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6 – Research question 1: technical traditions and laminar technology

As described in the previously, two distinct technological systems emerge as a result of the present analysis. In the following sections, a more global reconstruction comparing the technological systems is proposed. Besides the laminar technology, some typological elements are included when considered highly diagnostic and relevant for the comparison.

6.1 THE INITIAL UPPER PALEOLITHIC LAMINAR TECHNOLOGY

This technical tradition is identified at Kara-Bom in OH6 and OH5 and at UK1-1 in OH5.4 and OH5.5. In addition, it is argued that, although based on smaller samples, Kara-Bom OH4 and MPH1 share similarities with the trend described below.

6.1.1 LARGE TO MEDIUM BLADE REDUCTION SEQUENCE

The Initial Upper Paleolithic blade technology relies on the exploitation of high quality local raw material. This raw material mainly consists of fine-grained metamorphic rock (Figure 184). The blocks are likely selected for their large size, general rectangular in shape, and offering natural crests or sharp angles to initialize the reduction. The block is then flaked using a natural crest or by the shaping of an initial crest at the angle of the block. The first removals are likely detached behind the crest and progressively extend toward the broad face of the core. The occasional use of a median crest cannot be excluded. The technology produces massive, elongated blades, with parallel or convergent edges. A certain degree of gigantism can be observed in the blade production and represents one of the distinctive features of IUP assemblages. Cores are not strictly volumetric

as they are reduced using two distinct surfaces interacting with each other. This approach is described here as sub-volumetric. The main flaking surface is located on a broad face and is flaked from two opposed surfaces. After a certain number of removals, the flaking surface tends to flatten. A thicker blade is then removed from the intersection with the narrow face, either using a natural edge of the block (*débor-dant*, naturally backed) or by the preparation of a posterior crest. This operation allows resumed reduction by shaping a new flaking surface convexity. This sequence is then repeated until the exhaustion stage. Most of the cores are considerably reduced with the last removals visible being medium size blades. Usually, a single narrow face bears traces of removals, and the other face sometimes shows an anterior crest. Flat-faced cores without signs of removals on their narrow face are rare. Depending on the degree of preparation visible on their edges, the latter may be categorized as Levallois blade cores. In addition, some narrow face cores occur but do not necessarily represent a distinct reduction process and could also reflect a different stage of exhaustion.

Beside the technical side blades, two types of blanks are detached. Some display parallel edges and some have more convergent edges. Looking at the reduction sequence, it appears difficult to disentangle these two productions as they are integrated into a single process. Furthermore, both of these blanks are retouched, thus confirming their respective intentional character. Up to circa 50% of the blanks show bidirectional removals on their dorsal face, reflecting that the bidirectional reduction represents here a succession of short unidirectional sequences.

Platform preparation is a highly distinctive feature of these assemblages. It shows a combination of plain, faceted, and dihedral platforms. A specific type of faceting, or trimming, occurs on some of the blanks. This preparation is typical of IUP assemblages but

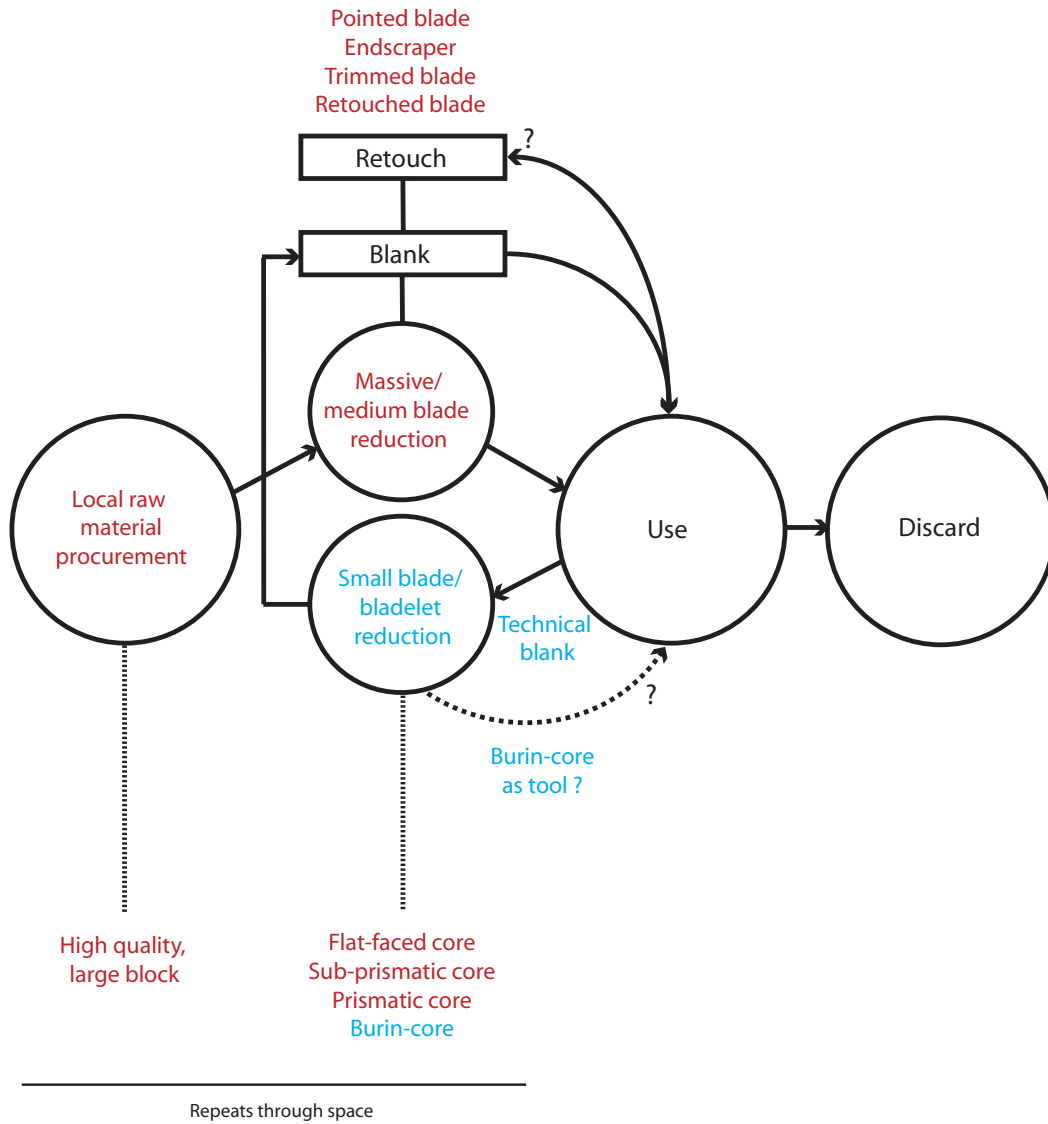


Figure 184: Analytical reconstruction of IUP laminar reduction sequences

may also reflect a singular response to the constraint imposed by the kind of percussion in use. In addition, some faceted *débordant* platforms are observed. They can be recognized by their clear and thin faceting, indicating a platform preparation rather than a crest. Generally speaking, such preparations may be related to the production of large and robust blanks. Extreme abrasion of the platform external edge is an additional recognizable feature. Although having a rather low frequency, it is observed among all studied IUP assemblages. The total absence of thin abra-

sion of the external edge and the platform and bulb attributes indicate hard-hammer percussion with a possible use of soft-stone hammer. Cores associated with this production are generally considerably smaller than the largest blade specimen. Discarded massive blade cores are unusual and neo-crested blanks occur in various sizes. These elements suggest, at least occasionally, an intense reduction of the large cores or their exportation.

6.1.2 SMALL BLADE TO BLADELET TECHNOLOGY

IUP laminar technology also includes the production of small blanks, ranging from the small blade down to the bladelet size. They are detached from Mode B cores exclusively produced on blades and which, typologically, fall into various categories of burin. They are characteristic of what is defined here as the burin-core (BC) technology. The BC blanks are selected among the thickest blades and laminar flakes produced by the large blade sub-prismatic reduction sequence. As described earlier, most of them are detached from the intersection between the two surfaces and are either *débordant*, naturally backed or crested. They usually display a trapezoidal or triangular section of minimum 10 mm and up to 40 mm thick. Some of the core blanks show traces of percussion on their cross-sections, indicating that at least occasionally, the core blank selected is intentionally snapped.

In the Chapters 3 and 4, BCs have been classified in several categories according to the quantity and to the location of their flaking surfaces (Mode B1-B7). This analytical classification is interpreted as reflecting different degrees of core exhaustion.

Modes B1 and B2 have a single flaking surface bearing a few unidirectional removals. They represent the initialization and the beginning of the reduction. In these early stages, the Mode B1 is the most frequent with removals detached from the proximal end of the core blank. Mode B2 occurs when the blank shows a relatively thick mesio-distal end. Mode B3 shows two flaking surfaces located on the two edges. Mode B5 represents a stage of active reduction. Removals are detached from two opposed platforms along a single edge. This mode is by far the most frequent in the studied samples, showing that the reduction ends frequently at this stage. Mode B5 also includes tested cores when they display the preparation of two opposed platforms. Modes B6 and B7 are not frequent and illustrate an advanced stage of reduction. Mode B6 shows a reduction from two opposed platforms along both edges, giving to the BC a lozenge shape.

Mode B7 groups the BC with a flaking surface extending toward the broad face of the core.

BCs are characterized by their flaking surface parallel to the long axis of the core blank (Figure 185). The reduction proceeds by brief unidirectional sequences between platform changes or by alternate bidirectionality. As shown by the blank dorsal patterns and by some of the negatives on BCs, the entire length of the flaking surface is exploited. In other words, it is a bidirectional reduction from two opposed platforms on a single flaking surface. Removal negatives rarely cover the whole width of the flaking surface and indicate a frequent use of a single guiding scar. Thus, this suggests that BC technology is for the production of long, narrow and pointed blanks that may have a natural back or *débordant* character.

According to the high frequency of B1 and B2 cores, initial stages of the BC reduction appear as critical. In fact, some of them display nothing but a deep, hinged negative. Some of the main difficulties that such a technology implies are related to the external platform angle (EPA) and the technique of percussion. On the one hand, after snapping, core blanks with parallel edges often display an EPA close to 90°. On the other hand, features observed on both large and small laminar elements suggest the use of a stone hammer. Where the reduction of small size bidirectional cores with an organic hammer increases the risk of overshoot accident (Pelegrin, 1995), high EPA values combined with a stone hammer increase the risk of hinge fracture and requires an increase in platform thickness (Dibble, 1997; Pelcin, 1997c; Dibble and Rezek, 2009). It, therefore, may explain the frequency and the relatively deep character of the hinge fractures occurring during the early stages of the BC reduction. Even assuming that the successful detachment of a first removal may decrease the EPA, angle management would remain a critical issue all along the reduction process. In fact, almost all BC reductions end by a succession of hinged removals that reduce the efficiency of the platform (Macgregor, 2005). Given the limited striking platform thickness available on BC, a deep hinge fracture is hard to fix and may compromise the reduction process. Among the possible ways to avoid such accidents, removing core tablets in order to obtain a lower EPA appears

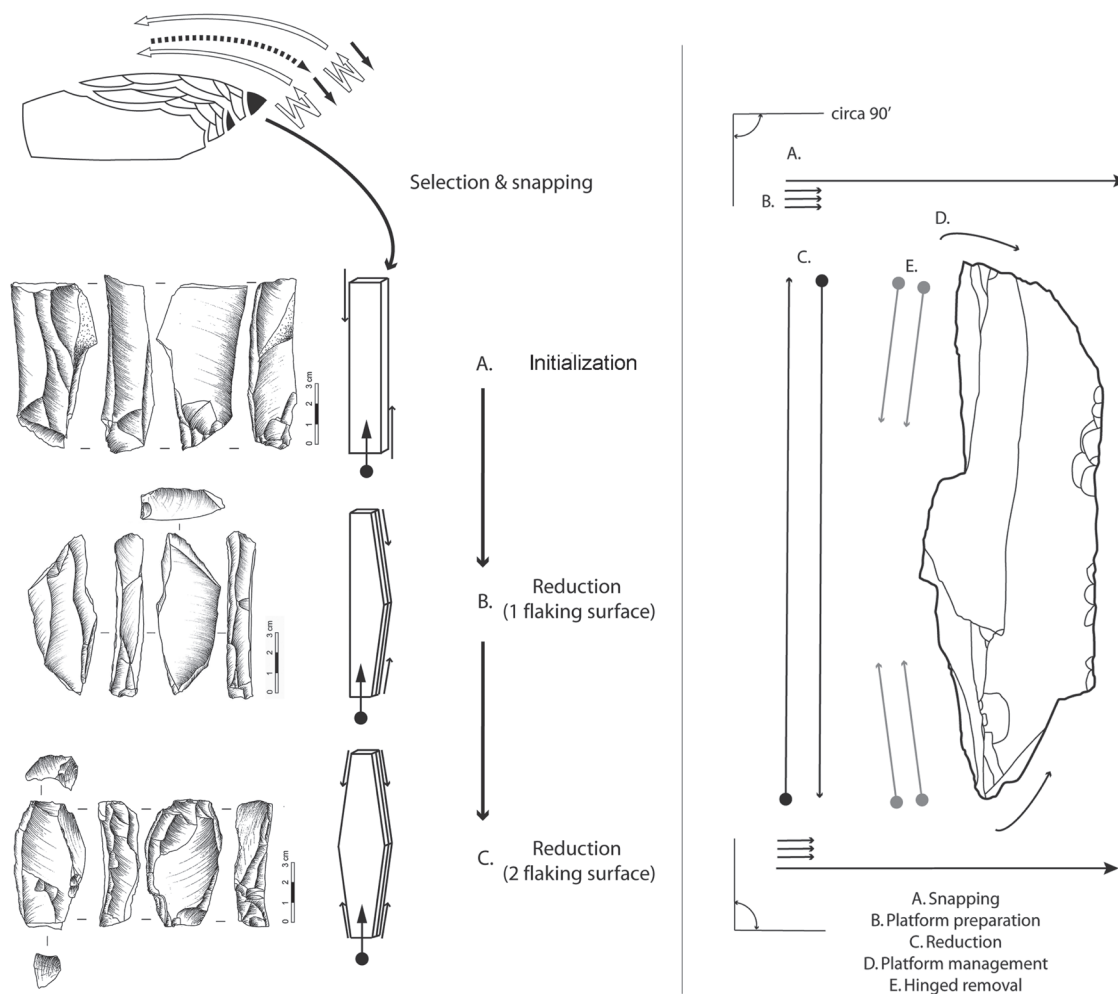


Figure 185: Analytical reconstruction of the BC technology

to be the most frequent. Switching platform appears to be another possibility to turn around the problem.

The size variability observed among the BC leads to the question of the intensity of the reduction. For example, differences in length between the largest and smallest shows a decrease of 75% (Figure 186 : A-D). To interpret this decrease as resulting from a continuous reduction would imply a concomitant decrease in width of the core blank, a considerable amount of tablet removals and/or several snapping events. Small core tablets are, however, almost absent. Although it remains possible, the existence of

such reduction is difficult to demonstrate in the absence of refits.

On the contrary, the observed variability could reflect a certain lack of standardization in terms of core blanks. Core blanks are selected according to their thickness regardless of their length or width. Being technical pieces from a distinct reduction sequence, they show a rather high degree of variability in shape. Thus, given the technical constraints linked with the EPA and the percussion technique, it is assumed that BCs have a relatively short use life. They illustrate a discontinuous reduction process, and their variability

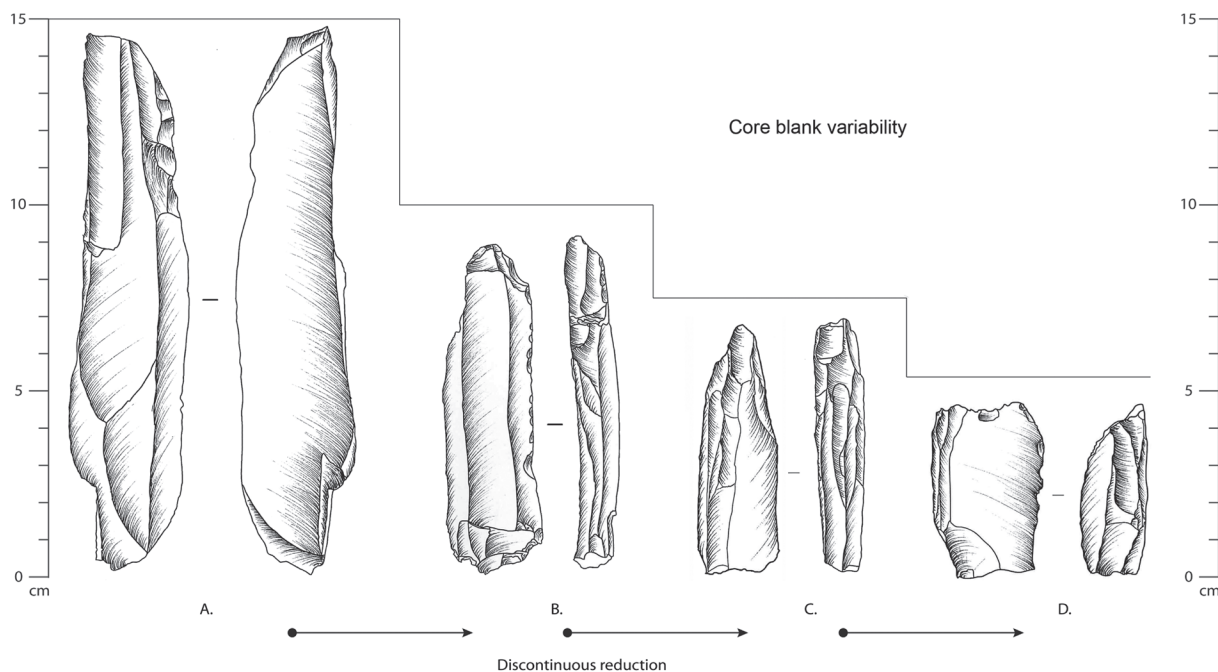


Figure 186: BC size and shape variability and reduction pattern

in size is more likely connected with the intensity of the large blade reduction sequence. As a result, BC represent a rather standardized technology with a poorly standardized production.

Beside the BC technology, rare small size truncated-faceted cores on blades are associated with IUP assemblages. They differ from the Mode B7 by the fact that their main flaking surface is located on the broad face of the core. In spite of their small size, these cores are technologically similar to those described for the sub-volumetric, large blade reduction.

The specificity of IUP technological system lies in the structural role of the *débordant*/crested blanks which represents a link between the sub-volumetric production of the large/medium size blades and the volumetric production of small blade blanks. Theoretically, any sub-volumetric or a volumetric technology using crested elements is likely to produce core blanks suitable for BC reduction. On the contrary, as BC reduction occurs almost exclusively on blade blanks, it depends on a volumetric or sub-volumetric approach as it requires the associated technical

blanks. On the one hand, due to their lack of standardization, technical blanks cannot be fully considered as intentional (predetermined) products. On the other hand, given the role they play in the large blade reduction and the recurring character of the BC technology, it is reasonable to assume that their production is anticipated. In sum, whether BC blanks should be considered as byproducts *sensu strictu* is hard to assess as it depends on the role played by BC reduction and, more generally, small blanks within the technological and functional system of IUP human groups.

6.1.3 RELEVANT TYPOLOGICAL ELEMENTS

The IUP is characterized by a coexistence of parallel and convergent blanks. Both types of laminar blanks are frequently retouched, and, therefore, can be considered as desired end products. Among them, blades with proximal thinning are highly diagnostic. They show discontinuous direct retouch and a proximal thinning with semi-steep, steep or flat retouch. Complete examples show that these blades are pointed by

a bilateral semi-steep and steep retouch. As suggested by Rybin (2000), they represent an effective and easily recognizable type that could be considered as a “type fossil” for IUP assemblages. Fragmented, distal ends are less easy to recognize, and the proximal end should be considered as the most diagnostic. Elongated Levallois points with retouch on their proximal end are also rather typical of the IUP, for which a general interest in axial, pointed elements is noted. Endscrapers on blades are also quite frequent and can vary in size. Sickle-like blades could be seen as typical but are exclusively found within OH5 in Kara-Bom. According to this analysis, bifacial tools, such leaf-points or bifaces, should be considered as part of the IUP variability whether they are produced on blades or on other blanks. Such tools are, however, poorly standardized and doubts remain regarding their cultural ubiquity. The situation is the same regarding the notched tools, which are frequent although they are for the most part on flake blanks. They may correspond to a more expedient type of tool. Small laminar blanks are very rarely retouched and a significant use of unretouched blanks cannot be excluded.

6.2 EARLY UPPER PALEOLITHIC LAMINAR TECHNOLOGY

The described EUP technological system includes the following assemblages: UK1-1 OH5.1-5.3, UK1-2 strata 11-8, Anuy II OH3-12 and Anuy III stratum 12.

6.2.1 BLADE TECHNOLOGY

EUP blade technology (Figure 187) is based on an exploitation of local raw material including mostly metamorphic rock from the Anuy River basin (Postnov *et al.*, 2000). The quality may vary spanning from high quality fine-grained to medium coarse grained material. The size of the blocks is hard to determine, but it is assumed that they are selected for their suitable shape. Judging by the size of the preforms, they are generally smaller than in the IUP, although sometimes relying on the same sources (*i.e.* Ust-Karakol).

This could then be seen as the result of a selection of blocks suitable for a medium-size blade production. Slabs may also be selected as they offer exploitable narrow flaking surfaces. In most cases, the reduction appears fully volumetric and semi-turning, generally unidirectional, and with a single semi-circular striking platform. A few bidirectional removals are sometimes visible on the cores, but they generally do not extend over the whole flaking surface and may represent the remains of a distal crest or, as suggested by Derevianko and Volkov (2004), a core management operation. Some cores display a volumetric reduction from the broad surface that produces short and wide blades or laminar flakes with parallel edges. In addition, genuine bidirectional cores are unusual, but they are present in these assemblages. Crested and neo-crested elements indicate core management operations. Blade blanks are of medium size and have almost exclusively parallel edges and unidirectional dorsal patterning. Bidirectional negatives are usually short and amorphous. These elements point to a reduction that proceeds by rather long unidirectional sequences turning around the edges of the core. The distal core management and the occasional bidirectionality could be interpreted as a way to obtain blanks with straight profiles. Platforms are usually rather small (<4 mm) and plain with an external edge prepared by soft abrasion and with a lip on the internal edge. These elements seem to indicate percussion by organic hammer although the occasional use of hard hammer cannot be excluded. Generally speaking, the blade production is quite variable and remains hard to define.

Blades are retouched in various ways, including blades with direct continuous scalar and thin retouch along one edge, endscrapers with distal or continuous retouch, angle burins, and burins on truncations. Retouched points are almost absent.

6.2.2 BLADELET AND MICROBLADE PRODUCTION

The production of small laminar blanks is the most diagnostic feature of these assemblages. It shows no apparent link with the larger laminar blank pro-

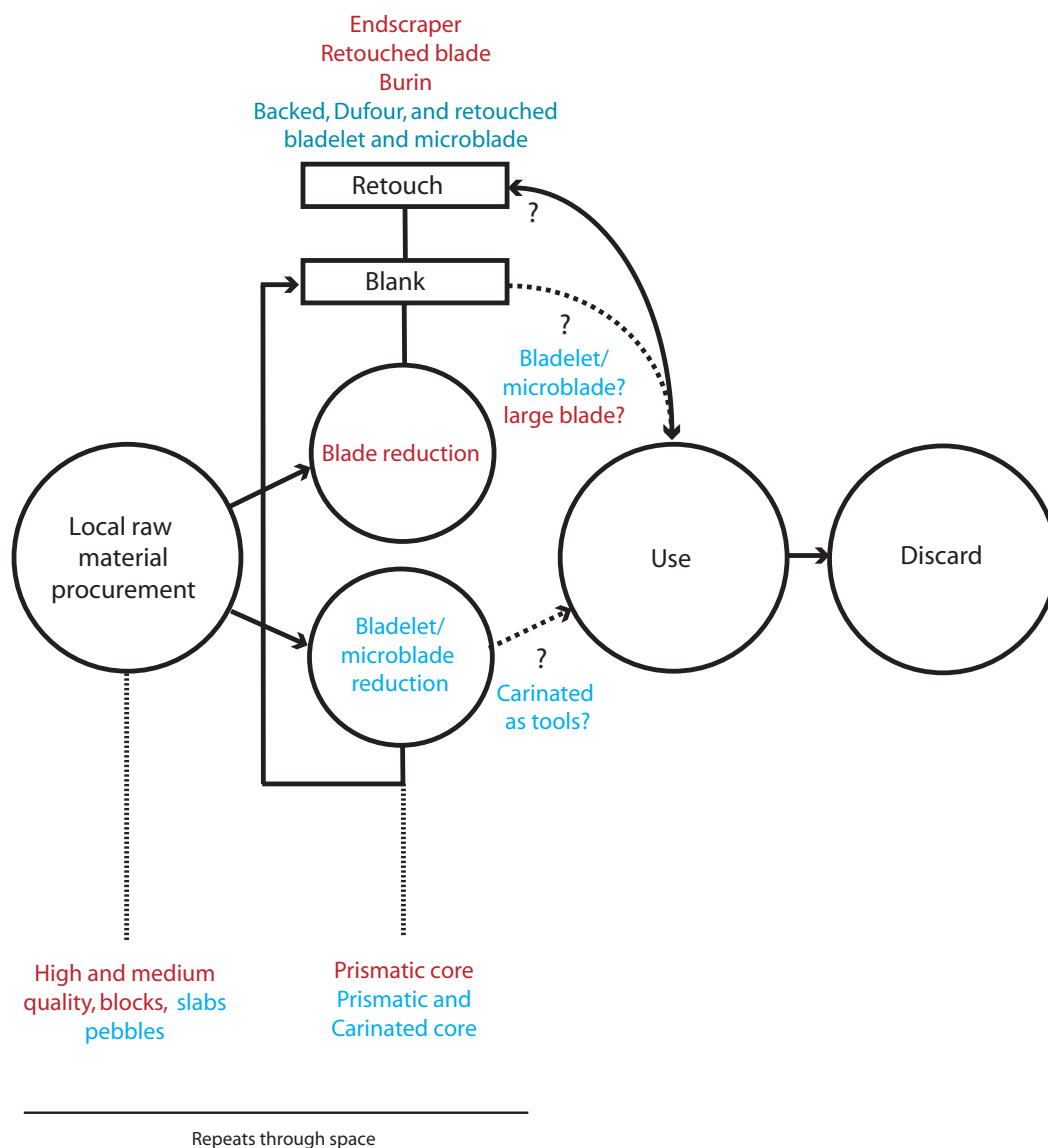


Figure 187: Analytical reconstruction of EUP laminar reduction sequences

duction and stands as a specific reduction sequence from the selection of the raw material onward. Small size slabs and pebbles of fine-grained metamorphic and, more rarely, of jasper-like material are collected from the Anuy River alluvial deposits. Three main types of cores are identified: narrow-faced cores, carinated cores, and cores with orientation changes. For the narrow-faced cores, the initial stage of reduction corresponds to the shaping of a central or lateral anterior crest along a narrow edge of the nodule. The

reduction takes place along a triangular flaking surface with a keel-shape at its distal end. This peculiar shape is described in Ahmarian context as a 'keel' (Davidzon and Goring-Morris, 2003; Goring-Morris and Davidzon, 2006) and is shaped by lateral flakes detached from the main or from an opposed platform by the removal of a lateral overshoot or by the shaping of a posterior crest. Occasionally, traces of a lateral crest are visible on the distal part of the flaking sur-

face. The reduction is strictly unidirectional with a frontal or semi-turning progression.

The carinated cores are named by analogy with tool types such as carinated endscraper or rabot. When they are produced on fragmented river pebbles, their morphology can, therefore, be seen as resulting from a raw material constraint. The split fracture of a pebble creates a striking platform from which unidirectional, frontal or semi-turning reduction takes place. The flaking surface is somewhat broader than for the narrow-faced cores and has a trapezoidal shape. The reduction system is relatively simple but may require lateral preparations to narrow the flaking surface. Fronto-lateral flakes may be detached from the corner of the flaking surface and by creating a notch may narrow the flaking surfaces to create a new guiding scar. This method modifies the core into something that can be typed as a shouldered or a nosed endscraper. The third main type of core is a combination between carinated and narrow-faced core. It illustrates orientation change in the course of reduction that can be seen as a response to a raw material constraint. After a pebble is split, the reduction starts as a carinated core, but following a change in the orientation of the core (or another split), the core is reduced as a narrow-faced core. It is noted that thick cortical flakes can occasionally be used as core blanks.

Due to their reduced size, some of carinated cores, including nosed-endscrapers and atypical carinated endscraper forms, tend to be seen as tools. It is not clear if the atypical endscrapers illustrate the final stage of a bladelet core reduction, a production of small lamellar flakes or if they are strictly tools. Although some burins bear negatives of lamellar spalls, they do not appear to play a major role in the production of blanks. Carinated burins and BC are atypical, if not completely absent. An occasional occurrence of sub-pyramidal and prismatic cores is noted.

The reduction system is adapted to the shape of the pebble but tends to switch to a narrow face when possible. The blanks produced are mainly bladelets and microblades, with unidirectional dorsal patterning and parallel edges. They have small, plain platforms and show traces of thin abrasion on the external edge. None of these cores display the whole

set of typical pressure flaking features (*e.g.* grooved morphology of the flaking surface, deep bulb negatives or denticulate edge platforms, or regular parallel-edge negatives). Instead, in the studied samples, blanks appear relatively poorly standardized and have a relatively heterogeneous secondary treatment. The negatives observed on the cores and the platform attributes suggest the use of organic hammer.

6.2.3 RELEVANT TYPOLOGICAL ELEMENTS

The typological spectrum observed fits classic UP features. As previously mentioned, small endscrapers on laminar flakes or blades, sometimes showing a rather thick working edge, are numerous. Angle burins and burins on truncations occur and usually show a rather narrow and sharp working edge. Carinated burins are absent. Heavily retouched blades also occur, but no systematic series of Aurignacian type retouched blades is present. No biface is attributed to these assemblages. The most diagnostic tools are on bladelet or microblade blanks. They consist of bladelets with distal truncations and of backed and Dufour microblades. Some microblades with distal retouch also occur (micro-grattoir).

6.3 TWO DISTINCT UPPER PALEOLITHIC VARIANTS IN THE ALTAI

Based on the Kara-Bom OH6 and OH5 assemblages and on UK1-1 OH5.4-5.5 assemblages, IUP blade technology appears as a distinctive techno-typological system that combines elements indicating a Levallois background with a well-developed volumetric approach. Blanks tend to be massive and very elongated, with a peculiar treatment of the platforms including classic and partial faceting, dihedral and plain preparations. In addition, the IUP includes associations of highly recognizable typological elements. The combination of technological and typological features can be used as a proxy to outline a recurring specific technical scheme. So far, although based on a smaller sample and lacking some of the diagnostic IUP features, Kara-Bom MPH1 and OH4 find their best fit within the IUP technological system.

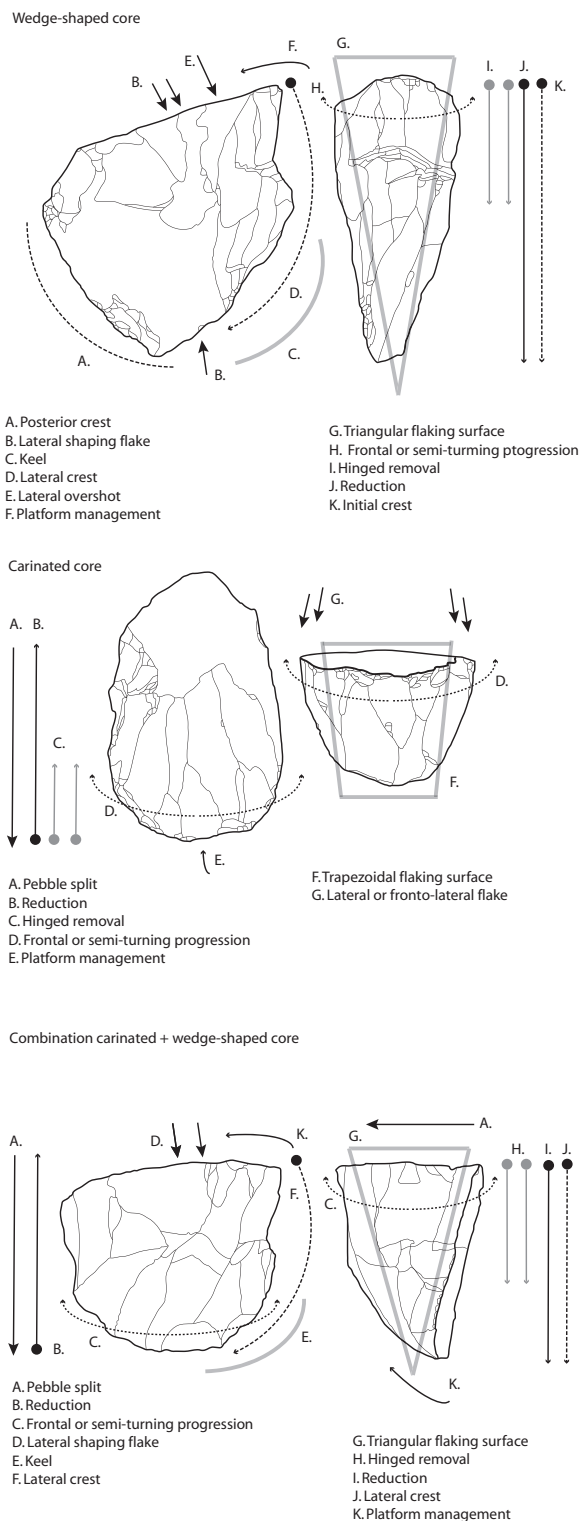


Figure 188: Analytical reconstruction of EUP bladelet/microblade Technology

The main specificity of the EUP laminar system is that it shows the parallel use of two independent reduction sequences. Medium and small blanks are produced following two unrelated paths starting with the raw material selection. Blade technology appears more variable than for the IUP, and there is a lack of massive elements. BC technology is absent although crested elements are quite common. Levallois elements are rare or completely absent. Platforms are mainly plain and suggest an introduction of the organic hammer as a mode of percussion. A particular focus on microblade production shows the development of adaptive strategies to initiate reduction from small nodules. Slabs are reduced as narrow-fronted cores, and pebbles are first reduced as carinated cores before being reduced from the narrow face and turned into wedge-shaped cores. From this point of view, microblade production represents a clear diagnostic character and can be seen as a technological proxy for EUP assemblages. Typologically, UP types such as endscrapers and burins are well represented.

Formal and structural differences between the two traditions are clear and cannot be seen as the result of a raw material constraint. In both cases, the raw material in use is local with a selection for fine-grained metamorphic material. In the case of the BC technology, one could argue that recycling of technical spalls of various shapes and size could correspond to a response to raw material constraints. At Kara-Bom, this idea is contradicted by the proximity of good quality raw material sources (Brantingham *et al.*, 2000; Derevianko *et al.*, 2000; Derevianko and Shunkov, 2005). At Ust-Karakol, although it is assumed that human groups were mostly relying on material drained by the neighboring rivers, technological differences between the two traditions are still clearly marked.

Following the results of the present analysis, the existence of two distinct UP traditions is confirmed.

	IUP	EUP
Raw Material	Metamorphic, local	Metamorphic, local
<i>Blade Technology</i>		
Blank category	Massive/medium blade	Medium/small blade
Platform preparation	Facetted+plain	Plain
Dorsal scar pattern	Uni+bidirectional	Unidirectional (?)
Profile	Straight	Straight+curved
Orientation	None	None
Core Mode	Flake	Mode B+Mode A
Reduction	Two interactive FS	Frontal, semi-turning
Conception	Sub-volumetric	Volumetric
<i>Small blanks technology</i>		
Blank category	Small blade/bladelet	Bladelet/microblade
Platform preparation	Plain+facetted	Plain
Dorsal scar pattern	Bidirectional	Unidirectional
Profile	Straight	Curved, slightly curved, straight
Orientation	None	None (?)
Core Mode	Mode B	Mode A
Reduction	Frontal	Frontal+semi-turning
Conception	Volumetric	Volumetric
<i>Others</i>		
Levallois	Yes	No
Convergent blanks	Yes	No (?)
Bifacial	Yes	No (?)
Specific tools	Pointed blade with proximal thinning	Small-size endscrapers

Table 107: Comparison between the main techno-typological features of the IUP and EUP