Copies of Flakes: Operational sequences of foliate pieces from Buran-Kaya III Level B1

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13

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The foliate pieces of the late Middle Paleolithic were the result of complex operational sequences comprising numerous operational steps. Their analysis has proved the diversity of their production modes and the variety of their use as long-term tools. Most surprisingly, Buran-Kaya III Level B1 has foliate pieces that can be interpreted as copies of their unifacial, flake counterparts. Unifacial and foliate pieces were both produced for use as parts of composite tools. Unlike other late Middle Paleolithic foliates, the Level B1 foliate tools occupy the same place within the functional system as their counterparts made on flakes.

Definition of Foliates

Foliate pieces are made from raw material nodules or large flakes that attain their final volume and their final contour line by special overall surface shaping. Surface shaping (*façonnage* in French, *Formüberarbeitung* in German) usually affects most of the surface and is mostly carried out by a soft hammer flaking technique (Boëda 1991).

Surface shaping of foliate pieces can be either bifacial, as in handaxes, or unifacial as in typical *Halbkeil* of the Central European Micoquian. This is why the term *foliate* (*pièce foliacée* in French) is used here instead of *bifacial piece*. The special mode of surface shaping by a large number of subsequent detachments is essential to the present definition, not that it may occur on both sides or just on one side of a piece. Moreover, foliate pieces may have a functional working edge that has marginal retouch. Table 13-1 shows the technically equivalent classes.

TABLE 13-1
Technically equivalent classes of primary production and surface shaping

	Primary flake production	*Foliate surface shaping*
Support realization of shape (blank)	unretouched flake	foliate piece
Formal tool modification of edge (retouch)	scraper	scraper on foliate piece

Principles of Analysis

The present analysis focuses on the operational chains for the production of foliates (Richter 2001). The analysis of operational chains is based on the chronological sequence among the negative surfaces produced by the detachment of preceding flakes, which are seen on the surface of an artifact. The negatives of detachments are the single elements that together form (1) the upper (dorsal) face of a flake, (2) the overall flaking surface of a core, and (3) one or two surface(s) of a foliate piece.

Evaluation of Completeness of Adjacent Negatives

The attributes indicating the chronological sequence of every two succeeding detachments are shown in Figure 13-1. The initial attributes indicate the completeness of a negative. The succeeding overlapping negative reduces the completeness of the previous negative. Thus, completeness decreases from the most recent negative (fully complete) to the oldest negative (minimal completeness of this attribute).

(1) The more recent negative displays more lateral convexity than its predecessor.

(2) The more recent negative displays radial scars at its periphery. These scars are missing from the preceding negative, thereby indicating the more recent negative removed the periphery and the preceding one is not complete.

(3) Small splinters, often lanceolate and scaled, usually accompany the radial scars of the most recent negative. They can also be found on the crest between two negatives.

(4) The contour line of the most recent negative follows the surface relief of the preceding negative.

(5) The distal part of the most recent negative displays a more significant concavity than does the underlying negative. At the microscopic scale, a micro-hinge can be observed where the most recent negative terminates.

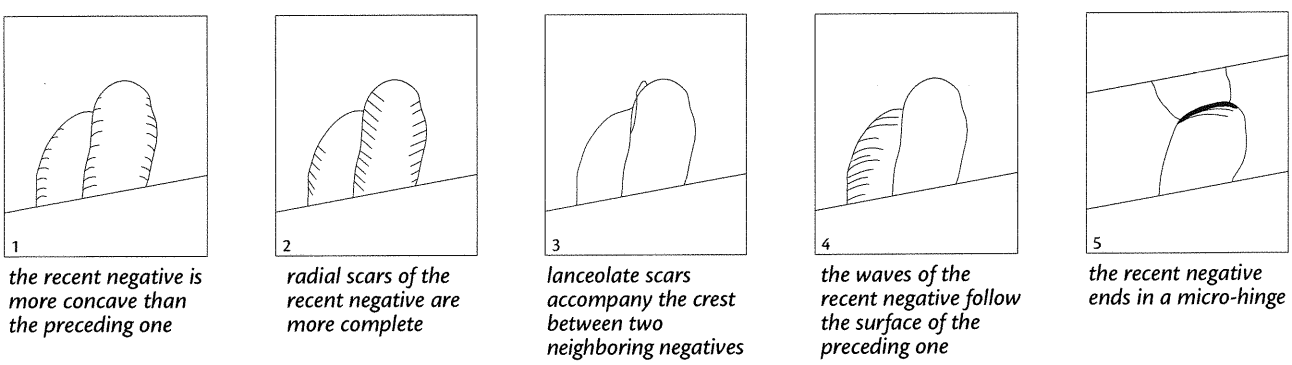

Figure 13-1—Time relations among operational steps.

Evaluation of the Completeness of Intersecting Negatives

A negative on the lower face and a negative on the upper face may oppose each other in the same place on the edge. The more recent one will display all attributes connected with the flaking process, such as the negative of the butt and the exploitation edge. The same attributes will be absent from the preceding negative on the other side: because its basal part served as a striking platform for the more recent flake. Thus, intersecting negatives help to establish a chronological sequence between the two different faces of a foliate piece, whereas adjacent negatives display chronological associations on one of the faces.

Definition of an Operational Step

Several negatives of adjacent detachments on the surface of a piece, displaying the same direction of percussion and belonging to the same technological unit (surface shaping, edge retouch, thinning, etc.), are regarded as related parts of the same *operational step*. As a rule, an operational step comprises more than one detachment. The individual detachments of one operational step were produced immediately after one another. As a frequent exception, it is also possible that one single detachment represents a full operational step; for example, an isolated lateral sharpening spall. The chronological sequence among operational steps results from the attributes described above. For the present analysis, the comparison of attributes is only important if the negatives compared come from two different operational steps, whereas attributes of negatives that form part of the same operational step may be ignored. Thus, the definition of the operational steps forming the surface of a piece is essential to the present analysis. Sometimes, the limits between such operational steps are not as clear as needed and definitions can be ambiguous.

Elements of the Analysis of Operational Chains

The operational steps, which are known from a huge number of data collections, can be attributed to six stages of production and modification of foliate pieces:
(0) provision of raw material
(1) initial surface shaping
(2) preparation of striking platforms
(3) final surface shaping
(4) retouch
(5) rejuvenation.

Provision of Raw Material

The forms and volumes to be found among raw material nodules are of principal importance in terms of the technical process. Raw material pieces can appear as bowl-shaped nodules, kidney-shaped nodules, slabs, and irregular pieces. The acquisition process includes the selection of the most convenient shapes and volumes.

Initial Shaping

The selected raw material pieces must be transformed in a specific manner to correct their volumes and shapes for further treatment. Large cortical flakes are initially struck off to reduce various kinds of flint nodules. The products of initial shaping are called *preforms*. In some cases, massive flakes were taken from large raw material pieces and were used directly as preforms for foliates. Breaking the flint slabs into fragments, for example, often opens them up.

Preparation of Striking Platforms

The preform needs further preparation to allow for the final surface shaping into a foliate, and this is usually carried out with a soft hammer. Therefore, special preparation of the edges results in certain essential technical conditions, such as a regular outline, a specific shape of the striking platform (for later soft hammer treatment), and a very precise determination of the angle of percussion. If large flakes are used as preforms, some of the aforementioned criteria are already present and additional preparation may not be necessary.

Surface Shaping

Boëda (1991) has identified two methods of surface shaping (*façonnage*). The first method is called *flat surface shaping* (*façonnage plan*): a crested striking platform is prepared on the edge of a piece and thin flakes are detached via very flat and orthogonal percussion with a soft hammer. The flakes are very often broken and have hinged lips. The basal parts of these flakes have a crested striking platform with dorsal reduction. Their longitudinal section is straight. The second method is called *convex surface shaping* (*façonnage convexe*). Here, a denticulated edge is produced by retouch. The protruding parts in between the small notches of the denticulation are used as striking platforms for subsequent surface shaping by soft hammer percussion. The flakes are convex and display butts *en bec*, dorsal reduction, lanceolate scars on the ventral face, and a convex longitudinal section. The combination of both methods—the flat method of surface shaping and the convex method of surface shaping—is very characteristic for the Central European Micoquian. Thus, most of the edges are plano-convex and, very often, opposed (right and left) edges are reciprocal to each other. Whereas one edge has a convex upper face and a flat lower face, the other one has a flat upper face and a convex lower face. Thus, foliate tools with a plano-convex/plano-convex surface shape are classic to the Central European Micoquian.

Retouch

After the surface shaping of one or both sides of a foliate piece, the additional retouch of one or more edges transforms it into a tool. Very often, the retouch can be found only on the convex parts of the edges of a foliate piece. At Sesselfelsgrotte, a Micoquian site in Bavaria, the retouch covers only limited parts of the edge, mostly not more than 20–30 mm. K. H. Rieder has demonstrated in the Hohle Stein at Schambach (Bavaria) that most of the foliate tools follow the functional principle of "tools with cutting edge," characterized by the following attributes: a flat lower face, pointed shape, cutting edge on the right of the convex upper face, and cutting edge adjacent to the point (Rieder 1992). At Schambach, the average length of the retouched parts of the cutting edge is 21 mm.

Rejuvenation

During their use, the edges of a tool become damaged and/or dull. Renovation of the functional parts of the tool is then required. Reworking of the tool may not only rejuvenate a worn-out edge, but may also be used to give an edge a different functional value. Usually, rejuvenation of an edge is carried out by secondary retouch. If the same edge is exploited again, a secondary final shaping or thinning might be necessary before the edge is retouched again. A particular method of sharpening an edge, quite classic to the Central European Micoquian, is the use of the lateral sharpening spall (Prondnik spall; cf. Bourguignon 1992), which occurs mostly on the upper face, but sometimes also on the lower face of a foliate. The same method may also be applied to the terminal part of a piece, as a terminal sharpening spall (*chanfrein*, or chamfered piece). A single foliate may undergo many stages of rejuvenation, such as secondary retouch, secondary surface shaping, secondary thinning, lateral and terminal sharpening spalls, etc. Whereas traces of final shaping and thinning processes are mostly preserved on the surface of a piece—at least in small remnants—secondary retouch might often be erased by further rejuvenation stages.

Final Methodological Remarks

Sometimes, foliated pieces have protracted life histories—they are used and repeatedly rejuvenated over a long period of time, from production to discard. During this time span, they may undergo several changes in their volume and outline. Formal classification of foliates is therefore a delicate process. The question arises whether a given form is a product of a typological and functional concept or a mere stage of reduction; and a reduction sequence might itself follow a regular, intended concept. The shape of a piece with its specific contour is most exposed to reduction alteration, which primarily affects the edges. At the same time, typological classification is principally based on shape. Consequently, formal classification of foliates depends on the knowledge of possible operational sequences connected with a specific concept of a tool.

E. Boëda and others have deciphered a technological grammar of foliates, which is mainly based on two methods of surface shaping (Boëda 1991): convex surface shaping and flat surface shaping. In Acheulean industries, for example, bi-convex surface shaping prevailed. In the late Middle Palaeolithic, on the other hand, plano-convex surface shaping (one face convex, the other face flat) was much more common. Within the Central European Micoquian, plano-convex/plano-convex surface shaping dominated (see above). Sometimes, the same concept can also be found among Crimean late Middle Paleolithic assemblages. The principal concept in Crimea, however, was the plano-convex concept of surface shaping.

A Database of Operational Chains

Every single operational step is described within a strict terminological framework and a special code indicates the exact place of the operational step on the surface of a foliate. To that end, a formula is needed as to how to orient the artifacts according to general rules. The rules are:

(1) all orientation is based on the longitudinal axis of the piece;
(2) pointed pieces are oriented with their point up;
(3) pieces with convergent edges are oriented with the angle of intersection up;
(4) pieces with a plano-convex section are oriented with their flat face as their lower face;
(5) pieces with a bi-convex section are oriented with their retouched edge to the right;
(6) if a piece has both a bi-convex section and retouched edges at the right and left, orientation is arbitrary.

Each operational step provides a set of data concerning such properties as place, outline, origin, order, state of edges, and logical position within a sequence of steps (micro-chronology).

The Place of an Operational Step

When the piece under analysis is oriented according to the rules specified above, the surface and the edges of a piece are represented by systematic codes (Figure 13-2). Every code represents a specific place on the piece, which is covered by the traces of an operational step. Codes for the upper face of a piece have "O" as a prefix and those for the lower face have "U" as a prefix. The subsequent number represents a part of the edge, beginning with (1) for the point, (2) for the right edge, (3) for the bottom, (4) for the left edge, and (5) for an additional left edge adjoining the point and separated from the (4) edge by an angle. If the place of an operational step is in the centre of a face without contact to one of the edges, (0) (zero) indicates this. If the same place (for example, O2) contains more than one operational step, the other steps are given secondary code numbers corresponding to their position, such as O21, O22, etc. Often, less than five parts of the edges are represented on a piece and bear traces of operational steps. Only those parts that display their own features (operational steps or primary conditions like cortex) are counted. For example, a triangular bifacial foliate has no O5/U5 code. Within an operational step located in a defined place, the five properties described below are analyzed and encoded.

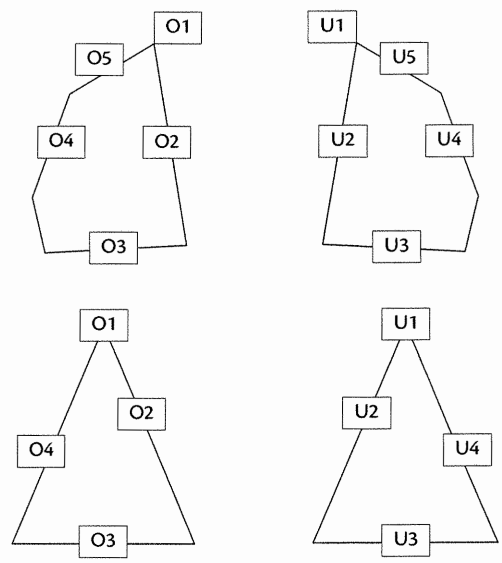

Figure 13-2—The different places of operational steps on a foliate piece (clockwise labels). The different areas on the upper face (O1–O5) and on the lower face (U1–U5) of a bifacial backed knife (*Keilmesser*) (top) and of a triangular foliate (*Dreieckiges Faustkeilblatt*) (bottom).

The Properties of an Operational Step

Contour Line

A code between 1 and 5 indicates the specific form of a contour line:
(1) concave-convex
(2) concave
(3) straight
(4) convex
(5) convex-concave.
The specific order of coding allows for intermediate estimates, such as "3.5" for an edge which is only slightly convex.

Origin

The mode of origin of the part of an edge under analysis is the most important element of the present analysis. The possible modes of origin are listed in Table 13-2.

Order

The attribute "order" describes the regularity observed among the single negatives composing an operational step:
(1) parallel order of adjoining negatives
(2) regular, but not parallel
(3) irregularly adjoining negatives
(4) isolated, disconnected negatives.

State of the Edge

This attribute describes the functional value of the edge:
(1) sharp
(2) still sharp but used
(3) heavily used or not intended for cutting.

Micro-Chronology

As a tool is worked step by step, every single operational step has an exact place within an operational sequence. The relations of adjoining negatives, which can be deduced from certain attributes, define this place within a sequence. As a rule, not all attributes related to the micro-chronology are preserved, since succeeding steps often remove them. Thus, it is most important to document all relations that can be observed on the surface of a piece. To this end, place codes of operational steps are given and their "stratigraphic" relations are indicated by the logical functions > (older than) and < (younger than), such as O21 > O22 and O22 < U2.

All observed stratigraphic relations may be transmitted to a Harris-Matrix program that computes all relations and produces an integrative scheme (WinBASP). It is not yet possible to compare a large number of such Harris diagrams to extract real chronological sequences of the working processes. Presently, Harris diagrams can only deliver those stratigraphic relations that have been observed in actuality. Since some relations have disappeared during the working process, the diagram is always incomplete. This often leads to unclear relations among single steps, which are then indicated as if they were contemporaneous. By contrast, contemporaneity among working steps principally can be excluded because within the real production process of a foliate piece, one operational step always followed another. For the present research, this problem has been solved graphically (Figures 13-3, 13-4, 13-6). The stratigraphic diagrams that are presented below show all operational steps of a foliate piece (indicated as boxes with address labels). The graph displays two different levels of empirical quality. The first level represents the stratigraphic relations between pairs of operational steps that were actually observed on the surface of the piece. This level is indicated by lines connecting the boxes. The second level represents an additional hypothesis of this author concerning the position of some operational steps that still remained ambiguous. This hypothetical level is indicated by the vertical position of the boxes.

Table 13-2
Foliate production: modes of origin of operational steps

Original state	11 cortical surface 12 broken part 13 exploitation edge of core (non-Levallois) 14 exploitation edge of core (Levallois)
Surface shaping	21 flat surface shaping 22 convex surface shaping
Retouch of edges	31 flat retouch 22 semi-steep retouch 23 steep retouch 34 Quina retouch
Preparation	40 preparation of exploitation face for thinning or for sharpening spall
Thinning	51 lateral thinning 52 distal thinning
Sharpening spall	61 lateral sharpening spall 62 terminal sharpening spall
Use wear traces	71 traces of utilisation 72 splintered edge 73 small Clactonian notch 74 irregular denticulation
Fragmentation	81 latitudinal 82 diagonal 83 longitudinal
Thermic alteration	90 crackled

Three Examples from Buran-Kaya III Level B1-2

The late Middle Paleolithic Layer B of Buran-Kaya III is very rich in foliate pieces. During the analysis of the lithic inventory from this layer, it became clear that a specific relation existed between unifacial points and some foliate pieces that had very similar dimensions. The question arose as to whether an analysis of operational chains would be able to yield more detailed information on the obvious similarity observed between those technically distant tool classes. Thus, two examples of foliate points were selected for analysis, as well as one example of a foliate scraper that had some intriguing parallels among unifacial tools.

A Distal Fragment of a Triangular Plano-Convex Foliate Point

The operational sequence for the distal fragment of a triangular plano-convex foliate point from square Д7 (Table 13-3; Figure 13-3) has a unilinear structure; surprisingly, without any hint of secondary reshaping. The principal operational stages follow each other: surface shaping, retouch, utilization, fracture, and discard. As secondary reshaping is absent, the long-life option was not used, as it was in many other Middle Paleolithic assemblages elsewhere with bifacial components. The flat lower face was shaped only once. Like a ventral face on tools made on flakes, the lower face was never reshaped. After finishing the lower face, all intentional alteration of the piece concentrated on the upper face, which underwent convex shaping and convergent retouching. This might have happened only once, as only one stage of convex surface shaping and one stage of retouch are still visible. Obviously, accidental breakage of the tool prevented further reduction and this distal fragment has preserved attributes of initial use only.

Forgoing the long-life option of foliates, increasing convexity of the upper face and steep edges were tolerated instead. Bifacial reduction would have reduced the thickness of the tool and also the general width. This was obviously not desired, and any alteration of the latitudinal section—at least in the proximal part—seems to have been inconvenient. If this is true, it probably can be explained by some form of hafting that did not allow for changes in the dimensions of those parts in contact with the haft.

Use was not bifacial. Only the upper, convex face displays use wear (O22 and O42), except two lamellar spalls (U1) near the distal end of the lower face caused by pressure impact on the tip. On the upper face, the right edge (O21) is more heavily utilized than the left one. If the user was right-handed, the principal cutting

TABLE 13-3

Operational sequence of a distal fragment of a triangular plano-convex foliate point from square Д7

Place	*Origin*	*Contour line*	*Order of operational steps*	*State of the edge*	*Micro-Chronology*
O2	22 convex surface shaping	0 –	2 regular	0 –	O2>O21>O22; O2<O4
O21	32 semi-abrupt retouch	3 straight	2 regular	0 –	O21<O4
O22	71 utilized	3,5 straight-convex	2 regular	1 sharp	O22<O21
O3	81 latitudinal fragmentation	3 straight	4 isolated	3 blunt	O3>O31; O3>U3
O31	72 splintered	0 –	4 isolated	0 –	O31>O4; O31<O2
O4	22 convex surface shaping	0 –	2 regular	0 –	O4>O2; O4>O41>O42
O41	32 semi-abrupt retouch	3 straight	2 regular	0 –	O41<O4
O42	71 utilized	3,5 straight-convex	2 regular	2 still sharp	O42<O41
U01	21 flat surface shaping	0 –	3 irregular	1 sharp	U01>U1; U01>U3
U1	72 splintered	3 straight	1 parallel	1 sharp	U1<O42; U1<O22
U2	11 cortex	3 straight	0 –	1 sharp	U2>U01
U3	72 splintered edge	0 –	4 isolated	3 blunt	U3<O3

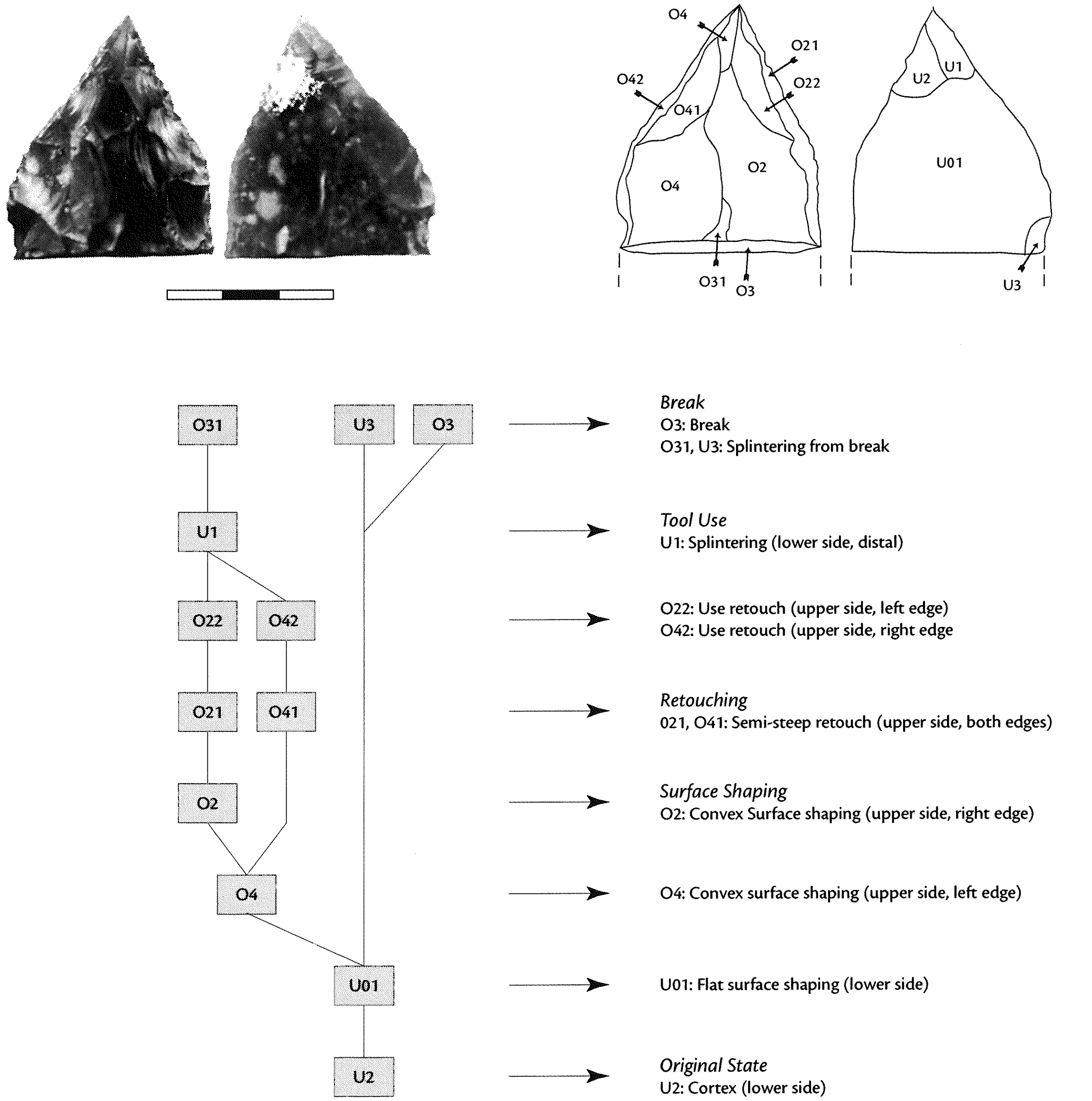

Figure 13-3—Result of the analysis of operational steps for the distal fragment of a triangular plano-convex foliate point. (Level B1, square Д7, no. 3, depth −215.) Raw material from RMU 4 (see Kurbjuhn, Chapter 14).

edge (right edge) of the tool was away from the user's body during use, with the tip pointed to the user's left side. The tool was held in a flat angle on, or nearly parallel to, the object's surface. Thus, sharp scraping was the principal task of this foliate point. The sharp tip of the point was also important. The splintered tip argues for lever-like use of the tool with frequent up-and-down movements, directing powerful pressure to the tip, which eventually caused medial fragmentation (O3). At that very moment, pressure came from the upper, convex side, as shown by reflected splintering (O31) of the adjacent upper surface. Most probably, this pressure was transmitted by the end of a handle or shaft protruding onto the convex face of the piece.

In this piece, surface shaping fulfilled a very particular task: the modification of the tool for hafting. The permissible dimensional tolerance was very low for hafting, and later alteration of those dimensions had to be kept at a minimum. The lower face was totally excluded from any intentional alteration. Traces of use—so often seen on long-life tools with multiple functions—are not ubiquitous. The specific pattern of use argues for a short-life tool with a very specific function, which required sharp, convergent edges and a stabile tip.

A Triangular Plano-Convex Foliate Point

A triangular plano-convex foliate point from square B8 belongs to a series of bifacial tools all having similar contours. Uthmeier (Chapters 11 and 12) has shown that the size and contour of these tools are

Table 13-4
Operational sequence of a triangular plano-convex foliate point from square B8

Place	*Origin*	*Contour line*	*Order of operational steps*	*State of the edge*	*Micro-Chronology*
O2	22 convex surface shaping	0 –	0 –	0 –	O2> O21; O2>O3; O2>O4; O2<O5
O21	31 flat retouch	3 straight	2 regular	2 still sharp	O21>O3
O22	71 utilized	3 straight	2 regular	2 still sharp	O22<O21<O2
O3	52 terminal thinning	2 concave	2 regular	2 still sharp	O3>O4
O4	31 flat retouch	4 convex	2 regular	2 still sharp	O4>O51
O5	82 diagonal fracture	3 straight	1 parallel	3 blunt	O5>O51; O5<U1; O5<U51
O51	51 lateral thinning	2 concave	1 parallel	3 blunt	O51<O4; O51<O2; O51<O21; O51<O5
U1	72 splintered	0 –	3 irregular	3 blunt	U1<O5
U2	21 flat surface shaping	3 straight	4 isolated	1 sharp	U2>U5; U2>U21
U21	21 flat surface shaping	5 convex-concave	3 irregular	2 still sharp	U21>O21
U3	40 striking plat. preparation	1 concave-convex	2 regular	3 blunt	U3<U21; U3<U4
U4	31 flat retouch	4 convex	3 irregular	2 still sharp	U4>U41
U41	71 utilized	4 convex	2 regular	2 still sharp	U41<O4
U5	21 flat surface shaping	0 –	3 irregular	0 –	U5<U2; U5>U4
U51	31 flat retouch	3 straight	3 irregular	3 blunt	U51>O5

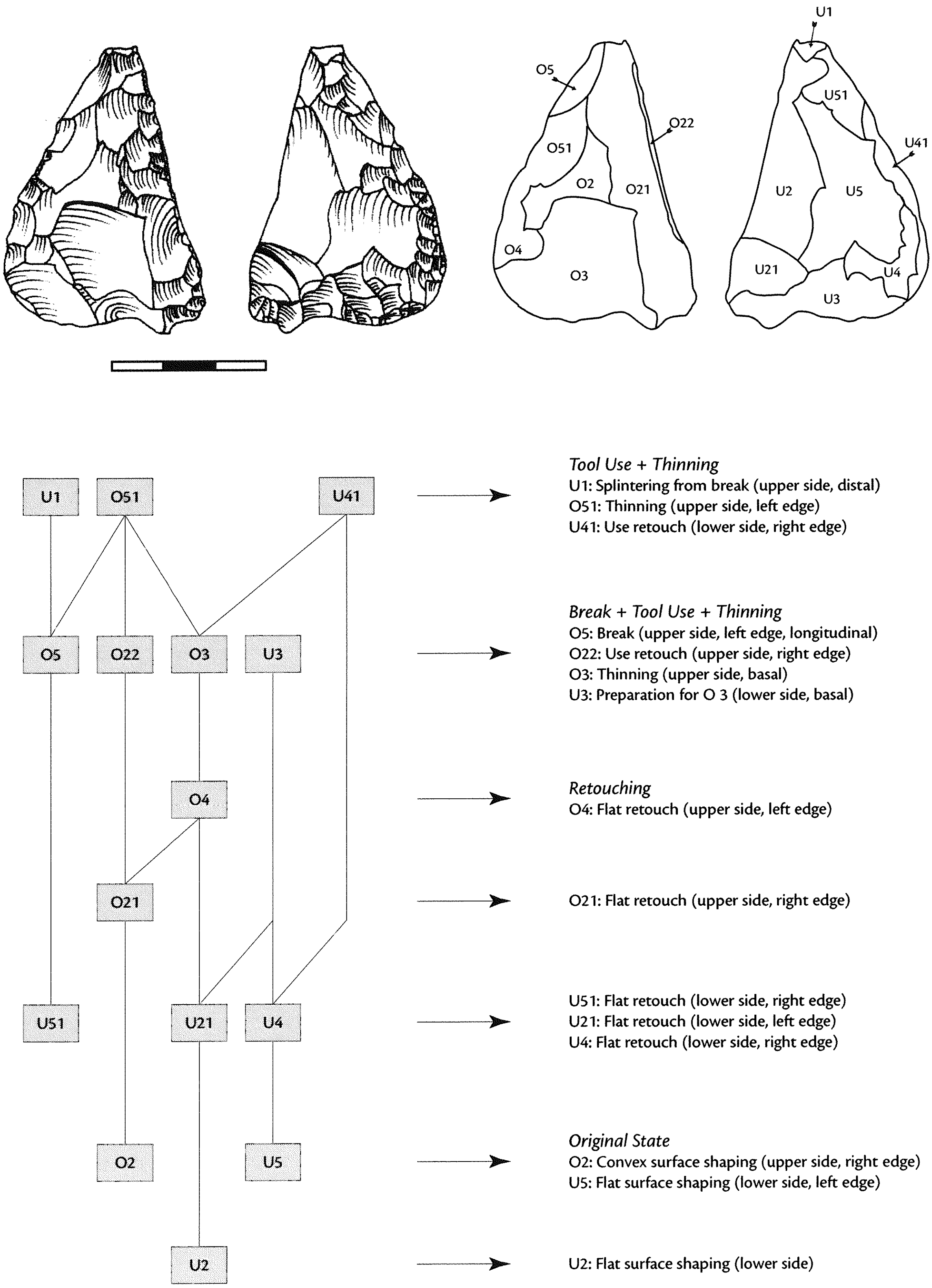

Figure 13-4—Result of the analysis of operational steps for a triangular plano-convex foliate point. (Level B1-2, square B8, no. 12, depth –2.13.) Raw material from RMU 68 (see Kurbjuhn, Chapter 14).

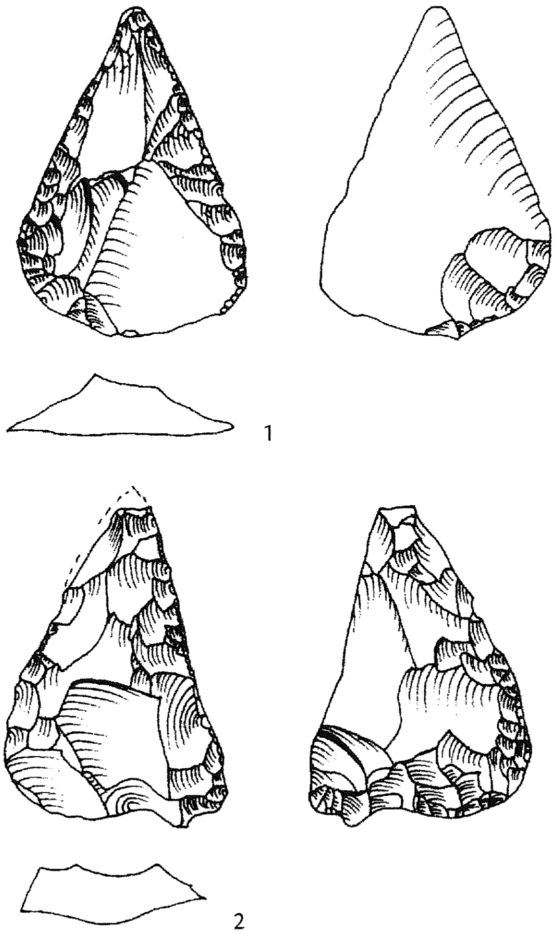

Figure 13-5—Two realizations of the same functional tool concept: an off-axis point made on a flake (1) and the triangular plano-convex foliate point discussed in the text (2), which is a copy of its flaked counterpart.

standardized and parallel the shape and dimensions of unifacial convergent scrapers or points made on flakes, all of which are abundant in the same Buran-Kaya III assemblage. These bifacial tools are copies of unifacial tools! This particular foliate point (Figure 13-4) may be interpreted as a bifacial copy of a convergent scraper or point made on an off-axis flake. It is identical in shape, size, and contour line to another unifacial piece from the same assemblage (Figure 13-5). The shape standardization probably allowed for hafting within a specific composite system. This must have included an organic haft, which was repeatedly equipped with new stone inserts of an exactly defined dimension. Thus, this bifacial tool may have been produced as an equivalent of the unifacial tools that were not available to the extent needed. Indeed, Level B1 is exclusively characterized by such foliate tools, which have unifacial counterparts within the same assemblage.

The result of the analysis of operational steps matches the "copy-hypothesis." A linear sequence of surface shaping—retouch—use—discard can be observed, and surface shaping occurs only at the beginning, without any repetition of the sequence by rejuvenation. The foliate piece was produced once and, consequently, underwent exactly the same processes as its unifacial counterparts.

The first operational step for this piece was a flat surface shaping of the lower face, followed by convex surface shaping of the upper face (Table 13-4). From U51 onwards, a flat retouch around the edge of the lower face followed, in order to correct its contour. Retouch of the principal working edge (O22) was then done with some additional retouch on the left side. Thinning (U3; O3) made the piece suitable for hafting. It was then ready for use, which produced traces on the upper face, right edge, and on the lower face, opposite edge. The tip broke (O5), and a part of the left contour was corrected by retouching the upper face. At the same time—or later—the present tip incurred an impact and splintered (U1).

A Foliate Scraper

A foliate scraper from square Γ7 (Table 13-5) has some relationships to other foliate pieces from Buran-Kaya III Level B1. First, a resharpening spall has been found in the same raw material unit (RMU 7), which indicates on-site reduction of the piece. Second, the operational sequence (Figure 13-6) resembles that of the triangular plano-convex point described above (cf. Figure 13-4), thus indicating that this point seems to represent an earlier stage of reduction of the same hafted composite tool as this foliate scraper.

The operational sequence of the present piece began with a flat surface shaping of the lower face (U2), followed by convex surface shaping of the upper face (O0). Then, the thickness of the base was reduced

Table 13-5
Operational sequence of a foliate scraper from square Γ7

Place	*Origin*	*Contour line*	*Order of operational steps*	*State of the edge*	*Micro-Chronology*
O0	22 convex surface shaping	0 –	0 –	0 –	Remnant of old surface shaping
O1	72 splintered	0 –	4 isolated	2 still sharp	O1>O41
O2	32 semi-abrupt retouch	3 straight	2 regular	2 still sharp	O2>O1; O2>O22; O2>O3
O21	31 flat retouch	4 convex	2 regular	2 still sharp	O21<U3
O22	74 irregular denticulation	3 straight	2 regular	3 blunt	O2>O22
O3	52 terminal thinning	4 convex	3 irregular	3 blunt	O3<O2; O3>O4
O31	40 striking plat. preparation	4 convex	2 regular	3 blunt	O3>O31
O4	22 convex surface shaping	0 –	2 regular	0 –	O4>O41>O1; O3>O4
O41	31 flat retouch	3 straight	2 regular	1 sharp	O41<O4; U41>O41
U1	72 splintered	0 –	4 isolated	2 still sharp	U1<U41; U4>U1
U2	21 flat surface shaping	3 straight	3 irregular	2 still sharp	U4<U2; U2>U3; U2>O22; U2>O2
U3	40 striking plat. preparation	1 concave-convex	2 regular	3 blunt	U3>O3; U3>U4; U3<U2
U31	52 terminal thinning	4 convex	4 isolated	3 blunt	U4<U31; U31>O31
U4	21 plane surface shaping	0 –	2 regular	0 –	U4<U3; U4>U41; U4<O4
U41	31 flat retouch	3 straight	2 regular	2 still sharp	

by thinning on both sides (U3/O3), obviously for later hafting. Now, a second phase of flat and convex surface shaping took place (U4/O4), again followed by some thinning (U31/O31), probably in order to optimize the foliate's dimensions for hafting. Then, the right edge was intensively used as a scraper. The same edge underwent heavy reduction and had to be reshaped several times, which was carried out exclusively on the upper face. Only the last sequence of repeated edge retouch is preserved (O2).

At the same time, the left edge was used, but as a knife. The same edge was retouched on the upper and lower face.

Throughout the whole reduction process (Figure 13-6), the pointed tip was also heavily used and splintered (U1/O1).

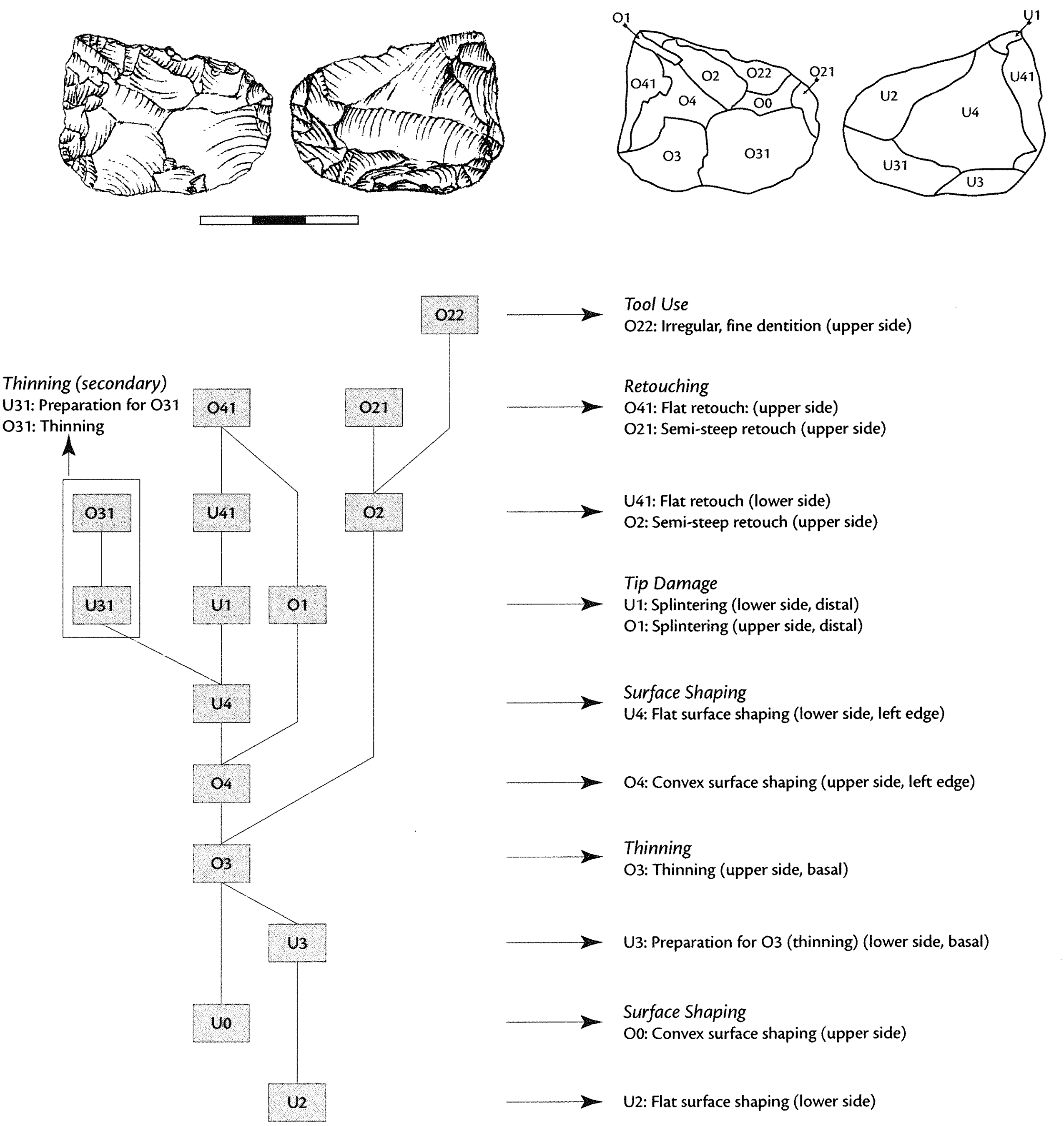

Figure 13-6— Result of the analysis of operational steps for a foliate scraper. (Level B1-2, square Г7, no. 18, depth –2.17.) Raw material from RMU 7 (see Kurbjuhn, Chapter 14).

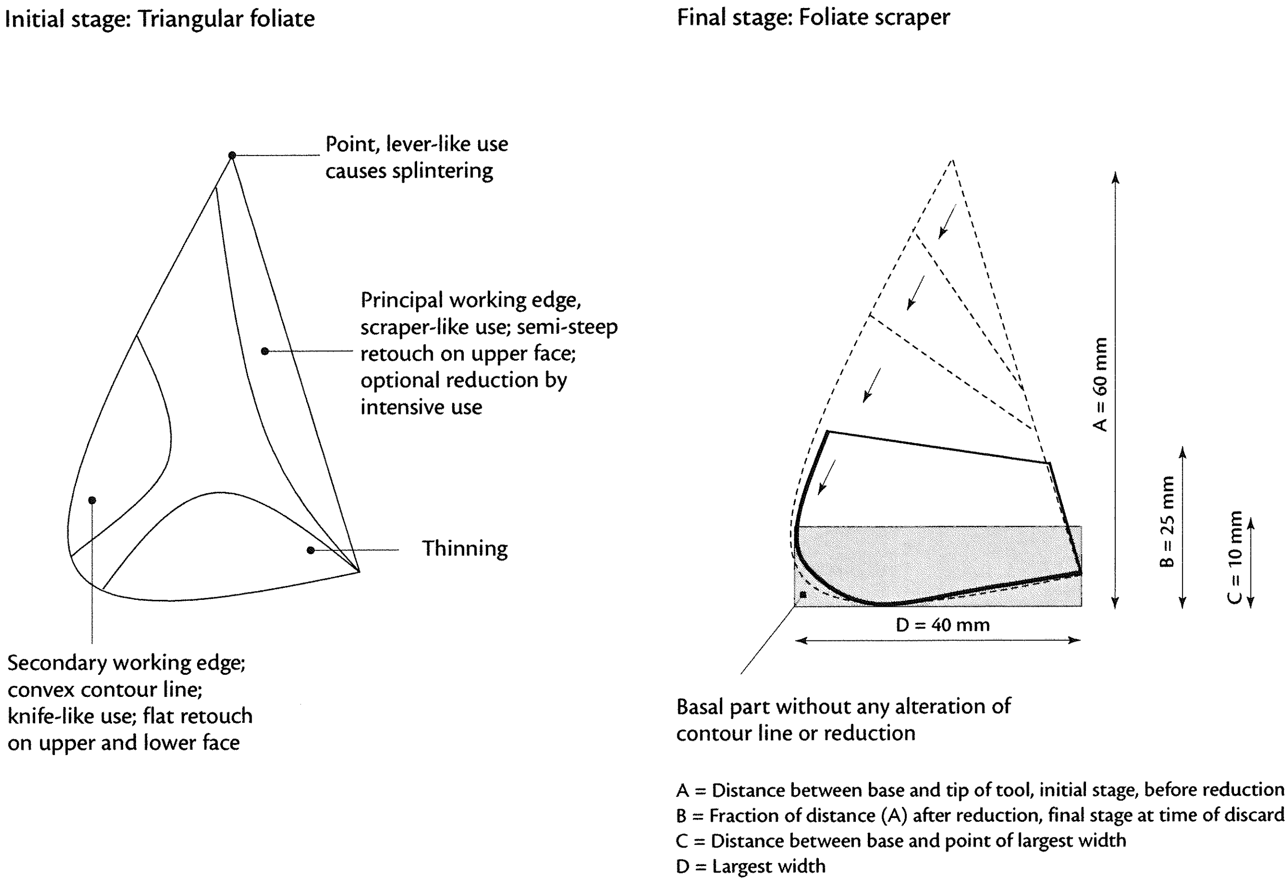

Figure 13-7—Reduction sequence of the principal formal tool from Buran-Kaya III Level B1. The distances A and B indicate the beginning and end of the reduction process. Distances C and D both remain constant throughout the whole reduction process. Values C and D are both identical among all foliate pieces, which belong to the "Triangular Foliate–Foliate Scraper" reduction sequence, whether they come from initial or final stages.

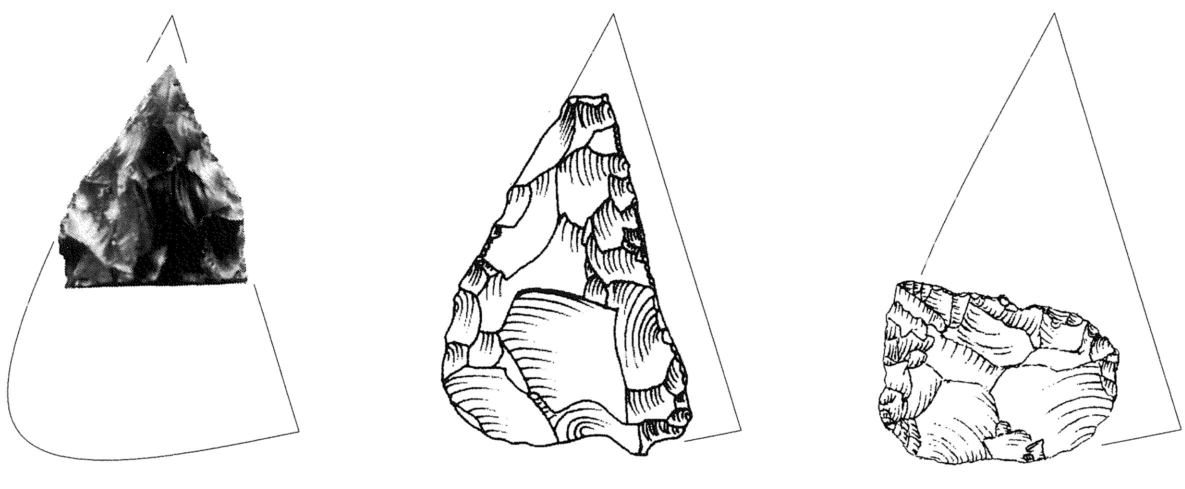

Figure 13-8—The position of the three analyzed pieces from Buran-Kaya III Level B1 within the principal functional concept of an elongated point.

Conclusions

What is most surprising in the Buran-Kaya III Level B1 assemblage is the foliate pieces that occur as copies of their unifacial flake counterparts (Figure 13-5). Each type was produced to be used in the same composite tools. Unlike other late Middle Paleolithic foliates, the foliate tools in this analysis occupy the same place within the functional system as their flake-based counterparts.

The foliate pieces from the late Middle Paleolithic Level B1 of Buran-Kaya III reflect a single preeminent functional concept, which was carried out through both flake production and foliate production: an elongated triangular point was the principal tool. The point was hafted, probably in a handle, and it had a straight right working edge, which was used as a scraper. Resharpening was only on the upper face, which led to the quick reduction of the right edge. As a result, the shape of the tool became more and more asymmetrical and its contour lines approached that of an off-axis convergent scraper (*racloir déjeté*).

The reduction sequence (Figure 13-7), was anticipated by the makers of the tool and was carried out several times in a consistent way. One may conclude that the reduction sequence followed a specific concept of reduction (ending up with off-axis scrapers), which accomplished the concept of production (ending up with elongated points) and the concept of function (ending up with a right-hand scraper edge) of the tool.

The three tool examples presented above represent remnants of the same, superimposed concept of shape. The first piece is a distal part of the same elongated type of point, mirrored by the more complete second piece. Both mark an initial stage of reduction. The third piece, a scraper, represents the final stage of the same reduction sequence (Figure 13-8).

In sum, the Buran-Kaya III Level B1 assemblage provides a case study of three interwoven concepts, all aimed at the same superimposed functional pattern (Figure 13-9).

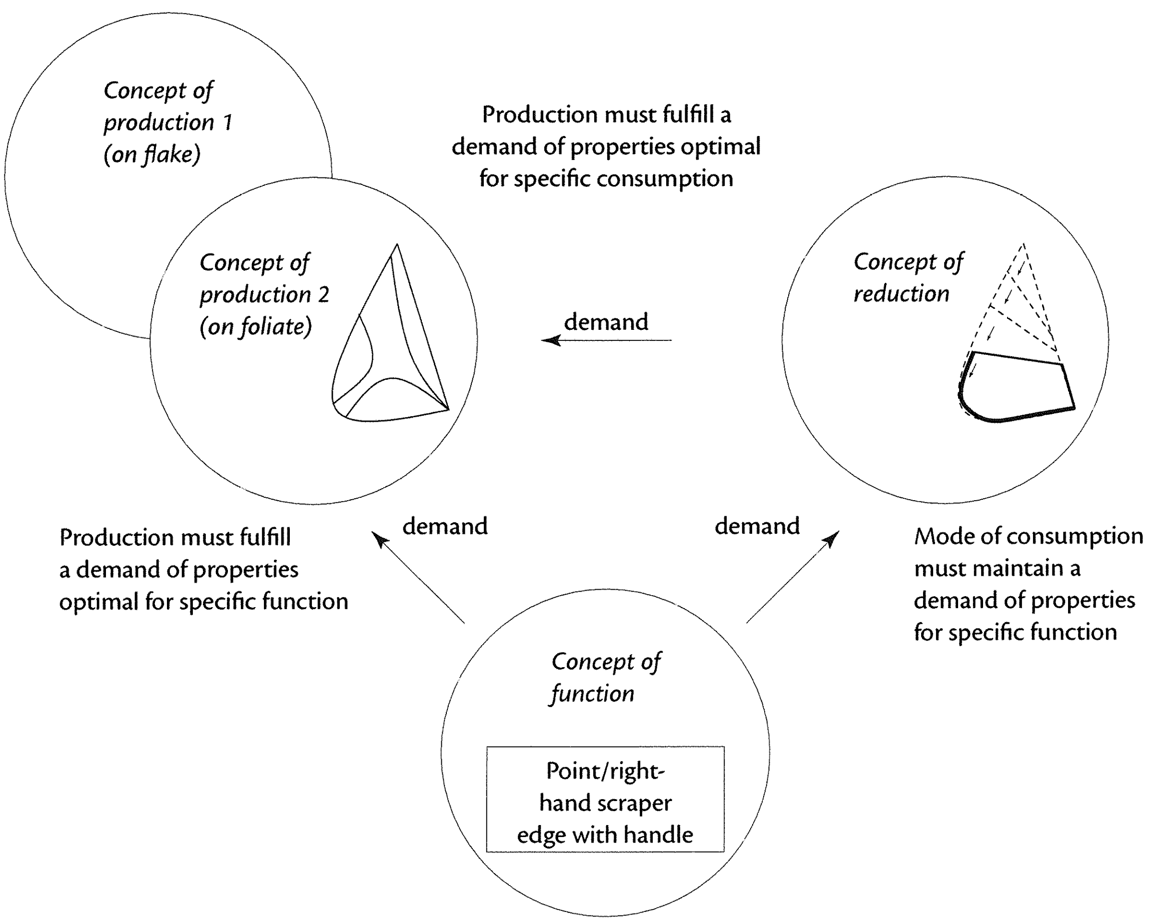

Figure 13-9—Buran-Kaya III Level B1. Two concepts of production and one concept of reduction delivered the properties that were defined by the superimposed concept of function.