

Autochthonous Development Of Lithic Industries In Central Asia During The Lower And Middle Paleolithic: Technological Continuity And The Raw Material Factor

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Abstract: The article examines the problem of autochthonous development of lithic industries in Central Asia during the Lower and Middle Paleolithic. On the basis of a techno-typological analysis of materials from Maly Karatau, Kyzyltau, Obi-Rakhmat, Ugam, Vakhsh, Koshkurgan, and Shoktas, the study considers core structures, methods of flaking, secondary modification, and the influence of raw material resources on the morphology of stone artefacts. Particular attention is paid to the long-standing discussion concerning the distinction between pebble tools and pebble cores, since this issue directly affects the cultural and chronological attribution of the early Paleolithic complexes of Karatau. The analysis demonstrates that the predominance of discoidal and fan-shaped cores, the stable development of flake-based technology, and the gradual increase of prismatic and Levallois elements do not indicate an abrupt replacement of cultural traditions. Rather, they reflect a long-term local technological evolution. The article argues that the Paleolithic industries of Central Asia represent an autochthonous line of development adapted to regional paleoecological conditions and raw material resources, while at the same time being involved in broader interregional contacts across Eurasia.

Keywords: Central Asia, Lower Paleolithic, Middle Paleolithic, lithic industry, autochthonous development, Karatau, Kyzyltau, Obi-Rakhmat, Ugam, Vakhsh, Koshkurgan, Shoktas, cores, flake technology, raw material base, technological continuity.

Introduction: The problem of the origin and development of Paleolithic lithic industries in Central Asia occupies an important place in the archaeology of Eurasia. Owing to its geographical position between the steppe zones of Northern Eurasia, the Near East, Eastern Turkestan, Southern Siberia, and the Indo-Iranian world, Central Asia has traditionally been interpreted as a region of migrations, cultural contacts, and technological transmissions. However, such an interpretation should not reduce the development of local lithic industries solely to external influences. Archaeological materials from Central Asia indicate the existence of stable technological traditions that developed in close connection with local environmental conditions, raw material resources, and

the long-term adaptation of ancient populations to changing landscapes.

The materials from Maly Karatau, Kyzyltau, Obi-Rakhmat, Ugam, Vakhsh, Koshkurgan, and Shoktas are of particular importance in this regard. These sites and findspots make it possible to trace not only the variability of lithic industries in the region, but also possible continuity between Lower Paleolithic flake-based complexes and more complex Middle Paleolithic industries. The most debated issues include the nature of the Karatau industry, the relationship between pebble tools and pebble cores, the degree of influence of Near Eastern Levallois-Mousterian traditions, and the role of local autochthonous development.

In the historiography of Central Asian Paleolithic

studies, the early complexes of Karatau have been interpreted in different ways. Kh. A. Alpysbayev initially attributed them to the Chellean-Acheulean circle, associating some artefacts with early chopping and bifacial forms (Alpysbayev, 1961; 1970; Alpysbayev, Kostenko, 1972). Later, some researchers considered these complexes within the framework of pebble industries and compared them with the Soanian tradition (Derevyanko et al., 2002). Z. A. Abramova, by contrast, emphasized the need for a stricter distinction between pebble tools and pebble cores, pointing out the danger of formal typological attribution without consideration of the technological context (Abramova, 1984). A. G. Medoev interpreted the materials from the eastern slopes of Karatau in the context of the Levallois tradition, which also demonstrates the complexity of the cultural and chronological interpretation of these complexes (Medoev, 1982).

The purpose of this article is to examine the Paleolithic lithic industries of Central Asia in the context of autochthonous technological development, to identify signs of continuity between Lower and Middle Paleolithic complexes, and to demonstrate the significance of the raw material factor in the formation of morpho-technological variability.

The study is based on a comparative techno-typological analysis of lithic assemblages from Maly Karatau, Kyzyltau, Obi-Rakhmat, Ugam, Vakhsh, Koshkurgan, and Shoktas. The analysis focuses on the following categories of artefacts: cores, flakes, retouched pieces, scrapers, notched tools, burins, spokeshaves, beak-like forms, pebble tools, and core-like implements.

The methodological approach includes:

1. classification of cores according to their morphology, striking platforms, direction of removals, and flaking strategy;
2. analysis of blanks and retouched tools;
3. assessment of secondary modification, including retouch, trimming, edge modification, and bifacial or alternating treatment;
4. comparison of raw material resources and their influence on the size, shape, and standardization of artefacts;
5. historiographical analysis of previous interpretations of the Karatau and related industries.

Particular attention is paid to the relationship between typology and technology. In the case of industries based on pebble raw material, purely morphological classification may lead to incorrect attribution. Therefore, the distinction between a pebble tool and a pebble core is made not only on the basis of external

form, but also according to technological criteria: mass, presence and structure of a striking platform, direction of removals, sequence of flaking, convenience of hand use, and the character of the working edge.

The study of the Lower Paleolithic industries of Central Asia is closely connected with the materials from the Karatau range in Southern Kazakhstan. The first discoveries in this region were associated with the works of Kh. A. Alpysbayev, who identified a number of artefacts as early Paleolithic tools and interpreted some of them as belonging to the Chellean-Acheulean tradition (Alpysbayev, 1961; 1970). In this interpretation, the presence of chopping and bifacial-like forms played a central role.

However, subsequent research demonstrated that the Karatau assemblages could not be explained only within the Acheulean model. A considerable part of the artefacts was made on pebbles, which led some researchers to interpret the industry as a pebble industry and to compare it with the Soanian complexes of South and Central Asia. This interpretation was later reconsidered, since a significant number of pebble artefacts turned out to be cores rather than tools.

Z. A. Abramova criticized overly broad interpretations of pebble tools and stressed the need to distinguish between tools and cores on technological grounds (Abramova, 1984). This position is especially important for the Karatau materials, where the use of pebble raw material often blurs the morphological boundary between a core and a chopping tool.

A different interpretation was proposed by A. G. Medoev, who considered some materials from Karatau in relation to the Levallois tradition (Medoev, 1982). This approach emphasized the presence of more advanced flaking elements but did not fully explain the dominance of discoidal and fan-shaped core forms.

A more comprehensive analysis was later provided by A. P. Derevyanko and A. A. Tsybankov, whose works made it possible to examine the Karatau and Kyzyltau materials not merely as isolated typological groups, but as components of a broader regional technological system (Derevyanko, 2017; 2019; Tsybankov, 2004). This approach is methodologically more productive, since it combines the analysis of cores, flakes, tools, raw material resources, and comparative data from neighbouring regions.

Thus, the historiography of the Karatau problem reveals several competing models: the Acheulean or Chellean-Acheulean model; the pebble industry model; the Levallois-oriented model; the autochthonous flake-industry model.

The present article develops the latter approach,

arguing that the most convincing interpretation is the model of long-term local technological development with the inclusion of certain external innovations and interregional contacts.

The Lower and Middle Paleolithic industries of Central Asia developed in a complex and heterogeneous natural environment. The region included foothill zones, river valleys, steppe and semi-desert areas, as well as territories with local outcrops of lithic raw material. Therefore, the development of stone industries cannot be considered separately from paleoecological conditions and the availability of raw material resources.

Paleoecological data indicate that, during certain phases of the Pleistocene, the present-day arid territories of Southern Kazakhstan, the Eastern Caspian region, and Southern Turkmenistan may have represented more productive ecosystems suitable for ancient human habitation. During colder periods and phases of decreasing productivity in open steppe environments, foothill zones, river valleys, and natural shelters became particularly important. These areas offered water sources, hunting resources, protection, and access to stone raw materials.

Multilayered sites such as Obi-Rakhmat and Kulbulak, where cultural horizons alternate with natural deposits, reflect not only the duration of human occupation but also the ecological flexibility of Paleolithic groups. Such sites make it possible to observe the relationship between environmental change, occupation intensity, and technological transformation.

The raw material factor played a crucial role in the formation of lithic industries. Stone raw materials differed in quality, size, density, fracture properties, and accessibility. These characteristics directly influenced core morphology, blank dimensions, retouch intensity, and the degree of standardization of tools. Therefore, morphological differences between assemblages do not always indicate different cultural

traditions. In many cases, they reflect the adaptation of a single technological line to different types of raw material.

The techno-typological analysis of cores from the Karatau assemblages demonstrates a clear structural orientation of the industry. In a sample of 1,017 cores, discoidal and fan-shaped forms predominate. Discoidal cores account for approximately 38%, while fan-shaped cores constitute about 34%. Together, they form nearly 72% of the total sample. Orthogonal varieties are represented by approximately 5%, cores of parallel flaking by about 15%, and Levallois forms occur only as isolated examples.

This structure indicates the dominance of a discoidal and fan-shaped flaking tradition. It was based on a relatively simple but stable strategy of flake production, adapted to the local raw material base. Fan-shaped cores usually had a striking platform occupying from one quarter to one third of the pebble perimeter. The negatives of removals converged toward the distal end, which made it possible to obtain elongated triangular flakes and blade-like blanks.

When the striking platform extended over more than half of the perimeter, such forms could transform into discoidal cores. This observation is particularly important: the difference between fan-shaped and discoidal cores does not necessarily reflect the presence of different cultural components. More often, it reflects intra-traditional variability related to the shape of the original pebble, the direction of removals, and the degree of core reduction.

The presence of orthogonal, parallel, prismatic, and isolated Levallois forms indicates that the industry was not static. A gradual complication of flaking techniques took place within it. However, this complication does not necessarily imply an external replacement of population or the sudden introduction of a new tradition. Rather, it reflects the internal evolution of a local technological system adapted to the conditions of the Middle Pleistocene.

Table 1. Core Structure in the Lithic Industries of Central Asia

Core type	Karatau, %	Obi-Rakhmat	Koshkurgan 1	Shoktas 1
Discoidal cores	38.0	++	++	++
Fan-shaped cores	34.0	+	++	++
Orthogonal cores	ca. 5.0	+	+	+
Parallel flaking cores	ca. 15.0	++	++	++
Prismatic cores	more than 19.0	+++	+	++
Levallois cores	less than 1.0	+++	++	+++

Note: +++ — dominant category; ++ — stable representation; + — rare forms. Percentages are approximate and reflect the working typological classification of the assemblages.

The comparison shows an evolutionary tendency from the dominance of discoidal and fan-shaped flaking in the earlier complexes to the increasing role of prismatic and Levallois flaking in Middle Paleolithic industries. This tendency should be interpreted as gradual technological complication within a regional tradition rather than as an abrupt cultural break.

The tool assemblage of Karatau is represented primarily by artefacts made on flakes. In a sample of 621 tools, approximately 75% are large retouched flakes. Scrapers and notched tools are represented in smaller proportions, about 5% each. Burins, spokeshaves, beak-like forms, massive fragments with retouch, and core-like implements occur as isolated or minor categories.

Secondary modification is usually represented by light retouch and trimming. Intensive steep retouch is rare. Retouch was most often applied from the ventral side of the flake; scalar retouch predominates, while stepped retouch occurs less frequently. On thick blanks, retouch often turns into large thinning removals. Isolated examples of bifacial and alternating retouch are also recorded.

Of particular interest are artefacts morphologically comparable with forms known from the Obi-Rakhmat tradition. These include spokeshaves, scrapers, beak-like forms, and tools of the bek/bec buriné alterné type. In the earlier complexes they are rare, but their very presence is significant for reconstructing possible technological continuity.

Table 2. Structural Parameters of Tool Assemblages

Tool category	Karatau	Obi-Rakhmat	Koshkurgan 1	Shoktas 1
Retouched flakes	ca. 75%	high proportion	dominant	dominant
Scrapers	ca. 5%	significant proportion	present	significant proportion
Burins / spokeshaves / side-scraping forms	isolated	diagnostic category	rare	rare
Tools of the bek/bec buriné alterné type	isolated	characteristic form	not recorded	rare
Pebble tools	ca. 5%	present	present	present
Core-like implements	present	present	present	present

The data show that Karatau should not be defined as a pebble industry solely on the basis of the presence of individual pebble artefacts. The overall structure of the complex is flake-based. Flakes and tools made on flakes form the technological foundation of the assemblage. Therefore, Karatau is more correctly interpreted within the framework of flake industries of the middle and northern latitudes of Eurasia.

One of the most complex issues in the interpretation of the Karatau industry is the distinction between pebble tools and pebble cores. This problem is of fundamental importance, because its solution directly affects the cultural and chronological attribution of the complex.

From a purely formal morphological perspective, some fan-shaped cores from Karatau may indeed be interpreted as pebble tools. This is especially true for artefacts made on large pebbles, where simple hard-

hammer flaking created edges that externally resemble chopping forms. However, technological analysis shows that many such artefacts are not tools, but cores from which flakes were systematically removed.

The distinction must be made on the basis of a combination of features: artefact mass, the character of the striking platform, direction of removals, presence of a series of negatives, convenience of hand use, and functional organization of the working edge. Pebble cores are usually larger, sometimes weighing up to 3–4 kg. They have a prepared or faceted striking platform from which a series of elongated flakes was detached. Pebble tools, on the contrary, are generally made on smaller flat pebbles suitable for holding in the hand and are shaped by bifacial flaking to create a working edge.

This problem is not unique to Central Asia. In the

Clactonian industry of Europe, pebble cores may also be morphologically similar to pebble tools, and in some cases they may have been used as tools. However, the functional possibility of using a core as a tool does not mean that the two categories are typologically identical (Bray, Trump, 1990).

For this reason, the category of “core-like implements” may be useful for the Karatau materials. It allows one to take into account artefacts that could combine the functions of a core and a working tool. Nevertheless, even with this flexible approach, quantitative data do not support the thesis that the entire Karatau industry had a pebble character. Pebble and core-like implements form only a small part of the assemblage, while the technological foundation is clearly associated with flake production.

One of the main arguments in favour of autochthonous development is the presence of features connecting the Lower Paleolithic industries of Karatau and Kyzyltau with later Middle Paleolithic complexes of the Obi-Rakhmat type. In the earlier assemblages, discoidal, fan-shaped, and orthogonal cores dominate. In the Middle Paleolithic, the role of single-platform prismatic cores and blade-oriented flaking increases. However, there is no complete technological break between these stages.

The Karatau and Kyzyltau materials contain rare forms typologically close to the Obi-Rakhmat tradition: burins on rough blades and flakes, pieces with trimming of the striking platform, truncated retouched forms, spokeshaves, side-scrapers, and beak-like artefacts. Techniques of fine trimming around the percussion bulb of flakes are also characteristic of the Obi-Rakhmat industry. In the collection of the Obi-Rakhmat grotto, similar artefacts were identified as spokeshaves and scraping tools (Suleymanov, 1972; Derevyanko, 2017).

Tools of the bek/bec buriné alterné type are especially significant. They became more fully developed in the Obi-Rakhmat complexes, while their isolated presence in earlier materials may indicate not accidental resemblance, but deeper technological connection.

Thus, the Obi-Rakhmat culture may be viewed not only as the result of external influence from Near Eastern Levallois-Mousterian complexes, but also as the outcome of a long evolution of the local Lower Paleolithic flake tradition. The geographical proximity of Karatau, Obi-Rakhmat, and Teshik-Tash, as well as their location within the western foothill zone of the Tien Shan, created favourable conditions for stable

contacts and gradual technological transformation.

Additional arguments in favour of regional technological continuity are provided by the materials from Ugam. In 2012, in the valley of a northern tributary of the Chirchik River, on the right bank of the Ugam River, surface materials morphologically close to the Obi-Rakhmat industry were identified. Subsequent investigations in 2013 revealed a buried Quaternary soil at an elevation of 50–70 m above the river floodplain. A small test excavation produced an in situ assemblage of Obi-Rakhmat appearance (Suleymanov et al., 2014).

The stone artefacts from Ugam were made from pinkish flint similar to the raw material used at Obi-Rakhmat. This is especially important because it confirms the local character of the raw material base and shows that the technological similarity is not accidental. Ugam occupies an intermediate position between Obi-Rakhmat and Maly Karatau, thereby strengthening the argument in favour of regional continuity.

Comparable parallels are also known from Southern Tajikistan, in the Vakhsh valley. Industries dated to approximately 100,000–300,000 years ago demonstrate features comparable to the Lower and Middle Paleolithic complexes of the region (Ranov, Schaefer, 2000). The Vakhsh materials are important because they expand the geographical range of similar technological principles beyond Southern Kazakhstan and the Tashkent oasis.

The materials from Koshkurgan 1 and Shoktas 1 clearly demonstrate how strongly raw material resources could affect artefact morphology. According to A. P. Derevyanko, quartz dominates in the Koshkurgan 1 collection, accounting for about 46%. It is followed by coarse-grained sandstone, flint, siliceous limestone, quartzite, fine-grained sandstone, effusive rocks, and gravelites. Such a heterogeneous raw material base caused the miniaturization and amorphous character of many artefacts. Artefact sizes range from 2 to 7 cm, while most tools do not exceed 5 cm (Derevyanko, 2017).

At Shoktas 1 the raw material situation is somewhat different. The main materials are quartz, flint, and quartzite. The higher proportion of flint contributed to the wider use of Levallois technique and the production of elongated retouched scrapers. Therefore, the differences between Koshkurgan and Shoktas are related not only to cultural specificity, but also to the quality of available raw material.

Table 3. Raw Material Base of Central Asian Lithic Industries and Its Morpho-Technological Consequences

Site	Dominant raw material	Proportion	Morpho-technological features
Karatau	silicified limestone	predominant	large cores, developed flake technology
Kyzyltau	limestone and siliceous rocks	predominant	homogeneity of industry, stability of forms
Koshkurgan 1	quartz	46%	miniaturization, amorphous artefact forms
Shoktas 1	quartzite, quartz, flint	mixed composition	more pronounced Levallois technique
Obi-Rakhmat	pinkish flint	predominant	blade-oriented flaking, developed secondary modification

This table demonstrates that raw material is one of the key explanatory factors in the analysis of Central Asian lithic industries. Miniaturization, amorphous morphology, or, conversely, the standardization of artefacts do not always reflect cultural differences. In many cases, they result from the physical properties and accessibility of stone raw materials.

The concept of autochthonous development does not exclude interregional contacts. On the contrary, the Central Asian materials show that local technological evolution occurred within a broader Eurasian context. Isolated Levallois features, similarities with Near Eastern complexes, parallels with Teshik-Tash, and comparisons with Tabun D indicate the presence of contacts and technological impulses (Suleymanov, 1972; Derevyanko et al., 2002).

However, the existence of contacts does not imply the complete external origin of local industries. Central Asia was not a passive territory to which ready-made technological traditions were simply transferred from outside. The materials from Karatau, Kyzyltau, Obi-Rakhmat, Ugam, Vakhsh, Koshkurgan, and Shoktas demonstrate the existence of a stable regional line of development. This line is characterized by continuity from discoidal and fan-shaped flake technologies toward more complex prismatic and Levallois forms.

Therefore, the most convincing model is one that combines three factors: local technological continuity; adaptation to environmental and raw material conditions; contacts with neighbouring regions of Eurasia.

Such a model avoids two extremes: an isolationist model that denies external influences, and a migrationist model that explains all technological

changes only by the arrival of new populations.

Conclusion. The analysis demonstrates that the lithic industries of Central Asia during the Lower and Middle Paleolithic represent a complex but internally connected system of technological development. The materials from Maly Karatau and Kyzyltau show a stable flake-based tradition characterized by the predominance of discoidal and fan-shaped cores. The presence of orthogonal, parallel, prismatic, and isolated Levallois forms indicates gradual complication of flaking techniques.

The tool assemblage of Karatau also confirms the flake-based nature of the industry. The predominance of retouched flakes, the limited proportion of pebble tools, and the presence of core-like implements show that earlier views about the “pebble character” of the industry require revision. The distinction between pebble tools and pebble cores must be based not on external resemblance, but on a combination of technological criteria.

The comparison of Karatau, Kyzyltau, Obi-Rakhmat, Ugam, Vakhsh, Koshkurgan, and Shoktas allows us to speak of a stable regional cultural and technological line in Central Asia. Differences between the assemblages were largely determined by the quality and accessibility of raw material. At the same time, the increasing role of blade-oriented and Levallois flaking in the Middle Paleolithic should be interpreted not as an abrupt cultural break, but as the result of gradual development within a local tradition.

Thus, Central Asia during the Lower and Middle Paleolithic was not only a zone of migration and interregional contacts, but also an independent centre of autochthonous technological development. The

lithic industries of the region reflect a long process of adaptation of ancient populations to paleoecological conditions, raw material resources, and changing forms of mobility in Pleistocene Eurasia.

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