Hind legs are depicted with emphasized hock joints and hooves. The right leg is put together with the tail hanging down to the hoof's base. Reins are shown on the horse's head and neck with an arched stripe, and a line of billet is shown on the croup. All four of the horse's legs are placed on a narrow horizontal stripe. The item is 4.0 × 3.7 cm in size. No close analogs among bronze plaques with horsemen have been revealed in southern Siberia and Central Asia.

The third plaque from the Chuya valley renders a figure of a horseman riding from right to left (Fig. 1, *3*; 2, *3*). He is depicted in a pointed headdress, probably a conical helmet, with a bashlyk flying behind, or unfastened hair. The facial features are not emphasized. The horseman holds the reins with his right arm bent at the elbow. The other hand is broken off. The lower part of the body and the legs are not emphasized. A long narrow strip, which probably depicts a straight sword blade, sheathed and suspended from the belt, extends from the belt towards the horse's croup. The horse is shown with its head up, an ear sharpened at the upper part, and with a curved neck. The chest, barrel, and legs are emphasized; the hind legs are shown as together. The tail is not emphasized. Reins are shown on the horse's head and neck, and a chest strap is depicted on the chest. A downward-hanging semi-oval on the horse's body probably renders a saddle cloth. This item is 3.5 × 3.5 cm in size. No exact analogs have been revealed among similar finds in the Central Asian region.

Though two last plaques from the Chuya valley do not have a close resemblance to the flat bronze figurines of horsemen studied earlier, and discovered within the Central Asian region and in adjacent territories, it is possible to suggest the typological, chronological, and cultural attribution of these new finds from Kyrgyzstan on the basis of several specific details.

Typology, chronology, and cultural attribution of plaques from the Issyk-Kul Basin and the Chuya valley

The majority of researchers who studied bronze plaques depicting horsemen attributed them to the Early Middle Ages. This is supported by plaques of similar shape that were found in the Turkic and Kimek burials in the steppe Altai and the Southern Urals (Alekhin, 1998: 20; Mazhitov, Sultanova, 1994: 113). Only modern Mongolian

researchers, without any extended argumentation, assigned such finds in the territory of Mongolia to the Xiongnu epoch (Erdenechuulun, Erdenebaatar, 2011: 74). It is difficult to accept their opinion because it contradicts the known cases of finding such plaques at early medieval sites. The above find from the Issyk-Kul Basin shows some resemblance to the plaques of type 2 of group 3 of bronze onlays according to the earlier developed typology of these items (Borisenko, Hudiakov, 2008: 49). As previously noted, in terms of representation it is close to the plaques from Kopeny Chaatas, each with the shape of a mounted archer, shooting an arrow backwards. These served as pommel-plaques for the saddle of a noble Yenisei Kyrgyz horseman. Researchers dated the Kopeny reliefs to the 7th–8th centuries, and noted some traits of resemblance to similar representations in the Iranian toreutics, as well as traces of Chinese influence (Evtyukhova, Kiselev, 1940: 50). However, the Issyk-Kul plaque differs from these by its rather sketchy character and by its lack of elaboration of some important details. It is reasonable to set it apart into a separate type 3 within group 3 of the plaques depicting mounted archers. Possibly, this subject (a riding horseman shooting an arrow backwards) was borrowed by the Yenisei Kyrgyz or by the Karluk from neighboring Turkic-speaking ethnic groups during the period of struggle for supremacy in Central Asia (Hudiakov, 2014: 44). It could also have been taken by craftsmen who lived in the Chuya valley immediately from Iranian and Sogdian artisans.

The first, partially damaged, plaque from the Chuya valley, which depicts a mounted rider with a belted quiver, sitting on a horse, whose legs are connected by a horizontal stripe, should be assigned to type 2 of group 1 according to the typological classification of such artifacts (Borisenko, Hudiakov, 2008: 45–46). This is supported by the general contour of the plaque, and by some representational details of the horseman and the horse. The horseman is depicted with a typical forward bend of head, and with the lower edge of the hem of his robe having a wide trimming stripe; the horse is shown with a head plume and a breast tassel. These details make this find similar to the plaque discovered earlier in a burial at the Birsk cemetery, in the Southern Urals (Mazhitov, Sultanova, 1994: 113). A head plume of similar shape is rendered on certain plaques from the Minusinsk Basin (Borisenko, Hudiakov, 2008: Fig. 2, *1*; 3; 7, *3*). Judging by certain traits, the plaques of type 2 of group 1 were assigned to the 6th–7th centuries, when the Tian Shan and Semirechye area was included in the First Turkic Khaganate and the Western Turkic Khaganate (Ibid.: 51). Possibly, such ornaments were also used by Turkic nomads in the times of the Turgesh Khaganate before the middle of the 8th century. Notably, the considered plaque from the Chuya valley differs rather from the Birsk find, and also from a similar one from the Ut River in Southern Siberia, by a greater schematism and by the lack of any representation of waist-length hair (such hair being typical of the ancient Turks).

The second plaque from the Chuya valley, representing a mounted warrior with a bow in his hand and a belted quiver, who is riding on a horse with its legs and tail connected by a horizontal stripe, does not have close analogs among similar items found earlier in the Minusink Basin, Mongolia, and the Southern Urals. This find can be attributed to a separate type 3 of group 1 of plaques. At the same time, the common contour of the horseman figure can be observed both on it and on the plaques of types 1 and 2 of this group. The most important feature of this plaque is the representation of a composite bow with a drawn bow-string in left hand of a mounted archer. Judging by some resemblance in representation of the horseman to the plaques of types 1 and 2 of group 1, this find can be assigned to the period of the Western Turkic and Turgesh Khaganates, the 7th–8th centuries (Ibid.: 51).

The third plaque from the Chuya valley, which represents a horseman with a bladed weapon suspended from his belt, differs from two others primarily by the fact that the mounted warrior is shown riding from right to left. The majority of horsemen rendered on the plaques that can be attributed to the ancient Turkic art of the 6th–8th centuries are shown riding left to right. The exception are the images of lightly armed mounted archers who are shooting backwards. These are shown riding both from left to right and from right to left. Meanwhile, armored horsemen with spears in their hands and belted swords are depicted riding from right to left. These plaques pertain to the archaeological cultures of the Yenisei Kyrgyz and the Kimek of the 9th–10th centuries (Ibid.: 46–49, 51). Among the plaques representing horsemen riding from right to left, there is a distinguishable find from the Ob-Irtysh interfluve, which can be probably dated to the end of the 1st millennium AD. Judging by this analogy, the third plaque from the Chuya valley relates to the 9th–10th centuries AD. It could have belonged to one of the Karluk nomads, and could have been used till the time when the Karluk rulers adopted Islam as their state religion in the early 10th century (Istoriya…, 1984: 291).

Determining the functions of these bronze plaques from the Issyk-Kul Basin and the Chuya valley involves certain difficulties, since all of them are occasional finds. Beyond the Tian Shan area, the majority of such artifacts were occasionally found in the Altai-Sayan, Transbaikalia, Mongolia, and at a settlement in Central Asia. Only one plaque representing a Turkic horseman, rather similar in configuration, was found in a child's burial in the Southern Urals (Mazhitov, Sultanova, 1994: 113). Two plaques, each rendering the image of an armored, mounted spearman, along with a pendant in the form of an anthropomorphic mask, were found in an undisturbed Kimek burial of a child in the Upper Irtysh

region. These items were probably the ornaments of a Kimek child's headdress (Alekhin, 1998: 20). Considering these important finds, it can be assumed that plaques that were found in the Chuya valley, representing horsemen with weapons in their hands or on their belts, were also used as suspended or sewn-on ornaments of costume worn by the Karluk—Turkic-speaking nomads. The above finds from children's burials suggest that the ancient Turks and Kimek could have used such plaques as protective amulets forming parts of costumes or headdresses for children and teenagers. They might have been used as ornaments for the clothes of young boys, future horsemen, since they represented mounted warriors, sometimes in combination with pendants in the form of anthropomorphic masks.

Conclusions

The study of bronze plaques representing armed, mounted warriors found in the Issyk-Kul Basin and in the Chuya valley has allowed a considerable expansion of the known earlier distribution area of such items in the Central Asian historical and cultural region within Tian Shan and Semirechye, in the northern provinces of the Republic of Kyrgyzstan. As a result of analysis and ethnocultural attribution of these finds, it became evident that such items were typical in the Early Middle Ages not only of the ancient Turks, the Yenisei Kyrgyz, and the Kimek who lived in the steppe and mountain areas of Northern Kazakhstan, Western and southern Siberia, including the steppe Altai and the Minusinsk Basin, but also of western Turkic, Turgesh, and Karluk nomads in Tian Shan and Semirechye, within the northern provinces of Kyrgyzstan. As was established earlier, similar plaques were widely used as ornaments of costumes for teenagers by some Turkic-speaking nomads in a number of other areas of Central Asia (Borisenko, Hudiakov, 2008: 44–46). The occurrence of such artifacts in the Tian Shan region may be indicative of certain historical and cultural relations between the Turkic population of this area and the Yenisei Kyrgyz during the period of their confrontation with the Uyghurs and the active military expansion within Central Asia at the end of the first millennium AD, in the epoch of the greatest territorial extension of the Kyrgyz Khaganate. Furthermore, this suggests cultural contacts between the Karluk of Tian Shan and Semirechye and the Yenisei Kyrgyz and the Kimek of the Altai-Sayan and adjacent areas of Kazakhstan and Western Siberia during the final period of the Early Middle Ages.

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Kimäk and *Chù-mù-kūn* 處木昆: Notes on an Identification

*This study addresses the origin of the Turkic tribe Kimäk, known from Muslim sources. In 800–1100 AD, the Kimäk lived in Semirechye. In the article, they are associated with the Chù-mù-kūn 處木昆 tribe, which resided in the same area in 600–800 AD and was described by Chinese sources. The Kimäk genealogical legend related by the 11th century Persian author Gardīzī includes the story of the founder of the Kimäk tribe's being immersed in water (the alleged reason why the Kimäk worshipped water). This story suggests that the reconstructed Chinese variant of the tribal name Chù-mù-kūn 處木昆 meant *čumuqun ~ *čomuqun *'immersed in water', *'drowned (?)'. On the basis of toponymy in the Chinese sources and of the Old Turkic personal names relating to Altai and Semirechye, it is concluded that the words Chù-mù-kūn 處木昆 and Yemäk (Yán-mò 鹽莫) were used as early as the mid-7th century, but were parts of personal names, unrelated to the Irtysh valley, where, according to Gardīzī, the Kimäk tribal union originated. These facts not only document the ethnic diversity of the Kimäk tribal union, but suggest that the name, at least, of the dominant tribe derived from a personal name. Like Y.A. Zuev, I am skeptical of the identification of the names of Kimäk and Yemäk.*

Keywords: *Ethnic history, Turks, nomads, tribes, ethnonymy, onomastics.*

Introduction

Study of the ethnic processes associated with the history of nomadic societies in the Eurasian steppes always encounters a number of difficulties, especially when it comes to attempts to identify peoples living in different chronological periods in the same territory, and/or having common ethnic names (Németh, 1991; Akın, 1982).

L.N. Gumilev proposed the hypothesis of identifying the *Chù-mù-kūn* 處木昆 tribe[1], which inhabited Semirechye in the 7th–8th centuries, and which is well-known from Chinese sources, with the *Kimäk* tribal group, known in the later period from Muslim sources (Gumilev, 1993: 380–381, nt. 38). Orientalists were skeptical of this hypothesis, and found this identification lacking any proof (Kumekov, 1972: 32). We do not intend to study the history of the *Kimäk*, since this is a separate and large issue (Kumekov, 1972; Golden, 1992: 202–205; 2002), but consider it necessary to turn to reviewing some data concerning the early history of the *Kimäk*. Such data may confirm the presence of a certain sound insight in the hypothesis by Gumilev, which can be rejected owing to the lack of philological arguments alone.

[1] Hereinafter, the hieroglyphic writing is omitted while using this ethnic name. When mentioning other names from the Chinese sources, hieroglyphic writing is provided only the first time the name occurs, or when otherwise necessary.

Chù-mù-kūn and *Yemäk*: from personal names to ethnic names

All direct information about the *Kimäk* that scholars currently have has survived solely in Muslim sources.

Thus, the Persian author of the 11th century Gardīzī cited the following legend on the origin of the people bearing this name: "<As for the Kīmek people (*kīmākiyān*)> their origin (*aṣl*) was this, that the leader (*mehtar*) of the Tatars (*Tatārān*) died leaving [82C] two sons. The elder son seized the kingship (*pādšāhī*) and the younger son became envious of his brother. The name of that younger brother was *Šad. He tried to kill the older brother but was not able, [after which] he be-came afraid for himself.

[Now], this Šad had a girl (lit. concubine, or maid, maiden, *kanīzak*), [who] was his lover (or mistress, *'ašīqe*). He took away this girl and fled [257D] from before his brother. He went to a place where there was a great river (or lake *āb-e bozorg*), many trees, and abundant game. There he pitched his tent (*xarqāh*) [Cl] and settled down (*forūd āmad*). Every day that man and girl, both of them, would go hunting and they would eat the flesh of the game [they killed] and they would make garments of [258A] skins of sable, grey squirrel, and ermine (*samūr*, *senjāb o qāqom*).

[And so it went] until seven persons from among the clients (**mawālīyān* or the adopted, inferior [tribesmen], *mowāledān* in the sense of *mowalladān*) of the Tatars [82D] came to them (*nazdik-e īšān šodand*). The first was Īmī; the second, Īmāk; the third, Tatār; the fourth *Bayāndur (*B*^{i}*lānd*^{i}*r*); the fifth, Qifčaq; the sixth, Lānīqāz; the seventh, Ajlād. And these were a party (*qōmī*) who had taken (lit. brought) <out> their masters' (*xodāvandān*) horses (*sotūrān*) to graze, but where the horses were there was no pasturage left and so they had gone (lit. went) in search of grass to that region in which Šad was. When the maid saw them she came out and said *'ertiš'*, which means 'dismount yourselves' for which reason this river has been named the Ertiš (Irtysh).

[Now] when this party recognized that girl, they all dismounted and put up [their] tents. [Then] when Šad returned (*ferāz rasīd*), he brought [258B] much game and [82E] entertained them, [so that] they stayed there until winter. When the snow came (*beyāmad*) they were unable to go back, [but] [83A] there was abundant grass in that place [and so] they were there all winter.

[At length] when the world became fair [again] and the snow went away, they sent a person to the abode (*bongāh*) of the Tatars, that he might bring them news of that party. But when he arrived, he *saw [that] the entire place had become desolate and devoid of people, for the enemy had come and plundered and killed the whole nation (*qom*), [except for] that remnant which had been left (and came forward) towards him from the foot of the mountain. [These] he told of Šad (**ḥāl-e Šad,* ut Barthold, *pro, xāli šod*) and his own comrades, and all that folk set out for the Ertiš. When they arrived there they greeted Šad at as their chief (*<be> riyāsat salām kardand*) and held him in awe (*u-rā bozorg dāštand*). Then other folk (*qōm*) who heard this news [83B] began to come, [until at length] seven-hundred persons came together [258C] and stayed a long [C2] time in Šad's service. Afterwards, when they became [more] numerous they spread out over those mountains and became seven tribes, named after those seven persons we have mentioned. <…> Now, all these Kīmekīs are bad tempered, ungenerous and inhospitable (*ğārīb-došmān*). One day this Šad was standing on the edge of the Ertiš with his attendants (*qōm-e x*^{v}*īs*) [when] a cry came [saying] 'O Šad, *give me [your] hand (Ḥab.: **ma-rā dast de*; Bart.: **ma-rā didi, pro, morād šodī*) in the water'. [But] he saw nothing except some hair that was floating (lit. going) on top of the water. He tethered his horse, went into the water and took hold of that hair. It was his wife, the Xātūn. He asked her 'How did you fall [in]?' The woman said, [83C] 'a water-dragon (*nehāng*) seized me from the river's edge'. [So now] the Kīmek people revere that river, worship it [258D] and prostrate themselves to it and they say thus that the river is the god of the Kīmek. To Šad they gave the name Tutuq which means that he heard the cry, entered the water and was not afraid." (cited after (Martinez, 1982: 120–121 (English translation), 179–181 (Persian text), cf.: (Marquart, 1914: 89–91; Bartold, 1973: 27–28 (Persian text), 43–44 (Russian translation)).

The last sentence, certainly, speaks about the "folk etymology" (Bartold, 1973: 44, nt. 14; Czeglédy, 1973: 259; Zuev, 2004: No. 2: 18); nevertheless this is a source reflecting such events as migration of a group of tribes of various origins to the Irtysh from somewhere else (this fact, albeit in a somewhat different aspect, was specially noted by S.M. Akhinzhanov (1995: 102, 103, 107, 115, 120)) and the formation of the *Kimäk* tribal union in that exact place. Without going into the discussion about the time and historical context of this migration (see (Golden, 2002)), we want to draw attention only to one point: whenever and wherever the representatives of the various tribal groups came to the Irtysh valley, the local population also participated in the formation of a new association. Since, in view of the specificity of social organization in the nomadic societies, all ethnic processes associated with their history appear to be much more complex than those in the sedentary societies (Németh, 1991: 38–44; Akın, 1982: 2–3), and any attempts to equate the peoples inhabiting the same territory, but in different historical periods, are ungrounded.

It has been established that the valley of the Emel River, in the area of the Chuguchak River, was the place where the *Chù-mù-kūn* tribe had settled (Chavannes, 1903: 34, nt. 3; p. 73, nt. 2; p. 270, nt. 1; Malyavkin, 1989: 38, 163, comm. 232). In the year of 656, the "Xīn Táng shū" and "Cè fǔ yuán guī" mentioned the *Chù-mù-kūn* "town of *Yàn*–咽" (*Yànchéng* 咽城), which apparently was the center of the tribal possessions (Chavannes, 1903: 267, 270, nt. 2; p. 294, 307); cf.:

(Zuev, 1962: 119)[2]. However, if we make a connection between this center and the territory of the district (*zhōu* 州) Yànmiàn 咽麪, created in 702, which apparently coincided with the territory of the Fúyán 匐延 province (*dūdūfū* 都督府), formed in 657 (Chavannes, 1903: 281, nt. 2; Zuev, 1962: 120, nt. 83; Malyavkin, 1981: 188–189, comm. 286; 1989: 38, 163, comm. 232)[3], we may assume: *yàn-miàn* < EMC **ʔɛn^{h}-mjian^{h}*, LMC **ʔjian´-mjian`* (Pulleyblank, 1991: 358, 214), MC **ʔiän-mjiän* (Schuessler, 2009: 319 (32–9h = K. 370), 250 (23–31a = K. 223)), < **emän*, which is comparable to the name of the Emel River ((Chavannes, 1903: 270, nt. 1; Malyavkin, 1989: 38, 163, comm. 232), cf.: (Zuev, 1962: 120–121)). This river now flows into Lake Alakol, which together with the adjacent lakes Uyaly and Sasykol, at least in the early second millennium AD, probably formed one large lake (Gagan غاغان in al-Idrīsī)) in the central part of the Semirechye possessions of the *Kimäk* (Kumekov, 1972: 70–74, 75).

The scholars who analyzed the fragment quoted by Gardīzī repeatedly paid attention to the report on the special status of water among the *Kimäk* (Ögel, 1995: 326; Zuev, 2002: 128–129; 2004, No. 2: 9–10). Mention of water in this context is curious, since it may give us an opportunity to reconstruct the original sound of the tribal name *chù-mù-kūn* < EMC **tɕ^{h}iə̆`-məwk-kwən*, LMC **tʂ$^{h}$iə̆`/tʂ^{h}yə̆`-məwk-kun* (Pulleyblank, 1991: 60, 220, 282), MC **tś^{h}jwo-muk-kwən* (Schuessler, 2009: 49 (1–18a = K. 85), 161 (11–24ae = K. 1212), 333 (34–1a = K. 417)), < **čumuqun*. The following etymology is probable: **čumuqun* ~ **čomuqun* *'immersed in water', *'drowned (?)' < *čom-uq-* 'to drown' (middle voice) (see (Erdal, 1991: Vol. 2, p. 646)), < *čom-* 'to sink in (water, etc. *Loc.*)' (Clauson, 1972: 422) + *-(X)k-* + *-Xn*. It is theoretically possible to imagine this form as primary, if we assume that the wide vowel is labialized under the influence of the adjacent nasal consonant /m/: **čam-* > *čom-* (Erdal, 1991: Vol. 1, p. 391). The hypothesis as to the presence here of the word *çomuk* (dialect. *çumak*) > *comuk* (Zeki Velidi Togan, 1946: 51, 428, dipnot 182, 183) leaves the presence of the third syllable without explanation. We should also compare the variants of reconstruction suggested by Zuev: < **tʂiʷo-muk-kuen* < ? *čumul qun* (1962: 119), *čumuq qun* (1967: 18; 1981: 66). The attempts to link this ethnonym with the group of words (personal names, toponyms, ethnonyms, and social terms) containing a wide vowel in the first syllable, for example, جموك (*ğmwk*) *ğamūk* in Arabic writing (see (Iskhakov, Kamoliddin, Babayarov, 2009: 8–10; Babayarov, Kubatin, 2010: 16; Otaxo'jaev, 2010, 65–67)) raise some doubts. For example, al-Ṭabarī mentioned "the people from the house of *al-ğ.mūk*" اهل بيت الجموكيين (*'hl byt 'l-ğmwkyyn*) present at the funeral of the Türk Qaghan who was killed in 119 AH / 737 AD[4]. The change in the form of the ethnonym may be explained by its reinterpretation, since the proposed variant **čamoq* ~ **čamuq* may be interpreted as a derivative of the same verb **čam-* by means of the corresponding affix *-(O)k* (Erdal, 1991: Vol. 1, p. 224–261), which, in turn, makes it possible to further make the form of **čomuq*. In this case, this abstract verbal name in its essence is synonymous with the form **čumuqun* ~ **čomuqun*.

In 649, 651, 739, and 740, the leader of this tribe was called *Chùmùkūn [Qū] Lǜ Chuò* 處木昆(屈)律啜 (Chavannes, 1903: 34, 60, 65, nt. 4: 84, 270; Taşağıl, 1999: 71, 96; Malyavkin, 1989: 39, 168, comm. 248), that is **külüg čor* (see (Hamilton, 1955: 96, nt. 8)). Such a reconstruction of the reading of this title (instead of the written form *Chùmùkūn Lǜ Chuò* 處木昆律啜) makes it possible to reject the E. Chavannes's suggestion (Chavannes, 1903: 285–286, nt. 3; Beckwith, 1987: 118, nt. 60) to correlate the leader of the *Chù-mù-kūn* with the Türgiš (with the nisba *'l-trqšy* الترقشى) commander named Kūrṣūl كورصول (*kwrṣwl*), who killed the Qaghan in a quarrel (119 AH / 737 AD), and who was mentioned by al-Ṭabarī. It seems more sensible to make a comparison with the Türgiš tribal leader Mòhè Dágān 莫賀達干 (< **baγa tarqan*), well-known from the Chinese sources, who killed Sūlù 蘇錄 Qaghan (738) (Marquart, 1898a: 38–39, Anm. 1; 1898b: 181–182) (*sū-lù* < EMC **sɔ-ləwk*, LMC *suə̆-ləwk* (Pulleyblank, 1991: 294, 201), MC **suo-ljwok* (Schuessler, 2009: 52 (1–31c = K. 67), 159 (11–15klm- = K. 1208)), < **suluq* (cf.: (Hirth, 1899: 77, Klyashtorny, 1986: 166, 169); cf. with the vowels of the palatal type (Zuev, 1998: 66))). If we take into account the hereditary nature of the titles, which is suggested, for example, by the epitaph of some "lady from the *Āshǐnà* 阿史那 clan" (*fūrén āshǐnà shì* 夫人阿史那氏), daughter of the governor (*dūdū* 都督) of Shuānghé 双河, named Shèshětí Tūn Chuò 慴舍提暾啜 (**Ton čor* from the tribe *Shèshětí* 慴舍提[5]; cf. the form *Shèshětí*

[2] Contrary to the opinion of Zuev, the combination of *tūqí* 突騎, which precedes the name of *Chù-mù-kūn* in the second source, is probably an abbreviation of *Tūqíshī* 突騎施 (<**türgiš*).

[3] *Fú-yán* 匐延 < EMC **buwk-jian*, LMC **fhyiwk/fhuwk-jian* (Pulleyblank, 1991: 98, 356), MC **bjuk/bək-jiän* (Schuessler, 2009: 112 (5–33 = K. 933), 257 (24–30 = K. 203)), < **bögän* < *bög-* 'to collect, gather together (people or things)', cf.: *bäg sü:sin bögdi* 'the *beg* assembled (*cama'a*) his army' ((Clauson, 1972: 324), cf.: (Drevnetyurkskiy slovar, 1969: 117), where erroneously *bök-*, + *-Xn*).

[4] O.I. Smirnova provided a rather inaccurate translation, but correctly pointed that this was not a social group, but some tribal community (1970: 33).

[5] Interestingly, judging by the name Kàn Tǔtún Shèshětí Yúqūzhāomù dūdū 瞰土屯摄舍提於屈昭穆都督, where instead of the character *kàn* 瞰 one should read the character *tūn* 暾 (in the "Táng huì yào": *zhí* 職), the governor of Ferghana (Dàyuàn 大宛) from 658/659, that is, after the defeat of Āshǐnà

摄舍提)[6], who married one of the Tang high-ranking commanders[7], and most likely this commander belonged to the tribe of Húlùwū 胡禄屋, whose leader, mentioned in the year 651, was called Húlùwū Què Chuò 胡祿屋闕啜 (< *uluγ oq kül čor) (Marquart, 1898b: 182; Chavannes, 1903: 34; Malyavkin, 1989: 39, 166, comm. 245; Taşağıl, 1999: 96).

It is curious that in the year 649, the Chinese sources mention *Básāifú Chùmùkūn Mòhèduō Qíjīn* 拔塞匐處木昆莫賀咄俟斤 (in "Xīn Táng Shū", *Chùmùkūn Mòhèduō Qíjīn* 處木昆莫賀咄俟斤) (Bichurin, 1950: Vol. 1, p. 263; Liu Mau-tsai, 1958: B. I, S. 155, 208; B. II, S. 585, Anm. 804, S. 646, Anm. 1139; Taşağıl, 1999: 40, 90) among the surrendered tribal chiefs (*qiúzhǎng* 酋长)—the companions of the Chēbí 車鼻 Qaghan (< *čaviš) (see (Ecsedy, 1980: 27; Kasai Yukio, 2012: 89)), who formerly resided on the northern slopes of the Mongolian Altai (see (Zuev, 2004: No. 2, p. 11–12)), where *básāi* 拔塞 is undoubtedly the transcription of the word *bars* (see, e.g., (Harmatta, 1972: 270, Malyavkin, 1989: 39, 169, comm. 251)); *fú* 匐 is the transcription of the Turkic word *bäg* ((Hirth, 1899: 107, Hamilton, 1955: 148–149), see also: (Harmatta, 1972: 270; Malyavkin, 1989: 41, 169, comm. 251)) (cf. the personal name *bars bäg* (Drevnetyurkskiy slovar, 1969: 84)); *mòhèduō* 莫賀咄 is the transcription of the word *baγatur* (Chavannes, 1903: 83–84, 90, 346); and *qíjīn* 俟斤 is the transcription of the title of *irkin* (Hirth, 1899: 103, 109, 111–112; Pelliot, 1929: 227–228; Hamilton, 1955: 98, nt. 1; Kasai Yukio, 2012: 90)[8]. This makes it possible to consider the word *Chùmùkūn* exclusively an element of a personal name. Thus there is every reason to believe that this name, being once the personal name of an individual leader, formed the basis for the name of the group under his leadership. This is a fairly well-known phenomenon among the nomads of the Eurasian steppes (Németh, 1991: 58–65).

One more point is remarkable in this respect in connection with the history of the Kimäk. While enumerating the peoples inhabiting the territory to the north of the Altai, "Tōng Diǎn" mentions the combination of *Yánmò Niàn Duōlù Què Qíjīn* 鹽漠念咄陸闕俟斤 (Zuev, 1962: 105–106; cf.: Kyuner, 1961: 54)). In this combination, the last three hieroglyphs (*què qíjīn*) certainly denote the title of *kül irkin* (see, e.g., (Zuev, 1962: 118)); the fourth and fifth, that is, *Duōlù*, like all other forms of this combination used in the name of one of the tribal confederations of Western Türks, taken together, make it possible to reconstruct here the sounding of *tölük (see (Golden, 2012: 167)) or *türük (cf.: (Klyashtorny, 1986: 169)); the third character *niàn* < EMC *nɛm^h, LMC *niam` (Pulleyblank, 1991: 225), MC *niem (Schuessler, 2009: 365 (38–24a = K. 670)), which, as Zuev pointed out (2004, No. 2: 3), is tempting to link with the Sogdian *nām* (*n'm*) 'name' (Gharib, 1995: 232); while the first and second characters, that is, *yán-mò* < EMC, LMC *jiam-mak (Pulleyblank, 1991: 357, 218), MC *jiäm-mâk (Schuessler, 2009: 347 (36–5n = K. 609), 74 (2–40ad = K. 802)), < *yemäk (Zuev, 1962: 118). With a significant degree of certainty, it may be assumed that the reconstructed *yemäk nam tölük (/türük) kül erkin, which originally had clearly designated a personal name, in the Chinese text marked some subordinate group, which was the subject of a certain leader. The word *yemäk here may act as an element of the personal name of that leader, and denote the name of

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Hèlǔ 阿史那賀魯, belonged to the group of *Shèshětí* 摄舍提 (cf. (Zuev, 1998: 91–92)). According to Yutaka Yoshida, Yú-qū-zhāo-mù 於屈昭穆 < EMC *ʔɔ-k^{h}ut-tɕiaw-muwk < Sogdian *Ukku^{r}t-camūk* (*'wkkwrtcm'wk*), was the name of the ruler of Samarkand in the 7th–8th centuries (see (Lurje, 2010: 115; Stark, 2008: 224–225, Anm. 1248, 2009: 4, 26, Komm. 40)). S. Stark considered this word to be Turkic. As P.B. Lurje noted, it cannot be etymologized on the Sogdian grounds. Apparently, the same person appears in the sources as Tūn Tǔtún 暾土屯—the ruler of the town of Binket (Tashkent, that is Shí 石, i.e. Čač), and probably as Tūn Chuò 暾啜 (< *Ton čor), mentioned in the Chinese sources under the years of 649, 651, and 658, and under the year of 658 as an associate of Āshǐnà Hèlǔ (see (Chavannes, 1903: 34, 60, 141, nt. 3; Malyavkin, 1989: 38, 164–165, comm. 239; p. 39, 166–167, comm. 246; p. 83, 270, comm. 638; Bichurin, 1950: Vol. 1, p. 289, 292; vol. 2, p. 313; Taşağıl, 1999: 71, 96).

[6] The tribal group of *Shèshětí* 摄舍提 occupied the lands in the Boro-Tala River valley, to the west of Lake Ebi (Malyavkin, 1989: 38, 164, comm. 238). According to Stark, the *Shèshětí* tribe was not Turkic (2008: 191, Anm. 1081; p. 225); cf.: *shè(zhé)-shě-tí* 摄(慴)舍提 < EMC *ɕiap(tɕiap)-ɕia'-dɛj, LMC *ʂiap(tʂiap)-ʂia'-tʰjiaj (Pulleyblank, 1991: 279, 400, 278, 304), MC *śjäp(tśjäp)-śjä-diei* (Schuessler, 2009: 344 (35–13d = K. 638), 356 (37–12 = K. 690), 56 (1–48a = K. 48), 124 (7–14n = K. 866)), < *čapšatā < Sogdian *šāw/u* (*š'w*) "black" (Gharib, 1995: 370) + Sogdian *xšēδ* (*xšyδ*) 'chief, commander' (< Avestan *xšaēta* id.) ((Ibid.: 433); see (Cheung, 2007: 451–452) + ? Sogdian plural suffix *-ā* (see (Gershevitch, 1961: 179)), cf. with the "king of the Turks" Šāba شابة mentioned by al-Ṭabarī, or at *Sāwa* Šāh شاوه سا, mentioned by Ferdowsī (Zuev, 2002: 195). Zuev reconstructed here *Jebšed (see (1998: 91–92)).

[7] According to the source, this lady died in 746, at the age of 54; thus she must have been born around 693. It is therefore difficult to imagine that her father could be the eponymous person mentioned in the mid-7th century as an active politician (Guō Màoyù, Zhào Zhènhuá, 2006). However, the administration (*dūdūfǔ*) of Shuānghé 双河 was established in the lands of the *Shèshětí* tribe in 658 (Malyavkin, 1989: 38, 238, comm. 164). Apparently, it is necessary to agree with the opinion of Guō Màoyù and Zhào Zhènhuá that this is a case of representatives of the line of chiefs all being from the same clan.

[8] The title *irkin* was typically used by the confederation of *Nǔshībì* 弩失毕, although the tribe of *Chùmùkūn* was a part of another confederation of Western Türk tribes *Duōlù* 咄陸 / *Dōulù* 都陸 / *Dōuliù* 都六 / *Duōliù* 咄六.

the tribal group from which he originated. The first option is preferable. If the interpretation of the second element in the reconstructed combination of the Sogdian lexeme is correct, then **yemäk nam* may literally be interpreted as 'the one bearing the name of *yemäk*' (Zuev, 2004: No. 2, p. 3). The former assumption seems more logical, if we take into account that, further into the source, the combination of *yán-mò* (< **yemäk*) occurs independently.

The word *yemäk*, which has been mentioned in the Chinese sources at least since the mid-7th century (Kyuner, 1961: 55), makes us turn again to the hypothesis (which has become commonly accepted by the scholars) of considering this word a secondary form of the word *kimäk.* The former word has reliably and independently appeared in sources written in Arabic since the second half of the 11th century AD in the form ايماك (*'ymāk*) as the name of one of the main tribes of the union called كيماك (*kymāk*) (sometimes كيمياك (*kymyāk*)) in Gardīzī, and in the form يماك (*ymāk*) as the name of this entire union in Maḥmūd al-Qašγarī, who did not know any *Kimäk* (see (Zuev, 1962: 121–122; Kumekov, 1972: 39–41; Golden, 1992: 202; 2002)). Differences in writing can be explained by the rules of Turkic phonetics: **īmak* < **yemäk* ~ **yimäk*, which is adequately linked with the data of the 7th century.

According to K. Czeglédy, the narration of Gardīzī about the *Kimäk*, like his stories about other Turkic tribal groups, may refer to events that happened between 745 and 766 (1973: 263–267). Notably, Czeglédy dated the "Turkic episodes" only on the basis of information about the tribes of *Qarluq* and *Yaγma*. Nevertheless, as Lurje has shown, the date proposed by Czeglédy is generally confirmed by the indirect evidence (2007: 189–190).

Abū Saʿīd Gardīzī, who had no knowledge of the Turkic languages, as Czeglédy had shown, borrowed information about the Turks from the author of the "Kitāb Rub' al-dunya" ("The Book of the Inhabited Quarter of the World") by the name of Abū Muhammad ʿAbd Allāh Ibn al-Muqaffaʿ (720 to ca 757) (Czeglédy, 1973: 259, 260–261, 263). More convincing is the suggestion of Lurje (2007: 189–190), according to which Gardīzī might have taken this information from another source that he mentioned, "Kitāb al-Masālik w'al-Mamālik" ("Book of Roads and Kingdoms", which has not survived) by Abū ʿAbd Allāh Jayhānī (first half of the 10th century), who served as a *wazīr* at the court of the Sāmānids.

The name of *Kimäk* has been reliably recorded in the most common form of كيماك (*kymak*) since the 9th century, although it might already have been known in the second half of the 8th century (Kumekov, 1972: 11–13, 36, 56). The latter date appears in the list of the Turkic tribes, which was given in the book "Kitāb al-Masālik w'al- Mamālik" ("Book of Roads and Kingdoms") by Ibn Khordāḏbeh (the 880s), which was one of the sources of Gardīzī.

Conclusions

The above analysis makes it possible to conclude that the hypothesis of Gumilev as to identifying the Semirechye tribe of *Chùmùkūn* with the *Kimäk*, which was based solely on the data regarding the coincidence of the territories inhabited by them, may find additional, albeit indirect, confirmation in the reconstruction of the Chinese sound of the name of the Semirechye tribe of *Chùmùkūn* as **čumuqun* ~ **čomuqun* with the meaning *'immersed in water', *'drowned (?)', which echoes the story about why the *Kimäk* worshipped water, which was cited by the Persian author of the 11th century Gardīzī. The formation of the *Kimäk* tribal union, according to Gardīzī, occurred exactly in the Irtysh valley, where the representatives of various tribal groups arrived. The most important of these tribal groups was the group of *Yemäk*. Its name occurred in the Chinese sources in the form of *Yánmò* as early as the mid-7th century. Initially, this name was mentioned as the personal name of a certain leader.

Without addressing the issues of migration-processes associated with the formation of a new tribal community and of their dating, we should emphasize that the formation was complex and involved both local and migrant populations.

We should also pay attention to the doubts voiced by Zuev, contrary to the opinion of most scholars, about the impossibility of identifying the names of *Yemäk* and *Kimäk* as forms of the same word. The identification of these two forms as **yimäk* < **kimäk* has been accepted by the scholars on the basis of reduction of the initial **k- > 0*, observed by the philologers in some Middle Kipchak dialects, which has not been found in the Old Turkic period. Together with the indirect data on the existence of both forms (for the 7th and 8th–9th centuries, respectively), this circumstance suggests another explanation for the consonance in the names used in relation to the same tribal group.

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Traditional Buryat Burials: Changes and Stereotypes

Buryat burials are described with regard to the age and social status of the deceased. Changes and conservative features are evaluated, and cultural stereotypes are discussed. Certain novel traits are due to a recombination of traditional elements; others are caused by external stimuli. Environmental adaptations and the role of cultural factors are assessed. There are two traditional types of low-rank burials: above-ground under cover with accompanying goods; and cremation. Both were practiced throughout the Buryat ethnic area. The latter's inclusion in the Russian Empire and the spread of Buddhism resulted in the emergence, in the Baikal region, of two major religious groups—shamanists in the Cis-Baikal region, and Buddhists living east of Lake Baikal. The changes affected burial practices as well. Under the impact of the Russian tradition, inhumation burials in coffins emerged. Under Buddhism, only members of the clergy (but not lay persons) had been cremated. Cremation became the principal rite west of Lake Baikal, while disappearing east of it. Above-ground burials from that time on may be divided into two subtypes—shamanistic and Buddhist, the latter being predominant in the Trans-Baikal region. Burials of children fall in several categories: air burial, cremation, both types of above-ground, and inhumation. Burials and commemoration practices relating to shamans and the Buddhist clergy are described. One evolutionary line demonstrates changes in burial practices concerning ordinary people, and contributing to the integration of the traditional culture into the outside world; another line highlights the sacral stereotypes, preserving the core of the traditional culture. Both opposing lines maintain the integrity of the Buryat ethnic tradition in both space and time.

Keywords: *Buryats, burials, memorization, cultural stereotypes, cultural changes.*

Introduction

This article presents a new version of the burial typology of the Buryats, and aims at describing specific aspects of burials for the groups of Buryats of varying age and social status. The innovations that have emerged from the recombination of elements of the tradition or under the influence of another culture are identified, and the limits for introducing innovations into traditional system are outlined.

Burial rituals sustain a conservative form of stereotyping the social experience (Semenova, 2006: 9). On the one hand, these rituals typically reveal their archaic nature, which persists in the burial of sacred persons and in ideological beliefs; on the other hand they are influenced by social and economic processes generating social dynamics. Habitation environment facilitated the emergence of regional types of burials among the Buryats. They live in a territory with a prevalence of either forest-steppe or steppe zones. The climate is such that the earth is frozen for half a year. Low population density also plays an important role. The specific nature of burial types is also conditioned by the traditional world view—shamanistic, and later Buddhist.

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The chronology of this study covers the historical processes after the accession of Buryatia to Russia, accompanied by the transformation of all aspects of life. These involved administrative allocation of clans' territories, reduction of the *porodnye* ('clans') lands* and nomadic routes, as well as the gradual adoption of a sedentary lifestyle. Buddhism, whose innovations fit into traditional culture, was spreading among the Buryats in the same period. Buddhist doctrines radically changed their worldview and beliefs concerning death, and led to the emergence of two large subregional communities of the Buryats in the Baikal region, differing primarily in religious affiliation of the shamanists of the Cis-Baikal and the Buddhists of the Trans-Baikal region, who in turn split into smaller groups, each with its own specific features. As is known, a part of the Buryats practiced dual faiths (shamanism and Orthodox Christianity), while another part followed triple faiths (shamanism, Orthodox Christianity, and Buddhism). A formalized approach, which allows us to view the topic in synchrony at the level of both the Cis-Baikal and Trans-Baikal regions, is used for creating a typology in this study. This article also describes the subjects of preserving the burial types in the Soviet and post-Soviet periods. Their uniformity in the pre-Russian and pre-Buddhist periods throughout the entire ethnic area confirms the concept of a unified culture of the ethnic group, which had been proven earlier, for example, by E.M. Zalkind (1958: 166, 169). Today, when the new tribalism is expanding in present-day Buryatia, a study that verifies the idea of the historical unity of the people becomes relevant.

The research is hampered by the lack of visual traces, since the Mongolian-speaking Buryats did not leave any outstanding funerary structures or above-ground monuments. This work is based on the field materials gathered by the author and A.S. Suvorova. Ethnographic information and archaeological data are also used, as well as archival materials—in particular, the manuscript of B.B. Bambaev, *Description of the Funeral Rite and Its Origin* (Center of Oriental Manuscripts and Xylographs of the Institute of Mongolian, Buddhist and Tibetan Studies (hereinafter, COMX IMBTS) of SB RAS, F. 11, Inv. 1, D. 13).

Research history

Despite the fact that there is no monographic study of funeral rites, the literature on the subject is extensive, and includes specialized articles and parts of ethnographic and archaeological works of general and local nature, etc. (Suvorova, 2014: 4–9). However, there are not many works on the types of burial. In his manuscript, Bambaev noted, "…funeral rites of non-spiritual persons differ in details. The main factor is the nature of the inhabited area. In the steppe, the burial is above-ground without a coffin; in the rocky mountainous areas, the stone mound is piled above the grave; in the forest areas, the corpse is either burned, inhumed in a coffin accompanied by the construction of mound, or buried in the cribwork above the ground" (COMX IMBTS SB RAS, F. 11, Inv. 1, D. 13, fol. 31).

T.M. Mastyugina, who studied the burial ritual of the Buryats, distinguished specific aspects thereof differing between the shamanists and Buddhists. She identified the traditional methods, such as leaving the deceased, including children, on the surface of the ground; burial of shamans on platforms-*arangases*; and cremation of shamans and ordinary people. In the case of cremation, the remains were left for disposal by predators. Burial in the ground in a cemetery emerged under the influence of the Russians. Mastyugina noted that the Buryat Buddhists commit the deceased to various elements (earth, water, fire, air, and tree) depending on the season, place of death, and social status (1980: 91–93, 96).

Using the materials of the Oka Buryats and Soyots, L.R. Pavlinskaya identified three types of burial: above-ground burial (on the ground, on the ground under dry trees or under stone mound), air burial (on a tree), and cremation. In her opinion, inhumation was not practiced by the peoples of Siberia (Pavlinskaya, 2002: 240). The typology of the Old Buryat burials was offered by N.V. Imenokhoev, who identified rock burials, flat burials, air burials, and cremation (2010).

A variant of the typology of the Buryat burials appeared in the dissertation of Suvorova, written under the supervision of the author of the current article (2014: 15–16). The stereotypes of burials of shamans and Buddhist priests are analyzed in joint articles (Zhambalova, Suvorova, 2013; 2015). When preparing the monograph, it became clear that the topic needed some further elaboration. This article presents new materials, their analysis, and findings.

Types of ordinary people's burials

The first type of traditional burial of the Buryats is above-ground. Apparently, this was common in their entire ethnic area. The Buryats employed above-ground burials as the most suitable for the steppes long before the spread of Buddhism; but under its influence, this type reached a new stage of development, which led to the emergence of two subtypes. The first subtype is a traditional above-ground burial of the pre-Buddhist period. Mastyugina believed that this was a typical form of burial by the Cis-Baikal Buryats in the 17th–18th centuries, which

*In the 19th century, the lands where individual clans would tend their herds.

disappeared in the mid-19th century (1980: 91). The existence of this practice in the region is confirmed by archaeological materials. In the Cis-Baikal region, at the Elga XII burial ground, two out of the eight unearthed Buryat complexes were above-ground burials. Five out of seven unearthed burials at Elga XIII were above-ground chambers adjoining rock outcrops (Kharinsky, 2006: 180, 192, 194–195).

The hypothesis that the Buryats of the Cis-Baikal and Trans-Baikal regions had similar types of burial before the spread of Buddhism corresponds to the opinion of Bambaev. In 1928–1929, he noted the principle behind the introduction of Buddhist innovations, "…over several decades, the traditional funeral rite has changed, completely unnoticed by the population. Or rather, it was created on the basis of the former rite" (COMX IMBTS SB RAS, F. 11, Inv. 1, D. 13, fol. 41). Further, Bambaev wrote, "With great difficulty I was able to find an old man… According to him, in ancient times, when the Trans-Baikal Buryats were still shamanists, people washed the faces of the deceased, combed their braids, and dressed them in their favorite clothes. After fastening the bow, arrows with quiver, and sword to him, and supplying him with the flint, knife, tobacco, and smoking pipe, and, in the case of a woman, with a needle and scissors, people took the deceased away, mounting him on a horse. Upon arriving at the burial place, people took him down, placed him on the saddle blanket, with his head to the northeast face up, and put the saddle with its right side under his head; or in the woods, people buried the deceased in cribworks. They brewed tea in a cauldron and sprinkled it in all directions, so the earth would receive him, and left the cauldron with tea near the deceased. They killed the horse at the grave of the deceased, or tied it to a pole, so it would die after a while. The bridle was the only thing they did not leave" (Ibid.: fol. 41–42).

Specific placing of the body, presence of grave goods, and structures over the grave technically characterize the pre-Buddhist above-ground burials as more sophisticated than Buddhist burials. There is no evidence as to leaving the exposed deceased on the surface of the ground at that time. In the 14th–15th centuries, the inhabitants of the Cis-Olkhon area, whose ethnicity is still unknown, built quadrangular structures of stones to the rock for the deceased (Kharinsky, 2006: 189). Archaeological data correspond to ethnographic materials. In the late 20th to early 21st century, dozens of burials under stone mounds were found among the Oka Buryats. These are located on the southern slope of steep rock and are oriented along the NS line (Pavlinskaya, 2002: 236–237).

Buryat cemetery and an above-ground burial under the cover are called *daraan*. Bambaev, who worked in a school among the Kabansk Buryats-shamanists in 1920, wrote, "Until the recent years, the deceased among the Kudara Buryats were not dug into the ground, but were covered with boards, and a large pile of trees was placed over…; not so long ago people placed the pile of stones called '*daraan*' on the grave, or made an earthen mound called '*bulasha*'" (COMX IMBTS SB RAS, F. 11, Inv. 1, D. 13, fol. 39). Burials on the ground under dry trees were made the East-Sayan Buryats. Their funeral rite combined shamanistic and Buddhist traditions, typical of the peripheral regions of Buryatia (Pavlinskaya, 2002: 236, 241). In case of the above-ground burial, the deceased, lying on his right side, with his right hand under his head, with legs bent, was wrapped in red or yellow cloth (the colors of the Tibetan Buddhism), and was covered with dry trees. Sometimes, the body was left in taiga, placed on the ground on the felt and covered with dry vegetation. The sleigh, on which the deceased was transported, was chopped and thrown on top. The horse was killed and left nearby. People tried to take the body to the places inhabited by predatory animals, so the soul of the deceased would quickly depart to the ancestors (Ibid.: 236–237, 241).

Buddhism corrected the above-ground type of burial and introduced fundamental ideological innovations. Technological simplification was caused by the Buddhist concept of life and death, body and soul. It was typical of other Buddhists in Siberia. Among the Tuvans, the corpse, wrapped in fabric, was left on the ground, without accompanying goods, placed on his back or on his side in the sleeping position (Dyakonova, 1980: 116–117). G.M. Osokin assigned the long preservation of this method of burial, despite the protests of the Russian State and the Russian Orthodox Church, to Buddhism. According to him, people were buried on the surface of the ground by the orders of lamas, who read in books that the person should be buried precisely that way (Osokin, 1906: 219).

In the Trans-Baikal region, this method of burial was common in the 19th to early 20th century, and survived in the form of relic until the mid 20th century. Among the Agi Buryats, it continued to be actively practiced during the Soviet period, which was caused by the beliefs on the possibility of fast rebirth (Tsydenova, 2007). The burial on the ground of a body wrapped in cloth, either in a cloth bag or thin board coffin, was recorded by archaeologists in the southern steppe regions of Buryatia in the second half of the 20th century (Imenokhoev, 2010: 30). In 1929, Bambaev, who participated in an expedition to the Zakamensk Buryats, noted the vitality of that custom (COMX IMBTS SB RAS, F. 11, Inv. 1, D. 13, fol. 49). It follows from the stories of informants that the abandonment of bodies of adults on the ground was practiced until about the 1940s, and was less frequently observed in the 1950s. There is some evidence on this practice in the Kizhinginsky District of the Republic of Buryatia in the mid 20th century. The movie *Close to Eden* by N.S. Mikhalkov demonstrates the

existence of this tradition in the second half of the 20th century among the Mongols of Inner Mongolia.

The above-ground burial of Buddhists was accompanied by sophisticated ritualistic actions, conducted by lamas. The presence of the same funeral rite among the Mongolian Buddhists is confirmed by the following evidence. In the early 20th century, this was the only method of burial (*il tawikh*) among the Altai Uryankhai people. The deceased was brought out of the yurt by lifting its wall, and was taken to a specially chosen worshipful place. People chose sunny terrain, bordered by mountains from the north and east. The body in a white shroud, sewn with hair threads, was laid on the ground on its right side, facing the setting sun, covered with white fabric or sheet of paper with the printed Buddhist text (*nomyn khunzhel*). People placed brick tea under the head of the deceased and covered him with blue *khadak*. The deceased was oriented towards the nearby mountain or to the north. The oldest person from among those present threw grain toward the deceased, sprinkle vodka to four sides, and then people drank it. After the prayer, they went around the body three times and left (Lkhagvasuren, 2013: 129, 131–132).

The above-ground burial of the Buryats, accompanied by construction of cribwork (*munkhan*), was rare. Its presence it attested in the materials of 1864 in the Barguzin Steppe Duma (State Archive of the Republic of Buryatia (hereinafter, SARB), F. 7, Inv. 1, D. 1208). Bambaev also mentioned above-ground burials in cribworks (COMX IMBTS SB RAS, F. 11, Inv. 1, D. 13, fol. 56).

Second traditional type of burial of the ordinary Buryats is cremation. It is simpler than cremation of sacred persons. Despite the fact that reliable data pertain to the Cis-Baikal region, there are reasons to believe that this custom is common throughout the entire ethnic area. In the 1760s, M. Tatarinov wrote that the Cis-Baikal Buryats of both sexes, dressed in the best clothes, were laid around with firewood and cremated in the forest (Opisaniye…, 1958: 20). In the late 19th century, E.E. Sno noted the presence of cremation among the Buryats (1904: 27). M.N. Khangalov wrote that they had the custom of burning the dead people without distinction of sex and age. According to Khangalov, this custom gradually disappeared, and in the late 19th century it was practiced only with the deceased shamans (1958a: 387). There is a wide range of field material testifying to cremation of not only shamans, but also of ordinary people aged 70–80 years and younger, in Ekhirit-Bulagatsky, Bokhansky, and Olkhonsky Districts of the Irkutsk Region. People leave instructions to commit them to the fire, believing that it cleanses them from earthly sins and quickly sends them to their ancestors (Nanzatov, Sodnompilova, 2005: 54).

Cremation of modern ordinary people was first observed in the Olkhon materials of the late 20th century. The rite of *selmedeg* (from the word ‘clear, pure’) gives the soul a thousand years of life (Zhambalova, 2000: 293). According to the beliefs of the Buryats, the soul of the shaman or the shaman himself rises to the sky in the smoke of fire, and leads a pleasant life there (Khangalov, 1958a: 390). In the 17th–18th centuries, poor Yakuts were burned together with their dwellings, and those killed far from their native places were cremated, so the ashes could be delivered to their homeland (Gurvich, 1980: 97).

There are few Trans-Baikal materials on the cremation of ordinary people at the turn of the 19th–20th centuries. Among the Oka Buryats, cremation was practiced until the Soviet period (Pavlinskaya, 2002: 238). Owing to the spread of Buddhism in the Trans-Baikal region, cremation, as is shown below, became the prerogative of lamas and, occasionally, noble people. The same situation can be observed among the Kalmyks. Modern Buryats, including those living in Ulan-Ude, often want to be cremated (Basaev, 2011).

Flat burial (inhumation) was probably known to the Buryats in the pre-Russian period of their history. The lack of reliable data is probably due to the fact that they did not have special cemeteries at that time, and the graves quickly overgrew with vegetation. Bambaev believed that in the pre-Russian period noble people were buried in this way for protection of rich accompanying goods (COMX IMBTS SB RAS, F. 11, Inv. 1, D. 13, fol. 57). In the 17th–18th centuries, rich Yakuts were buried in flat graves (Gurvich, 1980: 97); while among the Agi Buryats, asocial members of community, persons who committed suicide, criminals, and black shamans were buried in this way (Tsydenova, 2007). Buryat burials in the ground are attested in the archaeological materials of A.V. Kharinsky, who dated them to the Russian period (2006: 194–195).

There is rich written evidence on forcing Buryats to practice inhumation. It was imposed under the pressure of sanitary requirements of the Russian administration and ideological requirements of the Russian Orthodox Church. D.I. Stakheev described the lamaist rite of inhumation in the 1860s: the grave was shallow and was surrounded by poles covered with ropes, to which scraps with funeral prayers were tied (see (Mastyugina, 1980: 96)). With time, this innovation took root, and inhumation became the fourth type of burial of the ordinary Buryats. It was distinguished by the small depth of the grave pit, absence of a coffin, etc. Gradually, new type of funeral rite became established—inhumation in coffins at cemeteries. It finally took root in the first half of the 20th century, and now dominates in individual Buryat cemeteries.

Types of children’s burials

Specific nature of children’s burials among the Buryats is associated with the special social status of the children. The age of a child mattered. The following age groups

were distinguished: infants, children from 3 to 5 years of age, and children from 5 to 12 years of age. In the Cis-Baikal region, after 12 years of age, children participated in burial rites together with adults (Khandagurova, (s.a.)), and, accordingly, they were also buried as adults. Traditional burial of small children among the Buryats, like among the Yakuts and other peoples, is determined by the idea of children's "subhumanity", and thus it was not ritually formalized: people did not make a coffin, nor dig a grave, nor slaughter commemorative cattle, etc. (Bravina, Popov, 1992: 161–162). Among the Buryats, the death of small children was denoted by the word "lost" (*gegde*), while of deceased adults it was said that they "took the road", "exhausted their age" (*mordokho*, *naha barakha, nahanhaa nugshekhe*), etc.

The first type of children's burial is the sacred air burial of infants. The child was wrapped in birch bark, tied around with hemp rope, and attached to a birch tree. This type of burial is associated with the tripartite model of the universe and the cult of the World Tree, wherein the tree's crown personifies the upper celestial world. According to the beliefs of the Buryats, children's souls fly from there as birds to the Upper World, and then descend to earth, and enter the wombs of women. Traces of such burials were preserved in Okinsky District of the Republic of Buryatia at the turn of the 20th to 21st centuries (Pavlinskaya, 2002: 240).

The second type of children's burial is cremation. Children over 3 years of age were cremated at Olkhon. In 1840, two drowned boys 3 and 8 years old "were taken to the forest on the second day and burned according to the shamanistic custom" (Zhambalova, 2000: 292). R.I. Bravina and V.V. Popov suggested that children were cremated among the Yakuts (1992: 34, 162, 195).

The third type of children's burial is above-ground burial, which is subdivided into several subtypes. A.V. Potanina confirmed the shamanistic ritual of above-ground burial, "Children even now are not buried, but people lay stones on the coffin" (1912: 25). The Olkhon Buryats call such a burial of newborns *darsaldag* ('huddle, pile up') (Zhambalova, 2000: 295). Children up to 3–4 years of age were considered the beings of a different world, who did not depart to the world of dead, but received a new incarnation in another person. Therefore, according to the Buddhist tradition, which persisted until the 1930s, a child was left at the distance of hearing the knock of a tea mortar (Galdanova, 1987: 63). K.M. Gerasimova observed the practice of leaving the deceased children in the steppe in the Kizhinginsky District of the Republic of Buryatia (1969: 113). According to the informants, in the Kizhinginsky and Dzhidinsky Districts, before the 1960s, children who died prior to 2 years of age were wrapped in a bag, tied to the cart, transported to the steppe, and became "lost" when the rope was untied. According to the field materials, during the Soviet period, the bodies were left on the ground in the rocks, in a primitive coffin *khaptaga*.

The fourth type of children's burial is inhumation. It is known that before the 1960s, children up to 3 years of age were buried in the ground at the backyard near a barn. This example of contamination, the emergence of a new aggregate from the mixture of tradition and innovation, is not unique.

Stereotypes of burial of the society's sacred persons

The goal of this article cannot be accomplished without considering another aspect of public life—stereotypes of burial of the society's sacred persons. The main research findings have been published (Zhambalova, Suvorova, 2013, 2015). A holistic picture, illustrating both aspects of development (dynamism and stereotypy), is emerging from the verified and refined conclusions of these studies. Social stereotype is understood here as a universal mechanism closed for dynamic movement and intended to sustain the invariant stable core of the culture. Stereotypes of shamans' and lamas' burials differ fundamentally from each other, and from the types of burials of ordinary people. Burials of shamans and lamas are strictly regulated social events, which have important social and ideological meaning for the society.

The burial of shamans among the Buryats was always accompanied by memorization relying on the idea of cultural immortality. These are the symbols of the World Tree and the cult of ancestors, named *serge*, *obo*, and *barisa* (Zhambalova, 2000: 265–269). Six stereotypes in the burial of shamans can been identified. Their constant and accurate reproduction ensures the life of the society (Zhambalova, Suvorova, 2013). Some of them are more common in the Cis-Baikal region, others in the Trans-Baikal region. The first stereotype is air (celestial) burial, when the deceased is buried on a platform (*aranga*), suspended on poles or between trees in shaman groves. This is occasionally done even now, far from human eyes. In 2011, informants from the Irkutsk Region saw larch slabs that were hung on chains from four trees in the 1970s and 1980s. Other found larch slabs on hair ropes (Ibid.: 136–137). In 2007, informant A.A. Vankevich complained that the shaman grove near the village, formerly inaccessible to ordinary people, is becoming desacralized. The Internet is full of information about the Buryat sacred shaman groves, often posted for promotional tourist purposes.

The next two stereotypes are combinations of air burial and cremation. Cremation of shamans was technologically and ideologically difficult; it was not practiced in its pure form, and accompanied air burial

on *aranga* or in a tree. It could have appeared as a concession to the sanitary standards for utilization of the remains from the air burial. The second stereotype consists of three stages: burial on a platform; cremation after the completion of the sacred days; and burial of the specially collected ashes in a tree. The burial place is called *tabisa* (a place on a mountain pass for the offering to the mountain spirits). A hollow is made in a pine-tree, where the bag with ashes is placed. After that, the hollow is closed and the tree becomes a shaman's tree (Khangalov, 1958a: 389). Shamans' cemeteries existed in the Barguzinsky District of the Republic of Buryatia and in the Irkutsk Region in the Soviet period. The body of a shaman was placed on a platform, and in 49 days the remains were cremated (Lamaizm…, 1983: 133). The third stereotype is cremation of shamans with subsequent burial of the ashes in a tree, after a sacred period of time. The place where the burial is performed is called *shandan* (*shandaru* – 'white ashes').

The fourth stereotype is burial on the mountains between stones. This is probably more common in the Trans-Baikal region. This innovation could have resulted from adapting to the conditions of the Buddhist hegemony, as evidenced by the following story. By the order of the Trans-Baikalian lamas, the Selenga great shaman Shara *nokhoi* was exiled to Olkhon, Sarma. He died on the island, and was buried on *aranga* on Mount Ontkhoi. Later, according to the custom of the Trans-Baikalian people, his bones were laid on the ground and covered with stones (Zhambalova, 2000: 215). Here, a combination of two types of burial, air and above-ground, is evident, paying tribute to both the Cis-Baikalian and Trans-Baikalian traditions. The method of burying shamans on the ground on the mountains, on high sacred places, was engendered by the spread of Buddhism, when cremation became the prerogative of lamas.

The fifth stereotype is burial on inaccessible rock, in a mountain cave, or in a special grotto. The shaman in his armor is seated, and the entrance is built up with stones, leaving the clearance needed for the deceased (Zhivopisnaya Rossiya…, 1895: 159).

Essentially, all the above stereotypes are air burials. They convey the main idea of the Ascension: the sacred person returns to the divine world. Not only shamans were buried in this way. Those who were struck by lightning, as chosen by the heavens, were also subject to air burial. Smiths, who were particularly sacred persons in the society, were more often cremated (Suvorova, 2014: 22).

The sixth stereotype of burial is of the opposite nature. This is the burial of black shamans, dangerous for the society. Khangalov wrote that their souls are sent to the Lower World, or become completely destroyed through ritual manipulation. For frightful, most often black shamans, who supposedly ate people's souls, the underground burial was made with the use of aspen. They were buried face down, so they could not go back to the surface of the earth (Khangalov, 1958b: 484–485). Ritual flat burial with the use of aspen is known to the Siberian peoples, and is indigenous (Zhambalova, Suvorova, 2013: 136).

Burial and memorization of Buddhist priests are also stereotyped (Zhambalova, Suvorova, 2015). These are conducted in accordance with the written canons, following the Buddhist books. The method of burial depends on the will of the deceased and on divination, but more on the rank of the lama in the Buddhist hierarchy. There have been cases when ordinary lamas were buried almost like ordinary people, on the ground, and such cases are not considered in this study. A.M. Pozdneev described in detail two stereotypes of burial of the reincarnated persons (*khubilgan*) in Mongolia: embalming followed by cremation, and embalming with preservation of the body in the mummy's state of *sharil* (1993: 272–275). In Buryatia, the concept of reincarnated persons has not been developed; therefore these burial stereotypes are little known there. The primary stereotype in this region is cremation of lamas of high status, but below the rank of reincarnated persons. It has been practiced until the present day. This ceremony is simpler than the burial of reincarnated persons, but it is much more sophisticated than the burial of ordinary lamas and ordinary people. The added complexity of technique (special stoves, the use of large amount of melted butter, sophisticated rituals, etc.) is caused by the sacred nature of lama. For all Buddhists of Russia, cremation is a prerogative of lamas; it embodies the rite of the Ascension. In the Trans-Baikal region, cremation becomes impossible for lay people. In rare cases, noble people sought to obtain it. After the burial, a cycle of rites for memorization of the spiritual person is performed. On the next day or on the third day, people gather ashes, "the treasure of all treasures". Places of cremation in the future are good for the above-ground burial of ordinary people (Gombozhapov, 2006: 82). Ashes are added to the compound for the formation of *tsa-tsa*—miniature symbols of the cosmic body of the Buddha. Ashes are placed inside sacred stupas; these are often personal and are dedicated to specific lamas.

Another stereotype is flat burial in a special box, which makes it possible to arrange the deceased person in a meditative pose, with the subsequent exhumation usually of the well-preserved body. This is followed by cremation and memorization by placing ashes in stupas. Two hypotheses can be put forward. This stereotype is preferred for lamas who possess secret knowledge "enabling" them to enter the state of eternal *samadhi* meditation. Alternatively, it could have emerged in the Soviet period: the lamas believed that after the forthcoming end of the Soviet dictatorship they could be exhumed and traditionally memorialized. They were as if waiting for the arrival of a new wave of Buddhism.

Reliable stories are now known about lamas buried in Soviet times in the ground (in accordance with their wills), and returned as sacred objects to the post-Soviet areas via exhumation, cremation, and the erection of personal stupas. Their lives, deaths, and historical memories are legendary. The landscapes of the modern Trans-Baikal region are replete with stupas, and of the Cis-Baikal region with shamanistic attributes, which are important for the formation of ethnic and religious identity of the society, favorable vital territory, and its tourist attraction.

The incorruptible body of XII Pandido Khambo Lama D.-D. Itigelov is one of the holy objects of Buddhism. Here it is important to emphasize the following facts. Buddhists believe that Khambo Lama D.-D. Itigelov did not die, but left to the other world in 1927 on a personal decision during meditation, surrounded by lamas, who were asked to read the necessary prayers. After the ceremonies, he was placed in a cedar box and buried in the ground. In accordance with his will, he was taken out for inspection after 30 years, and again after 75 years. In 2002, the final exhumation was conducted. Now, Khambo Lama D.-D. Itigelov is in Ivolginsky Datsan and, according to Buddhist belief, is in a state of *samadhi* meditation, controlling his physical state.

Conclusions

The types of burial of ordinary and sacred people are fundamentally different. Prior to the radical historical events that led to dynamic changes in all spheres of life, ordinary people were typically buried in above-ground burials with covers and accompanying goods, or cremated. Such burials were made in the whole ethnic area and resulted from adaptation to the environmental conditions in accordance with specific worldview. Sanitary requirements of the Russian Empire and the Russian Orthodox Church led to a gradual transition to inhumation in coffins at cemeteries. Buddhism introduced innovations formed by recombination of the elements of tradition; therefore they quickly took root.

Accession to Russia and the spread of Buddhism resulted in the emergence in the Baikal region of two subregional religious groups—shamanists of the Cis-Baikal region and Buddhists of the Trans-Baikal region. The changes affected burial practices as well. Two types of the above-ground burials became common—shamanistic and Buddhist. In the peripheral Buddhist regions, contamination can be observed. In the Cis-Baikal region, cremation of ordinary people became widespread, while in the Trans-Baikal region, above-ground burial without cover, carried out according to Buddhist rules, became common. The types of children's burials are determined by their social status and age group, and include air burial, cremation, above-ground, and flat burial. Burials of sacred persons of the society are stereotyped, and the subsequent memorization is mandatory. Six stereotypes of shamans' burials have been identified; five of them convey the idea of Ascension, and one is of the opposite nature. Burial of the Buddhist clergy is conducted in several sophisticated ways. Social gradation has determined two trends in the development of funeral rite among the Buryats. One (profane) trend is characterized by dynamism, which allows the ethnic group to harmoniously fit into the global world. Another one (sacred) is stereotyped and closed to innovation, which preserves the traditional core of the culture—the basis of the ethnic group's identity. Both trends ensure the preservation and development of the Buryat society in the space-time continuum.

The section on the burials of children is fundamentally new in this typology. The impossibility of air burial for ordinary people has also been revealed; the presence of two types of above-ground burials (shamanistic and Buddhist) has been emphasized; contamination in the peripheral Buddhist regions as a result of dual faith has been observed. Other adjustments have also been made.

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Substitute Offering: An Ob Ugrian Ritual Tradition Surviving in the 20th and Early 21st Century

The substitute offering is a little known ritual practice described by Artturi Kannisto among the northern Khanty and Mansi in the early 1900s, and by the Novosibirsk ethnographers in 1985–2017. Substitution was practiced in case of the offeror's illness, absence of a requisite domestic animal, or unsuccessful hunt. In such cases, instead of actual animals, their effigies were offered to the guardian spirits—figurines of horses, reindeer, cows, sheep, and cocks cut from birch-bark or cast of lead; alternatively, purchased toys were offered. A substitute could be a pencil drawing on paper, or an embroidered figure of a horse on cloth. The specific substitute was normally prescribed by a shaman; it had to be made only by someone unrelated to and older than the supposed offeror. The effigy and the prayer to the deity, accompanying the offering, are described. Animal effigies were kept in sacral chests, placed into the clothes of guardian spirits, tied into the corners of head cloths and ribbons of blankets to be offered. The combined version of the substitute offering includes hitherto unknown representations of a head cloth, a coat, or a robe, cut from birch-bark.

Keywords: *Ritual, substitute offering, horse, reindeer, birch-bark.*

Introduction

An offering, to accompany prayer to a deity, is one of the main elements of the religious-ritual practice of the Ob Ugrians. This ritual was strictly regulated by their spatial and temporal prescriptions. Fellowship with the God was achieved through prayers and offerings accompanying the most important events of human life from birth to death. In the case of severe illness or ailment, a person had the right to a temporal delay of the offering: an effigy was substituted for the real animal. Another reason for a substitute offering was the sheer absence of a requisite animal (people were not engaged in animal husbandry, there were no animals because of poverty, reindeer were at distant pastures, etc.).

The substitute-offering ritual practiced by the northern Khanty and Mansi population was observed by A. Kannisto in the Lower Konda, Upper Losva, Upper Severnaya Sosva in the early 1900s, and by the Novosibirsk researchers in the Khanty-Mansi Autonomous Okrug–Yugra (hereinafter—KMAO–Yugra) and the Yamal-Nenets Autonomous Okrug (hereinafter—YNAO) in 1985–2017.

The Ob-Ugrian tradition of substitute offering as described by Kannisto

The Voguls from the Lower Konda River asked a shaman for prescriptions as to which specific animal should be offered in case of a particular illness. The shaman was supposed to eat a fly agaric and have a nap; having awakened, he went out of his house and informed the guardian spirit what animal would be offered. The shaman mentioned, for example, a horse—"the one with a mane" (Kannisto, Liimola, 1958: 286). Apparently,

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the illness did not make it possible for a sick person to perform the offering ritual; moreover, an ailment was considered an inappropriate state for such a ritual observance (cf. The temporal prohibition for ritual practices upon human's death).

At Konda, people used to cut a flat figurine of a sacrificial animal from birch-bark: a horse for a supreme god; a cow, sheep or cock for a supreme god or guardian spirits. The sacral effigy could be made by a shaman or a person unrelated to and older than the sick offeror. This member of the ritual held the birch-bark figurine in his hand and moved it around the head of the sick person from east to west three or four times. If the sick person was able to pray, he addressed the supreme god with the following prayer:

> Blessed man, blessed father!
> In the day of illness, when we got sick,
> In the day of suffering, when we got distressed,
> We drive
> With our hand an ungulate animal as a bloody sacrifice to you,
> With the live hand – a horned animal.
> Would you sweep me, would you wave your hand
> Holding a goose feather, a duck feather.
> With a good support as large as a bosom, a knee
> Support me! (Kannisto, Liimola, 1951: 310–311).

After prayer, the birch-bark effigy was put on a windowsill close to the head of the sick person's bed. When the sick person recovered, the animal offering ceremony was performed and the birch-bark effigy was burnt. If the person died, the real offering was not performed (Kannisto, Liimola, 1958: 299).

At the Upper Losva River, in case of a person's illness, substitute offering of horse- or reindeer-effigies cut from birch-bark was performed for a particular guardian spirit. Effigies were mostly offered to major gods: *Khul-otyr* (in case of smallpox), *Polum-torum*, or *Mir-susne-khum*; offerings to family guardian spirits were less common. During the ritual, people used to say: "A reindeer image should be cut for *Yevtim-sos-otyr-pyg*, who saved many souls from illnesses" or "I promised to offer you a horse with a mane, do not torment me any longer!" (Ibid.: 298). Birch-bark effigies were used to wrap banknotes, and this bundle was moved around the head of the sick person clockwise, with prayer. After that, the effigy was tied into a corner of the sacrificial head cloth, and put in a sacral chest. After recovery, when the actual animal was sacrificed, the birch-bark figurine was taken from the chest, dipped into the animal's blood, and torn into pieces. Alternatively, the effigy was burnt (Ibid.: 299).

A similar tradition was recorded by Kannisto among the Voguls inhabiting the upper reaches of the Severnaya Sosva: if a sick person died, an actual animal was not sacrificed, instead the effigy was burnt (Ibid.). Kannisto described in detail the sacrificial goods from several sacral chests. One of the chests contained the goods offered to *Tapal*-old man (*Polum-torum*): two summer sable skins, and four head cloths, one of which had a folded birch-bark reindeer effigy (*sali khuri* 'reindeer image') tied into one of the corners. Kannisto wrote that such a representation was cut when vowing to offer an animal, and was discarded when the offer was fulfilled (Ibid.: 314). Another chest, which stood at the rear shelf in the Vogul dwelling, contained many multicolored, black, or white sacrificial cloths; at its bottom lay a bird representation cut from cardboard (Ibid.: 315).

In case of unsuccessful hunt or absence of a requisite domestic animal, a substitute offering was made with an effigy cut from birch-bark for the family or forest guardian spirits (Ibid.: 299).

Substitute offering in the Ob Ugrian tradition of the late 20th to early 21st centuries

The field studies by the present author in northwestern Siberia have yielded new information; a few substitutes have been photographed for the first time in the history of research. Furthermore, it has been discovered that in the 20th century substitute offering was performed in two cases: when a person was ill and was not able to make an actual offering to the deity, and when no requisite domestic animal was available. Both options are addressed below.

Substitute offering in case of illness. Kannisto described the ritual of cutting an animal figurine from birch-bark, moving this figurine around the sick person's head, and praying, which survived in more recent times. In the late 20th century, for the first time, the situation was described when the sick person was a child: "If a child got sick, one should pray for the gods to take pity. I will promise to offer a reindeer for my child's recovery, and will put a head cloth into the chest. When you cut a reindeer effigy of birch-bark, it's like you make a sacrifice. When an actual reindeer is offered, the birch-bark effigy has to be burnt" (the village of Timka-paul, Sovetsky District, KMAO–Yugra; informant A.V. Dunaev, a Mansi; Field Materials of the Author (hereinafter—FMA), 1997). Among the Lyapin Mansi, the information was recorded that around her sick son's neck, a mother tied *arsyn*, the sacrificial cloth, which was removed in four days and put into the chest where family guardian spirits were kept (the village of Khurumpaul, Berezovsky District, KMAO–Yugra; informant P.I. Khozumov, a Mansi; FMA, 1985).

The birch-bark effigies represented either a horse or a reindeer. The sacrificial representation of a horse is mostly typical of the Mansi population of the Severnaya Sosva River basin. For instance, in Khalpaul, the cult attributes remaining upon the death of the first husband of M.V. Pelikova were kept in a large barn located near the

house. Inside the barn, two suitcases and a birch-bark box were placed on two wide shelves at the rear wall. One of the suitcases contained sacrificial head cloths, bunches of fox skins, two sacrificial blankets, a warrior's helmet, and a small bundle of red fabric, containing a silver saucer and a horse representation cut from birch-bark. Another birch-bark horse figurine, wrapped in foil, was kept at the bottom of the suitcase (Gemuev, Baulo, 1999: 39–42).

In the same village, in a sacral chest, among home fetishes belonging to G.V. Tasmanov, *arsyns*, sable- and squirrel-skins, a few shirts, and a birch-bark horse figurine, which was wrapped in white cloth, were kept (Ibid.: 42).

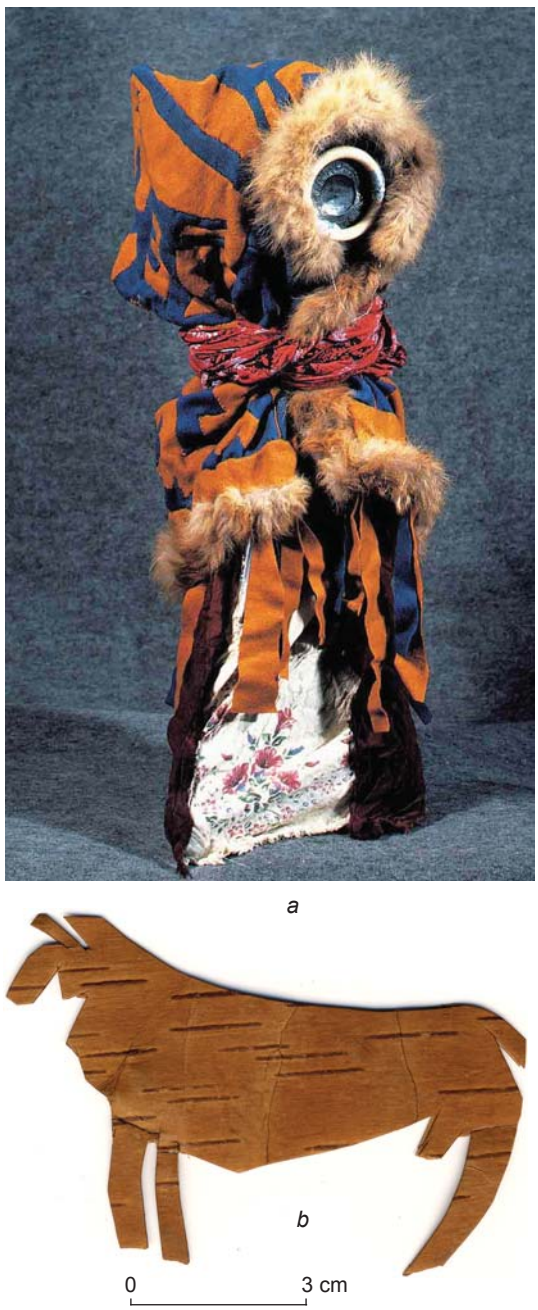

Fig. 1. Figurine of a guardian spirit (*a*), and a birch-bark reindeer effigy placed into its clothes (*b*).

Birch-bark reindeer effigies have been revealed both among Mansi and Khanty people. Several such effigies were found at the bottom of sacral chests: in particular, in the attics of the houses of A.N. Vadichupov, a Mansi (Kimkyasui, Berezovsky District, KMAO–Yugra; FMA, 1997), and of Khanty people: A.A. Alyaba (Vershina Voykara, Shuryshkarsky District, YNAO; FMA, 2001) and the Artanzeevs (Yamgort, Shuryshkarsky District, YNAO; FMA, 2005).

The substitute offering from a sick person was mostly made for the home (family) guardian spirit; therefore, the birch-bark animal effigies were often kept together with this person's clothes. For instance, in a house of T.I. Nomin, a well-known Mansi shaman, a large anthropomorphic figurine of *Nyays-talyakh-oyka-pyg* 'a son of a man from the upper reaches of the Nyays River' was kept. Its body was made of several red and white cotton head cloths; into the corners of the cloths, coins of 10, 15, and 20 kopeks produced in 1940–1953 were tied. A birch-bark reindeer effigy 8.7 × 5.8 cm was wrapped in one of the cloths (Ibid.: 69) (Fig. 1). The figurine of the guardian spirit of Mansi Khozumov's family (Yasunt, Berezovsky District, KMAO–Yugra; FMA, 1999) was made of four shirts (pink, red, blue and motley), on which a robe made of thick red woolen cloth and a red shirt were put. Silver coins of 5 kopeks of 1858 and 1859 were placed between the clothes. A reindeer birch-bark effigy was sewn on the edge of the red shirt close to the head of the guardian spirit (Baulo, 2013: Fig. 119). An anthropomorphic figurine cast in lead and dressed in several shirts and robes, dated to the turn of the 19th and 20th centuries, represented a guardian spirit of the Khanty family of Shianov (Lokhpodgort, Shuryshkarsky District, YNAO; FMA, 2017). The body of this figurine was girded with a red woolen cord, holding a reindeer birch-bark effigy.

Substitute offering in case of the absence of a requisite domestic animal. Such a situation was rather typical, and was the result either of a person's poverty, or of his/her temporary absence from home; for instance in summer, when reindeer were driven for pasturing in the Northern Urals.

For the rituals of substitute offering to family guardian spirits, horse- or reindeer effigies were most often cast in lead (more rarely, carved of wood). The figurine, together with a coin or a banknote, was wrapped into a piece of fabric and placed into the sacral chest. Lead horse figurines were found in the family sanctuaries of the Mansi family of Sambindalov (Yanypaul, Berezovsky District, KMAO–Yugra) (Fig. 2), the Khanty Noviyukhovs (Yukhan-gort, Berezovsky District, KMAO–Yugra) (Baulo, 2016: Fig. 7), and also among the

Kunovat Khanty (FMA, 2017). Lead reindeer figurines were found in the Khanty villages of Anzhigort, Karvozh, and Nimvozhgort, Shuryshkarsky District, YNAO (Ibid.: Fig. 256, 257). A wooden reindeer figurine was revealed at the Khanty sanctuary, near the village of Khoryer of the same district (Ibid.: Fig. 73).

When Mansi and Khanty people could afford it, they bought Russian or Zyryan toys (Gondatti, 1888: 7, 16; Glushkov, 1900: 72) representing horses (Fig. 3) or reindeer (made of copper, papier-mâché, rubber, or plastic) as offering substitutes (Baulo, 2016: Fig. 71, 72, 146, b; 149, 263, 264; 2013: Fig. 217). In the village of Khoshlog, a massive cast copper figurine of a horse with a bell on its neck was presented to heavenly gods: the horse figurine, together with a silver saucepan produced in Moscow in 1830 and copper and silver coins of the 1840s–1890s, were wrapped in a silk head cloth (Baulo, 2013: Fig. 219). Here, additional objects increased the value of the temporary substitute. The association of the animal figurine with the silver saucepan could have also been a holdover from an old custom of using only metal dishes to serve and consume the offering's meat (Chernetsov, 1947: 120).

Another example of the substitute offering is a red figure of a horse which is represented on a unique blanket of woolen cloth, 88 × 42 cm, kept by a Mansi K. Pakin (Verkhneye Nildino, Berezovsky District, KMAO–Yugra) (Gemuev, 1990: 117) (Fig. 4).

Combined version of the substitute offering. A birch-bark or paper effigy could supplement the other cult object, like a sacrificial blanket made for *Mir-susne-khum* 'world-watching man', and a large head cloth manufactured for Goddess *Kaltas*. Among the home fetishes belonging to A.N. Vadichupov, a Mansi mentioned above (FMA, 1997), there was a sacrificial blanket, 67 × 71 cm, made of red and black woolen cloth edged with squirrel fur, and bearing the images of four horsemen. It was manufactured in the early 20th century. The blanket's face was covered with a pink silk head cloth, sewn to the cloth along the edges. Between the cover and the cloth, a birch-bark effigy of a cock was placed (Fig. 5). Notably, a cock is a rather typical offering of the northern groups of the Ob Ugrians. According to P.A. Infantiev (1910: 14), the cock was "a favorite offering to home shaitans"; similar information was reported by V.N. Chernetsov (Istochniki…, 1987: 166), I.N. Gemuev (1990: 173–174, 192), E.G. Fedorova (1996), and others.

Fig. 2. Lead horse effigy, with a silver coin fused into its body.

Fig. 3. Papier-mâché horse effigy—an attribute of the family sanctuary.

Fig. 4. Sacrificial blanket with a horse image.

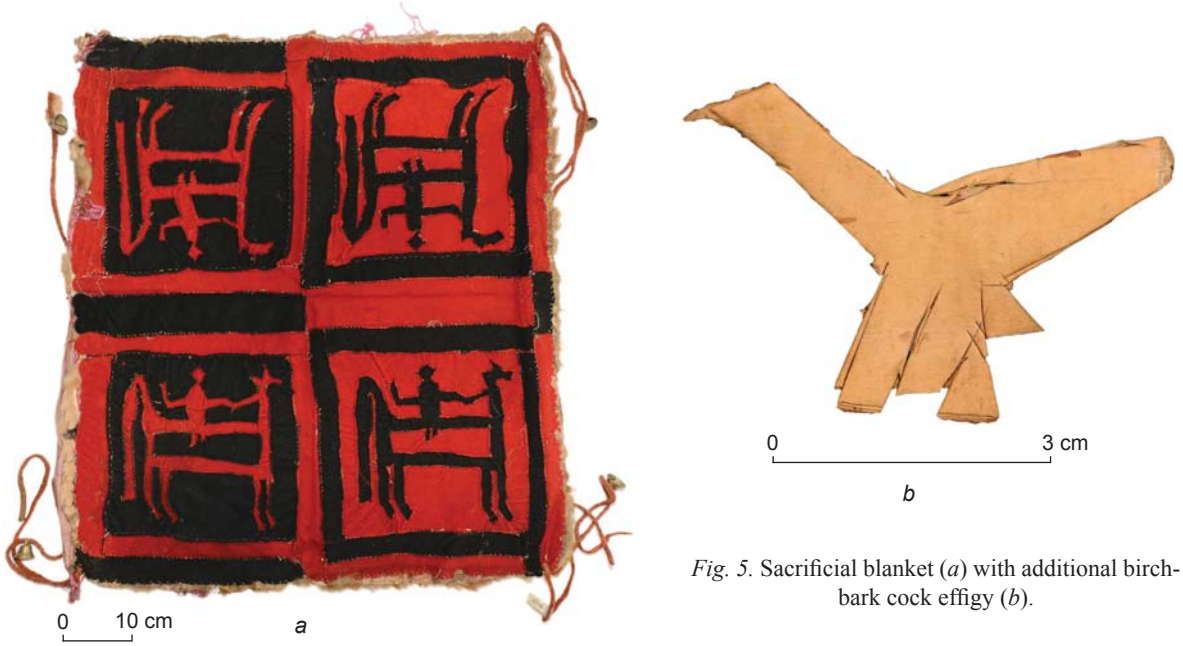

Fig. 5. Sacrificial blanket (*a*) with additional birch-bark cock effigy (*b*).

In the field season of 2016, in Khurumpaul of the Berezovsky District, KMAO–Yugra, a sacrificial blanket, 60 × 60 cm, was found, made of yellow and blue woolen cloth and edged with squirrel fur, and showing four images of horsemen. Two patches of multicolored cotton fabric, two copper bells, and two rattles (one of copper and one of iron) were attached to each corner of the blanket. One of the narrow patches at one of the corners was tied around a piece of paper, 7.4 × 6.2 cm, folded in two and bearing a reindeer image drawn with a pencil (Fig. 6).

We have noted other articles that had been additionally offered to Goddess *Kaltas* and not reported as substitute offerings earlier. For example, in 2015, in the village of Yukhan-gort, Berezovsky District, KMAO–Yugra, a large silk reddish-purple head cloth ornamented with golden-yellow floral embroidery was purchased from the Noviyukhov family of Khanty. The head cloth was edged with a strip of black cotton fabric, to which, along the perimeter, gray threads symbolizing a Goddess's silver with the threads is 160 × 10 hair were sewn. The head cloth is 86 × 86 cm; the size 0 cm. Silver 10-kopek coins from the year 1905, and 20-kopeks of 1923, together with a small "kerchief" 3.0 × 2.6 cm, cut of a small birch-bark piece, were wrapped into one of the head cloth's corners.

Fig. 6. Sacrificial blanket (*a*) with additional paper representation of a reindeer (*b*).

Fig. 7. Silk head cloth (*a*) and birch-bark "kerchief" (*b*).

The central square part of the small "kerchief" was marked with lines cut with a knife; its long sides were decorated with scallops imitating the sewn-on threads (Fig. 7).

In 2016, in the village of Lombovozh of the same district, a square head cloth offered to Goddess *Kaltas* was purchased from a Mansi. It was made of pink fabric, and was embroidered with blue and yellow threads. The head cloth was edged with a broad strip of red fabric, with gray threads attached to the edges. The head cloth is 100 × 90 cm; the size with the threads is 176 × 166 cm. Small copper bells were sewn on to the corners of the article; a copper ring was tied to one of the threads; a silver 10-kopek-coin of 1870 was tied to one of the corners; the other corner wrapped an effigy of a coat or a robe, cut from birch-bark, 4.5 × 4.5 cm in size (Fig. 8). The offering of overclothes (both ready-made and tailored) to guardian spirits was reported by many authors (see, e.g., (Kannisto, Liimola, 1958: 314–318; Gemuev, Sagalaev, 1986: 33; Gemuev, 1990: 106; Bogordaeva, 2008; 2012; and others)).

Fig. 8. Birch-bark figurine representing a coat or a robe.

Conclusions

Materials collected by A. Kannisto and field-materials of the author's describe the tradition of substitute offering among the northern groups of the Ob Ugrians throughout the 20th to early 21st centuries. Substitution was practiced in case of the offeror's illness, the absence of a requisite animal, or an unsuccessful hunt.

In the case of illness, the specific substitute was prescribed by a shaman; the sacral effigy had to be made by someone unrelated to and older than the sick person. Researchers described birch-bark figurines representing horses, reindeer, cows, sheep, and cocks. A substitute offering was intended for the family's guardian spirits; therefore, the birch-bark effigies were usually placed in its clothes. Upon the sick person's recovery, the actual animal was offered, and the birch-bark figurine had to be burnt or torn into pieces. In reality, these figurines were usually kept among other cult attributes. If the person died, no real offering was performed. In the case of a child's illness, the substitute offering had certain specific features. In the absence of a requisite domestic animal, a horse- or reindeer-figurine was cast of lead, or ready-made toys were used in the ritual.

The combined version of the substitute offering represented the use of a birch-bark (or paper) image in addition to the tailored sacrificial blankets and head cloths.

Thus, the new information on the practice of substitute offering among the northern Ob Ugrians, throughout the 20th to early 21st centuries, adds significantly to our knowledge of the tradition of communication between a human and the realm of deities and guardian spirits.

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Seventeenth Century Siberia as a Land of Opportunity: Social Mobility Among the Russian Pioneers

On the basis of individual biographies, we explore the social mobility patterns among the Russian colonists of Siberia (members of Russia's service class) in the 1600s, with reference to theories relating to the sociology of labor and social stratification. We show how peasants, hunters, fishermen, and freedmen were co-opted into the service class, and how their social status changed at all levels—horizontal, vertical, geographical, individual, group, intergenerational, and within-generational. Occupation, skills, and income were important factors affecting social mobility. For nearly all categories of migrants, the most common tendency was migration of entire families, though younger single migrants were more likely to move over longer distances. In Siberia, where social regulation norms copied those of the metropolis, upward social mobility occurred nearly exclusively within institutions. Social service provided maximal opportunity for the individual's promotion and for the current and future status of his relatives. This was an efficient mechanism for securing high mobility in Siberian society. By the early 1700s, the degree of mobility had decreased, downward mobility had increased, and the social system had become more sustainable.

Keywords: Career, promotion, social status, social classes, biography, Siberia, service people.

Introduction

The territory of Siberia began attracting pioneers and settlers from various regions of the European part of the country as early as in the 16th century. The region was extremely rich in land, water, fur, and other resources. Besides, the vast expanse of Siberia allowed moving over great distances within the same state. This provided the career advancement opportunities at the "horizontal" level.

It has been a long time since historians of Siberia paid attention to the problem of general social advancement of Siberian service class people and to their career progression, in particular. By now, researchers have amassed considerable factual material about dozens of Siberian service people of the 17th century: high (voivodes, boyar scions (petty noblemen), noblemen) and middle-ranking officers (atamans, sotniks, pyatidesyatniks), including their origin, service, promotion, or demotion. However, these studies were predominantly aimed at reconstruction of biography of one or another person or his family. For example, G.F. Miller presented the whole kaleidoscope of service people biographies in the pages of his "History of Siberia", including: Ilya Ermolin (Miller, 2003: 52–53, 153, 162, 171, 195), the Kolmogorov family (Ibid.: 195–197, 217–218, 236, 250–251), ataman Dmitry Kopylov (Ibid.: 50, 76–81, 205–206, 223–239), pyatidesyatnik Vasiliy Moskvitin (Miller, 2005: 47, 169–183, 186–190), and others. K.B. Hasenwinkel even attempted

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to compile a reference and biographical dictionary of Siberian notables of the 16th–17th centuries (1893–1895); N.N. Ogloblin restored the professional and personal life chronology of Vladimir Atlasov, Semen Dezhnev, and Demyan Mnogogreshny (1890, 1892). S.V. Bakhrushin introduced many details in the lives of the Siberian voivodes (1955a, b).

In spite of radical methodological turns, the approach to Siberian service people in the Soviet and post-Soviet historiography remained substantially the same. The careers of service people and changes in their social status were still being looked through the eyepiece of biographical method. At the same time, the best practices of sociology of labor, even in its Marxist interpretation, remained beyond the scope of specific historical studies. Publications by V.A. Samoylov, N.I. Nikitin, G.A. Leontieva, D.Y. Rezun, E.V. Vershinin, A.S. Zuev, I.R. Sokolovsky, P.N. Barakhovich, and others, devoted to reconstruction of the biographies of service people (Samoylov, 1945; Nikitin, 1999a, b; Leontieva, 1997; Rezun, 1993, 2003; Vershinin, 1998; Zuev, 2000; Sokolovsky, 1999, 2006; Barakhovich, 2015a, b), may be mentioned as examples.

Methodology

The existing situation in the historiography forces us to turn towards discussion of social advancement among the members of service class in Siberia of the 17th century, having considered abundant factual material using social-science theories and social mobility concepts. The major issue to be studied is to what extent the "land of opportunity" formula corresponds to Siberian reality and, accordingly, where the Siberian society was on the "social mobility" scale. This issue has never been accentuated earlier in Siberian studies. In theoretical sociology, these issues were considered at a complex level by P.A. Sorokin in the 1920s (2005). His conceptual framework and treatments became universally recognized and gained momentum in further studies conducted by such sociologists as D.V. Glass (1967), M. de Certeau (2010), N. Luman (2005), J. Urry (2012). Among the recent Russian publications, we shall mention a summarizing paper by O.I. Shkaratan (2012).

The systemic assertion that forms the basis of our paper is the presentation of career advancement among the service people in Siberia of the 17th century as a regular change in the status (position) at all levels of social mobility—horizontal, vertical, geographic, individual, group, intergenerational, and within-generational. The mobility in this case is described as a universal phenomenon inherent in the highly organized societies and, more broadly, meaning the change of position in the social hierarchy. As a rule, upward social mobility occurs within institutions (social elevators in the terminology proposed by Sorokin (2005: 87). In the Siberia of the 17th century, one of the main institutions was the sovereign's service. Exactly this public service provided maximal opportunity for the upward social mobility of an individual, his family members, and descendants, and determined the degree of mobility of Siberian society. Along with trends in individual promotion, we also consider the mobility parameters of service people in general as a group within Siberian society in respect to its relations with other social layers.

It should be expressly stated that we study biographies of the most numerous group of service people, predominantly of middle-rank men. The social mobility processes among the voivodes and the bureaucratic administration are not touched upon. Also, captured Polish nobles from Rzeczpospolita (the Polish-Lithuanian Commonwealth), who were usually appointed to the highest administrative positions in Siberia, are not considered. All the above allows us to fit individual facts of career movement into the general pattern of social mobility among the service class in the Siberia of the 17th century.

The role of the state in social mobility

In the early development of the Trans-Urals territory, there were large disparities of social status between settlers. In essence, service people reassigned from the European part of the country, after arrival in Siberia, immediately fit into its social life. Only the civil service could have guaranteed material security and position in Siberian society. Therefore, active menfolk sought admission into the sovereign's service. By the decision of the tsarist government, in the Trans-Urals territory, garrisons were formed and stockade fortresses were built; subsequently, the latter became considerable settlements, around which rural areas arose. The garrisons consisted of Cossacks (both foot and cavalry) and of "boyar scions", who were the main helpers of the voivode administration.

People often went to Siberia, explaining it as "escaping from crop failure and Church dissent". These reasons were not the only ones; however, only the most active, passionate persons could have broken away from a traditionally established way of life and set off for an unknown land. At the initial stage of colonization, adventurous and skillful settlers always managed to find

their place in life under new conditions. A significant role here was played by the capacity of each settler for adaptation: social, ecological, economic, and linguistic (since the newcomers had to live among indigenous ethnic groups).

In addition, over a span of several centuries, Siberia was a place of exile, where the accommodation of disgraced people gradually shifted to the northeast of the region. The service class was supplemented both by numerous reassignments from various regions of the state, and by involving representatives of other social groups, including the aboriginal population. For the aboriginals, this was a mutually beneficial process. By involving indigenous population in the sovereign's service, the authorities compensated for the lack of human resources and mitigated ethnic conflicts, while newly baptized aboriginals received benefits and material support. In the history of Siberia of the 16th–17th centuries, there were many cases when local aboriginals made their "careers" after mandatory baptism (Bakhrushin, 1955b; Lyutsidarskaya, 2011, 2014, 2015). As shown in the paper by M. de Certeau, the diversity in a society consisting of communities often entails various forms of social mobility (2010: 161–162). However, this is a subject of special studies, so we do not consider the attitude of authorities to the indigenous population of Siberia in this paper.

Apart from service class people (whose movements were controlled by the governmental structures), peasants, commercial hunters oriented towards procurement of valuable furs, craftsmen, and others rushed to Siberia. Freedmen, who moved without restriction and chose occupations at their own discretion, made up a special category of the population. Thus, for some time, they fell outside of the stationary social relations; though they often were affected by them again over time. The previous social status of the freedmen was extremely varied; however, most of them originated from the peasant communities and settlements of the Russian North (Preobrazhensky, 1972: 100–101). There is an opinion that the "freedmen ("free-walking people") wander as shadows across the pages of documentary history, and are portrayed almost as an annoying hindrance for the activities of officials" (Golovnev, 2015: 500). In general, this is true for the history of Siberia of the 17th century. However, at the initial stage of colonization, the freedmen were often successfully involved to "close the gaps" in various situations resulting from the obvious lack of human resources. This is quite in line with the theoretical considerations of D. Glass, who supposed that social equilibrium had a mobile character in developing societies, and the stronger circulation is, the more flexible is the population structure and more expedient is selection of individuals for each layer (Glass, 1967: 18–19).

In new Siberian conditions, settlers might change their way of life as dictated by new circumstances. Frequently, the freedmen learned skills that subsequently became their "specialty". In 1604, there was an instruction from Moscow to Siberian voivodes to select "carpenters at Verkhoturye from good freedmen who are skillful in any carpentry jobs and capable of building ships" (Verkhoturskiye gramoty…, 1982: 149). Ship-construction required a certain expertise, and, together with "master workmen", who were obviously not numerous in Siberia, other "free-walking carpenters" underwent training in special skills during work. Subsequently, this enabled many good workmen to change their status from "freedman" to "ship's carpenter", which promised a good salary and higher social standing (Ibid.: 150). The possibilities of gaining a new status expanded with the construction and development of new cities. In 1604, Tomsk was founded, and in 1605, an instruction from the tsar was given to invite to Verkhoturye "fifty freedmen and eager people to the new town of Tomsk as service people and plow peasants… payment in money and bread will be provided…" (Ibid.: 167–168). In 1607, owing to a lack of riflemen for guard duty, a tsar's letter was sent with a requirement to enlist the deficit from freedmen that were "…fit for service, skillful at shooting, and not thieves". In so doing, the Cossacks were invited to take charge of new riflemen (Ibid.: 195–196). Most frequently, freedmen started their working activities in Siberia as employees involved in the transportation of various cargoes. Subsequently, their life journeys made highly improbable twists and turns. Some of them settled in towns, acquired real estate, families, etc.

An example of changing social standing from the lowest level to a higher one can be found in the census record of Tomsk boyar scion Dmitry Litosov. His grandfather, born in Kargopol, appeared in Tomsk as a freedman, then he managed to enlist in the Cossacks, and subsequently was awarded the rank of boyar scion for his services. Thereafter, his son and grandson remained in this highest service-rank. There is no information about the actual status of the grandfather of Litosov in the Kargopol region. A peasant, a craftsman, a work-hand, a fugitive debtor, a robber, and the like could hide in the guise of a freedman. However, there is no doubt that if Litosov remained in the Kargopol region, he would not have reached a high rank, nor ensured decent living standards for his heirs (Tomsk…, 2005: 44). The career of Cossack cavalryman Avdey

Titov, from Kuznetsk, was rather similar. His father, who lived by himself near the Sysol River, came to Siberia as a freedman, settled in Kuznetsk, enlisted in the foot Cossacks and died after 20 years of continuous service. His son took over Avdey's father-in-law's position in the Cossack cavalry (Kamenetsky, 2005: 296). The mobility of service people of varying ethnicity is in line with the conclusions of Sorokin, who argued that natural selection is particularly effective when "maximally professional and active individuals establish themselves in certain social layers, while those who do not possess these characteristics are 'washed out'" (2005: 349).

Having joined the service class in one way or another, Cossacks usually tried to take a step up. The foot men missed no opportunity to become Cossack cavalrymen, while the latter, in turn, strove to distinguish themselves and take a place among the boyar scions. Such promotions promised improvement of social status, and doubtless also financial benefit, including both an increase in salary and the appearance of new business opportunities. For example, Zakharey Matveev, a "townsman's son", came to Siberia with his wife and children from the Ustyuzhsky Uyezd. In Kuznetsk, he enlisted in the Cossack cavalry. After this, Zakharey was assigned to the voivode's office as a scrivener in the provision supply department, where he served for nearly 30 years, after which he was given the status of boyar scion "for old age and mutilation". Subsequently, his son Nikita found his place in the Cossack cavalry (Kamenetsky, 2005: 319).

A flow of petitions to Moscow, addressed to the tsar from across Siberia, was permanent. A considerable part of these contained requests for an increase in salary or promotion to a higher rank. The petitions usually recited military achievements, indicated the term of service, etc. Generally, these requests were granted. For example, in 1623, a tsar's letter was received about the appointment of Cossack cavalryman Gavrila Ivanov, from Tyumen, as the ataman of Cossack cavalry. This was preceded by a petition addressed to the tsar that recited all the achievements of Ivanov during his long service in Siberia (42 years). By that time, the position of ataman had fallen vacant in Tyumen, so the request was granted (Miller, 2003: 446–447).

Sometimes, petitions ended with a curious attempt at some sort of "blackmail". For instance, Cossack cavalryman Yakim Zakhariev, who considered himself to have been left out of salary increases, wrote to the tsar that if his request were not granted, he would not serve with his former zeal. Yakim asked that he should be rewarded for his service, and for the blood that he had shed "by a salary from the Tsar, as God may advise, your merciful Majesty, so that I, your slave, will not be completely shamed in front of my comrades and will not retire from your further service" (Butanaev, Abdykalykov, 1995: 36). Such expressions are encountered in a number of other petitions. In the petition addressed to Tsar Mikhail Fyodorovich by the service people of the Yeniseysk stockade with regard to paying their salaries (late 1620s), the record of service is completed by the following sentence: "Please reward us, your slaves… so that we, being in the stockade of Yeniseysk, will not leave your Majesty's service" (Sbornik…, 1960: 15–16). In 1645, the Tyumen voivode knyaz G.P. Boryatinsky addressed the tsar with a request to hear his report on his service in Siberia and grant a lucrative compensation. The petition ended with the following words: "Please give the order, your Majesty, to heed my note, so that I, your slave, will not be completely lost and dishonored in front of my brethren, and will do my duty in your Majesty's service with joy" (Pribylniye dela…, 2000: 151). Petitions relating to career progression demonstrate the use of sociocultural adaptation mechanisms and show how important adaptation was in terms of population mobility.

Meanwhile, the notion of "social status" is considered by modern sociologists in the context of creation of family groups (Berto, Berto-Vyam, 1992: 106). Families contributed to the evolution of social mobility among their members, or transferred to them various elements that allowed an individual to change or retain his social status. A good example of this is the Grechaninov family (Grek, Grechanin, Grecheninov, Manuylov), which stood, socially, somewhat apart in Tomsk. In the land of Siberia, the Grechaninovs had managed to create a kinship clan, which guaranteed them a sustainable position in society for a long time. According to the archival documents, Manuyla Grek had at least nine sons. All of these were appointed to higher service ranks, the boyar scions. Even grandsons of Manuyla held one administrative position or another. All of the Grechaninovs were not only literate, but rather well-educated for their time. It happened that after moving to Siberia, Manuyla Konstantinovich Grechanin was able to teach his sons (quite probably, the father himself participated in teaching his children). The founder of the clan served in Moscow in a military Greek company, and in the 1640s was reassigned to Tomsk at the rank of boyar scion. One of his sons mentions in his census record that Manuyla had been deported. This was most probably true, but they preferred to conceal this fact. Stepan and Kalina Grechaninov were employed in the diplomatic service. Stepan participated in diplomatic missions to the Mongolian ruler Altyn Khan on more

than one occasion, while Kalina showed his abilities in the Altai region. Ivan Grechanin participated in military operations, leading a joint detachment of Cossacks from Tomsk and Kuznetsk. He was also the author of letters addressed to the Siberian Department about the state of affairs in the stockaded towns of Achinsk and Melessk. Fedor Manuylov Grechanin prospected for silver ore near the Kyshtak River at the end of the 17th century. Mikhayla Grechanin also held an administrative position. Petr Yakovlev Grechanin (a great-grandson of Manuyla's) carried out the first capitation in the Sosnovsky District of the Tomsky Uyezd in the 1720s. Description of the Grechaninovs' activities could be continued at length. They lived in Tomsk and owned acreages in the uyezd. Apart from administrative and political activities, the Grechaninovs did not stray from the activities peculiar to all service people of that time (they bargained, participated in agricultural land development, etc.). It was a very prolific family with many branches, that undoubtedly left an imprint in the history of the colonization of Siberia (Lyutsidarskaya, 1992: 25, 59).

Comparison of the social status of parents and their children allows intergenerational mobility to be identified, which is an important factor as regards status changes and manifestations of the activity of individuals. A positive transformation of children's social status as compared that of their parents is one of the indicators of a dynamically developing society (Luman, 2005: 158–160).

Expanse of Siberia and social mobility

Sustainable family clans guaranteed the stable existence of colonists in Siberian conditions. Having settled down in a new place, settlers tried to attract their relatives from the European part of the country to Siberia. Some documents about such movements are preserved in archives. Thus, Cossack cavalryman Terentiy Semenov, from Kuznetsk, asked permission to bring his wife and son, his brother with his wife and children, and his daughter-in-law to him from Ustyug; Yeniseysk Cossack foreman Fedor Elizarov Kazanets made a similar request regarding his nephew (RGADA. F. 214, Inv. 3, Col. 136, fol. 175, 213). The presence of relatives allowed them to expand their economic activities, the basis of subsistence.

The story of Parfen Stepnov, his children, and grandchildren is very interesting in terms of changes in social status. Judging by the available sources, it is hard to tell how Stepnov found himself in Siberia, particularly in Tomsk. Documents of the mid-17th century describe him as a service man, though one source calls him a foot Cossack. During this period, Stepnov was distinguished from other service class people by his regular fur-trading operations. However, more than furs fell into the scope of his commercial interests. The amounts involved in the trade activities of Stepnov differ markedly from the volumes of ordinary transactions in the Tomsk market. For example, in 1648/1649, he sold furs alone to the amounts of 44 rubles, while another business deal consummated as "local goods" (elks, hops, skins, bacon, fat, horsetails, etc.) amounted to 500 rubles. These are very considerable sums for that time. In subsequent years, customs documents continuously recorded the presence of Stepnov in the Tomsk market. In 1657, he sold furs to the amount of 26 rubles, and bought 29 head of cattle from indigenous inhabitants of Siberia. Ten years later, Stepnov undertook a journey to Yeniseysk, with sables owned by merchant F. Kislov to the amount of 100 rubles. At the same time, he sent hops to A. Tikhonov, a known Yeniseysk salt producer, who charged him with delivery of 700 pounds of salt to Tomsk. Furthermore, Stepnov also carried his own goods to the amount of 177 rubles. Obviously, such transactions in goods were made annually. Unfortunately, we have not found any documented data on the agricultural activities of Parfen Stepnov; it is known only that in the middle of the 17th century, local authorities borrowed from him more than 33 quarters of rye, intended for paying service people (Ibid.: Col. 470, fol. 30). However, Stepnov could have purchased grain from the local population too.

Parfen's sons were immediately, without gradual promotion from rank to rank, assigned to the boyar scions, and combined their service with business and economic activities. Andrey Stepnov was head of a customs office in 1706 (Ibid.: Inv. 1, Bk. 1452, fol. 4). Judging by the documents, he visited Moscow on missions. Andrey had a large mansion in Tomsk and considerable acreages in the rural district, owned two mills, and organized the catching fish in the Tom River. In 1707, being already a Tomsk customs tax collector, he bought valuable furs (ermines) from the Teleuts for treasury needs. Apparently, it was a very profitable position (Umansky, 1980: 273). Thus, Parfen Stepnov created in Siberia a clan of his near relatives, who were extremely successful in economic and commercial activities for a long time. By the beginning of the 19th century, Stepnovs were listed as merchants of the 3rd guild, who traded in German and Chinese goods, as well as Russian ones (Kratkaya entsiklopediya…, 1997: 88).

In our opinion, the destinies of the Grechaninovs and Stepnovs are not only an excellent example of

intergenerational mobility, but also demonstrate the accuracy of the theory developed by French sociologist P. Bourdieu regarding the existence of various capitals (not only financial, but also social, cultural, etc.) in society. As their advanced forms determine social inclusion, the societies with a high level of social capital are characterized by "dense social relationships, an ensemble of developed mutual commitments, shared understanding, a high level of trust between neighbors, intergroup community clubs, and ties that overcome accepted social barriers" (Bourdieu, 2002: 66).

Social mobility in Siberia was closely related to the spatial movements of the population. On the one hand, it hampered the arrangement of economic and family life of service people; but on the other hand, it facilitated the quickest adaptation to Siberian conditions and, ultimately, a broadening of their outlook. Their knowledge of Siberia was not limited to a certain location, region, etc. The life trajectory of many generations of Siberian Cossacks can be traced quite well from the sources of the 17th century. In his census record, Aleksey Kirillov (a foreman of Cossack cavalry in Kuznetsk) describes his family history as follows: "My great-grandfather was a Novgorod townsman who, escaping wrath, fled to Veliky Ustyug, and from Ustyug to Perm Velikaya; and when ataman Ermak Timofeevich left the Volga, he took my grandfather to Siberia as a guide… and my grandfather served at Verkhoturye, Turinsk, Tyumen, and Tobolsk in the Cossack cavalry service, and he served twenty years in Tomsk. Upon a petition of Tomsk service people and various other sorts of people, he was installed as a priest, owing to the scarcity of candidates; and my (Aleshka's) father Kirilo Merkuryev, served the Great Sovereign since 149 in the customs office for Tomsk and Narym, and in Kuznetsk, and I, Aleshka, was assigned to the vacant position in 188…" (see (Kamenetsky, 2005: 289)). This extract from the Kuznetsk Service register of 1681 contains not only interesting information about changes in places of living of the Siberian service class people, but also a curious fact concerning a dramatic change in the social status of a service man. The Cossack, having served for 32 years, became a Bogoyavlensk *dyachok.* No doubt he was literate and was, obviously, supported by the town's population. From that time on, he named himself Merkuryev, because the priest of the Bogoyavlensk church was Merkury Leontiev. Thus, this Cossack changed not only his social status, but also his surname in the modern sense of this term (Pokrovsky, 1989: 379). This is hardly the only case of changing first names and surnames to reflect changing circumstances in the 17th century. Such phenomena often hamper the work of researchers when correlating sources.

The expanse of Siberia provided the possibility of traveling long distances within the same state (career advancement on the "horizontal" level). To a large extent, this situation neutralized the process of "shrinking" the service class into itself by the end of the 17th century, when the opportunities for mobility were limited by the existence of a large number of "sons, brothers, and nephews outside of the service", as was mentioned in the historiography. Moreover, the trend towards inheritance of service only increased over time. By the beginning of the 18th century, it had become more and more difficult for a layman to find his place in the sovereign's service (Lyutsidarskaya, 2016: 516). This situation was caused by a decrease in the number of garrisons, a change in the political environment of Siberia, and other factors relating to a general reduction in the number of enlisted Cossacks in Siberian territory. S.V. Bakhrushin described this process in more detail in his overview of the Krasnoyarsk garrison (1959: 131–134).

Besides, the existence of vast undeveloped expanses in the east facilitated a returning to a position in state service that had been lost for subjective or objective reasons. This may be referred to as "undulating" (falling-rising) mobility, which is specifically mentioned by J. Urry (2012: 22). Being at fault in one place and, in some cases, having been punished, a person was reassigned to different, usually northeastern territory. At the new place, he remained in the same social position; or, having been demoted, regained his status or even got promoted over time. The entire history of Siberia is riddled with such examples. Even service people punished for their involvement in plots, escapes, and murders sometimes managed to restore their status completely, and the standing of their families. The story of the Chernigovsky family, whose founder's name was Nikifor Romanovich, is interesting in this respect. In 1632, he was taken captive in the course of the Smolensk War (1632–1634). Upon its completion, Chernigovsky preferred to stay in Russia and joined the tsar's service. In 1635, he enlisted in the streltsy of the Tula garrison. However, next summer, Nikifor took part in a "Lithuanian" plot: he knocked the guards senseless, took the garrison's weapons and supplies, and tried to flee abroad. His escape failed, he was overtaken and exiled to Siberia as a punishment. Chernigovsky not only lost his rank and status, but he and his wife were left with no outer garments or life savings; he wrote in his petition: "And we, your slaves, poor people, naked and barefoot, have no clothes to reach Siberia and may starve or freeze to death on the road… Please be merciful and order, your Majesty, that we be given some money for clothes, as God shall tell you" (see

(Krasnoshtanov, 2008: 23)). Generally, the picture in petitions is dramatized. Upon arrival in Yeniseysk in 1637, Nikifor submitted a petition and was reinstated in the sovereign's service "on a par with the Yeniseysk Cossacks" at the rank of Cossack cavalryman—privileged, by Siberian standards. In the Yeniseysk garrison, Chernigovsky proved himself an experienced administrator, and as early as the next seven to ten years, he became a manager of state-owned villages, salt-works, and other state properties in the large Ilimsk region. At the beginning of 1650s, he is mentioned as a Cossack foreman, and in 1655 as a pyatidesyatnik. By that time, his sons, who were born in Siberia, had grown up, and took up the positions of Cossacks in the Ilimsk voivodeship. However, in 1665, indefatigable Chernigovsky took part in the plot of service people and peasants against voivode L.A. Obukhov, who was killed as a result. Witnesses implicated Nikifor's younger son in the murder, while Nikifor himself was designated as one of the organizers. Along with other coup plotters, the Chernigovskys fled towards the Amur River. They were deprived of all statuses earned over decades of service, and the threat of execution for murdering a high-ranking official hung over them. In the Amur region, the fugitive Cossacks built Fort Albazin, hoping to make amends to the sovereign for the past by serving and collecting fur tribute. They actually managed to do it: ten years after his escape, Chernigovsky was officially appointed a manager of Fort Albazin, with the annual salary of a Cossack ataman. His sons also avoided the death penalty, but were reduced in rank from mounted to foot Cossacks (the elder son Fedor was divested of his rank of foreman). Shortly after these events, Nikifor died, and his sons were able to start a new career in Irkutsk and in the border stockades of the Irkutsky Uyezd. The younger son, Anisim, became a foreman as early as 1684, and Fedor was reinstated in the mounted service at the beginning of the 1690s; first, he achieved the rank of Cossack pyatidesyatnik, and then rose to boyar scion. During the 1680s–1700s, the grandsons of N. Chernigovsky occupied the posts of Cossack foremen, pyatidesyatniks, and atamans (for details see (Krasnoshtanov, 2008)). Thus, even after a complete demotion, service people were able to restore their status by means of reassignment to remote and underdeveloped eastern areas. Many people took this opportunity in the 17th century.

Undeveloped expanses of Siberia invited service people to fulfill their aspirations. In the reasonable opinion of A.V. Golovnev, the mainstream Russian culture covered a tremendous territory, owing to eco-social adaptability, variability, and mobility. Adaptability included the ability to capture various eco-niches, adapting to fast social changes. This was the key quality and advantage of Russian culture (Golovnev, 2009: 424). The state supported social mobility, since it had an interest in the fastest possible development of the territory. And vast expanses gave such an opportunity.

Conclusions

Thus, the conducted study, with a certain degree of conventionality, presents the migratory community in the Siberia of the 17th century as a highly volatile organism. A number of objective and subjective factors ensured mobility among the service class people. A sealed off, class-based state was forced to open slightly the window of opportunity in the Siberian region during the first century of its active colonization.

The various cases of social mobility discussed in this article were related to general processes of ethnocultural, social-political, and economic adaptation under the conditions of the initial development of the territory. By the beginning of the 18th century, the mobility of the service community had decreased, and this was accompanied by de-intensification of upward flows and a gradual increase in the downward flow and reproduction-rate of the group. It became relatively closed to newcomers, so people from other social layers encountered increasing difficulty in trying to join it. The bulk of social movements proceeded at the horizontal level of the social structure.

The important results of economic and cultural activities of the Siberian society in the 17th century involve the formation of a movable group of service people. This subcultural group had features of professional military-administrative associations, with a high index of social and territorial mobility, which added a useful adaptive characteristic to the developing Siberian community. Such a variant of adaptive behavior was a regulator of social, ethnocultural, and ethnopolitical processes.

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Deciduous Human Teeth from the Upper Paleolithic Site of Yudinovo, Western Russia

Population affinities of the Timonovka-Yudinovo Upper Paleolithic people are reconstructed on the basis of three isolated deciduous teeth (a lower lateral incisor, and lower and upper second molars, likely representing three individuals) found in 1987–1996, from Yudinovo in the Middle Desna basin (15–12 ka BP). On the basis of measurements and descriptive traits and computed microtomography, the teeth were compared with those from other Upper Paleolithic sites in northern Eurasia. The principal component analyses of metric and nonmetric traits revealed similar patterns. To minimize random variation, the results of both analyses were integrated. The results indicate affinity with the Pavlov people of Central Europe. The diagnostic trait combination includes weak expression of the Carabelli cusp on the upper second molar, accessory sixth cusp on the lower second molar, large vestibulo-lingual diameter of both molars, and moderate mesio-distal diameter of the lower second molar. These results support the view that the Timonovka-Yudinovo tradition is related to the eastern Gravette one.

Keywords: *Upper Paleolithic, Timonovka-Yudinovo culture, Yudinovo, Pavlov, dental measurements, nonmetric dental traits, deciduous teeth, micro-CT analysis, Gravette.*

Introduction

The Upper Paleolithic site of Yudinovo is located in the Middle Desna basin, at the southwestern periphery of Yudinovo village (Pogarsky District of the Bryansk Region). The site lies on the right bank of the Sudost River, and is restricted to the higher level of the first above-flood terrace of this (Velichko, Gribchenko, Kurenkova, 1996: 35). The site was discovered in 1934 by K.M. Polikarpovich. In 1947, he had started an excavation, which was continued in 1961, and led by V.D. Budko from 1962 to 1967. In 1980, after a long break, the excavation was resumed by the Bryansk Paleolithic expedition of the Leningrad Branch of the Institute of Archaeology of the USSR Academy of Sciences. From 1980 to 1985 and from 1987 to 1990, the excavations were led by Z.A. Abramova, and from 1995 to 1997 and from 2000 to 2003 by G.V. Grigorieva. From 2004 on, the site has been excavated by the Desna Paleolithic expedition of the Museum of Anthropology and Ethnography (MAE) of the Russian Academy of Sciences (RAS) led by G.A. Khlopachev.

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Yudinovo is a multilayered site: its lower layer, with houses made of mammoth bones, belongs to the period from 15 to 13.5 ka BP, while the upper layer is dated to 12.5–12.0 ka BP. The structure and paleogeographic features of the lower cultural layer point towards a long duration for the functioning of the site, and the cyclic character of its habitation. Yudinovo belongs to the Timonovka-Yudinovo variant of the Middle Dnieper archaeological culture, first described by L.V. Grekhova (1970, 1971). Typical features of the lithic industry of this culture are: scarcity of tool shapes; prevalence of burins and end-scrapers; leading role of retouched side-burins in the group of burins; shortened forms of end-scrapers; presence of blunt-edged points; low number of perforating tools; absence of geometrized tools; rarity of bifacial and ventral processing of blanks; and low number of combination or double tools (Grekhova, 1971: 15, 21).

The genesis of the Timonovka-Yudinovo traditions of the Desna basin remains a hotly debated topic. Some researchers consider them as Epigravettian, and relate them to local Gravettian traditions of a Central European origin (Desbrosse, Kozlowski, 1988: 100). Some elements of the primary processing of a tusk are similar between the Timonovka-Yudinovo sites and the Eastern Gravettian site Khotylevo-2 from the same region (Khlopachev, 2006: 215, 237). Other scholars tend to find the roots of those traditions among the Magdalenian of Central Europe (Otte, 1981: 141; Grigorieva, 1999: 26; 2002; Belyaeva, 2002). In order to assess this problem objectively, an analysis of biodistances based on anthropological data is required. But such an analysis has long been impossible, since all sites found to date are settlements, and thus there were no anthropological data available from them. The site of Yudinovo was an exception: in 1987, 1990, and 1996, three deciduous human teeth were found there.

The teeth from Yudinovo have not yet been studied by anthropologists because only permanent teeth have traditionally been used for inter-population comparisons. During the last several decades, a number of studies have shown that the distal upper and lower deciduous molars (m^2 and m_2, respectively) are not less informative than their permanent counterparts, since they are the key teeth in the row of the deciduous and permanent molars (Farmer, Townsend, 1993; Bockmann, Hughes, Townsend, 2010). The permanent molars, which are commonly considered the teeth of "second generation", in fact belong to the row of primary teeth, because they do not have predecessors. Both deciduous and permanent molars are formed on the basis of the same dental lamina and, taking into account the high degree of their morphological similarity, the second deciduous and first permanent molars can be considered meristic elements in the row of the molars (Bailey, Benazzi, Hublin, 2014: 105; Bailey et al., 2016). But the second deciduous molars start their formation earlier, and their crowns are formed faster than those of the first permanent molars. Thus, the morphology of m^2 and m_2 is under a stricter genetic control and is less influenced by environment than that of the permanent molars (Sofaer, 1973). In the light of these data, the deciduous teeth from Yudinovo appear as an exceptionally important source of information regarding the population history and origin, not only of the population of Middle Desna basin, but of northern Eurasia in general. The main purpose of this study is to analyze comprehensively the morphology of the teeth from Yudinovo, in order to shed light on the biological relatedness of the Timonovka-Yudinovo population.

General description of the specimens

The lower right first incisor Yudinovo 1 (Fig. 1, *1*) was found in 1987. It belonged to a 5–7 year old child, and was lost naturally. The tooth is well-preserved, with no signs of post-mortem damage. A little less than a half of

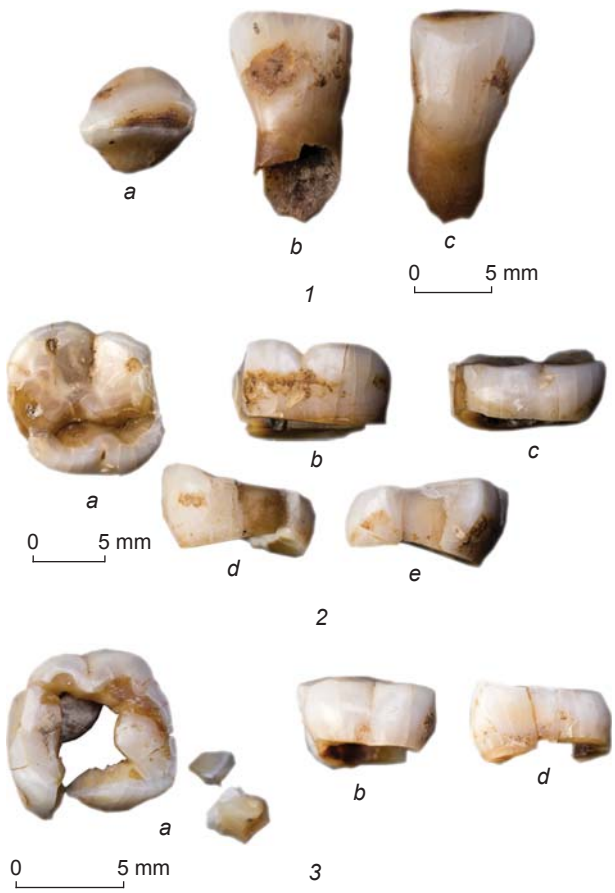

Fig. 1. Dental remains from Yudinovo.
1 – lower right first incisor (Yudinovo 1); *2* – lower left second molar (Yudinovo 2); *3* – upper left second molar (Yudinovo 3).
a – occlusal norm; *b* – lingual norm, *c* – vestibular norm, *d* – mesial norm, *e* – distal norm.

the crown is worn out, and a wide stripe of naked dentine can be observed at the cutting edge. The root is mainly resorbed (the maximal length of the remaining part is just 4.7 mm). Deposits of dental calculus are observed on the lingual and interdental surfaces.

The lower left second molar Yudinovo 2 (Fig. 1, *2*) was found in 1990. It belonged to a 10-12 year old subadult individual. The enamel of the occlusal surface is heavily worn. There are wide areas of open dentine in the protoconid, hypoconid, and hypoconulid, and dentine points in the metaconid and entoconid. Moderate calculus is found on the lingual surface of the crown and in the interdental space.

The upper left second molar Yudinovo 3, belonging to a 10–11 year old child, was found in 1996. It is separated into six fragments (Fig. 1, *3*), two pairs of which can be attached to one another. Pre-mortem damage and pathological changes are absent, except a very weak calculus.

All three teeth belonged to different individuals. This is evident from the mismatch between contact points of the occlusal surfaces of the crowns of the upper and lower molars, as well as from the different intensity of calculus in the incisor as compared to the molars.

Study protocol and analytical methods

The specimens were investigated using both dental metrics and nonmetric traits. The measurement protocol included mesio-distal and buccolingual diameters of the crown and neck of each tooth. The group of nonmetric traits was composed of a conventional set of markers used in Russian and world dental anthropology (Zubov, 1968, 1974, 2006; Turner, Nichol, Scott, 1991), as well as archaic and Neanderthal complex markers (Zubova, 2013; Khaldeeva, Kharlamova, Zubov, 2010; Bailey, 2002; Bailey, Skinner, Hublin, 2011). A detailed description of the grade scales for all variables can be found elsewhere (Zubova, Chikisheva, Shunkov, 2017: 122–125; Zubova, Stepanov, Kuzmin, 2016: Tab. 1, p. 136–138).

The upper molar was examined only visually, owing to its poor preservation. The incisor and lower molar were scanned with a computed X-ray microtomograph Skyscan-1172, which made a thorough description of the morphology of the teeth possible despite the attrition of the external enamel. The scanning protocol was set as follows: tube voltage 100 kV, current strength 100 μA (no filter), rotation step 0.25°, averaging over three frames, at the resolution of 3.45 μm/pixel. The raw data were reconstructed using NRecon (Bruker-microCT) software. For each specimen, a 3D model was rendered in CTAn (Bruker-microCT), allowing visual separation of dentine and enamel. The models were visualized using CTVox (Bruker-microCT) software.

Principal component analysis (PCA) was the main statistical method employed for both metric and nonmetric traits. Input variables in the PCA were the buccolingual diameter of the m^2, and the mesio-distal and buccolingual diameters of the m_2. Six variables from the entire set of nonmetric markers were employed in the statistical analysis, since these variables are common between this study and publications of most comparative samples: hypocone reduction (minimal grade of presence 4–) and metacone reduction (minimal grade 2); Carabelli cusp (grades 2–5) at the m^2; sixth accessory cusp; tami; protostylid (grades 2–5) at the m_2. The grades of presence of the traits were converted in a binary form (presence of a trait – 1, absence – 2). The sample mean was substituted for missing values. Coordinates of specimens along first two principal components of both analyses (i.e. analyses of metric and nonmetric traits) were used as raw variables for calculating integrated principal components (IPC). These latter describe most of the metric and nonmetric variation in the sample (for description of this technique see (Kozintsev, Gromov, Moiseyev, 2003: 152)). All calculations were carried out using Statistica for Windows, version 7.0.

The question regarding the possibility of direct comparison of the morphology of the deciduous and permanent teeth, and the use of their traits in the same analysis, is being discussed (see, e.g., (Brabant, 1967; Edgar, Lease, 2007)). Therefore, the specimens from Yudinovo were compared only to deciduous teeth from other locations. The reference sample included: Caldeirão 2, 11 (Voisin et al., 2012; Trinkaus, Bailey, Zilhão, 2001); Cisterna 3 (Trinkaus et al., 2011); Dolní Věstonice 36 (Trinkaus et al., 2000; Early Modern…, 2006: 200–210); Pavlov 6/2, 7, 8, 9, 10, 12 (Sládek et al., 2000: 130–131, 137–140; Early Modern…, 2006: 211–234); Sungir 3 (Zubov, 2000); Kostenki 14 (layer IV, 6/1), Kostenki 15, Kostenki 18, Ust-Kyakhta (unpublished data of A.A. Zubova); Malta 1, 2 (Zubov, Gokhman, 2003; Shpakova, 2001); Listvenka (Shpakova, 1997, 2001); Khaiyrgas (Zubova, Stepanov, Kuzmin, 2016), Strashnaya 1 (Zubova, Krivoshapkin, Shalagina, 2017).

Morphological description of the specimens

Yudinovo 1. The crown (Fig. 1) is of subtriangular shape, with the edge strongly inclined in a distal direction. The root is almost round in section, and moderately flattened mesio-distally at the neck. The lingual cusp is not developed; accessory ridges on the external layer of enamel of the lingual surface are absent. After the enamel was virtually removed and the relief of the dentine surface had been reconstructed, two finger-shaped ridges spreading from the lower third of the crown to the cutting edge were observed (Fig. 2).

The dimensions of the crown and the neck (see *Table*) are close to the means of these variables in modern populations (Zubov, Khaldeeva, 1993: Suppl., tab. 1). Considering the Upper Paleolithic European specimens, Yudinovo 1 can be compared to the lower first incisor of Dolní Věstonice 36: the dimensions of its neck and its vestibulo-lingual diameter are smaller than those of Yudinovo 1. Among Siberian dental remains from Malta and Listvenka, specimens exhibiting either larger or smaller vestibulo-lingual diameters can be found.

Yudinovo 2. Visual examination of the tooth revealed that the crown was of oval shape (see Fig. 1) and included at least five cusps, arranged in two rows. Large contact facets are present at both mesial and distal sides of the crown. The length of the distal facet is 5.8 mm, but the length of the mesial facet could not be measured, as the enamel of the mesial side was damaged post-mortem. C7, protostylid, or cingular derivatives were not observed.

When the layer of worn enamel was virtually removed on the CT reconstruction (Fig. 3), a Y-type of contact between cusps of the crown, a vestibular position of the hypoconulid, and the presence of an accessory sixth cusp became visible. A rudimentary element of C7 was detected in entoconid; but the degree of development of this structure does not permit scoring this trait as present. The distal trigonid crest and deflecting wrinkle of the

Fig. 2. 3D-reconstruction of enamel-dentine junction of the Yudinovo 1 incisor. Lingual side.

Dimensions of the deciduous teeth from Yudinovo and comparative samples (mm)

Specimen	m^2		m_2		i_1		
	MD cor	BL cor	MD cor	BL cor	BL cor	MD col	BL col
Yudinovo 1	–	–	–	–	4.2	3.2	3.8
Yudinovo 2	–	–	9.6	9	–	–	–
Yudinovo 3	–	10.2	–	–	–	–	–
Kostenki 14	–	–	11	9.5	–	–	–
Kostenki 15	9.6	9.8	10.72	8.7	–	–	–
Kostenki 18	8.9	10	9.55	8.75	–	–	–
Sungir 3	8.8	9.9	9.2	9.1	–	–	–
Caldeirão 2	–	–	10.5	9.5	–	–	–
Caldeirão 11	–	–	11.1	9.6	–	–	–
Cisterna 3	–	–	11.1	9.7	–	–	–
Dolní Věstonice 36	10.2	10.9	10.9	8.6	3.9	2.8	3.5
Pavlov 6/2	8.2	10.2	–	–	–	–	–
Pavlov 7	–	–	9.4	9.1	–	–	–
Pavlov 8	–	–	9.7	9	–	–	–
Pavlov 9	–	–	9.3	9.5	–	–	–
Pavlov 10	–	–	9.5	–	–	–	–
Malta 1	8.2	9.2	9.7	8.4	4.6	–	–
Malta 2	9.7	10.1	10.8	8.7	4	–	–
Listvenka	–	–	10.8	9.2	4.1	–	–
Ust-Kyakhta 3	…	9.5	–	–	–	–	–
Strashnaya 1	–	–	11.6	10.1	–	–	–

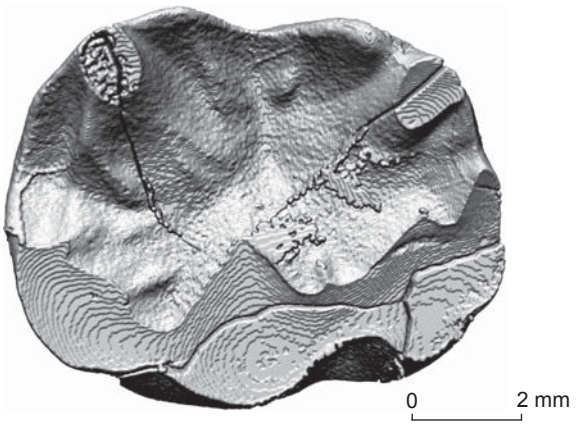

Fig. 3. 3D-reconstruction of enamel-dentine junction of the Yudinovo 2 molar. Left – mesial side; right – distal side.

metaconid are absent. An anterior fovea, delimited by the mesial segments of the protoconid and metaconid, was observed in the mesial part of the crown.

The odontoglyphic pattern was also reconstructed using the microtomography data. It includes the intertubercular fissures I–VI; grooves of the second order 1 and 2med, 1 and 2end, and 1 and 2prd; grooves of the third order 3med, 3prd, and 2'end. The odontoglyphic pattern of the hypoconid and hypoconulid could not be reconstructed, owing to their severe attrition. The presence of the 4end groove at the entoconid can be supposed, but its presence or absence cannot be demonstrated convincingly because of the post-mortem damage of the crown, which precludes a complete virtual removal of the enamel layer. Of diagnostically important odontoglyphic combinations, the 2med (fc) variant and type 2 of superposition of the first grooves' points of contact of the metaconid and protoconid can be observed. Both traits are neutral in terms of assigning the specimen to the Western or Eastern dental patterns.

Yudinovo 3. The crown (see Fig. 1) is of subrectangular shape, with a large hypocone and a moderately reduced metacone. The distal accessory ridge and posterior fovea are absent. A little groove (grade 1) was observed in the area where the Carabelli cusp is usually found, but no other structure indicative of the presence of this trait is present. No cingular derivatives were observed on the vestibular surface. The presence or absence of other traits cannot be determined, owing to post-mortem damage.

Results of comparative analysis

The comparison of the teeth from Yudinovo with other samples from northern Eurasia has shown that such features as the weak development of the Carabelli cusp at the m^2 and the presence of the sixth accessory cusp at the m_2 limit the range of morphologically similar finds to the specimens from Pavlov in Central Europe. Yudinovo 3 is most similar to the Pavlov 6 and Pavlov 12 specimens, in which the Carabelli cusp is absent and the distal cusps of the crown are equally reduced. Yudinovo 2 exhibits a similarity in most traits to the Pavlov 7 and Pavlov 8 specimens, which most likely belonged to the same individual as Pavlov 6. The most convincing indicator of its affinity is the presence of the sixth cusp, which is rarely found among the Upper Paleolithic European dental specimens and is traditionally considered an "Eastern" marker. It is much more often found in Siberian samples, and was observed at Malta (the younger child), Strashnaya, and Khaiyrgas. But the lower molars of those Siberian individuals are not similar to the specimens from Yudinovo, if many dental traits are taken into account.

As upper and lower molars are not always both represented in the Upper Paleolithic specimens employed in the comparative analysis, only 7 reference samples were employed in the PCA: Kostenki 15, Kostenki 18, Malta 1, Malta 2, Sungir 3, Dolní Věstonice 36, and Pavlov 6 and 8 (features of the upper and lower molars were combined as if they belonged to the same individual). The results of the analysis confirm the similarity between the Yudinovo and Pavlov molars. They plot closely at the positive ends of PC 1 and 2 of the nonmetric traits PCA (Fig. 4, *1*). The PC1 experiences statistically significant loadings from the Carabelli cusp (–0.77), tami (–0.84), and protostylid (–0.8). The PC2 differentiates the specimens on the basis of the degree of the metacone reduction (0.75) and the presence/absence of the sixth accessory cusp of the m_2 (0.898).

According to the results of the PCA based on dental metrics, the Yudinovo teeth remain similar to the specimens from Pavlov (Fig. 4, *2*) despite an apparent 90° rotation of the plot as compared to the previous analysis. Another difference is a more clearly pronounced separation of Dolní Věstonice 36 from the dental remains from the Kostenki-Borschevo archaeological region. The PC2 ordinates the specimens according to the vestibulo-lingual diameter of the m^2 (0.93). Loadings on the PC1 demonstrate different directions of variation of the mesio-distal vs. vestibulo-lingual dimensions of the m_2. Both variables produce high loadings, but of different sign (0.94 and –0.76, respectively). Such a discrepancy in the variation of the sagittal and transverse dimensions of permanent teeth can, in some cases, be explained by sexual dimorphism (Zubova, Moiseyev, Khartanovich, 2017). But for deciduous teeth it is not possible to assess the degree to which sexual dimorphism affects the results, since the sex of most specimens cannot be determined by their morphology. It is unlikely that the influence of sexual dimorphism on the PCA results for the Yudinovo teeth was very strong, because both metric and nonmetric traits exhibit similar patterns of variation. Importantly, the raw variables are not significantly correlated.

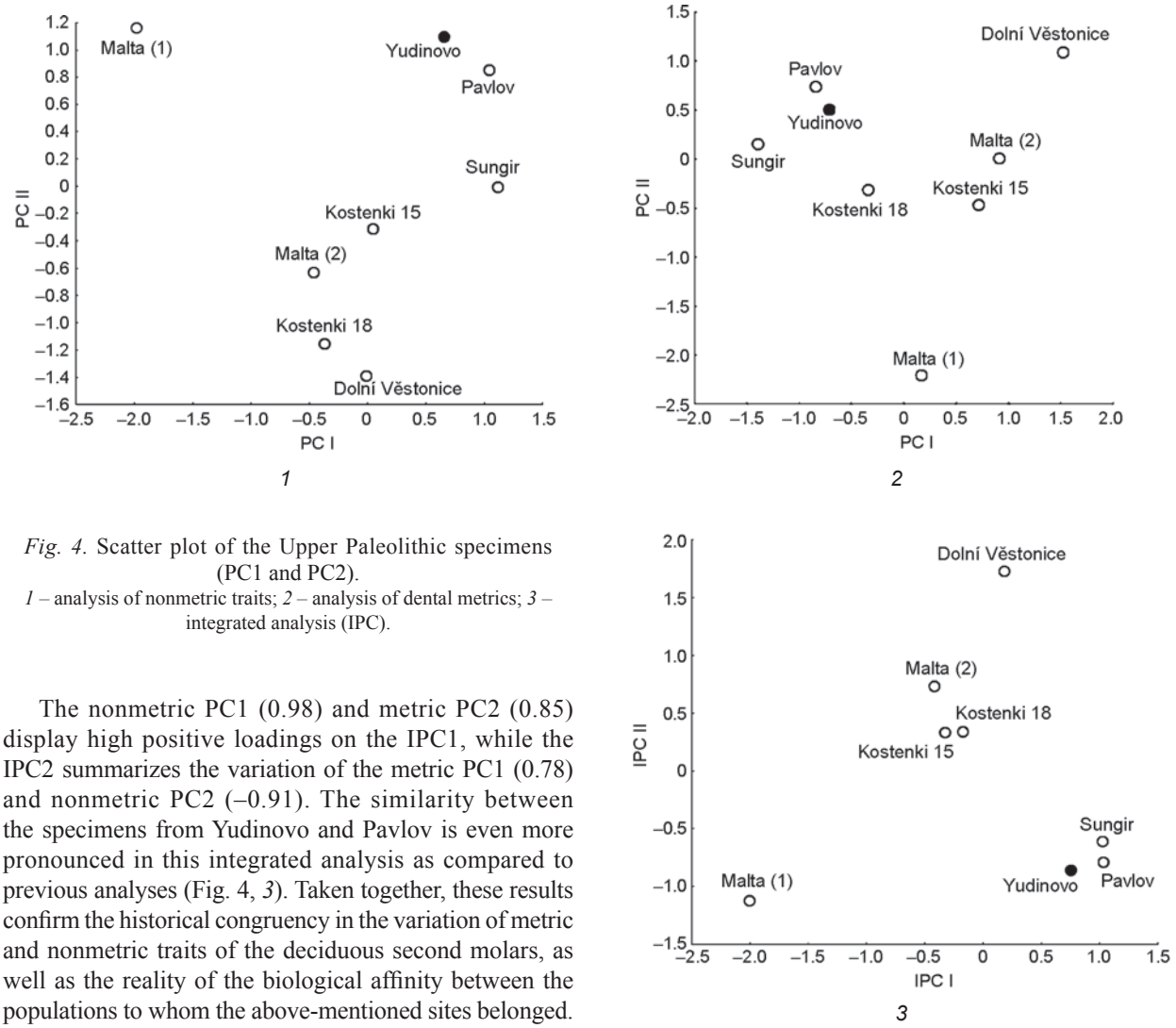

Fig. 4. Scatter plot of the Upper Paleolithic specimens (PC1 and PC2).
1 – analysis of nonmetric traits; *2* – analysis of dental metrics; *3* – integrated analysis (IPC).

The nonmetric PC1 (0.98) and metric PC2 (0.85) display high positive loadings on the IPC1, while the IPC2 summarizes the variation of the metric PC1 (0.78) and nonmetric PC2 (–0.91). The similarity between the specimens from Yudinovo and Pavlov is even more pronounced in this integrated analysis as compared to previous analyses (Fig. 4, *3*). Taken together, these results confirm the historical congruency in the variation of metric and nonmetric traits of the deciduous second molars, as well as the reality of the biological affinity between the populations to whom the above-mentioned sites belonged.

Conclusions

The results of the current study lead to two important conclusions. First, the existing data on the dental morphology of the Yudinovo inhabitants confirm the views according to which the genesis of the Timonovka-Yudinovo traditions is more related to the eastern variant of the Gravette culture rather than to the Magdalenian culture of Central Europe. Only a few Magdalenian representatives were employed in this study: Cisterna 3 and the relatively early materials from the Solutrean-Magdalenian layer of Caldeirão, which could not be included in the statistical analysis. Nevertheless, the differences in metric traits between them and the Gravettian specimens from Pavlov and Dolní Věstonice are fairly evident (see *Table*) and fit very well into the paleogenetic results showing a genetic differentiation between the populations of the two archaeological cultures (Fu et al., 2016).

Second, the results of this study demonstrate that information on distal deciduous molars gives a very good perspective on the biological relationships between Paleolithic populations. This not only due to their "key" position in the molar row, but also to historic congruency in the variation of metric and nonmetric traits of isolated teeth, which is accompanied by the absence of a strict biological association between the sizes of the crowns and their morphological complexity.

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Realism of Face Depiction in Portraiture

This study presents an analysis of the realism of portraiture in the context of physical anthropology. Standard descriptive traits, such as the development of the upper eyelid fold, nasal profile, etc., were scored on 120 portraits. To examine the accuracy of painters' renditions, these traits were assessed on 30 pairs of portraits of the same people painted by different painters, and on 30 pairs of portraits with photographs of the same people. For each trait, the mean difference of scores was calculated. The mean differences are within the scoring error, indicating the painters' high accuracy in rendering facial features. Next, four composite portraits were generated, two relating to 15th–16th century French aristocrats, and two to the 15th–17th century Dutch population, mainly that of Amsterdam. Composite portraits for every geographic region are virtually identical, suggesting that they represent a specific population rather than just a total of individual data. Also, even though painters might have been somewhat imprecise in depicting individual faces, these inaccuracies are averaged out in composite representations. In sum, portraiture is a very informative source of anthropometric information.

Keywords: *Composite portraits, portraiture, descriptive facial features, French aristocrats, Holland.*

Introduction

For decades, anthropologists have been using images of people in their studies. Usually, single images are used to illustrate specific facial features of anthropological types, or to prove the age and presence of an anthropological type in a certain territory. Most researchers who use these single characteristic images miss the opportunity of using a series of images as a sample from an ancient population. The images are not seen as realistic in the most common sense of that word (showing the features of a certain individual), but more as a stereotype reflecting the typical characteristics of a group. The reason for this approach in working with images is the fact that "specific racial and ethnic facial features are depicted in art, although generalized and typologized, but with a significant level of accuracy at the group level" (Shpak, 2015: 116). For example, C.S. Coon in his book *Races of Europe* widely uses art, and highly values its importance saying "…the (Sumerian) sculptors have left behind them records in stone, which may piece out the evidence of the skulls" (1939: 90). In the chapter on Neolithic people of Iran and Iraq, Coon notices a varying level of realism in sculpture, and points out that while bas-reliefs reflect the canon, a typical man, "portrait busts… seem really to depict individual men rather than conventional types or ideals" (Ibid.).

V.V. Bunak in his monograph *Crania Armenica…* uses sculpture in the discussion on the ancient presence of the Armenoid type in Western Asia. He writes that "craniological studies of ancient populations of Western Asia only provide… the most general indication of the Western Asian racial type of distant eras. But the most ancient history of this region… opens another source for

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studying this problem—abundant sculptural material" (Bunak, 1927: 200). Undoubtedly, not all images are equally realistic, and in the history of the visual arts of Middle East, there were several stages, differing in the specifics of style and the canons used in the depiction of men. Nevertheless, certain features of the Western Asian ancient sculptures are so peculiar and characteristic that "they cannot be understood otherwise than as a reflection of the racial characteristics of the peoples who created these sculptures" (Ibid.: 201).

I.I. Gokhman and L.L. Barkova, in their study of an ancient population of Altai, used images of humans in quite an original way. As a source of information about the appearance of the ancient human, they used images on the Pazyryk carpet and wooden facial sculptures used as decoration on a horse tack, found in the first Pazyryk mound. Researchers believe that "all the images found on the carpet represent people of the South-European race. Faces on horse pendants are mongoloid; or mixed, with an apparent prevalence of mongoloid features" (Gokhman, Barkova, 2003: 423). Even the use of such unusual sources allows researchers to determine the race of the population.

Portraits reflect the private life of an individual at some level, including his or her health. Every image can be regarded as an independent and fully-fledged source of individual pathologies. Remarkably, images used in this kind of research include not only realistic portraits of certain people (an Italian poet of the 16th century, Teofilo Folengo, with a face disfigured by paralysis (Galassi F.M., Galassi S., 2015)), and unknown persons (a man of the mid-15th century with manifestations of Horton's disease (Galassi F.M., Galassi S., 2016)), but also religiously themed works (Madonna from 15th century with signs of goiter (Traversari, Ballestriero, Galassi, 2017)), which are usually seeing as highly idealized.

Until the beginning of the 21st century, portraits were rarely used in anthropology; and if they were, each image was seen as a reflection of typical group characteristics. Modern studies of human variability use a population approach (Vergeles, 2015; Edwards, 2003; Jorde, Wooding, 2004; Edgar, 2009; Edgar, Hunley, 2009; Gravlee, 2009), according to which a series of images from the same geographical region and time-period is viewed as a sample from a population or a group. In this case, the object of study is not an individual and his or her facial features but the characteristics of the whole group. This approach can be used only with a sufficient number of high-quality realistic images.

L.Y. Shpak, in a review article on the possibility of using ancient images (up to the first centuries AD) in anthropology, wrote that "…the development of portraiture from ancient times to the present day shows that images of men vary greatly geographically, and also in terms of realism and informational content" (2015: 124). Nevertheless, certain periods in the history of ancient art provide researchers with highly realistic and precise images. These periods include, for example, the Greco-Roman period in the history of Egypt. The research group of Moscow State University studied portraits from 1st–4th centuries AD Faiyum, and created composite portraits of this ancient population (Perevozchikov, Shpak, Shimanovskaya, 2012). Other periods with highly realistic portraiture include the sculpture and painting of the Classical and Hellenistic periods of ancient Greece, Etruscan votive sculpture, and the Roman sculpture of the republican period (Shpak, 2015).

K.E. Lock studied Russian portraiture of the 18th and 19th centuries, and the use of these images in anthropology. She studied various groups, including merchants and nobility (Lock, 2011a) and 1812 war officers (Lock et al., 2012), and wrote a Ph.D. thesis based on these studies (Lock, 2011b). Lock also paid attention to methodological problems: in particular, the realism of face depiction in portraiture from the Renaissance era until the 19th century. As a proof of the realism of portrait art, the author cited numerous examples of painters portraying small defects in appearance (warts, strabismus, etc.), and also made a comparison of the painted and photographic portraits of writer S.T. Aksakov, a comparison of several portraits of Catherine II painted by various artists, and a comparison of two portraits of A.S. Pushkin. The researcher concludes that "painters are precise and skilled in depicting anthropological features of a particular human, and differences between portraits created by various painters are usually inessential for the anthropologist" (Ibid., 2011b: 72). However, these pieces of evidence are descriptive, qualitative, and seem inadequate to legitimize the use of portraiture in physical anthropology. Additional new research on identification of the "objective" errors of a painter is needed.

This article presents a complex study of the realism of portraiture, based on standard anthropological scales for facial features on the one hand and on the method of the composite portrait on the other. Our hypothesis is that portraiture, although reflecting painters' imagination and skill, is a reliable source of information about such features as the shape of the nose, the cut of the eyes, the thickness of the lips, etc. These characteristics cannot be hugely retouched and changed in favor of the ideal, because the main goal of portraiture is creation of a lifelike, recognizable image of the person portrayed.

Portraiture as a material for anthropological studies of 15th–19th century European populations

Before considering the problem of the realism of portraiture, it is important to address the definition

of a portrait. The Oxford English Dictionary defines portraiture as "a representation or delineation of a person, especially of the face, made from life, by drawing, painting, photography, engraving, etc.; a likeness" (cited after (West, 2004: 11)). The Great Russian Encyclopedia emphasizes that "the necessary requirement for every portrait is the transfer of individual resemblance" (Portret, 2015). Every definition of the portrait will include one or another form of likeness as an essential characteristic of the genre. The customer demanded from the painter that portrait should be a recognizable likeness of the portrayed person. The likeness is not the only function of a portrait, but an essential and fundamental one. In fact, what does not reflect reality, cannot be called a portrait at all. Portrait painting originated and developed with the goal of creating a likeness, copying reality.

Any portrait is a compromise between painter and customer. Depending on the purpose of the image, change of form and even level of realism of the portrait is possible. Therefore our study only focuses on the images that were intentionally created as a likeness and that, from our point of view, realistically enough reflect the physical appearance of a certain person.

Material and methods

To prove that portraits are realistic enough to be used in anthropological research, we used two approaches: first, we compared standard descriptive characteristics of face for pairs of images, where each pair depicts the same person; second, we created composite portraits from various samples from the same population. For the first part, we used digital images of portrait paintings in oils, portrait drawings, photographs, and daguerreotypes. The total sample of 120 images was obtained from various website sources: the National Portrait Gallery in London (http://www.npg.org.uk/) and the Victoria and Albert Museum (http://collections.vam.ac.uk/), as well as the Wikipedia site: https://en.wikipedia.org/wiki/Category:French_portrait_painters, https://en.wikipedia.org/wiki/Category:English_portrait_painters, https://en.wikipedia.org/wiki/Category:Dutch_portrait_painters. Descriptive characteristics for all images were determined on an Acer AL1916W monitor with standard "graphics" settings.

Two experiments, each with 60 images, have been performed. For the first experiment we used 30 pairs of portrait paintings: each pair consisted of two portraits of the same person painted by different painters; and for the second experiment, we used 30 pairs of images, with one image being a painting, and the second a photograph or daguerreotype of the same person. The first experiment included images from the 16th–17th centuries, the second experiment the late 19th century. Most of the images used were from the UK, but some were from France and other European countries. An essential condition for sampling was the independence of the images, i.e. none of the images were copies of other paintings or photographs.

The values of the following descriptive characteristics were determined for each image: growth of beard, color of beard, hair color, hair shape, eyebrow thickness, eye color, eye width, eye length, upper eyelid fold (separately proximal, medial, and distal part), nose height, transverse profile of the nasal bridge, profile of the nasal bridge (separately for the bone and cartilage part, as well as general), tip of the nose, height of the nostrils, protrusion of the nostrils, height of the upper lip, lip thickness (separately upper and lower), and cheekbone protrusion. Characterization was carried out according to the standard procedure (Bunak, 1941), with limitations and amendments relating to two-dimensional images (Lock, 2011b). For eye color, a three-level scale was chosen: dark, mixed, and light. For any characteristic it was possible to use halves of points (0.5, 1.5, and so on). Hair color and shape, and beard color and growth were only determined for less than 50 % of cases, so they weren't used in the following analysis. The method of determining descriptive characteristics on two-dimensional portrait images has been successfully and repeatedly used in the Anuchin Research Institute and Museum of Anthropology at Lomonosov Moscow State University (for the description of anthropological features of the Amsterdam population in the 16th–17th centuries see, e.g., (Perevozchikov et al., 2015)).

The images were described in such a way that no two images of the same person followed one another. For example, for portrait-photograph pairs, first, all 30 photographs were described, and then all 30 portraits. That was done in order to avoid possible unconscious transfer of the scores of the characteristics from one image of a person to another. For every pair of images, the difference in scores has been calculated. On the basis of these modules, the mean difference has been found for every characteristic.

Results and discussion

For the majority of characteristics, the mean difference between the two images is less than 0.5 point (see *Table*). Notably, this difference is a result of several factors, which includes the "mistakes" of a painter in depicting the physical appearance of a person, and the "mistakes" of a researcher in describing a characteristic. In previous unpublished studies where we tried to determine the "mistakes" of a researcher (we compared two descriptions of the same portraits made with a time

interval), the resulting difference was 0.5 point as well. Thus, half a point difference in our experiment seems to be more dependent on the researcher's "mistakes" than on an inaccurate depiction of facial traits by the painter. However, there are some great discrepancies in the representation of certain facial traits. For example, eye color is often painted in different ways in two portraits of the same individual. Probably, the way the painter sees eye color is dependent on the lightning. A.M. Maurer (personal communication) notes that the color of eyes is often difficult to determine even when working with a modern population in the field; this characteristic requires an additional follow-up check on the photo. Surprisingly, less difference for eye color was found for portrait-photograph pairs, even though the photographs were exclusively black and white. The reason is that the color scale that we chose (dark – mixed – light) relies more on the intensity of the eye color than on the shade.

The accuracy of determination of pigmentation depends on the preservation of paint layer and the changes in the paints color over time. Painters knew about that for centuries, even before the Renaissance era, and tried to prevent fading (for a review of treatises from antiquity to the Modern Period on painting technique see, e.g., (Grenberg, 1982)). For example, painters covered the finished picture with lacquer (isolation of the paint layer from air/light), used a certain proportion of pigment and oil when mixing paints, used a bright foundation for paintings (compensation for oil paints darkening over time), reduced the number of paint layers, or mixed oil paint with lacquer (Slansky, 1962).

In both experiments (pairs of portrait paintings of the same person, made by different painters; and portraits versus photographs pairs), some characteristics showed high discordance in the determined scores: eye color, height of nostrils, thickness of lower lip. In our opinion, this fact shows not only that some traits were painted with less accuracy, but that these characteristics are less important for facial recognition. When working on a portrait, the painter pays more attention to the traits that are most important for recognition of the portrayed person—nose shape, eyelid folds, etc.—and less attention to the traits whose alteration is not going to change the overall likeness of the face.

Additional evidence of the accuracy of portraiture can be found in composite portraits created from two different samples from the same population/group. The method of composite portraits allows a group portrait of a population to be created (for history and method see (Perevozchikov, Maurer, 2009). Anthropologists have repeatedly created composite portraits based on samples of images from a single population. Examples include composite portraits of female Old Believers from the settlements along the Selenga and Chikoy rivers, created by A.M. Maurer and I.V. Perevozchikov using materials on Russian old settlers in Siberia that were obtained during an expedition of the Institute of Ethnography of the USSR Academy of Sciences in 1960–1964 (head V.V. Bunak) (Maurer, Perevozchikov, 1999). The available sample of photographs was separated into two parts (35 and 38 individual photographs); and two composite portraits have been created. The authors, noting the very high degree of similarity between the two composite portraits, even compare them to identical twins. This result indicates that "a composite portrait of more than 25 individual images reflects the similarity of the gene pool in different samples from a single population" (Ibid.: 96). To test whether it is possible to obtain a similar result using portrait paintings, we have created two composite portraits of the 15th–16th-century French aristocracy (Fig. 1, 2), and two composite portraits of 15th–17th-century Dutch people (Fig. 3, 4). For the first ones, we used individual portraits of the French aristocracy from printed books (Novoselskaya, 2004; Exposition…, 1907) and from the Wikipedia site (https://en.wikipedia.org/wiki/Category:French_

Mean difference in traits between two portraits, score*

Trait	Pair of portraits painted by different artists	Painted portrait versus photograph pair
Eyebrow thickness	0.37 (30)	0.38 (30)
Eye color	0.82 (22)	0.6 (20)
Eye width	0.28 (30)	0.25 (30)
Eye length	0.42 (30)	0.33 (30)
Upper eyelid fold		
prox	0.24 (29)	0.6 (30)
med	0.24 (29)	0.37 (30)
dist	0.26 (29)	0.45 (30)
Nose height	0.37 (30)	0.28 (30)
Transverse profile of the nasal bridge	0.35 (30)	0.25 (30)
Tip of the nose	0.37 (30)	0.24 (29)
Height of the nostrils	0.52 (30)	0.47 (30)
Protrusion of the nostrils	0.43 (30)	0.32 (30)
Height of the upper lip	0.37 (30)	0.3 (30)
Profile of the nasal bridge		
bone	0.27 (30)	0.32 (30)
cartilage	0.1 (30)	0.15 (30)
general	0.17 (30)	0.13 (30)
Upper lip thickness	0.07 (28)	0.06 (28)
Lower lip thickness	0.61 (27)	0.52 (27)
Cheekbone protrusion	0.07 (30)	0.17 (30)

*The number of cases is given in parentheses.

Fig. 1. Composite graphic portrait of 15th–16th-century French aristocracy (77 individual images).

Fig. 2. Composite painted portrait of 15th–16th-century French aristocracy (43 individual images).

Fig. 3. Composite painted portrait of 15th–17th-century Dutch people (72 individual images).

Fig. 4. Composite painted portrait of 15th–17th-century Dutch people (68 individual images).

portrait_painters). The second ones were created using images published in the exhibition catalogue of the Pushkin State Museum of Fine Arts (Gollandskiy gruppovoy portret zolotogo veka…, 2013), and at the websites of the Rijksmuseum in Amsterdam (www.rijksmuseum.nl/en) and Wikipedia (https://en.wikipedia.org/wiki/Category:Dutch_portrait_painters).

For the French aristocracy, the first composite portrait was created using 77 graphic portraits (see Fig. 1), and the second using 43 oil paintings (see Fig. 2). The resulting pair of composite images doesn't only reflect the high level of realism in face depiction, but also the indifference of the composite portrait method to the technique used for individual images. For Dutch composite portraits, only oil paintings have been used: 72 for the first one (see Fig. 3) and 68 for the second (see Fig. 4). None of the individual images was used for both portraits; the original sample of 140 images was randomly separated into two parts. Composite portraits were created using the faceONface program (Savinetsky et al., 2015). The resulting pairs of composite portraits are characterized by a high level of likeness, with minor differences that can be attributed to differences in technique and accidental fluctuations. Thus, composite portraits are the same for two different samples from one population. This shows both the high accuracy of painters in creating portraits, and that even with the possible presence of inaccuracies in the individual images, the group characteristic remains unchanged.

Conclusions

Nowadays, the study of portrait paintings and drawings using anthropological methods is actively developing and growing owing to the prevalence of the population approach, in which a series of images of one time and geographical region is considered a sample from a population or group. This approach makes it possible to create descriptions, not only of individuals, but also of the group as a whole. Portraiture, of course, is a genre of art. However, the painters were usually very accurate in depicting most of the anthropological features of face. Comparison of the descriptive features of one person in portraits painted by different painters, as well as in photographic and painted portraits, has shown that a difference between them in half a point is within the error of the method. This indicates a high degree of realism in the representation of the anthropological traits of a person in portraiture. Such characteristics as eye color, height of nostrils, and thickness of the lower lip, apparently do not affect the recognition of face, so the painters paid less attention to them and drew them less accurately.

The creation of composite portraits for representative samples from one group made it possible to establish that painted and graphic images, like photographs, display a group characteristic well, regardless of which particular images were included in a particular composite portrait.

The results of the study of portraits in terms of physical anthropology show a high degree of accuracy in the representation of facial traits by painters. Of course, not all images are suitable for anthropological research. However, with proper selection of images (excluding fantasy, unrealistic, and images of people in childhood and the elderly), one can count on obtaining objective group characteristics.

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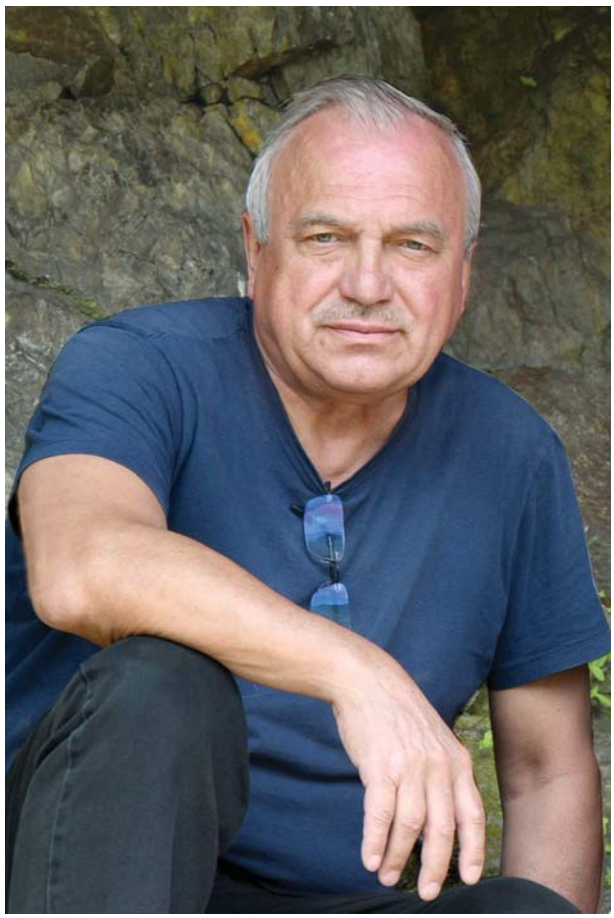
To the 65th Birthday of Mikhail Vasilievich Shunkov

On May 24, 2018, Mikhail Vasilievich Shunkov, the Director of the Institute of Archaeology and Ethnography of SB RAS, the Corresponding Member of the Russian Academy of Sciences, Doctor of Historical Sciences, and Professor at the Department of Archaeology and Ethnography of the Institute for the Humanities at the Novosibirsk State University, turned 65.

Mikhail Shunkov was born in Irkutsk in the family of old dwellers of Siberia. His father Vasily Maksimovich, the decorated veteran of the Second World War, was a multi-talented person, an academic economist, and one of the most authoritative representatives of the Siberian school of game management. In the beginning of war, the mother of Mikhail Shunkov, Nadezhda Vladimirovna, graduated with distinction from the Department of World Literature of the famous Moscow Institute of Philosophy, Literature, and History, and taught foreign literature in Irkutsk State University. As a theater-lover and theater researcher, well-known in Irkutsk, she wrote vivid reviews of performances staged in Irkutsk theaters. At the university, Nadezhda Shunkova was remembered as a brilliant lecturer and very strict professor, who loved her subject endlessly. She passed this love and knowledge to her children and numerous students. Nadezhda Shunkova has brought up several generations of teachers, philology scientists, and writers. Writer V.G. Rasputin and playwriter A.V. Vampilov were among her students.



Both of their sons have inherited the giftedness, independence, and balance of actions and thoughts from their father Vasily, and profound education and perfectionism towards herself and others from their mother Nadezhda. Boris, the older brother of Mikhail Shunkov, graduated from the All-Union State Institute of Cinematography, and was a well-known camera operator, scriptwriter, and director of documentary films. Boris Shunkov left a bright mark on Siberian documentary filmmaking. His piercingly sincere works have been awarded many times at international film festivals in Poland, Germany, France, and Spain.

Mikhail Shunkov was brought up in the intellectual creative atmosphere of the "old Irkutsk", and since his young years, he has become interested in studying ancient history. After graduating high school in 1971, Mikhail Shunkov enrolled in the Department of History at the Irkutsk State University. His first archaeological expedition was directed by Mikhail Aksenov, a prominent representative of the Irkutsk archaeological school. Participation in research of the sites, which are currently considered the classic Paleolithic objects of the Baikal Siberia, determined the choice of the scholarly specialization for Mikhail Shunkov—the earliest stages of human formation.

After graduating university with distinction in 1976, Mikhail Shunkov was sent by the state to work in the Tomsk State University, where he was promoted to the position of Junior Researcher at the Basic Research Laboratory of History, Archaeology, and Ethnography of Siberia. Two years later, the motivated young scholar entered the postgraduate training program at the Leningrad Branch of the Institute of Archaeology, where

his supervisor became Vasily Lyubin, an outstanding scholar, one of the greatest specialists in Paleolithic studies. During this period, Mikhail Shunkov was fortunate to have an internship in the Caucasian and Kostenki Paleolithic expeditions, obtain invaluable scholarly experience, and gain many friends among archaeologists of his generation from the Moscow and Leningrad archaeological centers, most of whom were to become outstanding researchers.

In 1987, young talented archaeologist was noticed by Academician Anatoly Derevianko, who invited him to work in the Institute of History, Philology, and Philosophy of the Siberian Branch of the USSR Academy of Sciences. New stage in Mikhail Shunkov's biography, associated with the study of the Stone Age of the Altai, started in the Novosibirsk Scientific Center. After successful defense of his candidate dissertation entitled "Mousterian Sites of the Intermountain Depressions of the Central Altai" (supervised by Vasily Lyubin) in 1990, Mikhail Shunkov was confirmed in the position of Senior Researcher, in which he worked before defending his doctoral dissertation "Archaeology and Paleogeography of the Paleolithic of the Northwestern Altai" in 2001. A year later, he became a Chief Researcher and the Deputy Director for Research; and in 2015, he was elected the Director by the team of the Institute of Archaeology and Ethnography of SB RAS.

Mikhail Shunkov acquired his first experience in organizing scholarly research in 1987–1988, when he became the Head of the Middle Yenisei Archaeological Team. Since 1989, he has been the Head of the Altai Archaeological Team, which focuses on comprehensive study of multilayered Paleolithic sites in the northwest of the Altai Mountains. Thanks to these studies, these sites have gained worldwide recognition. Since 1990, Mikhail Shunkov has been in charge of the largest in Russia Archaeological Research Station "Denisova Cave" in the Altai, where comprehensive studies of the most informative Paleolithic sites of Siberia have been conducted.

Mikhail Shunkov combines active field research with serious analytical work. He is the author and co-author of eleven monographs and over four hundred and fifty articles on the most important issues of ancient history of North Asia. A part of his works has been published in academic journals *Nature* and *Science*. The priority areas of scholarly research by Mikhail Shunkov include the key issues of human settlement in Northern Eurasia, such as the formation and development of the earliest cultural traditions, chronostratigraphy and correlation of Paleolithic cultures, Pleistocene paleogeography, reconstruction of natural and climatic environment of ancient populations, and the influence of natural environment on the subsistence strategies of ancient humans.

A number of Paleolithic sites have been studied and are being under research led by Mikhail Shunkov. Outstanding discoveries have been made using materials from these sites. They include the Lower Paleolithic site of Karama, earliest in Northern and Central Asia, whose finds testify to the appearance of the first humans in the territory of Southern Siberia ca 800 ka BP. The multilayered geoarchaeological sites of Denisova Cave, Ust-Karakol, and others are the most informative on the territory of Siberia. Interdisciplinary research of these sites made it possible to restore the chronicle of gradual evolution of the prehistoric humans and their culture in North Asia, and also to make a detailed reconstruction of the natural complex of the Pleistocene in this region, which existed during the last 300,000 years.

One of the main areas of scholarly activities of Mikhail Shunkov in recent years is research of the problem of anthropogenesis. It resulted in the discovery of a new form of fossil hominins, which was called *Homo altaiensis*, or Denisovan, after the site of their discovery, in Denisova Cave, in the Altai. The DNA sequencing of the Denisovan hominin has been recognized by the world community as the second most important scientific discovery of 2012, after the Higgs boson problem.

Mikhail Shunkov pays great attention to pedagogical work and training of highly qualified specialists. From 1976 to 1989, he directed archaeological practical training of students from the Departments of History at the Tomsk State University and the Krasnoyarsk State Pedagogical Institute; and since 2000 until presently, he has been supervising field practical training of students from the Department for the Humanities at the Novosibirsk State University. Thanks to his enthusiasm and talent, and not only as a lecturer who teaches the course "Paleoecology of Man", but also as great storyteller of adventures from expeditions, many first-year students were fascinated with archaeology. Subsequently, Mikhail Shunkov became the scholarly supervisor of their student works. A whole number of young scholars prepared and successfully defended dissertations under his supervision.

Mikhail Shunkov carries out a great deal of administrative and organizational work. He has been heading the projects of the Russian Foundation for the Humanities, the Russian Foundation for Basic Research, and the Presidium of the Russian Academy of Sciences. For many years, Mikhail Shunkov was a member of the Expert Council of the Russian Foundation for the Humanities in History, Archaeology, and Ethnography.

He is an expert of the Russian Science Foundation and the Russian Foundation for Basic Research in the field of Human and Social Sciences. Mikhail Shunkov is a member of the Editorial Board of the journal *Archaeology, Ethnology and Anthropology of Eurasia*, the Head of the Department of Archaeology of the Stone Age in the Institute of Archaeology and Ethnography of SB RAS, and a member of the Research and Dissertation Council in the same Institute. He is a regular member of the organizing committees of academic events at international and all-Russian levels.

Mikhail Shunkov has spent dozens of field seasons on the expanses of Eurasia, and has made many important discoveries and achievements, but he is still full of new creative plans and aspirations, since there are no limits in scholarship. We wish him good health, best of luck, great success, and prosperity!

A.P. Derevianko, V.I. Molodin,
A.I. Krivoshapkin, K.K. Pavlenok,
and O.I. Novikova

To the Anniversary of Evgeniya Ivanovna Derevianko

Evgeniya Ivanovna Derevianko was one of the founders of the Institute of History, Philology and Philosophy of the SB USSR Academy of Sciences, from which the present-day Institute of Archaeology and Ethnography of SB RAS was separated. The entire creative life of the scientist is related to these organizations. Moreover, the institute has always been, and remains a native home for Evgeniya Derevianko. This is the reason of a sincere affection that each and every employee has for her, and not only the personnel of the Department of Metal Ages Archaeology, where Evgeniya Derevianko is an eternal Deputy Head.

Development of Evgeniya Derevianko as a researcher took place in the 1970s, in the unique creative atmosphere of the Novosibirsk Akademgorodok. It is here that, being in continuous communication with outstanding scientists, representatives of various disciplines, and talented youth, she formed into a brilliant scientist, who made a substantial contribution to the national and global archaeology.

The major part in the education of the young scholar was played by Alexey Okladnikov, her scientific adviser and mentor, who at that was actively involved in formation of the talent pool of his institute, where the Siberian school of archaeologists was established as early as in a decade. Evgeniya Derevianko became not only a prominent representative of this school, but also an active successor to Alexey Pavlovich's ideas.

Evgeniya Derevianko became a member of the Okladnikov's team after graduation from the Philology Department of the Blagoveschensk State Pedagogical Institute. Certainly, in order to master a totally new profession, she had to learn a lot, and her teacher was a great help to her. Evgeniya Derevianko developed as a field researcher in her native Amur Region. Okladnikov discerned her natural talent of a born field researcher.

In 1970s, a research project for the young scientists was determined; it was related to studying the Mohe people, which inhabited the Far East region during the Early Middle Ages. In the 1970s–1980s, Evgeniya Derevianko conducted active archaeological studies at the Mohe sites, settlements, and burial grounds. Such currently well-known sites as the Troitskoye and Novopetrovka burial grounds, Mikhailovskoye fortified settlement, Semiozerka, Mount Shapka, Osinovoye Ozero, Grodekovo, Kuryn, etc. were brilliantly studied under her supervision. In 1974, Evgeniya Derevianko

defended her candidate dissertation entitled "The Mohe Cemeteries of the Middle Amur".

From 1977 to 1979, Evgeniya Derevianko worked in the Institute of Ethnography of the USSR Academy of Sciences in Moscow. She prepared her doctoral dissertation, the topic of which was substantially at the interface of archaeology and ethnography. As noted by Evgeniya Ivanovna herself, of great importance for her were creative contacts with academician V.P. Alekseev, doctors habil. A.I. Pershits, L.A. Feinberg, V.A. Shnirelman—the foremost Russian experts in the prehistory. The work in the Institute of Ethnography of the USSR Academy of Sciences was fruitful: on the basis of archaeological and ethnographic materials of Far Eastern tribes and peoples, and of data from Chinese, Japanese, and Korean written sources, Evgeniya Derevianko developed a strict concept of ethnic history and culture of early-medieval population of this Asian region. She gave the status of ethnographic and historical sources to the archaeological evidence obtained as a result of excavations of settlements and burial grounds, which

sources, in combination with written data, enabled a comprehensive reconstruction of ethnocultural processes in this tremendous region in the Early Middle Ages.

In 1982, Evgeniya Derevianko defended her doctoral dissertation on "Amur Tribes of the 1st Millennium AD (Outlines of Ethnic History and Culture)", and was recognized one of the leading specialists in the medieval history of the Far East. Her reconstructions of almost all aspects of life of the Mohe tribes (economy, household activities, funerary rite, warfare, house building) have been reflected in a number of monographs. The series of published studies by the scientist includes such books as "The Mohe Sites of the Middle Amur" (1975), "The Burial Ground of Troitsk" (1977), "The Tribes of the Amur Region. The 1st millennium AD (Outlines of Ethnic History and Culture)" (1981) based on materials of her doctoral dissertation; "Reviews of Warfare of the Amur Tribes" (1987), and "Ancient Dwellings of the Amur Region" (1991). Even now, they are in great demand by specialists, especially those engaged in studying ancient and medieval history of the Far East. Evgeniya Derevianko is a co-author of several collective monographs, for example, "Siberia. Atlas of Asiatic Russia" (2007), "History of the Amur Region" (2008), etc., and the author of more than 150 scientific papers. More than 30 papers by the scientist were published abroad: in Japan, Korea, China, and other countries. The book "On the Pathway of Former Millennia" (2008) (co-authored with professional journalist A.B. Zakstelsky) was devoted by Evgeniya Derevianko to her teacher, archaeologist, academician Alexey Pavlovich Okladnikov, and to his wife, painter Vera Dmitrievna Zaporozhskaya.

Evgeniya Ivanovna combines active scientific life with public work. For many years, she has been fulfilling duties of the Deputy Head of the Department of Metal Ages Archaeology. Evgeniya Derevianko is a real life and soul of the team. It cannot be forgotten that in the hardest 1990s, she did her best to give young researchers of the Department a start in life. Each and every employee of the Institute or colleague from Mongolia and Korea who are pursuing a PhD or undertaking an internship in the IAE SB RAS felt and feel her truly mothering warmth and care.

Evgeniya Derevianko is a member of the Scientific and Dissertation Councils of the Institute. In 2016 to 2018, in the Institute, she headed a team that was specially established for improving the quality of scientific documentation in order to examine field reports before their submission to the Department of Field Research of the Institute of Archaeology of RAS. The team experts' conclusions on the readiness of reports were taken into account during review in the Department of Field Research, which accelerated their acceptance and issue of Permits for archaeological excavations and surveys. The activity of Evgeniya Derevianko in this complicated area was highly appreciated both in Novosibirsk and in Moscow.

Evgeniya Ivanovna has devoted a great deal of time to training of highly professional academic staff. The scope of her activities involves examination of almost all candidate and doctoral dissertations submitted to the Dissertation Council of the Institute of Archaeology and Ethnography of SB RAS, organization of primary discussion of manuscripts of numerous dissertation works delivered to the Department of Metal Ages Archaeology.

For her long-term scientific work and creative success, Evgeniya Derevianko was granted the title of "Honored Scientist of the Russian Federation" (1996); she was also awarded with the "Silver Sigma" badge of honor (2007), and certificates of appreciation from the Russian Academy of Sciences, the Russian Academy of Sciences Employees' Trade Union (1999, 2007), and the Siberian Branch of RAS (2004, 2008, 2015).

Evgeniya Derevianko has become, figuratively speaking, a center of attraction for many generations of the Institute staff: she is always friendly and responsive, ready to give support in a difficult situation, to share joy on the occasion of dissertation defense, childbirth, or just to talk about doubts and concerns.

Evgeniya Derevianko celebrates her anniversary among her loving daughters, granddaughter and great-granddaughter, colleagues and friends, who wish her good health, creative vitality, and… new concerns, without which the modern scientist's life is inconceivable!

A.P. Borodovsky, V.I. Molodin, V.P. Mylnikov
L.N. Mylnikova, S.P. Nesterov, N.V. Polosmak,
A.I. Soloviev, A.V. Tabarev, Y.S. Hudiakov,
and T.I. Chikisheva

AMB – Small Business Association

AN RT – Academy of Sciences of the Republic of Tatarstan

AVČR – Czech Academy of Sciences

BAR – British Archaeological Reports

BNC SO RAN – Buryat Science Center, Siberian Branch of the Russian Academy of Sciences (Ulan-Ude)

CNRS – Centre National de la Recherche Scientifique

GANIIIYAL – Gorno-Altaysk Research Institute of History, Language and Literature (Gorno-Altaysk)

GIM – State Historical Museum (Moscow)

IA RAN – Institute of Archaeology, Russian Academy of Sciences (Moscow)

IAE SO RAN – Institute of Archaeology and Ethnography, Siberian Branch of the Russian Academy of Sciences (Novosibirsk)

IGU – Irkutsk State University

IPOS SO RAN – Institute of Northern Development, Siberian Branch, Russian Academy of Sciences (Tyumen)

KhakNIIYALI – Khakass Research Institute of Language, Literature and History (Abakan)

KRSU – Yeltsin Kyrgyz-Russian Slavic University (Bishkek)

KSIA – Brief Communications of the Institute of Archaeology, Russian Academy of Sciences

MAE – Peter the Great Museum of Anthropology and Ethnography (Kunstkamera), Russian Academy of Sciences (St. Petersburg)

MIA – Materials and Investigations on Archaeology in the USSR

NANA – Azerbaijan National Academy of Sciences

PNIAL UrGU – Fundamental Research Archaeological Laboratory, Ural State University (Yekaterinburg)

PNIL UrFU – Fundamental Research Laboratory, Ural Federal University (Yekaterinburg)

RGADA – Russian State Archive of Early Acts (Moscow)

SAI – Collection of Archaeological Sources

SAIPI – Siberian Association of Prehistoric Art Researchers

SAV – Slovak Academy of Sciences

UrO RAN – Ural Branch of the Russian Academy of Sciences

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