THE LITHIC INDUSTRY OF OBI-RAKHMAT GROTTO, UZBEKISTAN

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Abstract: Obi-Rakhmat Grotto is situated 100 km northeast of Tashkent, Republic of Uzbekistan. The site was first studied in the 1960s and excavations through the 1970s yielded more than 40,000 stone artifacts. Excavations were renewed in 1998 with the goal of clarifying the archaeological, geological and environmental sequence. Based on studies of the 1998-1999 collections and a sample of artifacts with accurate provenience from earlier excavations, it is now possible to classify the Obi-Rakhmat industry as initial Upper Paleolithic, showing mixtures of Middle and Upper Paleolithic features. New AMS radiocarbon dates suggest that the local Middle-to-Upper Paleolithic transition began before 50 ka with the majority of lithic assemblages at Obi-Rakhmat spanning the interval from approximately 48 to 40 ka.

INTRODUCTION

Northwestern Central Asia has been the focus of renewed programs of archaeological research in part because this vast territory may have served as a geographic bridge between Paleolithic populations in western and eastern Eurasia. Information accumulated over the past 10 to 15 years provides new insight into the regional Paleolithic sequence, particularly the nature and timing of the Middle-to-Upper Paleolithic transition. The earliest Upper Paleolithic industries found in different parts of Eurasia, often referred to as initial Upper Paleolithic, are characterized by distinctive local characteristics superimposed on, or coincident with a set of common technological and typological features. The most important of these common features include: (1) a predominance of blades removed from cores exhibiting a combination of Middle Paleolithic (i.e., Levallois) and Upper Paleolithic features; (2) the appearance of Upper Paleolithic techniques for rejuvenating core striking platforms; (3) a high index of platform faceting linked to core maintenance; (4) elongate Levallois points; and (5) increased frequencies of retouched blades and Upper Paleolithic tool types such as endscrapers, burins, and chisel-like tools (Bar-Yosef 2000; Brantingham et al. 2001; Kuhn, Stiner, and Güleç 1999).

The roughly contemporaneous appearance 50–40 ka of initial Upper Paleolithic complexes showing these common techno-typological features appears to signal some manner of ecological, or evolutionary change in human adaptations. Whether it is convergent behavioral evolution (e.g., Brantingham and Kuhn 2001), or an event stimulated by (or signaling) the dispersal of one or more hominid populations is unknown. We have argued elsewhere that there is insufficient theoretical grounds at present for linking archaeological patterns of variability to specific hominid populations (Brantingham et al. 2001). These problems aside, the tasks of identifying and describing the patterns underlying the emergence of the earliest Upper Paleolithic remain critically important.

The leptolithic (i.e., blade-dominated) variant of the Upper Paleolithic is typical for eastern Eurasia, and in several cases these industries appear to have emerged out of local variants of the late Middle Paleolithic. This hypothesis seems to be in accord with models stressing convergent evolution of Upper Paleolithic cultures. Many researchers argue moreover that the late Middle Paleolithic of southern Siberia exhibits many features in common with industries reported from southwest Asia (Okladnikov 1949; Derevianko, Markin 1992, 1998; Ranov, Laukhin 2000), and explain such commonalities as the result of much earlier dispersals of hominid populations. In particular, Derevianko (2001) has suggested that the leptolithic variant of Levallois-Middle Paleolithic is connected with the dispersal of archaic Homo sapiens (see also Foley and Lahr 1997). The regional evolution of anatomically modern humans from dispersed archaic Homo sapiens populations thus may have occurred together with, and perhaps contributed to the emergence of local Upper Paleolithic adaptations. Such a model would appear to explain both the contemporaneous appearance of Upper Paleolithic industries in widely separated geographic locations such as the Levant and southern Siberia, as well as the occurrence of local features on a common techno-typological substrate in each of these cases (see also Kuhn et al. 2001).

As the primary territorial bridge between these regions, we ask whether a similar pattern of evolution of Upper Paleolithic adaptations from local Middle Paleolithic precursors is indicated in western Central Asia. As noted elsewhere (Derevianko, Petrin, Rybin, Chevalkov 1998; Derevianko, Islamov, Petrin et al. 1999), the Middle and early Upper Paleolithic complexes associated with the sites of Khudji and Obi-Rakhmat exhibit features similar to the industries of Kara-Bom affinity in Northeast Asia, as well as to Middle Paleolithic and transitional complexes of Southwest Asia. The present article is focused on an analysis of the Obi-Rakhmat lithic industry, the most thoroughly investigated and best dated early Upper Paleolithic locality in western Central Asia.

SITE BACKGROUND

Obi-Rakhmat Grotto was discovered in 1962 by a research team from the Institute of History and Archaeology, Uzbekistan Academy of Sciences, headed by A. R. Mukhamedzhanov. Initial excavations were carried out under the supervision of M. M.

Fig. 1. Map of the Republic of Uzbekistan indicating the location of Obi-Rakhmat Grotto.

Gerasimov and H. K. Nasretdinov and in 1964-1965 research was directed by R. H. Suleimanov (Suleimanov 1972). Investigations at Obi-Rakhmat were renewed in 1998, under the direction of U. I. Islamov and A. P. Derevianko, by a joint research team from the Institute of Archaeology, Uzbekistan Academy of Sciences, and the Institute of Archaeology and Ethnography, Siberian Branch of the Russian Academy of Sciences (Derevianko, Islamov, Petrin et al. 1998, 1999).

Obi-Rakhmat Grotto (N41°34'08.8" and E70°08'00.3", 1,250m asl) is located 100 km northeast of Tashkent in the Republic of Uzbekistan (Fig. 1). The site is situated at the southwestern end of the Koksui mountain range, in the western Tian Shan, near the junction of the Chatkal and Pskem Rivers. The site is found within a Paleozoic limestone massif bordering the Paltau River, a tributary of the Chatkal. A spring located within a linear depression above the grotto produces a small stream that falls near the entry of the grotto and ultimately enters the Paltau River. The limestone cliff containing the grotto borders the southern slope of Karatut-Bashi Mountain, where exposed bedrock (limestone in various states of silicification) and talus formations provide many of the stone raw materials found in the Obi-Rakhmat sequence.

The grotto itself is a large, south-facing niche 20m wide at the entrance, 9m long, and maximally 11.8m in height. The sequence of soft sediments contains 22 strata, which reach a total depth of about 10 m (Fig. 2). The deposits consist of intercalated horizons of pale-yellow and gray sandy loams. The strata are generally horizontal, but dip slightly in places to the southwest in the directions of the entryway zone and the western wall of the cave. The density of debris (éboulis) contained within the sediment matrix varies from very low in the upper layers to a maximum in the middle of the stratigraphic column (stratum 15), followed by a sharp decrease below stratum 16. The debris is mostly composed of small- to medium-sized, slightly rounded limestone fragments. Strata 11, 12, 14, and 15 contained high concentrations of large- (up to 40 cm in diameter) and medium-sized limestone cobbles linked to rock-falls. The sediment matrix in all strata is variably carbonate cemented. The densest areas of cementation were noted in the immediate vicinity of the walls; along the western portions of the excavation area some levels are represented by petrocalcic travertines with minimal detritus inclusions.

Palinological analyses of samples collected from Obi-Rakhmat suggest climatic conditions very similar to those of the present-day Tian Shan (I. A. Kulkova, personal communication). Pollen spectra reveal a nearly identical collection of floral species throughout the sequence. Variability in relative proportions of these species is thought to reflect changes in effective humidity. It should be noted that the Tian Shan was never completely glaciated, even during the height of the Last Glacial Maximum. Glaciers did fill some sub-set of depressions and valleys, while others preserved forest and meadow communities. The available palinological information suggests dry, shrub-forb steppe was the principal landscape type for the western Tian Shan during the late Pleistocene. River valleys and north-facing slopes of mountain ranges, however, were vegetated by maple, birch, walnut, hornbeam, pistachio, and other broad- and small-leafed species.

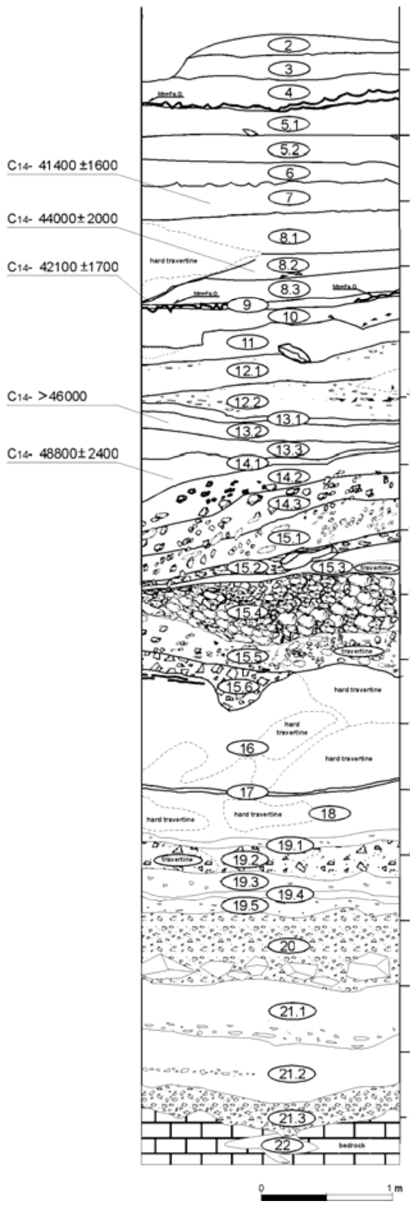

Fig. 2. Obi-Rakhmat stratigraphic column based on excavations carried out in 1998-2001.

Coniferous trees, including pine, spruce, and fir, grew higher in the mountains. The northern and southern faces of medium-elevation mountains contained both open woodland and meadow-steppe environments. The higher elevations had a decreased diversity of vegetation types. Decreased floral species diversity is also indicated in environmental zones situated below the shrub–forb steppe, namely in the wormwood plains and desert zones containing saline, alkaline (solonchak) soils. Similar patterns were noted in the distribution of fauna species; the richest variety of animals was, and still is typical of the shrub-forb steppe zone ranging between 800–1300m above mean sea level. Faunal remains recovered from Obi-Rakhmat in 1998-1999 contain species characteristic of both mountain forests and steppe zones, namely red deer (Cervus elaphus), mountain goat (Capra sibirica), sheep (Ovis sp.), wild boar (Sus scrofa), fox (Vulpes vulpes), and marmot (Marmota sp.) (I. V. Foronova, personal communication).

New AMS radiocarbon dates1 allow the chronological placement of the middle and upper parts of the Obi-Rakhmat sequence within oxygen-isotope stage 3 (Figure 2; Table 1, just below).

Stratum	Age	Standard Deviation	Material	Lab Number
4	19700	4000	charcoal	AA-31575
7	41,400	4000	charcoal	AA-31577
8.2	44,000	2000	charcoal	AA-31580
9	42,100	1700	charcoal	AA-31581
12.1	>28,800		charcoal	AA-31584
13.2	>46,000		charcoal	AA-35318
14.1	48,800	2400	charcoal	AA-36746

Table 1. List of radiocarbon AMS dates.

ARCHAEOLOGICAL MATERIALS

Selected materials from strata 2–14 excavated in 1963, 1968–1970, 1978, 1979, and 1986 are analyzed in the present article2. Artifacts recovered in association with strata 3–14 in 1998-1999 also are discussed. The total number of specimens analyzed here is 31,399. The distributions of artifacts with respect to stratigraphic layers are shown in tables 2-5. Following the system established by Suleimanov (1972), archaeological collections from adjacent lithological strata and demonstrating similar techno-typological characteristics are assigned to three different units3. Unit I materials are associated with strata 10–14. Unit II materials are associated with strata 6–9. Unit III materials are associated with strata 2–5.

Unit I. A total of 16,552 specimens was classified, including chips (n = 9,678), shatter (n = 972), and pebbles (n = 3) (Fig. 3, 4). Core and core-like implements are represented by 118 specimens and include both core fragments and nuclei of various types (Fig. 5). The set of typologically distinct cores (n = 61) is dominated by forms fashioned on flake or blade blanks (n = 23). Most of the latter core forms are identified as core-burins (n = 17). Such cores were produced mostly on massive laminar blanks. The residual striking platform and/or distal end of the original blank was utilized as a striking platform for detaching small laminar blanks from the narrow edge. The second most abundant series of cores consists of flat-faced flake (n = 14) and flat-faced blade cores (n = 14), technologically reminiscent of Middle Paleolithic

Stratum	Cores and core-like pieces N	%	Flakes N	%	Blades N	%	Microblades N	%	Laminar flakes N	%	Pointed blades N	%	Sub-triangular flakes N	%	Points N	%	Shatters N	%	Chips N	%	Technical elements N	%	Pebbles N	%	Total
2	1	1.4	7	9.6	16	21.9													49	67.1					73
3	6	3.8	43	27.2	37	23.4			1	0.6			1	0.6	1	0.6	22	13.9	45	28.5	2	1.3			158
4	8	1.5	148	28.1	113	21.5	4	0.8	10	1.9	5	1.0			11	2.1	41	7.8	184	35.0	2	0.4			526
5	15	0.7	826	39.3	620	29.5	8	0.4	9	0.4	39	1.9	12	0.6	5	0.2	207	9.8	363	17.3					2104
2 – 5	30	1.0	1024	35.8	786	27.5	12	0.4	20	0.7	44	1.5	13	0.5	17	0.6	270	9.4	641	22.4	4	0.1			2861
6	22	1.5	485	33.3	328	22.5			9	0.6	15	1.0	23	1.6	7	0.5	121	8.3	445	30.6	1	0.1			1456
7	71	1.2	866	14.7	885	15.0	26	0.4	51	0.9	69	1.2	12	0.2	15	0.3	350	5.9	3525	59.9	16	0.3			5886
8	23	0.7	984	31.4	551	17.6	11	0.4	48	1.5	12	0.4	20	0.6	18	0.6	419	13.4	1043	33.3	2	0.1			3131
9	15	1.0	320	21.2	292	19.3	8	0.5	3	0.2	12	0.8	2	0.1			120	7.9	730	48.2	8	0.5	3	0.2	1513
6 – 9	131	1.1	2655	22.2	2056	17.2	45	0.4	111	0.9	108	0.9	57	0.5	40	0.3	1010	8.4	5743	47.9	27	0.2	3	0.0	11986
10	33	2.0	649	39.7	339	20.7	1	0.1	25	1.5	22	1.3	15	0.9	9	0.6	193	11.8	345	21.1	4	0.2	1	0.1	1636
11	15	0.3	967	20.8	671	14.4	34	0.7	13	0.3	18	0.4			3	0.1	213	4.6	2720	58.4	4	0.1	1	0.0	4659
12	23	1.1	641	30.8	241	11.6	8	0.4	13	0.6	10	0.5			11	0.5	199	9.6	932	44.7	5	0.2			2083
13	26	0.5	850	15.1	379	6.7	24	0.4	28	0.5	8	0.1			1	0.0	226	4.0	4095	72.6	4	0.1	1	0.0	5642
14	21	0.8	537	21.2	215	8.5			17	0.7	9	0.4	4	0.2	1	0.0	141	5.6	1586	62.6	1	0.0			2532
10 – 14	118	0.7	3644	22.0	1845	11.1	67	0.4	96	0.6	67	0.4	19	0.1	25	0.2	972	5.9	9678	58.5	18	0.1	3	0.0	16552
Sub-total	279	0.9	7323	23.3	4687	14.9	124	0.4	227	0.7	219	0.7	89	0.3	82	0.3	2252	7.2	16062	51.2	49	0.2	6	0.0	31399

Table 2. Classification of primary reduction products by stratigraphic layer.

Stratum	Cores and core-like pieces N	%	Flakes N	%	Blades N	%	Microblades N	%	Laminar flakes N	%	Pointed blades N	%	Sub-triangular flakes N	%	Points N	%	Shatters N	%	Chips N	%	Technical elements N	%	Pebbles N	%	Total
2	1	1.4	7	9.6	16	21.9													49	67.1					73
3	6	3.8	43	27.2	37	23.4			1	0.6			1	0.6	1	0.6	22	13.9	45	28.5	2	1.3			158
4	8	1.5	148	28.1	113	21.5	4	0.8	10	1.9	5	1.0			11	2.1	41	7.8	184	35.0	2	0.4			526
5	15	0.7	826	39.3	620	29.5	8	0.4	9	0.4	39	1.9	12	0.6	5	0.2	207	9.8	363	17.3					2104
2 – 5	30	1.0	1024	35.8	786	27.5	12	0.4	20	0.7	44	1.5	13	0.5	17	0.6	270	9.4	641	22.4	4	0.1			2861
6	22	1.5	485	33.3	328	22.5			9	0.6	15	1.0	23	1.6	7	0.5	121	8.3	445	30.6	1	0.1			1456
7	71	1.2	866	14.7	885	15.0	26	0.4	51	0.9	69	1.2	12	0.2	15	0.3	350	5.9	3525	59.9	16	0.3			5886
8	23	0.7	984	31.4	551	17.6	11	0.4	48	1.5	12	0.4	20	0.6	18	0.6	419	13.4	1043	33.3	2	0.1			3131
9	15	1.0	320	21.2	292	19.3	8	0.5	3	0.2	12	0.8	2	0.1			120	7.9	730	48.2	8	0.5	3	0.2	1513
6 – 9	131	1.1	2655	22.2	2056	17.2	45	0.4	111	0.9	108	0.9	57	0.5	40	0.3	1010	8.4	5743	47.9	27	0.2	3	0.0	11986
10	33	2.0	649	39.7	339	20.7	1	0.1	25	1.5	22	1.3	15	0.9	9	0.6	193	11.8	345	21.1	4	0.2	1	0.1	1636
11	15	0.3	967	20.8	671	14.4	34	0.7	13	0.3	18	0.4			3	0.1	213	4.6	2720	58.4	4	0.1	1	0.0	4659
12	23	1.1	641	30.8	241	11.6	8	0.4	13	0.6	10	0.5			11	0.5	199	9.6	932	44.7	5	0.2			2083
13	26	0.5	850	15.1	379	6.7	24	0.4	28	0.5	8	0.1			1	0.0	226	4.0	4095	72.6	4	0.1	1	0.0	5642
14	21	0.8	537	21.2	215	8.5			17	0.7	9	0.4	4	0.2	1	0.0	141	5.6	1586	62.6	1	0.0			2532
10 – 14	118	0.7	3644	22.0	1845	11.1	67	0.4	96	0.6	67	0.4	19	0.1	25	0.2	972	5.9	9678	58.5	18	0.1	3	0.0	16552
Sub-total	279	0.9	7323	23.3	4687	14.9	124	0.4	227	0.7	219	0.7	89	0.3	82	0.3	2252	7.2	16062	51.2	49	0.2	6	0.0	31399

Table 3. Percentages of core and core-like implements by stratigraphic layer.

Core types	2		3		4		5		2 – 5		6		7		8		9		6 – 9		10		11		12		13		14		10 – 14		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Levallois			1	16.7			1	6.7	***2***	***6.7***	1	4.5	2	2.8					***3***	***2.3***							1	3.8			***1***	***0.8***	6	***2.2***
point cores											1		2						***3***														3	
blade cores			1						***1***																		1				***1***		2	
flake cores							1		***1***																								1	
Flat-faced blade cores	1	100			2	25.0			***3***	***10.0***	2	9.1	11	15.5	3	13.0	3	20.0	***19***	***14.5***	4	12.1	1	6.7	2	8.7	3	11.5	4	19.0	***14***	***11.9***	36	***12.9***
unidirectional with single flaking surface	1								***1***		1		7		1		3		***12***		2				2		1		2		***7***		20	
bidirectional with single flaking surface					1				***1***				4		2				***6***		2		1				1		1		***5***		12	
bidirectional with two flaking surfaces					1				***1***																		1		1		***2***		3	
multidirectional with two flaking surfaces											1								***1***														1	
Flat-faced flake cores			3	50.0			2	13.3	***5***	***35.7***			2	2.8	1	4.3	2	13.3	***5***	***3.8***	5	15.2	3	20.0	1	4.3	2	7.7	3	14.3	***14***	***11.9***	24	***8.6***
bidirectional with two flaking surfaces																																		
unidirectional with single flaking surface			2				2		***4***				2		1		2		***5***		3		3		1		1		2		***10***		19	
multidirectional with multiple flaking surfaces			1						***1***												2						1		1		***4***		5	
Protoprismatic cores									***0***	***0.0***	3	13.6							***3***	***2.3***					1	4.3					***1***	***0.8***	4	***1.4***
Narrow-faced cores			1	16.7	1	12.5	1	6.7	***3***	***10.0***	1	4.5	4	5.6	3	13.0	4	26.7	***12***	***9.2***			2	13.3	1	4.3	2	7.7	3	14.3	***8***	***6.8***	23	***8.2***
Cores fashioned on flakes/blades							1	6.7	***1***	***3.3***	5	22.7	17	23.9	6	26.1	1	6.7	***29***	***22.1***	12	36.4	6	40.0			3	11.5	2	9.5	***23***	***19.5***	53	***19.0***
unidirectional with single flaking surface													1		1				***2***		3										***3***		5	
core-burins							1		***1***		5		15		3		1		***24***		6		6				3		2		***17***		42	
combined cores													1		2				***3***		3										***3***		6	
Amorphious cores											1	4.5			4	17.4			***5***	***3.8***	4	12.1			1	4.3			1	4.8	***6***	***5.1***	11	***3.9***
Core-like shatters			1	16.7	5	62.5	10	66.7	***16***	***53.3***	9	40.9	35	49.3	6	26.1	5	33.3	***55***	***42.0***	8	24.2	3	20.0	17	73.9	15	57.7	8	38.1	***51***	***43.2***	122	***43.7***
Sub-total	1	100	6	100	8	100	15	100	***30***	***100***	22	100	71	100	23	100	15	100	***131***	***100***	33	100	15	100	23	100	26	100	21	100	***118***	***100***	279	**100**

Table 4. Percentages tool types by stratigraphic layer.

Tool types	3		4		5		6		7		8		9		10		11		12		13		14		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
Levallois points	1	25.0	9	45.0	1	1.1	7	16.7	11	13.1	10	28.6			4	10.3	2	6.5	2	10.5	1	1.7	1	5.0	49
Mousterian points							1	2.4	9	10.7	1	2.9			5	12.8					1	1.7			17
Racloirs					3	3.4	9	21.4	5	6.0	4	11.4	2	15.4	6	15.4	2	6.5	3	15.8	11	18.6			45
Notch-denticulate tools	1	25.0			7	8.0	2	4.8	1	1.2	3	8.6	2	15.4	9	23.1	2	6.5			4	6.8	4	20.0	35
Spurs									1	1.2									1	5.3			2	10.0	4
Pebble tools																					1	1.7			1
Grattoirs	2	50.0	2	10.0	11	12.5	1	2.4	8	9.5			1	7.7			1	3.2			4	6.8	2	10.0	32
Burins					7	8.0	6	14.3	2	2.4	6	17.1	3	23.1	2	5.1	7	22.6	3	15.8	9	15.3	5	25.0	50
Borers																							1	5.0	1
Chisel-like tools			1	5.0																	2	3.4	1	5.0	4
Backed knives									5	6.0	2	5.7	1	7.7	2	5.1	1	3.2	2	10.5	8	13.6			21
Retouched pointed blades			2	10.0	25	28.4	1	2.4	15	17.9			1	7.7	1	2.6	4	12.9			2	3.4			51
Retouched blades			4	20.0	18	20.5	13	31.0	23	27.4	5	14.3	3	23.1	5	12.8	11	35.5	6	31.6	12	20.3	3	15.0	103
Truncated flakes/blades			1	5.0	1	1.1													1	5.3					3
Slightly retouched flakes			1	5.0	15	17.0	2	4.8	4	4.8	4	11.4			5	12.8	1	3.2	1	5.3	4	6.8	1	5.0	38
Sub-total	4	100	20	100	88	100	42	100	84	100	35	100	13	100	39	100	31	100	19	100	59	100	20	100	454

Table 5.

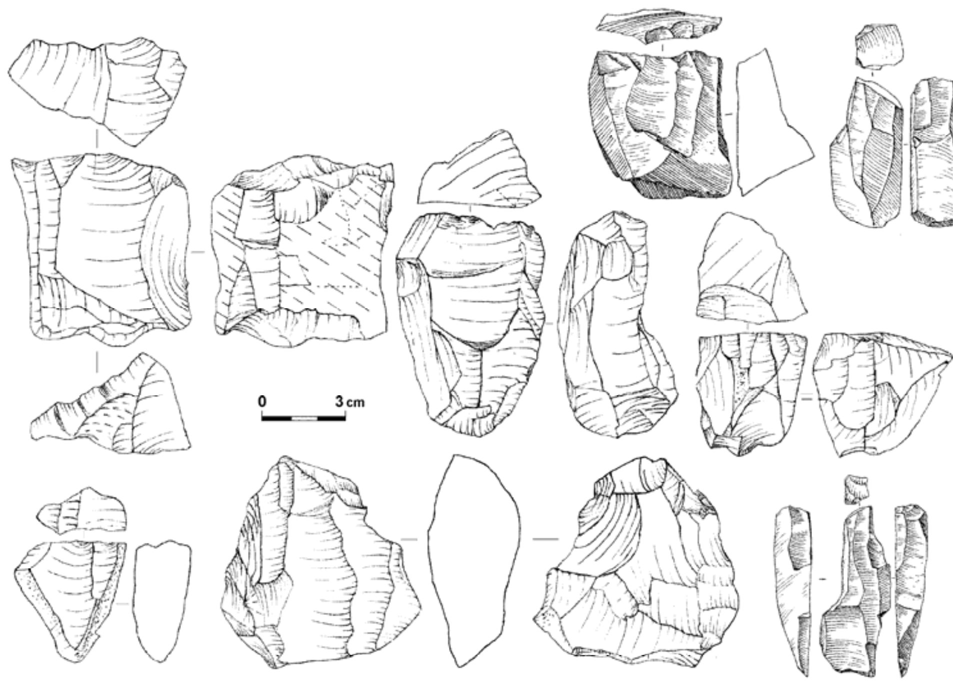

Fig. 3. Unit I lithic artifacts.

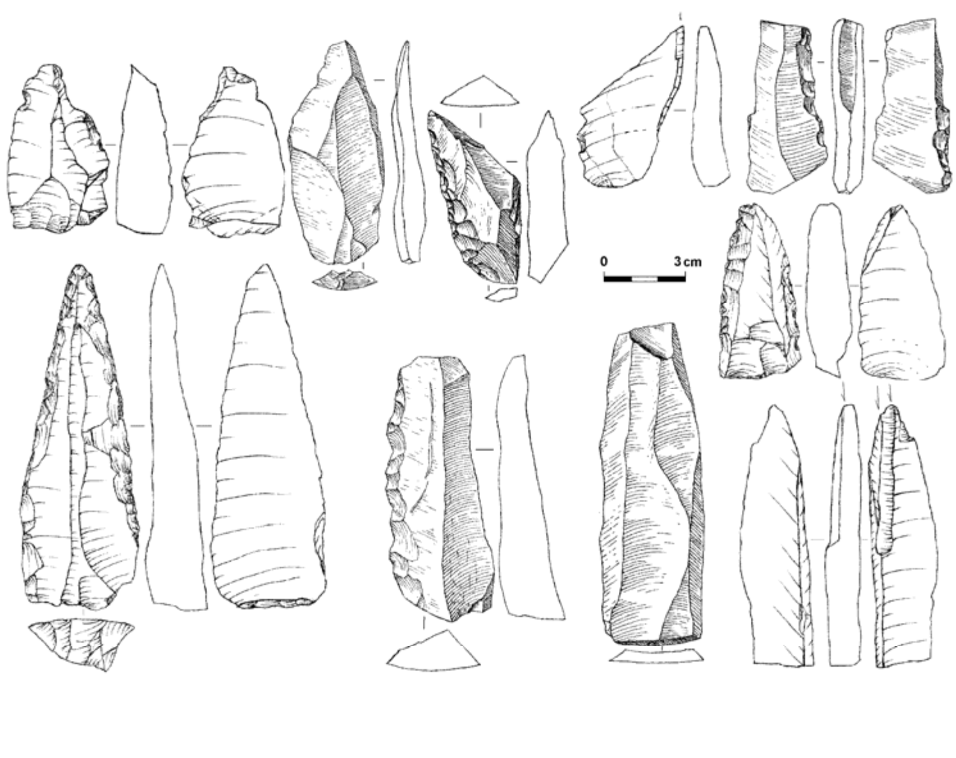

Fig. 4. Unit I lithic artifacts.

Levallois core technologies. The category of flat-faced flake cores includes two varieties, single platform cores with only one flaking surface (n = 10) and multiple platform cores with many flaking surfaces (n = 4). The series of flat-faced blade cores is dominated by single platform nuclei with only one flaking surface. The majority of these cores (n = 7) were used to detach both medium and small blades. Double platform cores were also noted, including those with one (n = 5) or two (n = 2) flaking surfaces. In all of these core forms, plain striking platforms are distinctly beveled toward the back face. Some single platform cores exhibit traces of reshaping the distal, convex end from a specially prepared striking platform. Several cores may also be classified as single platform nuclei with primary reduction along the narrow face to produce medium and small blades (n = 8). As a general rule, these cores exhibit minimal preparation; only plain platforms beveled towards the back were observed. Several crested technical spalls (lames à crêtes or lames débordants, n = 18) were identified within the Unit I assemblages. One example of a proto-prismatic core and one classic, recurrent Levallois blade core were also noted.

The collection of blanks totals 5,781 specimens. Most numerous are flakes (n = 3,644, or 63.0%) followed by blades (n = 1,845, or 31.9%). Several additional blank types were identified including laminar flakes (n = 96, or 1.7%), pointed blades (n = 67, or 1.2%), microblades (n = 67, or 1.2%), triangular flakes (n = 19, or 0.3%), technical spalls (n = 18, or 0.3%), and elongate Levallois points (n = 25, or 0.4%). For those blanks retaining visible striking platforms (n = 3,931), the majority are classified as plain (total = 79.5%; flakes = 78.4%; blades = 82.2%). Other platform types are not numerous. Faceted platforms were noted on 9.3% of blanks (flakes = 11.8%; blades = 3.3%), dihedral platforms on 6.1% (flakes = 5.8%; blades = 7.0%), punctiform platforms on 3.9% (flakes = 2.7%; blades; 6.6%), and cortical platforms on 1.2% (flakes = 1.4%; blades = 0.8%). Examination of dorsal scar patterns pattern shows that most blanks were produced through a method of longitudinal-parallel flaking executed primarily from a single striking platform (n = 3445, or 59.6%). Fewer spalls exhibit longitudinal-parallel flaking executed from two striking platforms (n = 146, or 2.5%) or convergent reduction (n = 82, or 1.4%).

The toolkit from Unit I consists of 168 specimens which have been classified as retouched blades (n = 37, or 22.1%), burins (n = 26, or 15.5%), sidescrapers (n = 22, 13.1%), notch-denticulate tools (n = 19, or 11.3%), retouched flakes (n = 12, or 7.1%), backed knives (n = 13, or 7.7%), elongate Levallois points (n = 10, or 6.0%), endscrapers (n = 7, or 4.2%), retouched pointed blades (n = 7, or 4.2%), Mousterian points (n = 6, or 3.6%), chisel-like tools (n = 3, 1.7%), spurs (n = 3, 1.7%), and borers, truncated flakes and pebble tools each represented by single specimens (Fig. 6).

Unit II. A total of 11,986 specimens were recorded in this unit including chips (n = 5,743), fragments (n = 1,010), and pebbles (n = 3) (Fig. 7, 8). Cores (n = 131) include both core fragments formal cores of various types (Fig. 5). The series of typologically distinct nuclei (n = 71) is dominated, as in Unit I, by cores fashioned on blanks (n = 29), most of which have been identified as core-burins (n = 24). Indeed, there appear to be no substantial technological differences with the core-burins represented in Unit I. The second most numerous category consists of Levallois-like flat-faced blade cores (n = 19), including both single (n = 12) and double platform (n = 6) varieties with one flaking surface, and a single multi-platform core with two flaking surfaces (n = 1). Casual, single platform narrow-faced cores were utilized for the production of medium and small blades (n = 12). As in Unit I, some narrow-faced core specimens retain prepared crests, and a few crested technical spalls were noted in this collection (n = 27). Proto-prismatic and classic Levallois core types are represented by three specimens each. Small, elongate points were detached from the Levallois nuclei.

The collection of blanks (n = 5,099) is dominated by flakes (n = 2,655, or 52.1%), followed by formal blades (n = 2,056, or 40.3%). Additional blank types include laminar flakes (n = 111, or 2.2%), pointed blades (n = 108, or 2.1%), triangular blanks (n = 69, or 1.4%), microblades (n = 45, or 0.9%), elongate Levallois points (n = 28, or 0.5%), and technical spalls (n = 27, or 0.5%). Definable residual striking platforms were identified on 2,531 blanks, of which the predominant type is plain (total = 85.1%, flakes = 84.7%; blades = 81.4%). Other types represent only minor fractions of the total collection: punctiform platforms were noted on 6.1% of specimens (flakes = 5.6%; blades = 8.0%), dihedral platforms were noted on 5.4% (flakes = 6.9%; blades = 4.9%), 3.0% of blanks show faceted platforms (flakes = 2.1%; blades = 5.4%), and 0.5% bear cortical striking platforms (flakes = 0.7%; blades = 0.3%). Analysis of dorsal scar patterns (excluding small blanks) indicates a predominance of longitudinal–parallel flaking from one striking platform (n = 3107; 61.3%). A considerably smaller fraction of blanks demonstrates a longitudinal–parallel pattern of flaking from two striking platforms (n = 178; 3.5%), or a convergent system of core reduction (n = 152; 3.0%).

The Unit II toolkit (n = 174) includes retouched blades (n = 44, or 25.3%), elongate Levallois points (n = 28, or 16.1%), sidescrapers (n = 20, or 11.5%), burins (n = 17, or 9.8%), retouched pointed blades (n = 17, 9.8%), Mousterian points (n = 11, or 6.3%), endscrapers (n = 10, or 5.7%), retouched flakes (n = 10, or 5.7%), notch-denticulate tools (n = 8, or 4.6%), backed knives (n = 8, or 4.6%), and “spurs” (n = 1, or 0.6%) (Fig. 6).

Unit III. The number of artifacts classified in this unit totals 2,861 specimens including chips (n = 641) and fragments (n = 270) (Fig. 9). Of the 30 cores and core-

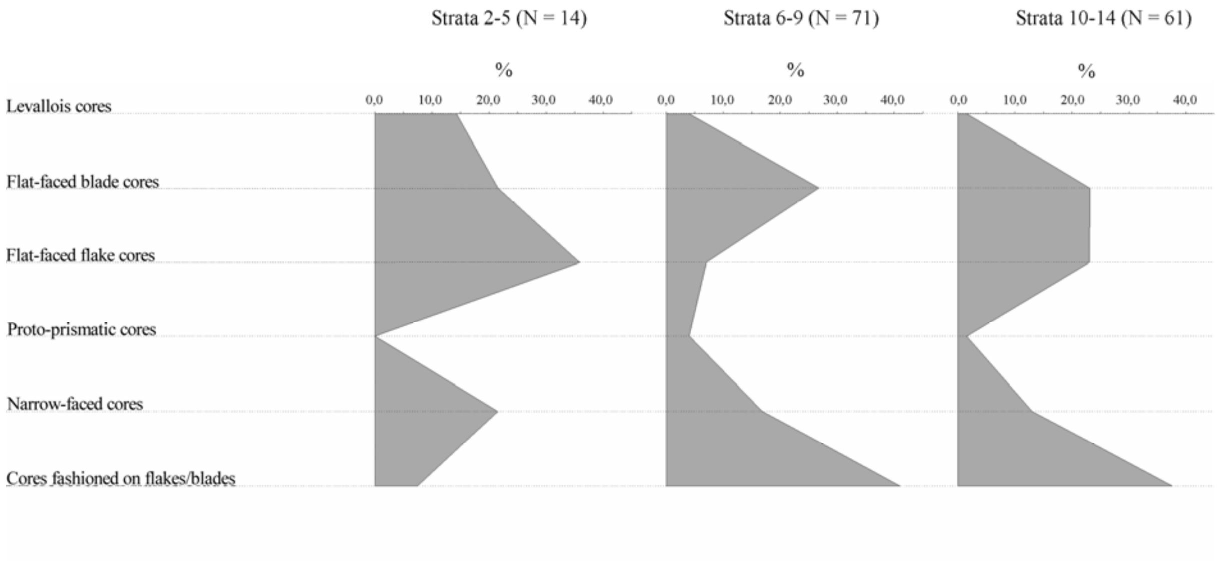

Fig. 5. Diagram illustrating the distribution of core types by stratigraphic unit. Core-like fragments and amorphous cores are not included in the calculation of percentages.

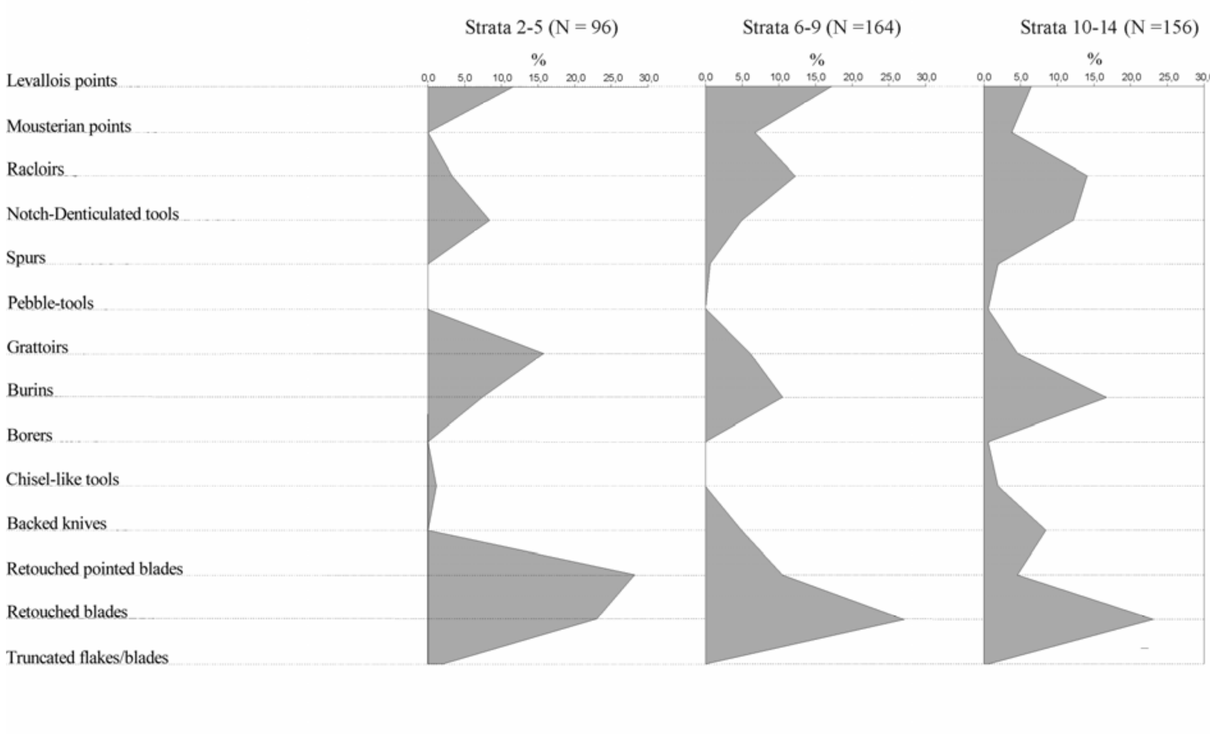

Fig. 6. Diagram illustrating the distribution of tool types by stratigraphic unit. Retouched flakes are not included in the calculation of percentages.

like pieces (Fig. 5), the typologically distinct nuclei (n = 14) are dominated by flat-faced flake cores (n = 5) including single platform varieties with one flaking surface (n = 4) and one specimen with multiple platforms and multiple flaking surfaces. Plain striking platforms beveled towards the back are the most common. Blade cores exhibiting a parallel pattern of flaking (n = 3) and narrow-faced cores for the production of small blades (n = 3) were identified. Two Levallois cores were utilized for the production of both blades and flakes. One core-burin, a characteristic type in Units I and II, was also noted.

The collection of blanks (n = 1,920) is dominated by flakes (n = 1,024, or 53.3%), followed by blades (n = 786, or 40.9%), pointed blades (n = 44, or 2.3%), triangular blanks (n = 30, or 1.6%), laminar flakes (n = 20, or 1.0%), microblades (n = 12, or 0.6%), and technical spalls (n = 4, 0.2%). Definable residual striking platforms were identified on 739 blanks, of which the predominant type is plain (total = 88.4%; flakes = 85.9%; blades = 90.8%). Punctiform platforms were noted on 3.8% of specimens (flakes = 5.7%; blades = 1.9%), dihedral platforms on 3.7% (flakes = 5.4%; blades = 1.9%), and faceted platforms on 3.7% (flakes = 3.0%; blades = 4.3%). Cortical platforms were observed only on blades, comprising 0.5% of all blanks and 1.1% of all blades with residual striking platforms. Dorsal scar patterns on blanks indicate a predominance (n = 1046, or 55.3%) of a longitudinal–parallel flaking from one striking platform, the remainder consisting of convergent flaking (n = 78, or 4.1%) or longitudinal-parallel flaking from two platforms (n = 36, or 1.9%).

The Unit III toolkit (n = 112) includes retouched pointed blades (n = 27, or 24.1%), retouched blades (n = 22, 19.6%), retouched flakes (n = 16, or 14.3%), endscrapers (n = 15, or 13.4%), elongate Levallois points (n = 11, or 9.8%), notch-denticulate tools (n = 8, or 7.1%), burins (n = 7, or 6.3%), sidescrapers (n = 3, or 2.7%), truncated blanks (n = 2, or 1.8%), and a chisel-like tool (n = 1, or 1.8%) (Fig. 6).

DISCUSSION

Analysis of the Obi-Rakhmat archaeological collections allows the following general inferences regarding the technological and typological characteristics of the industry. First, the core populations are dominated by forms falling within the range of variation of Upper Paleolithic reduction strategies, especially core-burins, narrow-faced cores and several varieties of informal microcores executed mostly on flakes and massive blades. Although most identifiable microcores were recovered from layers above stratum 10, the products of these core reduction strategies were uncovered in all layers through stratum 14. Flat-faced and classic Levallois nuclei, both reminiscent of Middle Paleolithic technologies, are also present. However, most of these latter core types incorporate elements of Upper Paleolithic reduction strategies, especially late-stage reduction along the narrow face for detaching blades and bladelets.

Second, the collection of blanks includes a considerable number of laminar forms, comprising more than 40% of all blanks in Units II and III and more than 30% of all blanks in Unit I. Microblades show a similar pattern of increasing frequencies and it is clear, more generally, that the mean metric dimensions of all blanks becomes smaller through the sequence. Most distinctive of the Obi-Rakhmat blank populations is a type of pointed blade. Pointed blades were noted in all strata, and increase in frequency towards the top of the sequence.

Third, the tool kit is essentially homogeneous throughout and is dominated by Upper Paleolithic tool types. The most numerous tool types include burins, endscrapers, and sidescrapers (all fashioned on laminar blanks), and retouched blades, including pointed varieties. Levallois forms are not numerous and are represented by elongate Levallois points. Mousterian points, though typologically classic when encountered, are rare.

The analysis of the Obi-Rakhmat archaeological materials provides us with data suggesting a process of gradual transition from the Middle to the Upper Paleolithic occurring in western Central Asia. The available chronometric dates suggest that these developmental processes began prior to 50 ka ago. The earliest Upper Paleolithic at Obi-Rakhmat was based on a form of Middle Paleolithic Levallois technology aimed at the production of laminar blanks. In this regard, Obi-Rakhmat displays many similar features with both late Middle Paleolithic and early Upper Paleolithic complexes in Southwest Asia and the Siberian Altai.

In the Altai, the most complete archaeological sequence representing the emergence of the early Upper Paleolithic has been obtained from Kara-Bom (Brantingham et al. 2001). This site has yielded the earliest known dates for the Upper Paleolithic in Siberia: 43, 200 ± 1500 BP (GX-17597) and 43,300 ± 1600 BP (GX-17596) (Goebel, Derevianko, Petrin 1993). Analysis of lithic artifacts derived from clear stratigraphic contexts at Kara-Bom allows us to document a continuous developmental sequence from the late Middle Paleolithic to the early Upper Paleolithic. The late Middle Paleolithic (i.e., Mousterian Horizons 1 and 2), ESR dated to perhaps as early as 63 ka (calendric), is represented by Levallois core technologies dedicated to the production of Levallois points and some blades. The earliest, or initial Upper Paleolithic (i.e., Horizons 5 and 6) shows a shift in emphasis within Levallois core reduction strategies towards greater blade production and fewer points. The overlying early Upper Paleolithic assemblages (i.e., Horizons 4-1) show an increasing emphasis on the removal of laminar blanks from prismatic and narrow-face cores. The archaeological

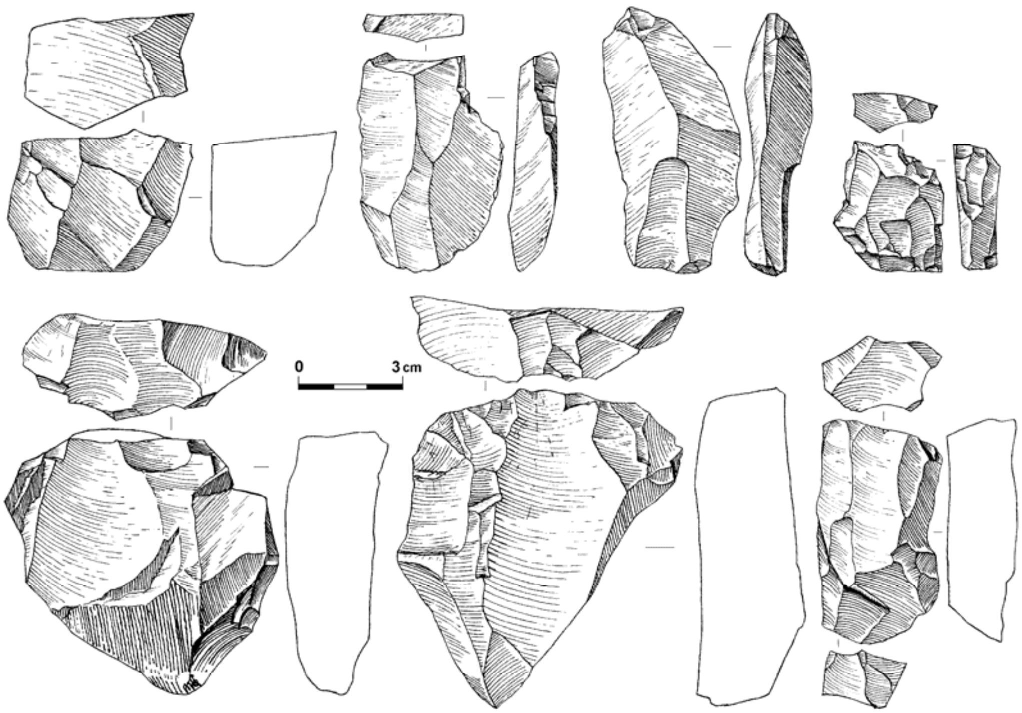

Fig. 7. Unit II lithic artifacts.

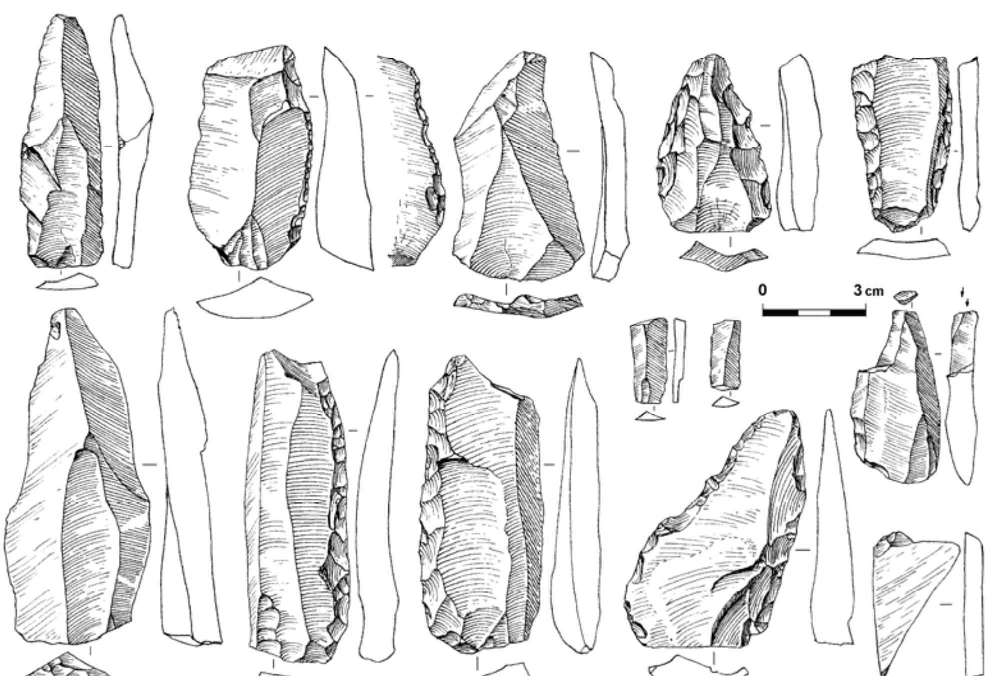

Fig. 8. Unit II lithic artifacts.

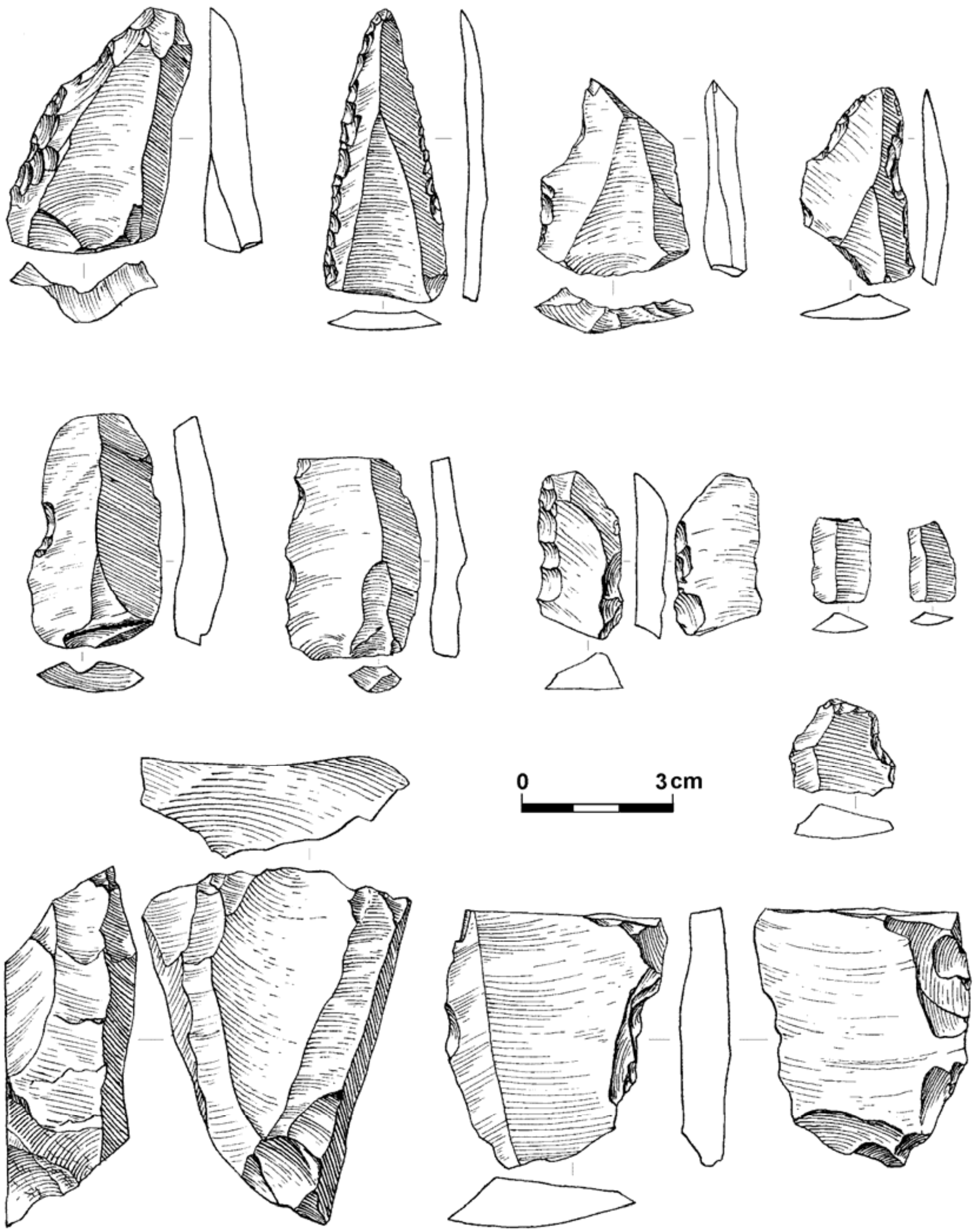

Fig. 9. Unit III lithic artifacts.

collections associated with all horizons of the Kara-Bom sequence include a variety of Middle and Upper Paleolithic tool types, with the proportion of Upper Paleolithic tools gradually increasing from the lower to the upper sections of the profile. Most tools, regardless of their typological classification into Middle or Upper Paleolithic groups, were fashioned on elongate laminar blanks. Noteworthy with respect to the Obi-Rakhmat industry is the morphology of the classic and elongate Levallois points from Kara-Bom. These blanks differ only minor ways from the pointed blades typical of the initial Upper Paleolithic at both sites. This fact suggests a gradual quantitative transformation, rather than qualitative shift, of Levallois core reduction strategies into an Upper Paleolithic parallel blade technology. Within the realm of lithic technology, it would appear that the Upper Paleolithic in Siberian Altai emerged from a local Middle Paleolithic established in the area perhaps 100–50 ka.

The Middle-to-Upper Paleolithic transition in the Levant is best illustrated by materials obtained from the open-air site of Boker-Tachtit dated to 47–46 ka (Marks & Ferring 1988). It has been argued that the Boker-Tachtit transitional industry originated from the early Levantine Middle Paleolithic (Mousterian Tabun D type), which appeared perhaps as early as 250 ka and have lasted until 50–60 ka ago. The Tabun D type Mousterian is characterized by a developed unipolar Levallois technology, which was based on the production of both elongate blades and Levallois points. In addition to the more wide-spread parallel and convergent unipolar Levallois method, other core reduction strategies yielding blades have been identified with this time period. The Rosh-Ain-More site in Israel, for example, dated to around 80 ka ago, has yielded proto-prismatic cores with clear use of crested eclats débordants as part of the reduction strategy. To many, this feature is typical of transitional Middle-Upper Paleolithic industries. Complexes of this sort include Middle Paleolithic tool types such as Mousterian points and sidescrapers with lateral working edges. The number of denticulate tools tends to be small and the proportion of Upper Paleolithic tools (e.g., endscrapers, burins, and backed knives) tends to be somewhat larger. Later examples of such industries yield decreased numbers of Middle Paleolithic tools, though there appears to be no complete replacement of the Middle Paleolithic with a uniform Upper Paleolithic.

Evidence from Southwest Asia, western Central Asia and the Siberian Altai generally support a model for the gradual development of Upper Paleolithic industries on a foundation of Middle Paleolithic laminar, or point reduction strategies. Moreover, these developments are roughly contemporaneous in the three regions. As a consequence, hypotheses strictly linking the development of the Upper Paleolithic to the dispersal of a new hominid population would seem difficult to support. Rather, it would appear that the cognitive, behavioral and social apparati sufficient to support the development of the Upper Paleolithic were already well entrenched within the Middle Paleolithic. If we must search for a dispersal event leading to the emergence of the Upper Paleolithic, it is probably rooted within the Middle Paleolithic and is therefore associated with archaic hominid populations. However, as we have emphasized elsewhere (Brantingham et al. 2001), there is a lack of theoretical foundation for linking archaeological evidence to the emergence and dispersal of any hominid population, modern or archaic.

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NOTES

1 A date of 125,000±16,000 yrs BP (Cherdyntsev, 1969) was given in the text without reference to stratigraphic context, thus we are not able to interpret its significance in the present work.
2 Materials obtained during earlier excavations have not been published in full. Regrettably, due to improper storage conditions, catalogue numbers on many artifacts are now obliterated. The present analysis includes only those artifacts whose plan and catalogue references are available.
3 It should be noted that such subdivision is conventional and when excavations at Obi-Rakhmat and a full analysis of resulting archaeological materials are finished, the proposed subdivision can be altered.

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BIBLIOGRAPHY

Bar-Yosef O., 2000. The Middle and Early Upper Paleolithic in Southwest Asia and neighboring regions. In The geography of Neanderthals and modern humans in Europe and the Greater Mediterranean. Edited by O. Bar-Yosef and D. Pilbeam. Cambridge: Peabody Museum of Archaeology and Ethnology, p. 107–56.

BRANTINGHAM P.J., KRIVOSHAPKIN A.I., LI JINZENG, TSERENDAGVA YA., 2001. The Initial Upper Paleolithic in Northeast Asia. Current Anthropology, 42 (5), p. 735-747.

BRANTINGHAM P.J. & KUHN S.L., 2001. Constraints on Levallois Core Technology: A Mathematical Model. Journal of Archaeological Science, 28, p. 747-761.

CHERDYNTSEV V.V., 1969, Uran-243. Moscow: Atomizdat.

DEREVIANKO A.P., 2001. The Middle to Upper Paleolithic Transition in the Altai (Mongolia and Siberia). Archaeology, Anthropology and Ethnology of Eurasia, vol. 3(7), p. 70-103.

DEREVIANKO A.P., ISLAMOV U.I., PETRIN V.T., SULEIMANOV R.H., Krivoshapkin A.I., Alimov K., Anoikin A.A., Miliutin K.I., Saifullaiev B., 1999, Issledovania grota Obi-Rakhmat (Respublika Uzbekistan) in 1999 g. In Problemy arkheologii, etnografii, antropologii Sibiri i sopredelnykh territorii. Novosibirsk: Izd. IAE SO RAN, p. 60-66.

DEREVIANKO A.P., ISLAMOV U.I., PETRIN V.T., SULEIMANOV R.H., KRIVOSHAPKIN A.I., ALIMOV K., KRAKHMAL K.A., FEDENEVA I.N., ZENIN A.N., ANOIKIN A.A., 1998, Issledovania grota Obi-Rakhmat (Respublika Uzbekistan) in 1998 g. In Problemy arkheologii, etnografii, antropologii Sibiri i sopredelnykh territorii. Novosibirsk: Izd. IAE SO RAN, pp. 37-45.

DEREVIANKO A.P., MARKIN S.V., 1992, Mustie Gornogo Altaia (po materialam peshery im. Okladnikova). Novosibirsk: Nauka.

DEREVIANKO A.P., MARKIN S.V., 1998, Mustie yuga Severnoi Azii v sravnenii so srednim paleolitom Vostochnogo Sredizemnomoria. In Paleoecologia pleistotsena i kultury kamennogo veka Severnoi Azii i sopredelnykh territorii, v. 1. Novosibirsk: Izd. IAE SO RAN, p. 100-106.

DEREVIANKO A.P., PETRIN V.T., RYBIN E.P., CHEVALKOV L.M., 1998, Paleoliticheskie kompleksy stratifitsirovannoi chasti stoianki Kara-Bom. Novosibirsk: Izd. IAE SO RAN.

FOLEY K & LAHR M.M., 1997. Mode III Technologies and the evolution of modern humans. Cambridge Archaeological Journal, vol. 7(1), p. 3-36.

GOEBEL T., DEREVIANKO A.P., PETRIN V.T., 1993, Dating the Middle-to-Upper Paleolithic Transition at Kara-Bom. Current Anthropology, 34 (4), p. 452-458.

KUHN, S. L., M. C. STINER, and E. GÜLEÇ, 1999. Initial Upper Paleolithic in South-Central Turkey and its Regional Context: A Preliminary Report. Antiquity, 73, p. 505-517.

MARKS A., FERRING R., 1988, The Early Upper Paleolithic of the Levant. In The Early Upper Paleolithic: Evidence from Europe and Near East. BAR International Series, 437. - p.43-72.

OKLADNIKOV A.P., 1949, Issledovania mustierskoi stoianki i pogrebenia neandertaltsa v grote Teshik-Tash. Moscow: Nauka.

RANOV V.A., LAUKHIN S.A., 2000, Stoianka na puti migratsii srednepaleoliticheskogo chelovaka is Levanta v Sibir. Priroda, 9, p. 52-60.

SULEIMANOV R.H., 1972, Statisticheskoe izuchenie kultury grota Obi-Rakhmat. Tashkent: Fan.