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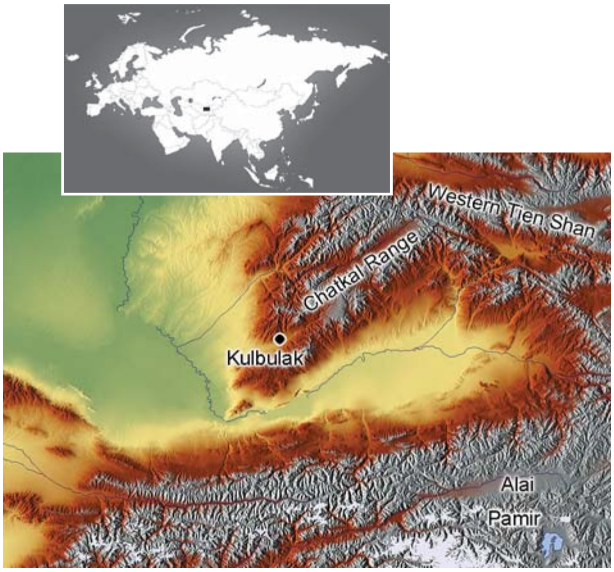
# The Emergence of Levallois Blade Industry in the Western Foothills of Tien Shan: Kulbulak Layer 24

*We describe finds from layer 24 of Kulbulak, Western Tien Shan, excavated in 2018–2019. On the basis of the age of layer 16 (MIS 5e) and the geological context of the deposits, the profile of the site was subdivided into paleogeographic stages. Layers 25–22 likely correlate with the warming period in the second half of MIS 7. Primary reduction in layer 24 industry was based on parallel uni- and bidirectional techniques, with wide and narrow-faced cores, and following the Levallois strategy. Tools include various side-scrapers, a point on a heavily retouched blade, a retouched blade, an atypical angular end-scraper, and blanks of bifaces. Parallels are found between those finds and contemporaneous industries of the Near East. Technologically and likely chronologically, layer 24 is intermediate between Late Amudian and Early Middle Paleolithic assemblages of the Tabun D stage. This is evidenced by a combination of non-Levallois and Levallois flaking (the latter being predominant), by different types of blanks within the same reduction sequence, by a high share of blades among blanks, by bifacial pieces, by an elongated heavily retouched point, and by an atypical end-scraper.*

Keywords: *Lithic industry, primary reduction, toolkit, scar pattern analysis, Middle Paleolithic, MIS 7, Western Tien Shan.*

## Introduction

The typical feature of the Stone Age studies in the latest decade is the revision of cultural and chronological attributions of several key Paleolithic complexes in the western part of Central Asia. For example, the lithic industries of Selungur Cave (south of the Fergana Valley, Kyrgyzstan) and the lowermost layers of the site of Kulbulak (western spurs of the Tien Shan, Eastern Uzbekistan) (Fig. 1) were previously considered Lower Paleolithic, while they have currently been attributed to the Selungur



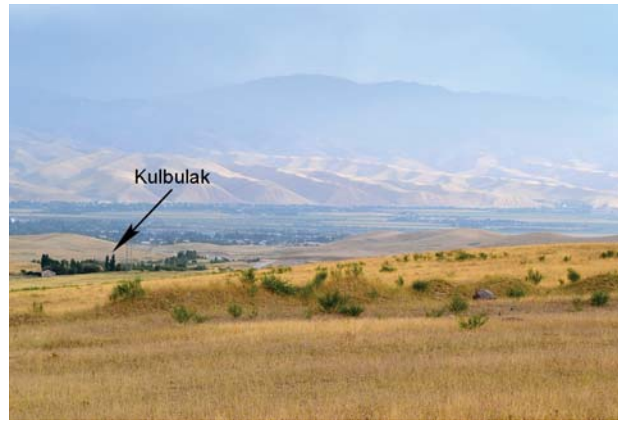




*Fig. 1.* Map showing the location of the site of Kulbulak.

and blade Obi Rakhmat traditions of the Middle Paleolithic (Pavlenok K.K., Belousova, Rybin, 2011; Kolobova et al., 2018; Krivoshapkin et al., 2020; Vandenberghe et al., 2014). The reassessment of research concepts called for certain clarifications of the time of emergence of the first Middle Paleolithic industries in various parts of Central Asia.

Owing to the objective lack of data, we have correlated the relative age of layer 24 with the closest date to these cultural strata—the TL-date of 111 ± ± 19 ka BP (UG-7094) derived for Kulbulak layer 16 by S. Fedorovich (Department of Geomorphology and Quaternary Geology, University of Gdańsk, Poland) (Pavlenok K.K., Pavlenok G.D., Kurbanov, 2020). On the basis of the age determination for layer 16, which corresponds to MIS 5e, the analytical data on the structures of deposits and the locations of horizons, as well as data on granulometry, a stratigraphic subdivision of the latest deposits was carried out, with the identification of the main paleogeographic stages of sedimentation (Taratunina et al., 2020). In accordance with the proposed paleogeographic reconstruction, layers 25–22 can be preliminarily correlated with an evident warming stage in the second half of MIS 7. During sedimentation of layer 24, the relief in the area of the site was stabilized: a reservoir with calm lacustrine sedimentation originated, and the activity of mudflow processes sharply decreased, as recorded in the sediments of layer 25. The terminal phase of MIS 7 is marked by the activation of mudflows.

Several complementary methods have been used as the main research tools in the analysis of the archaeological collection. The attributive analysis of the collection made it possible to identify non-random combinations of technologically significant features of lithic artifacts (Pavlenok K.K., Belousova, Rybin, 2011). Statistical tests processed in the Past software (4.03) (Hammer, Harper, Ryan, 2001) were used to confirm these observations and to compare individual groups of artifacts, and scatter plots were proposed. The nonparametric Mann-Whitney test has been chosen because of the small size of samples in the studied collection. Scar pattern analysis was used to reconstruct the sequence of operations with individual artifacts (Kot, 2014; Shalagina, Kolobova, Krivoshapkin, 2019).

The present article proposes a comprehensive description of the artifacts from Kulbulak layer 24 excavated by the team of the Joint Russian-Uzbekistan Archaeological Expedition in 2018–2019.

## Archaeological finds from Kulbulak layer 24

The archaeological material of the layer is subdivided into two stratigraphically different assemblages—the upper (depth of finds from –1995 to –2030 cm) and the lower one (depth of finds from –2065 to –2145 cm) (Fig. 2). The upper assemblage is small ($n$=8) and includes a primary core-trimming element, three flake fragments, and 4 small flakes. The lower assemblage consists of 2654 specimens. The majority of the finds are production waste (scales, chips, shatters, small flakes, and fragments of flakes); the debitage share is 86 % of the entire collection (see *Table*).

There are 22 core-shaped artifacts, including 16 typologically distinct specimens.

Single-platform unifacial cores (*n*=4) (Fig. 3) typically have plain striking platforms prepared through a single removal, with one or two target negative scars with proportions of flakes or blades.

Double-platform unifacial cores (*n*=5) (Fig. 4) have either natural striking platforms or those prepared by one or two removals. All the cores were used for detachment of elongated spalls. Flaking was usually executed from one of the platforms. Bidirectional flaking was carried out mainly to maintain the lateral curvature of the flaking surface. The scar pattern analysis suggests phased, rather than alternating, flaking from the platforms.

Narrow-faced cores (*n*=3) (Fig. 5) were used to produce small laminar spalls. The cores show a thorough preparation of the base and a clear reduction-pattern: 1) preparation of the striking platform; 2) processing of the lateral sides; 3) removal of spalls from the flaking surface. The smallest (probably, most exhausted) core of this group shows traces of alternate use of striking platforms, as well as bidirectional knapping.

The Levallois core (Fig. 6) corresponds to the *preferential radial centripetal* type (Shea, 2013) used for detachment of a single elongated spall.

The collection also includes three core blanks: single-platform unifacial cores (*n*=2) and a radial core.

Core-trimming elements total to 89 items, which is 26 % of the number of identifiable spalls (Fig. 7, *1–9*). Their morphology correlates with the described reduction strategies—longitudinal and Levallois (*preferential radial centripetal*). Marginal flakes predominate. According to the proportions

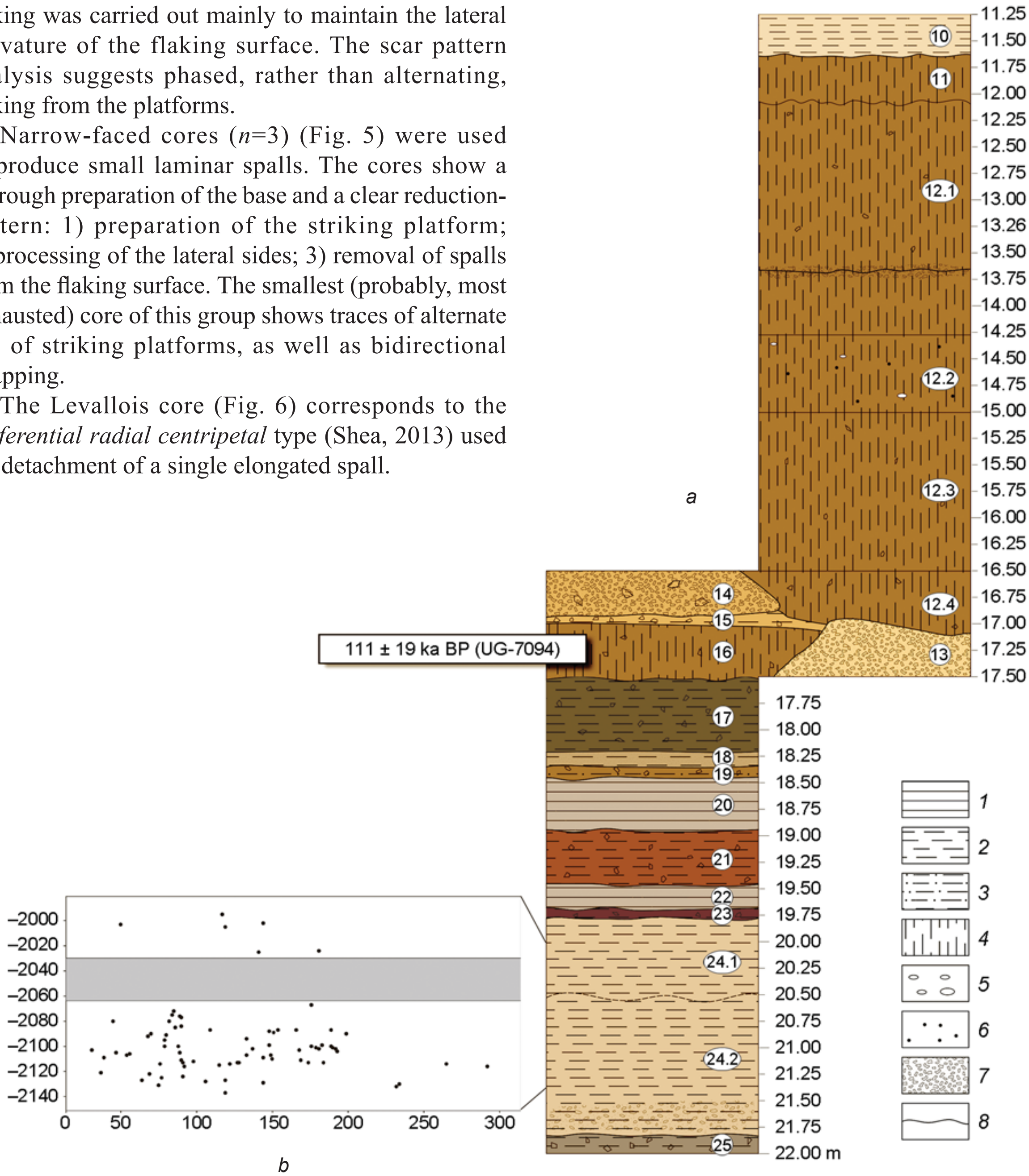



*Fig. 2.* Stratigraphic column of the southern wall of the excavation area (*a*) and location of artifacts within layer 24 (*b*) at Kulbulak.

*1* – clay; *2* – loam; *3* – sandy loam; *4* – loessy loam; *5* – carbonate concretions; *6* – charcoal; *7* – detritus/ grus; *8* – erosion boundary.

**Categories of lithic tools from Kulbulak layer 24**

| Categories | Spec. | % | % excluding waste |
|---|---|---|---|
| *Upper assemblage* | | | |
| Core-trimming elements | 1 | 12.5 | 100.0 |
| Fragments of flakes | 3 | 37.5 | – |
| Small flakes | 4 | 50.0 | – |
| *Total* | 8 | 100.0 | 100.0 |
| *Lower assemblage* | | | |
| Core-shaped artifacts: | | | |
| cores | 16 | 0.6 | 4.4 |
| core-shaped fragments | 6 | 0.2 | 1.6 |
| Spalls: | | | |
| flakes | 147 | 5.5 | 40.4 |
| blades | 56 | 2.1 | 15.4 |
| bladelets | 29 | 1.1 | 8.0 |
| points | 4 | 0.2 | 1.1 |
| Core-trimming elements | 89 | 3.4 | 24.5 |
| Tools | 17 | 0.6 | 4.7 |
| Production waste: | | 0.0 | |
| scales | 638 | 24.0 | – |
| chips | 1058 | 39.9 | – |
| shatters | 190 | 7.2 | – |
| fragments of flakes | 165 | 6.2 | – |
| small flakes | 239 | 9.0 | – |
| *Total* | 2654 | 100.0 | 100.0 |

and faceting of the "steep" side, the marginal flakes are divided into marginal cortical blades (MCB), marginal lateral blades (MLB), marginal ridge blades (MRB), marginal cortical flakes (MCFC), marginal lateral flakes (MLF), and marginal ridge flakes (MRF) (Kolobova et al., 2019).

In the industry of spalls, the following categories were distinguished: flakes ($n$=147, 43 % of the total number of spalls), blades ($n$=56, 16 %), bladelets ($n$=29, 8 %), and points ($n$=4, 1 %).

The flakes show various flaking patterns. Longitudinal and longitudinal-convergent patterns predominate; radial, orthogonal and bidirectional patterns are also rather numerous (scars of bidirectional removals are rarely shorter than 1/3 of the total length of the artifact). Longitudinal and longitudinal-convergent flaking patterns are most typical for blades and bladelets. The noticeable proportion of blades is orthogonal; products with bidirectional flaking scars are few.

In the category of flakes, the ratio of the artifacts with straight and non-straight side view (twisted


*Fig. 3.* Single-platform unifacial core from Kulbulak layer 24.

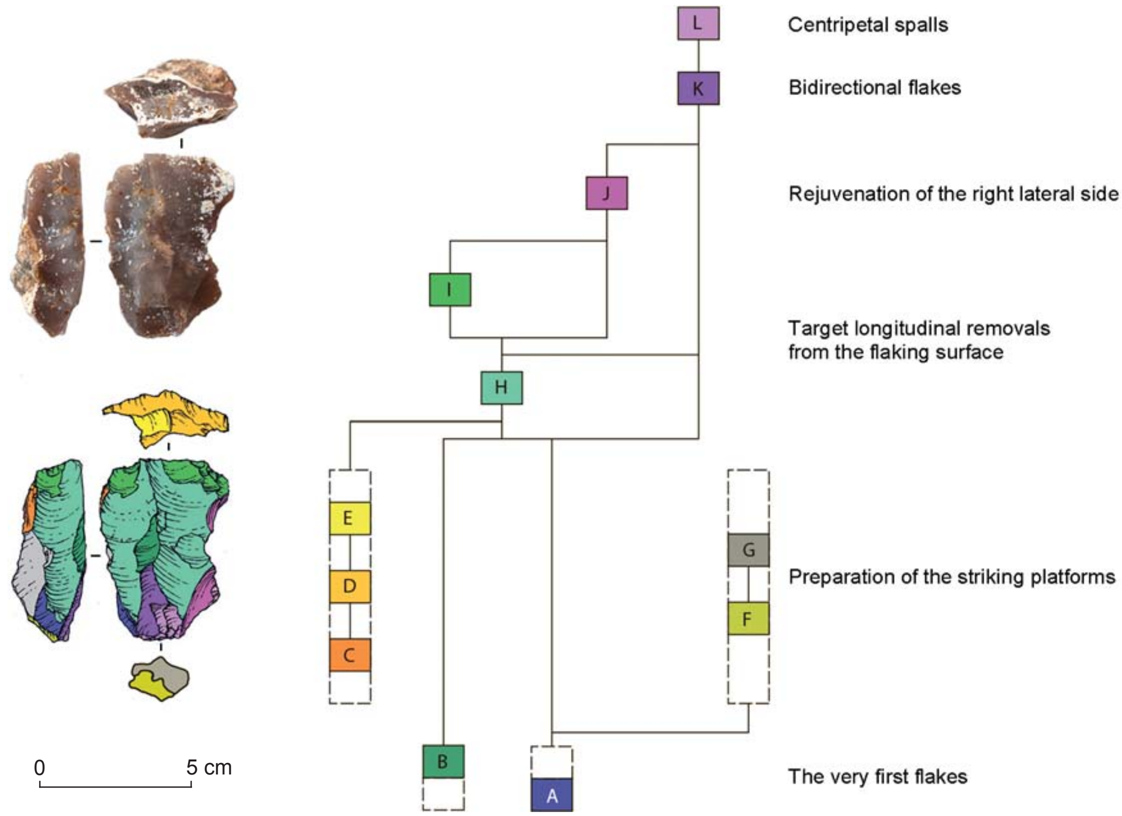



*Fig. 4.* Double-platform unifacial core from Kulbulak layer 24.

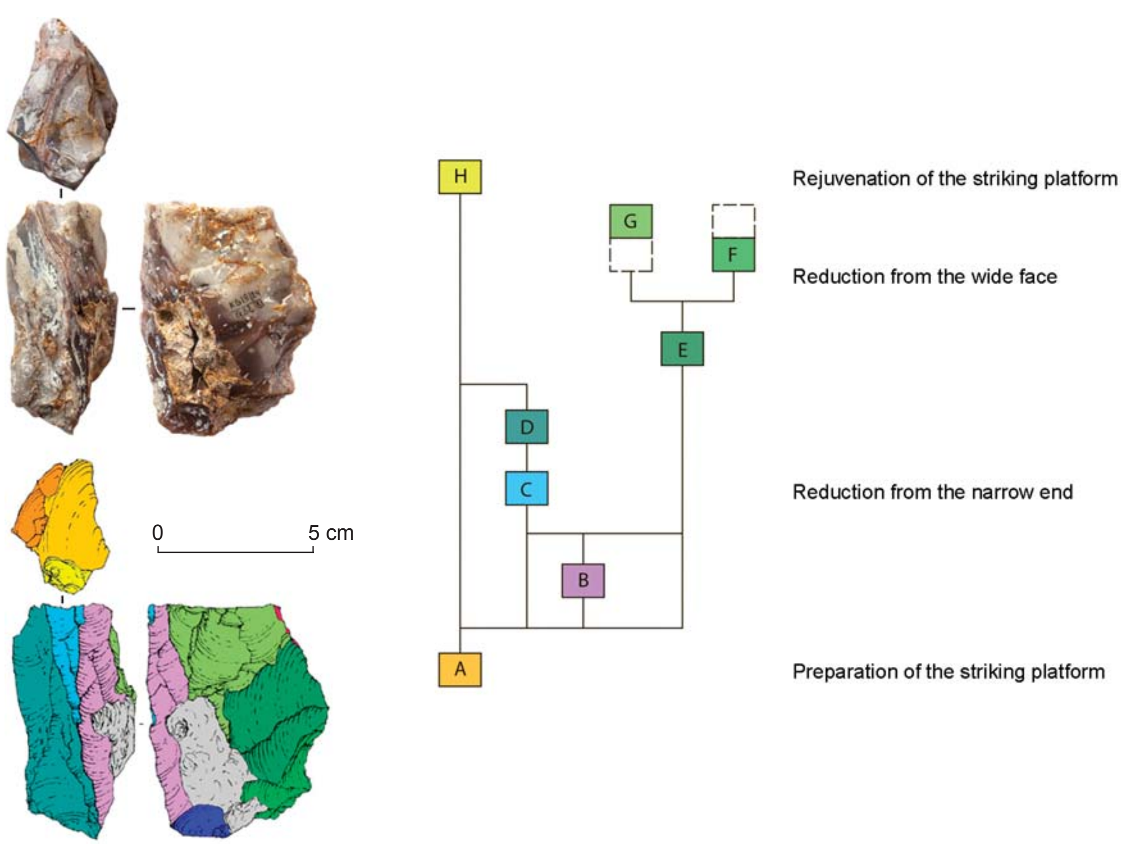



*Fig. 5.* Narrow-faced core from Kulbulak layer 24.

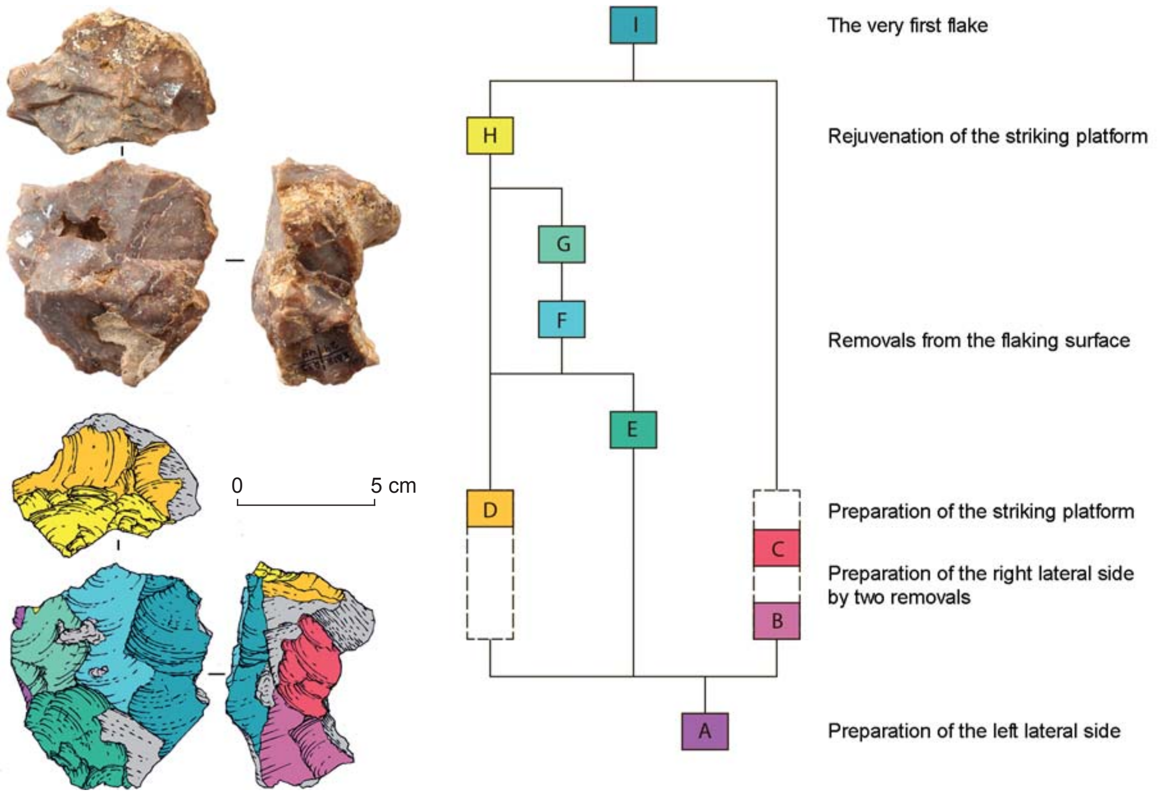



*Fig. 6*. Levallois core from Kulbulak layer 24.

and curved) is approximately 1 : 2; that in the group of blades is 1 : 3. In the category of bladelets, the compared indicators are almost equal.

Plain striking platforms are the most common in the industry: these have been recorded on 60 % of flakes and 45 % of blades. Dihedral platforms have been identified on 1/3 of the products. Polyhedral platforms are present on 10 % of the flakes and 23 % of the blades. Approximately 10 % of the flakes and 20 % of the blades were subjected to lateral-transverse preparation of the striking platform. Almost all the bladelets show plain platforms.

Notably, the collection contains flakes with the Levallois features: with centripetal, orthogonal and transverse, as well as convergent and longitudinal-convergent flaking patterns and convex di- and polyhedral platforms (Fig. 7, *10*, *11*).

The distribution of laminar spalls by width showed that the blades and bladelets were produced following the same chaîne opératoire, with the majority of removals 9 to 28 mm wide (Fig. 8).

Solitary points (*n*=4) include varieties of regular longitudinal-convergent flaking pattern, with a characteristic Y-shaped negative scar; but with the percussion point shifted to one of the edges. The blanks are usually straight and have thoroughly prepared slightly convex striking platforms.

Tools were fashioned mainly on flakes (*n*=11) or core-trimming elements with the proportions of flakes (*n*=2); blades and core-trimming elements with the proportions of blades were used less often (*n*=2 each). The toolkit (*n*=17) includes single side-scrapers (*n*=5); side-scraper fragments (*n*=3); a double longitudinal-transverse side-scraper; a point on a blade retouched on both edges, a blade retouched on two longitudinal edges, an atypical angular end-scraper on a blade (see Fig. 7, *12–21*). In addition, the toolkit includes flakes (*n*=5). The dorsal, scalar, semi-abrupt and moderate retouch was mostly used.

Two artifacts on large flakes have been identified as biface blanks. One of them is flat-convex in side view; the other is biconvex. The latter demonstrates the initial stage of preparation: its side view shows the blank morphology rather than the manufacturing technique.

## Study results

The category of cores from Kulbulak layer 24 includes specimens looking asymmetric: both their flaking


*Fig. 7.* Archaeological materials from Kulbulak layer 24.
*1–9* – core-trimming elements; *10*, *11* – Levallois spalls; *12–21* – tools.

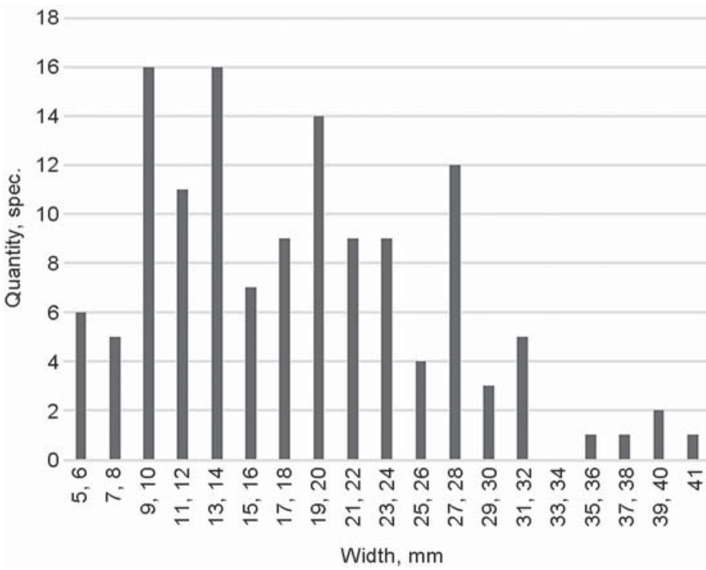



*Fig. 8.* Histogram of distribution of laminar spalls by width.

surface and one of the lateral sides were subjected to reduction. However, scar pattern analysis shows that these flaking zones were used independently of one another (see Fig. 4). Moreover, if we arrange the cores with traces of reduction on adjacent planes and the narrow-faced cores in a sequence from larger to smaller ones, then we can easily see that the largest specimen has negative scars only on its narrow end (see Fig. 5), the specimen of medium size on its flaking surface and narrow end (see Fig. 4), and the smallest specimen on both lateral sides and flaking surface (leading to its similarity to a subprismatic core).

To find out whether bidirectional flaking was a separate technological strategy, a scatter plot was constructed, showing the distribution of cores with one and two striking platforms by their length (Fig. 9, *1*). These two sets practically do not intersect, which is confirmed by the Mann-Whitney test ($U = 9$, $p = 0.04$). Signs of the use of a second striking platform and bidirectional flaking have been noted on the shortest specimens; most likely, the strategy was used involuntarily when the core was heavily exhausted.

Another scatter plot was constructed for considering the degree of exhaustion of cores based on the length of the cores for elongated flakes, blades and bladelets, and core-trimming elements with proportions of blades and bladelets (Fig. 9, *2*). The plot suggests that the analyzed cores represent the average and heavy degree of exhaustion, since the collection does not contain core-shaped items with a length close to the maximum length of core-trimming elements.

The comparison of the lengths of cores with traces of longitudinal flaking and the lengths of complete spalls with longitudinal faceting shows that there are statistical differences between these samples (Mann-Whitney test, $U = 68$, $p = 0.0001$) (Fig. 10). The plot reflects the situation when the lengths of the cores are much greater than the lengths of the flakes. Therefore, it can be assumed that the largest flakes with longitudinal negative scars were carried by people away from the site.

Predominantly plain ($n$=156) and dihedral ($n$=58) striking platforms of spalls match the residual platforms of cores. A significant part of the flakes ($n$=48, 26 %) and blades ($n$=17, 23 %), showing platforms rejuvenated from the lateral sides, can also be correlated with the morphology of the cores: in 6 out of 16 specimens, signs of lateral rejuvenation of the striking platform were identified.

No cores for the production of pointed flakes were found. However, the combination of features of a regular longitudinal-convergent flaking pattern with a

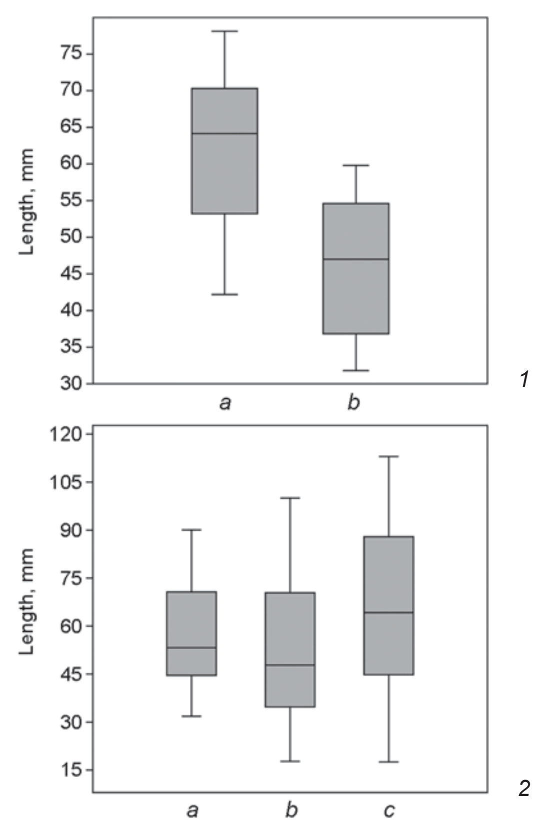



*Fig. 9.* Length distribution of single- (*a*) and double-platform (*b*) cores (*1*), cores for removal of laminar spalls (*a*), laminar (*b*) and core-trimming (*c*) elements (*2*).

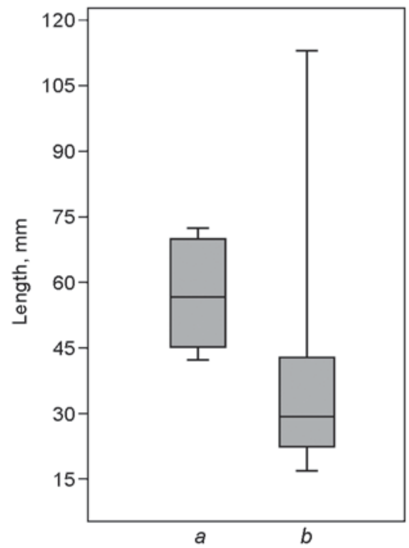



*Fig. 10.* Length distribution of cores with traces of longitudinal flaking (*a*) and spalls with longitudinal flaking pattern (*b*).

characteristic Y-shaped negative scar and a shift of the percussion point to one of the edges suggests the use of a modified pattern of Levallois point production known by the evidence from the sites of the Obi-Rakhmat affinity (Krivoshapkin, 2012).

## Discussion

The place of the lithic industry of Kulbulak layer 24 among other industries of the region can be determined primarily through its comparison with the collection of overlying layer 23 (Krivoshapkin et al., 2010; Pavlenok K.K., Pavlenok G.D., Kurbanov, 2020). For the industry of this layer, tentatively assigned to the second half of MIS 7, the basic *chaîne opératoire* was previously reconstructed, which corresponds to the preferential Levallois technique, recently well described elsewhere (Pavlenok K.K., Pavlenok G.D., Kurbanov, 2020; Krajcarz et al., 2016; Pavlenok et al., 2022). The industry of layer 23 shows the use of the Levallois technique, along with the reduction strategy involving a simple parallel detachment of blades. The layer also revealed a few disc-shaped and radial cores, as well as nuclei for the production of bladelets. The latter category is represented by burin-cores, narrow-faced cores (including those with converging laterals), subconical, subcylindrical, and carinated cores.

The toolkit from layer 23 is dominated by heavily retouched blades, side-scrapers, and points. Among the side-scrapers, single-edged longitudinal forms are the most numerous; dejété and alternative side-scrapers occur in series; and there is an artifact of the "Selungur" type. Pointed forms are represented by points with one retouched edge, Mousterian points (including a specimen with the Tayacian retouch), and Levallois points (including those with ventral retouch). A separate group consists of tools of the Upper Paleolithic typological series: atypical end-scrapers, borers, and retouched bladelets. Truncated-faceted forms and bifacially processed tools have been identified. Flakes and blades with irregular retouch account for approx. 1/3 of the total number of artifacts.

Comparison of data on the lithic industries from layers 23 and 24 revealed the following differences:

in the industry of layer 24, simple parallel detachment of blades is common; in the industry of layer 23, the main array of cores shows various stages of the Levallois reduction strategy;

in the industry of layer 24, rare bladelets were removed from the cores simultaneously with blades; in the industry of layer 23, about 1/10 of the cores were used for the targeted production of bladelets through several splitting techniques;

only in the industry of layer 23 were the following rare items identified: a side-scraper of the "Selungur" type and a point with Tayacian retouch, both associated in a regional context with the Selungur line of the Middle Paleolithic development (Krivoshapkin et al., 2020).

The above analytical data suggest a preliminary conclusion that the collection of layer 23 represents a higher level of development of the Levallois blade tradition than that corresponding to the morphology of artifacts from layer 24. However, apparently, the industry of layer 23 is not absolutely homogeneous in cultural terms, owing to the occurrence of rare "Selungur" forms.

The site of Khonako-3 in Southern Tajikistan is chronologically and geographically close to Kulbulak, if we agree with the "new" stratigraphic sequence of this site, according to which the age of pedocomplex 2 (PC 2) is 186–242 ka BP (Ranov, Karimova, 2005). The site's researcher V.A. Ranov attributed the materials from PC 2 to the Levallois-Mousterian blade industry (the share of blades is 31 %). This industry is characterized by pyramidal cores intended for the production of long and narrow blades of Upper Paleolithic morphology, and by series of such removals (Ranov et al., 2003; Ranov, Schäfer, 2000). The toolkit includes side-scrapers on blades, atypical end-scrapers and knives, and a point. The noted features suggest that the collection from PC 2 of Khonako-3 is closer to the industry of Kulbulak layer 23.

No other industries that would be similar both in terms of production techniques and chronological affiliation have been found in the western part of Central Asia. In the Iranian Plateau (Zagros), sites of the developed Middle Paleolithic industries (MIS 4 to first half of MIS 3) are known, characterized by a high proportion of convergent side-scrapers, Mousterian points, and a relatively low proportion of Levallois products (The Paleolithic Prehistory…, 1993; Shidrang et al., 2016). In the southeast of Transcaucasia, the earliest Levallois-blade assemblages are associated with MIS 4. For example, in Khovk-1 Cave, the OSL-date for the lowermost unit of layers 12–8, generated on a sample from layer 8 (~104 ka BP), is over 100 ka BP. A few artifacts (~40 spec.) were found in these layers: elongated Levallois points, a side-scraper, and spalls (mainly blades), including those with faceted striking platforms (Pinhasi et al., 2012).

The established cultural sequences of Denisova Cave and the site of Ust-Karakol-1 suggest that in Southern Siberia, assemblages containing cores showing simple parallel reduction and Levallois strategies, as well as bifacially processed artifacts and the Upper Paleolithic types of tools, developed ca 150 ka BP, in the period corresponding to MIS 5 (Derevianko, 2022; Derevianko, Shunkov, Kozlikin, 2020).

The Near East is the only region with a similar lithic industry corresponding to MIS 7: its lithic reduction techniques, identified by the artifacts from Kulbulak layer 24, were used as early as in the Lower Paleolithic. The earliest evidence of the use of the Levallois primary reduction strategy both in this region and in Eurasia as a whole is provided by the technocomplex of Gesher Benot Yaakov, in the north of modern Israel (Goren-Inbar, 2011; Goren-Inbar et al., 2000). The earliest cultural strata here date back to ca 780 ka BP (MIS 18–20) (Feibel, 2004). Most of the Levallois cores (87.5 %) were intended for the detachment of flakes of various sizes. Large flakes were subsequently used in the manufacture of bifaces and cleavers (Goren-Inbar, Grosman, Sharon, 2011). This reduction technique was identified in the materials from the Late Acheulean site of Berekhat Ram in the Golan Heights (Goren-Inbar, 1985). Levallois artifacts were also reported from Qesem Cave (Derevianko, 2016a, b).

Laminar blanks emerged in the Near East at the multilayered sites of Yabrud and Tabun as early as in the Late Acheulean (Ibid.; Monigal, 2001). For example, layer G in Tabun Cave has yielded a small number of short pyramidal cores used for the detachment of blades and laminar flakes. At the terminal Acheulo-Yabrudian stage of the Late Acheulean, blade technology becomes one of the main approaches in lithic reduction. This technique was especially spread in the pre-Aurignacian, Amudian, and Hummalian industries, which belong to the range from ca 400 to 250 ka BP (Derevianko, 2016a; Schwarcz, Rink, 1998; Laukhin et al., 2000; Mercier et al., 2013; Mercier, Valladas, 2003; Barkai et al., 2003; Gopher et al., 2010). For example, in the Amudian industry of Qesem Cave (Hershkovitz et al., 2011; Shimelmitz, Barkai, Gopher, 2011), there are both cores for the manufacture of blades and those with negative scars of blade and flake removals. Blades were used for the production of end- and side-scrapers, burins, and notched-denticulate tools (Shimelmitz, Barkai, Gopher, 2011). In the Amudian horizons of Qesem Cave, several bifacially processed tools were also recorded.

The earliest Middle Paleolithic technocomplexes of the region, dated to the Tabun D stage, 260 (250)–165 (150) ka BP, clearly demonstrate the continuity with the Acheulo-Yabrudian industry of the Levant (Derevianko, 2016b). The main feature of the industries of this type is the abundance of blades and elongated points (among the spalls, they make up from 20 to 60 %). The industries aged 220–230 ka BP demonstrate, along with the Levallois techniques for making blades and elongated points (parallel and convergent unidirectional), simple parallel reduction techniques aimed at blade removal. The laminar spalls at all the sites, except for Hummal layer la, were accompanied by numerous flakes and points, which were made through various reduction techniques, ranging from the Levallois to disc-shaped, including blade removal from "burin-cores" (Monigal, 2001; Marks, Monigal, 1995).

The toolkits of lithic industries belonging to the Tabun D stage are characterized by the combination of numerous retouched blades and elongated points with Middle and Upper Paleolithic implements—Mousterian points, longitudinal side-scrapers, denticulate-notched tools, atypical end-scrapers, burins, borers, truncated tools, and others (Copeland, 1975; Jelinek, 1981; Marks, 1992; Meignen, 2000). At the late stages of development of these industries, the proportion of Middle Paleolithic tools is significantly reduced, up to their complete absence.

Thus, technologically and likely chronologically (MIS 7), the archaeological materials of Kulbulak layer 24 occupy a position between the latest Amudian complexes and the earliest Middle Paleolithic assemblages of the Near East, belonging to the Tabun D stage. This assumption is supported by the following features of the industry: combination of traces of the use of the Levallois and non-Levallois (simple, parallel, and narrow face) reduction techniques, with a predominance of the latter; production of various types of spalls within the same reduction sequence; a significant proportion of blades among spall-blanks; presence of bifacially processed tools, an elongated retouched point bearing heavy dorsal retouch (can be classified as an Abu-Sif point), and an atypical angular end-scraper.

## Conclusions

The Amudian and Tabun D Paleolithic assemblages are valuable information sources in the consideration of the issues relating to the distribution of the oldest Levallois-blade complexes over the continent. Some researchers associate the emergence of industries of the Tabun D type with the arrival of a new population in the Near East ca 250–220 ka BP—anatomically modern humans from Africa (Hershkovitz et al., 2018; Valladas et al., 2013). An alternative opinion is held by A.P. Derevianko (2016a, b): lithic assemblages of the Early Middle Paleolithic indicate an inseparable connection with the Lower Paleolithic Acheulo-Yabrudian industry; the archaeological records of the Levant do not show any clear evidence of penetration of human populations with other cultures into the region in the period corresponding to MIS 7.

The lack of anthropological remains hampers a clear identification of the creators of the earliest Middle Paleolithic industries in the foothills of Tien Shan, which are represented in the Kulbulak cultural sequence. The chronological position of the archaeological materials of layer 24 is also not absolutely clear. However, on the basis of the results of the comprehensive studies carried out, it can be inferred that in the Western Tien Shan there was the Levallois-blade industry technologically and likely chronologically corresponding to the boundary between the Lower and Middle Paleolithic of the Near East. This stage of research suggests that the cultural interaction of the ancient population of the Near East and the foothills of Tien Shan, which took place during the transition to the Upper Paleolithic (Krivoshapkin, 2012) and in the Upper Paleolithic (Kolobova et al., 2013), was rooted in a much earlier period, the time of development of the Middle Paleolithic traditions.

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