Comparison of Boker Tachtit and Stránská skála MP/UP Transitional Industries

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ABSTRACT

The paper aims to provide a detailed comparison of the Middle to Upper Paleolithic transitional period on the basis of durable remains of human behavior, specifically lithic technology from two sites: Boker Tachtit (Negev, Israel) and Stránská skála (Moravia, Czech Republic). The refitted sequences from Boker Tachtit, Levels 1-4 and Stránská skála, sites III, IIIa, and IIIc are studied and compared in detail. The striking similarity, especially between Level 2 of Boker Tachtit and Stránská skála is documented. This observation documents the possible transfer of lithic technology from the Levant to Moravia some 40 kya ago.

INTRODUCTION

On the basis of current DNA studies, the emergence of anatomically modern humans occurred some 200,000-100,000 years ago, probably in sub-Saharan Africa (*e.g.*, Cavalli-Sforza *et al.* 1988; Harpending and Rogers 2000). According to Stringer's "Out of Africa" or "replacement model" hypothesis (*e.g.*, Stringer 1994; Stringer and Gamble 1993), these populations migrated through the Sinai Peninsula into the Levant, the Balkans and some 40,000-35,000 years ago reached Central Europe (Fig. 1).

The remains of both Neanderthals and anatomically modern people have been documented from Middle Paleolithic sites in the Levant, where the two populations produced Levantine Mousterian lithic assemblages. In Central Europe, only Neanderthals have been documented during the same period.



Fig. 1. Emergence of anatomically modern humans in Europe according the "Out of Africa" hypothesis.

The MP/UP transitional period, sometimes called also the Early Upper Paleolithic (hereafter EUP) or Initial Upper Paleolithic, is traditionally accepted as a period when archaic populations (Neanderthals) were replaced by anatomically modern ones (*Homo sapiens sapiens*). However, this event or process was probably more complicated and several other scenarios need to be taken into account (*cf.* Lagar Velho-child, Duarte *et al.* 1999).

In the archaeological record of the MP/UP transitional period, Upper Paleolithic human behavior replaces Middle Paleolithic human behavior (*e.g.*, Clark and Lindly 1989). However, because of a lack of human fossil finds, it is possible to study this shift only on the basis of the durable remains of human behavior, specifically the material culture

(*e.g.*, the *chaîne opératoire* approach, *cf.* Geneste 1985). This paper is mainly focused on a comparison of lithic technologies from the sites of Boker Tachtit and Stránská skála, because both sites were radiometrically dated and provided a series of refitted lithic sequences. The detailed descriptions of Boker Tachtit refits are given in the appendix. (For a detailed description of the Stránská skála refittings see Svoboda and Bar-Yosef in press).

The Levant and Moravia are *ca*. 3,000 km apart, and are located in different ecological zones. Still, some similarities have been documented. The site of Boker Tachtit is located in scree while Stránská skála and Bohunice are in decalcified subsoil within a loess sequence. In the former site no organic material was preserved, while the latter yielded only a limited number of fragmentary animal bones. In the absence of human fossils the biological taxonomy of the people who produced these industries remains unknown. Thus the human behavior at both sites may be studied mainly on the limited basis of the settlement and subsistence strategies and durable remains within a site. Because settlement and subsistence patterns are heavily influenced by environmental variables, they cannot be used as a solid foundation for interregional comparisons.

Methodology

In this study, the lithics from both sites have been analyzed using the *chaîne opératoire* approach, where the technological process is divided into several sequential stages (*cf.* Geneste 1985; Tostevin 2000): 1. Raw material procurement; 2. Preparation (core shaping); 3. Production of blanks; 3a. Core abandoment; 4. Tool production (secondary modification); 5. Tool discard.

The method used for the study of the technological processes was established during research on the Stránská skála material between 1993 and 2000. It is based on reconstructing a cross-section (perpendicular to the core axis), marking all the detached artifacts (those present in the assemblages as well the absent ones). This visualization facilitates the study of the position of each particular artifact within the technological sequence.

The material discussed herewith consists of all refitted sequences from Stránská skála III, IIIa, IIIc, as well as almost all of the refitted sequences from Boker Tachtit (with the exception of the pieces exhibited in the Israel Museum, Jerusalem).

When studying the technological process, it is necessary to take into account that reduction is not always carried out as was intended, and some core reconstructions do not represent the characteristic technology (for example, sometimes a core is not successfully prepared and almost all of it is reduced to frontal crests and platform preparation flakes). The methodology used here is based on finding characteristic features that are shared by the assemblages under study. It means ascertaining the **overall**

technological concept. At the same time, it is important to note that Valoch *et al.* (2000) have recognized three different techniques within the Bohunician technology, and Marks and Volkman (1983) have described several techniques in Boker Tachtit (*e.g.*, in Level 2). In other words, one can argue that the methodology used here creates schemes that are too generalized in comparison with other analytical approaches. However, this methodology has been validated by my own knapping experiments. However, for the future testing of the homogeneity or heterogeneity of Bohunician and/or Emiran technologies, the study of additional refitted sequences will be necessary.

CENTRAL EUROPEAN BOHUNICIAN

The term Bohunician is derived from the site of Bohunice (currently a district of the city of Brno, Moravia, Czech Republic). There are other sites with similar assemblages in Brno Basin, the most important of which are Stránská skála and Líšeň. Comparable industries are derived from surface collections in neighboring regions such Prostějov and Bobrava River, *ca*. 40 km from Stránská skála. The Bohunician is characterized by a mixture of UP and MP features, such as evolved Levallois technology and predominantly UP toolkit supplemented by characteristic MP tool forms (for details see Svoboda *et al.* 1996).

The only stratified sites affiliated with the Bohunician in Moravia are the Stránská skála hill sites (SS IIa, SS III, SS IIIa-f) on the eastern margin of the Brno basin, and the Bohunice sites (I-IV, and 2002 excavations) on the opposite (western) margin of the Brno basin.

The Stránská skála and Bohunice sites yielded a series of ¹⁴C dates (between 36-42 kya BP, Svoboda and Bar-Yosef in press), and lithic materials have been successfully refitted (especially from Stránská skála – Svoboda and Škrdla 1995). There is a series of other sites, often surface localities, whose affiliation to the Bohunician is not generally accepted or may represent an accumulation of several different occupation floors of different cultural entities (*e.g.*, sites in the Bobrava River valley, in Prostějov area, Svoboda *et al.* 1996).

Based on new series of ¹⁴C dates from Stránská skála, the Bohunician occupation appears to have developed at 38-35 kya BP in parallel with both, the Szeletian and Early Aurignacian in Moravia (Svoboda n.d.; Svoboda and Bar-Yosef in press).

Background – The Moravian MP

Small-sized industries dating to the last interglacial and technologically and typologically belonging to the Taubachian, have been documented in Kůlna Cave in the Moravian karst (Valoch 1988) and at Předmostí u Přerova, Site II (Svoboda *et al.* 1994). The Central

¹⁸ O	Kya	Reg			gion
stage	B.P.		Levant		Moravia
	30	Upper Pal.	Levantine A	urignacian /	Aurignacian
3	40	MP/UP	Early Ahmarian Emiran		Bohunician, Szeletian
	50	м	Tabun "B"		
4	60	i			CE Micoquian,
	70	d			
5	80	l e			Mousterian
	90	Р			
	100	a l			
	110	e			
	120	1		Tabun "C"	Taubachian
	130	i t			
6	140	h i			
	150	С			

Fig. 2. Middle Paleolithic and MP/UP transition in Levant and Moravia (Levant according to Bar-Yosef 1996).

European Micoquian, rich in bifacially worked artifacts, has been documented in Kůlna Cave (Valoch 1988) in strata dating from the beginning of the last glacial (Würmian, OIS stage 4) through the warmer Hengelo oscillation. Several Mousterian assemblages from the later period were recovered from Šipka Cave, Švédův stůl Cave, as well as other Moravian caves (Svoboda *et al.* 1996) (Fig. 2).

Generally, the local (Middle Danubian, Ukrainian) Middle Paleolithic industries are characterized by a low frequency of Levallois technique, and the rare MP Levallois points have flake-like proportions (Demidenko and Usik 1993: 12; Škrdla 1996: 103). The Bohunician technology with its elongated Levallois points differs significantly and appears to be a new phenomena (Škrdla 1996; Tostevin 2000). The "flake-like" proportions of the Levallois points of the MP industries do not reflect raw material size limitation. The Cretaceous chert used in Kůlna Cave during the Micoquian has technological characteristics and nodule dimensions similar to the Stránská skála-type chert. In addition, the Bohunician technology was applied to imported materials such as radiolarite, the Krumlovský les chert, and the Cretaceous spongolite chert with the same results as those observed on the Stránská skála-type chert. Typologically, the local MP industries are characterized by a typical MP toolkit comprising sidescrapers, points, bifacially worked artifacts, and rare endscrapers and burins.

Settlement Pattern of Central European Bohunician

Generally, all the EUP sites within the region are located away from the main Moravian rivers, and are distributed along the margins of the highlands (with elevations of up to 600 m), often on the top of isolated high spots or on the top of ridges spreading out from a central massif (Fig. 3). The absolute elevation of EUP sites ranges between 250-350 m a.s.l., and their relative elevation above the river valley bottom ranges between 50 and 150 m. The sites were concentrated around raw material outcrops and formed so called "distribution areas" (Svoboda 1980, 1987).

The Brno basin, *ca.* 10 x 10 km in area, which opens to the south and is drained by three rivers, represents the termination of southern Moravian river valley lowland. The Jurasic limestone rock of Stránská skála with rich chert outcrops of the same name (Stránská skála-type chert) is located at the eastern margin of the Brno basin. This raw material plays a key role in the Bohunician lithic economy in the Brno basin, where it is the dominant raw material (more than 90% of the artifacts are made of Stránská skála-



Fig. 3. Location of Bohunician sites in the Brno basin. The scale is in km.

type chert). At the same elevation on the opposite side of the Brno basin is the site of Bohunice. Both site complexes are located at strategic elevations, which allow good control over the Brno basin.

Chaîne opératoire for the Central European Bohunician (Fig. 5)

This section presents the results of the intensive refitting of the Stránská skála material (*ca.* 10,000 refitted artifacts) (for details see Svoboda and Bar-Yosef in press).

- 1. Raw material procurement. The Bohunician technology (as well as that of the majority of the EUP assemblages in the region, *i.e.*, the Szeletian and Aurignacian) was predominantly characterized by the utilization of locally available raw materials. The raw material spectrum is dominated by the local Stránská skála chert, derived from outcrops located a few dozen meters from the sites. However, this source is supplemented by a maximum of up to 10% (of the artifacts) of imported materials (Svoboda and Škrdla 1995; Škrdla 1996). A lithic distribution pattern has been recognized that is marked by a sharp decline in the proportion of raw material with increasing distance from its source point (Svoboda 1980, 1987). The local chert was available in globular, semi globular or ovoid nodules (maximum diameter of 35 cm) as well as in different types of prismatic, polyhedral and indeterminate blocks, shaped by natural cracks (again up to 35 cm in size). There are great differences in raw material quality among the Stránská skála-type chert collected on the outcrops; generally, the quality of Stránská skála type chert is lower compared to erratic flints or radiolarite. However its quality is occasionally comparable to that of the latter raw materials.
- 2. Preparation stage (core shaping). As was often the case in the UP the cores were shaped to be narrow with a frontal crest. The frontal crest was shaped by a series of cortical flake removals. Sometimes, in the case of prismatic raw material blocks, the core was initiated from a natural surface. Two opposed reduction platforms were then prepared, however, the second platform was sometimes prepared during the production stage. Platform preparation often cannot be reconstructed in greater detail because of the limited number of refitted flakes.
- 3. Production stage (blank production). The result of the preparation phase was often a core with a frontal crest and one or two prepared striking platforms. The core reduction began with the removal of the crest blade. A series of blades, often produced from two opposed platforms, was manufactured in order to achieve a triangular shape for the frontal face of the core. At this time, the first series of Levallois points with fine preparation (faceting) of the striking platform was produced (from the same direction). It was necessary to narrow the resulting wide frontal face of the core with several blade removals to allow for the production of the next series of Levallois points. The

process of core shaping and narrowing followed by Levallois points production was continued until the core was exhausted.

- 3a.Core abandonment. In the final stage of the core's use life, the striking platforms were further prepared, and the frontal face was intensively shaped by a series of blade and flake removals from both opposed platforms. The artifacts produced were short and not suitable for further modification. The final shape of the residual core does not reflect the technology used during the production phase.
- 4. Tool production. The presence of both Middle (*e.g.*, points, sidescrapers, notches and denticulates) and Upper (*e.g.*, endscrapers, burins) Paleolithic tools characterizes the typological spectra of the Bohunician industry. The dominant point type is the Levallois point (Fig. 4). Because these artifacts represent a "target flake of the third degree" (Svoboda 1980, 1987) rather than a modified blank (*i.e.*, retouched tool), they were not included in the category of tools. Other points, such as leaf points (documented only at Bohunice, where they represent only 5% of tools), convergent retouched points (documented only at Stránská skála IIIa and Bohunice, where they represent only 5% and 1.3% of tools, respectively), as well as the ventro-distally retouched Jerzmanowice-type points (documented only at Stránská skála III and IIIa, where they represent



Fig. 4. Bohunician Levallois artifacts. Stránská skála IIIc.

only 1.7% and 2.5% of tools, respectively) are rare (Škrdla 1996: tab. 2). The group of sidescrapers as well as the group of notched and denticulate artifacts together reached values of around 20%. Endscrapers are more numerous at Stránská skála (30-40%) in comparison with Bohunice (13%). Occasionally, these endscrapers have Aurignacian proportions (made on thick blades). A higher frequency of burins was documented at Bohunice (14%), with only isolated specimens occurring at Stránská skála III (5%) and IIId. The tools were produced on points, blades, and flakes all produced by the above described technology, with no other reduction sequence being identified.

Comparison to Other Transitional Assemblages

In the Middle Danube region, there are several variants of the MP/UP transition. The first is the Bohunician with evolved Levallois technology, the second is the Szeletian with characteristic flat retouch, and the third is the Early Aurignacian (Alsworth-Jones 1990).

The EUP industries in this region show a broad degree of variability (*cf.* variability within the Bohunician industry, Tostevin 2000). For example, the Levallois technology, which plays a very important role during the transitional period and characterizes the Bohunician, is not present in the Aurignacian. It is, however, represented by differing degrees of abundance in Szeletian collections (generally in lower frequencies compared with the Bohunician) (Nerudová 1999). Unfortunately, the only stratified Szeletian site in Moravia, the Vedrovice V site, which yielded isolated Levallois products, is not yet amenable for technological reconstruction (Valoch 1993; Nerudová 2000: 23). Therefore the role of the Levallois technique in the Szeletian remains open to question. Nerudová's (1999) study is based on the analysis of artifact morphology in surface collections from the region, where several EUP cultural units occurred in the same locality and within the same time frame. As a result of this situation, different authors assigned different cultural affiliations to certain assemblages (*cf.* Svoboda *et al.* 1996; Valoch *et al.* 2000). Thus Nerudová's statement concerning the differences between the Bohunician and Szeletian Levallois technologies cannot be accepted unquestioningly.

LEVANTINE EMIRAN – THE BOKER TACHTIT TRANSITIONAL SEQUENCE Background – The Levantine MP

The schematic classification of the main phases of the Mousterian lithic industries is based on the Tabun Cave sequence (*cf.* Bar-Yosef 1996). The earliest is the "Tabun D-Type", which is characterized by blades and elongated points produced from Levallois and non-Levallois unipolar convergent cores and bipolar cores, with minimal preparation of the striking platform (Bar-Yosef 1996). The "Tabun C-Type" industry is characterized by often ovoid, sometimes large, flakes produced from Levallois cores through centripetal and/or bi-directional preparation (Bar-Yosef 1996, 1998, 2000). The "Tabun B-Type" industry is characterized by broad based points, often short, thin flakes, and some blades produced from unipolar convergent Levallois cores (Bar-Yosef 1996, 1988, 2000).

However, Hovers (1998) argues for a high degree of variability in reduction strategies among the lithic assemblages of the Late Levantine MP, *i.e.*, during the short time span directly preceding the transition to the Upper Paleolithic. Material from the recent excavations at the site of Tor Faraj in southern Jordan yielded several refits (Henry *et al.* 1996). The site is dated to Oxygen Isotope Stage 4 and represents a terminal MP, Tabun B-Type industry. The Levallois points were produced both from unidirectionally and bidirectionally prepared cores. The most important refit consists of two short convergent Levallois points and one flake (Henry *et al.*1996: Fig. 8). This sequence shows a high degree of similarity with the technique recorded at Boker Tachtit – the points were produced on the same axis. After the first point removal, the frontal face of the core was narrowed from the same platform from which the Levallois point had been removed. The striking platform for the second point production was then re-prepared, resulting in a characteristic step-like pattern, with interval of *ca.* 0.5 cm. Agreeing with Bar-Yosef's interpretation, the Tabun B-Type industry may be ancestral to the Emiran (Bar-Yosef 1996: 177).

The blades and the crest blade (*lame à crête*) technique, both traditionally accepted as characteristic UP elements, occur throughout the whole of the Levantine MP (Goren-Inbar and Belfer-Cohen 1998; Bar-Yosef and Kuhn 1999; Monigal 2001)

Geographic setting

The site of Boker Tachtit is located on the terrace of Nahal Zin, in a hilly terrain, cut by deep wadis, within the Avdat/Aquev area of the central Negev desert. The locality is situated almost at the bottom of the valley.

The Chaîne opératoire for Boker Tachtit

The material from Marks' excavation, which had been refitted by P. Volkman (Marks and Volkman 1983; Volkman 1983) was reexamined using the same method that was previously applied to the Stránská skála material. All available refitted sequences, currently stored in the Israel Antiquity Authority, were studied in detail (with the exception of the pieces exhibited in the Israel Museum, Jerusalem), and the most complete refitted sequences are documented in the enclosed appendix.

1. Raw material procurement. The Negev desert is a region rich in good quality raw materials. Good quality siliceous raw materials, accessible in the form of different

types of nodules (including ovoid and tabular ones, often of large dimensions), are available in the immediate vicinity of Boker Tachtit.

- 2. Preparation stage (core shaping). This stage varies throughout the site's sequence. In the case of Levels 1 and 2, the nodules were decorticated by a series of cortical flake removals, and a characteristic frontal crest was prepared as often is the case in the UP (*cf.* Figs. 7, 9-10). Two opposed reduction platforms were prepared. This stage is rather undiagnostic in Level 3 because of the small sample (Marks and Volkman 1983). However, in the case of Level 4, two significant differences were observed. The frontal face of the core was decorticated by a series of blade/flake removals and no characteristic frontal crest was prepared. Sporadically, the natural crest was used to guide the first blade removal (*cf.* Figs. 17-18). The second difference lies in preparation of only one reduction platform (*cf.* Figs. 15, 17-19).
- 3. Production stage (blank production). This stage varies throughout the site's sequence. In the case of Levels 1 and 2, the result of the preparation phase was a core with a frontal crest and two prepared striking platforms (cf. Figs. 7, 9-10). The core reduction began with the crest blade removal. A series of blades, often removed from both opposed platforms, was produced in order to achieve an elongated triangular shape for the frontal face of the core. At this time, the first Levallois point (or a series of points) with fine preparation (faceting) of the striking platform was produced (from the same direction). It was necessary to narrow the resulting wide frontal face of the core with several blade removals to allow for another Levallois point production. This process of shaping and narrowing, followed by Levallois point production, continued until the core was exhausted (cf. Figs. 7-14). This trend is more regular within Level 2. Level 3 is undiagnostic. In the case of Level 4, the series of blades, including pointed artifacts, are produced from unipolar cores. The pointed shape of the artifacts (of which some are morphologically similar to Levallois points, see Marks and Kaufman 1983) is the result of a distal convexity and the convergence of the frontal face of the core (see Marks and Monigal 1995: 275), and pointed artifacts are produced from ridges determined by previous blade removals. These ridges were created at different times at different places within core volume (see the core crosssections, Figs. 15, 18-19). In contrast to Levels 1 and 2, the cores are not shaped for a series of Levallois point production. Also, as compared to Levels 1 and 2, the preparation of striking platform occurs in distinctly lower frequencies.
 - 3a.Core abandonment. The core's use-life sometimes ends in the production of small blanks, probably not suitable for further modification. It means that the final morphology of the residual core may not reflect the technology used during production phase. This statement is valid for all layers.
- 4. Typology. The presence of both Middle (e.g., Levallois points, sidescrapers, notches

and denticulates) and Upper (*e.g.*, endscrapers, burins) Paleolithic tools characterizes the typological spectra of the Boker Tachtit industry (Marks and Kaufman 1983). This phase of the operational sequence also shows differences along the stratigraphic sequence. The typological spectra of Levels 1 and 2 are quite similar. Burins represent *ca.* 30% and endscrapers *ca.* 20% of the retouched tools. Relatively frequent are notched and denticulate pieces (*ca.* 30%), and Emireh points (*ca.* 10%). Other tools in the assemblages are sporadic sidescrapers, perforators, truncated pieces, and a ventro-distally retouched point. In comparison to Levels 1 and 2, Level 4 is characterized by a significant increase in endscrapers, and a decrease in burins along with notched and denticulate pieces. Retouched points are frequent, mainly on blades, with variable location and intensity of retouch, while Emireh points are absent. Other tools represented are sporadic truncated and partly backed pieces, and composite tools. The tools were produced on points, blades, and flakes all manufactured using the described technology, with no other reduction sequence identified.

Comparison to Another Transitional Assemblage

Several other sites with transitional industries exist in the Levant; however, no other refitted materials are available for comparison with Boker Tachtit. The transitional sequence from Ksar Akil, Lebanon (Ohnuma and Bergman 1990), differs from the one known from Boker Tachtit. A possible northward link is represented by Ücagizli Cave in Anatolia, from which a transitional industry was reported (Kuhn *et al.* 1999). While the transitional layers from Ksar Akil are poor in material, the material from Ücagizli Cave could yield important refittings for future technological study and comparison to Boker Tachtit.

CONCLUSION: A COMPARISON OF THE MORAVIAN BOHUNICIAN AND THE LEVANTINE TRANSITIONAL SEQUENCES

The MP backgrounds in the two compared regions differ significantly. While there is an almost continuous development of Levallois-based technologies (including elongated Levallois points and blades) in the Levant (*e.g.*, Monigal 2001), a similar technological tradition does not exist in Moravia and its vicinity. The Moravian MP (as well as the Middle Danubian in general) produced only non-frequent, short, broad based Levallois flakes (*cf.* Demidenko and Usik 1993: 12; Škrdla 1996: 103). For this reason the Bohunician with its evolved Levallois technology is considered to be a foreign and intrusive element in Moravia.

In the case of the settlement geography, the Bohunician seems to have preferred open sites with strategic positions, which allowed control of the countryside. Outcrops of useable raw material were available directly on the site or located nearby. The raw material procurement strategies of Stránská skála and Boker Tachtit are similar. Still there is a difference predetermined by nodule dimensions and raw material quality – larger and better at Boker Tachtit. Stránská skála and Boker Tachtit Levels 1 and 2 show the same core preparation – the characteristic frontal crest and two opposed platforms – while Boker Tachtit Level 4 differs. The reduction stage is the same in the cases of Stránská skála and Boker Tachtit, Level 2, similar in the case of Level 1, while Level 4 again differs significantly. The final stage of the core reduction, abandonment, is again similar between Stránská skála and Boker Tachtit as a whole. However, residual cores in Boker Tachtit are larger and not so intensively modified in this stage in comparison to the Stránská skála ones. As in the case of the Bohunician, at Boker Tachtit the tool blanks were produced through a single reduction sequence (described above).

Typological differences are clearly visible between the two sites. While at Stránská skála and Boker Tachtit, Level 4 endscrapers significantly outnumber burins, at Bohunice and Boker Tachtit, Levels 1 and 2 the burins slightly exceed endscrapers. Another difference, in this case probably influenced by different typological classifications, is in the number of sidescrapers, notches and denticulates. Some of the Boker Tachtit denticulate pieces would have been classified in the Moravian sites as sidescrapers. When summed, the combined number of sidescrapers, notches and denticulates is similar. At Boker Tachtit, Levels 1 and 2 are characterized by the occurrence of Emireh points, absent in Level 4. These artifacts are described as a characteristic "guide-fossil" of the Near Eastern transitional industry (e.g., Copeland 2001). Their absence in the Bohunician marks a significant difference between the industries described herewith. Only an isolated atypical Emireh point was documented from the surface collection from the site of Ondratice in Moravia (Svoboda 1980, Fig. 39: 9). On the other hand, in contrast to Boker Tachtit, leaf points and ventro-distally retouched points (Jerzmanowice points) are abundant in some Moravian collections. They may, in fact, reflect the possible contacts with other contemporaneous Central European cultural entities (Szeletian and Jerzmanowician).

A point of similarity between Stránská skála and Boker Tachtit is the retouch located at the intersection of the lateral edge and the butt of Levallois points. According to Shea (1995) this feature represents evidence of hafting. If this is accepted, the similarity stems from functional rather than stylistic/traditional constraints.

While the Boker Tachtit transitional sequence fits well in the local technological development scheme towards fully UP industries (*i.e.*, MP–UP technological continuity, Bar-Yosef and Kuhn 1999; Monigal 2001), in Moravia, the Bohunician represents a newly introduced component in the local technological development. This may be a different case than that of the Szeletian, which according to Valoch (2000, and references therein) represents a case of continuity from the local Micoquian (Svoboda 2001).

Another issue is the development towards a fully UP technology, without any Levalloisian products. Although Kozlowski (1990: 422) asserts that Levallois-based transitional industries exerted no influence on the development of UP blade technologies, *i.e.*, considers these industries as a *cul-de-sac* (Kozlowski 1988: 15), the Bohunician technology, which allows the serial production of target artifacts of a predetermined shape, presents a potential for further evolution towards the UP. In addition, the large degree of variability among EUP industries in Moravia may reflect continual leptolitization (*i.e.* increasing blade frequencies and decreasing in those of Levallois implements). Stratified Aurignacian collections dating from 33-35,000 B.P. show no traces of the Levallois technique (see Tostevin 2000 as regards the concept of the Bohunician and Aurignacian behavioral packages).

The detailed comparison of knapping technologies from Stránská skála and Boker Tachtit based on refits (Figs. 5-6) has confirmed the previously postulated similarity between these assemblages (Svoboda and Škrdla 1995; Škrdla 1996). The highest degree of similarity was documented between Boker Tachtit Level 2 and Stránská skála, while Boker Tachtit Level 4 represents a local development without any influence on European assemblages.

The collections from Üçağizli Cave, Turkey (Kuhn *et al.* 1999), Kulichivka, Ukraine (Demidenko and Usik 1993), Temnata Cave, Bulgaria (Ginter *et al.* 1998), and possibly Kara Bom, Russia (Derevianko *et al.* 2000), all show a high degree of similarity to the Emiran/Bohunician technology.

In accordance with Bar-Yosef (*e.g.*, 2000) and Tostevin (2000), and based on my own results presented in this technological study, I have hypothesized a diffusion of lithic technological practices from the Levant to Moravia some 45-40,000 years ago, during a period most probably connected with the first migrations of early anatomically modern humans into Europe.

The archaeological record of the Near East and Central Europe around 40,000 B.P does not hold evidence for other similarities in material culture, expect the ones documented here in the lithic technologies. If the "Out of Africa" hypothesis is accepted, it is the Emiran–Bohunician connection that demonstrates it archaeologically.

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Fig. 5. A theoretical schematic of the Bohunician reduction strategy in cross-section. The Levallois artifacts are marked with a darker raster. Various scales.



Fig. 6. Boker Tachtit, Level 1, 2, and 4. A cross-section of the refitted Cores. The Levallois artifacts are marked with a darker raster. Various scales.

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APPENDIX: DESCRIPTIONS OF THE REFITTED BOKER TACHTIT CORES

The refitted cores presented here are described according to the system previously used for the Stránská skála material (Svoboda and Bar-Yosef in press). The refitted cores are identified by a "letter" code used by Volkman (1983), Israel Antiquity Authority Inv. No., and a reference to Figure. Some drawings are taken from Volkman's (1983) publication (*i.e.*, Figs. 7, 9, 10, 11, 15, 17, 18, 19, 20).

Level 1

Core "F", IAA Inv. No. 2001-2 (Fig. 7)

This sequence is one of the most completely reconstructed cores from this level. The raw material used was a tabular nodule of a characteristic brown chert with a white patinated cortex. The nodule dimensions may be reconstructed as follows: more than 13 cm in length, more than 10 cm wide, and *ca*. 5.5 cm thick. The set consists of a core and *ca*. 20 joined artifacts. The following reduction phases can be recognized: preparation stage (decortication of the nodule, preparation of a frontal ridge, preparation of two opposed platforms) and production stage (production of blades and points).

Preparation stage. The nodule was partly decorticated using a series of several cortical flake removals (7 of them were refitted). The result of that operation was a prepared frontal crest, which shaped the future frontal face of the core. The back of the core was shaped using the same method. Simultaneously, two opposed reduction platforms were prepared.

Production stage. Blank removal began from the core upper platform (the terms "upper" and "lower" platforms relate to their position in figures, not any hierarchical relationship), from which a short part of the frontal crest was removed. The rest of the crest was removed from the same platform after a small reshaping of the crest and the preparation of the striking platform. When the frontal crest was removed, two pointed artifacts (missing) were produced from the opposed (lower) platform, the first of them was probably an elongated Levallois point (length 9 cm, width *ca.* 2.5 cm). At this time, the frontal face of the core was shaped by several blade removals produced from both



Fig. 7. Boker Tachtit, Level 1: Core IAA No. 2001-2. Adapted from Volkman 1983, addditions by the author.

opposed platforms. The result was a frontal face prepared for a Levallois point production (Fig. 7: a). The basal part of this point was refitted. It has a faceted striking platform and the bulb of percussion is removed suggesting an a-typical Emireh point. At this stage, the core was abandoned. During the reduction, the platforms were reshaped by a series of flake removals; in consequence the core became gradually shorter. The striking platforms of the blanks were faceted, in the case of the final point most intensively and precisely.

This core was prepared and initiated in a way characteristic for Upper Paleolithic crested cores, and was bi-directionally reduced from narrow platforms. One of the first



Fig. 8. Boker Tachtit, Level 1: Core IAA No. 2001-4.

removed artifacts had elongated Levallois point proportions (missing). A series of blade removals shaped the frontal face. In the final stage of this core reduction, a non-typical Emireh point was removed. The resulted core is bidirectional with a narrow reduction edge (Fig. 7: b).

Core "K", IAA Inv. No. 2001-4 (Fig. 8)

The raw material used was a nodule of characteristic light brown chert. Its dimensions may be reconstructed as follows: more than 12 cm in length, more than 6.5 cm wide, and

ca. 4.5 cm thick. The set consists of a core and 20 refitted artifacts. The following reduction phases can be recognized: preparation stage (decortication of the nodule, preparation of two opposed platforms) and production stage (production of blades and points).

Preparation stage. The nodule was partly decorticated using a series of several cortical flake and blade removals (only decortication of the core back was reconstructed). The frontal crest preparation was not reconstructed. However, based on negatives of flake removals on both sides of the core, it probably had a prepared frontal crest. Two opposed reduction platforms were prepared.

Production stage. Even if the beginning of the production stage was not reconstructed, according to the negatives on the first refitted artifacts, a series of blades with faceted striking platforms was produced from both opposed platforms. On the resulting frontal face of this core, an elongated Levallois point was removed from the lower platform (Fig. 8: a). Because the frontal face preserved the shape necessary for further point production, a small narrow pointed blade (resulting in a narrow Y-pattern), followed by another Levallois point (Fig. 8: b) were produced from the opposed upper platform. This ended the reduction of this core.

The beginning of this particular core reduction was not reconstructed. However, bidirectional reduction from narrow platforms resulted in two Levallois points. The resulting core is bi-directionally reduced from the narrow edge.

Core "U", IAA Inv. No. 2001-1 (Fig. 9)

The raw material used was a nodule of characteristic dark brown chert. The nodule dimensions may be reconstructed as follows: more than 13 cm in length, more than 7 cm wide, and *ca*. 5 cm thick. The set consists of a core and *ca*. 30 refitted artifacts. The following reduction phases can be recognized: preparation stage (decortication of the nodule, preparation of a frontal ridge, preparation of two opposed platforms), production stage (production of blades and points), and core abandonment (final modification of the residual core).

Preparation stage. The nodule was partly decorticated by a series of cortical flake removals (7 of them were refitted). The result of that operation was a prepared frontal crest, which shaped the future frontal face of the core. Simultaneously, two opposed reduction platforms were prepared.

Production stage. Blank removal was initiated from the upper platform and several short crested blades were removed. The aim of removing the frontal crest was not achieved. Therefore the core was turned over and the crest was successfully removed from the opposed (lower) platform. A significant number of artifacts pertaining to this stage are missing and the reconstruction is unclear. Probably, a series of blades from both opposed platforms was produced. The left side of the core was shaped (decorticated and narrowed)



Fig. 9. Boker Tachtit, Level 1: Core No. 2001-1. Adapted from Volkman 1983, additions by the author.

by several flake removals. There are negatives of at least two massive, wide flakes produced from the upper platform. The result was a core with a narrow frontal face, which was shaped by several blade removals (produced from both opposed platforms) resulting in the core's frontal face prepared for Levallois point production. The first point was short and created the characteristic Y-pattern for the second point (Fig. 9: a), which was 5 cm long and 2 cm width.

Abandonment. In the final stage of reduction, the frontal face of core was again narrowed. Reduction was not continued.

This core was prepared and initiated in a way characteristic of Upper Paleolithic crested cores. We were not able to reconstruct the middle segment of the reduction sequence. In the final stage of the core reduction, a narrow edged core was bi-directionally shaped for Levallois points production, and two points were produced. The residual core is bi-directional.

Level 2

Core "AA", IAA Inv. No. 2001-7 (Figs. 10-11)

This sequence is one of the biggest and most completely reconstructed cores from this level. The raw material used was a nodule of characteristic brown chert with a white patinated cortex. The nodule dimensions may be reconstructed as follows: more than 24 cm in length, more than 15 cm wide, and *ca*. 7 cm thick. The set consists of a core and *ca*. 70 refitted artifacts. The following reduction phases can be recognized: preparation stage (decortication of the nodule, preparation of a frontal ridge, preparation of two opposed platforms), production stage (production of blades and points), and core abandonment.

Preparation stage. The nodule was partly decorticated by a series of *ca.* 15 cortical flake removals. The result of that operation was a prepared frontal crest, which shaped the future frontal face of the core. Simultaneously, two opposed reduction platforms were prepared.

Production stage. The core was initiated from the upper platform and a massive crest blade was removed (Fig. 11: a). This artifact was transformed into a polyhedral burin and its multiple resharpening, which reduced its length by more than 3 cm, was reconstructed (6 refitted burin spalls). The next artifact removed, another massive blade produced from the upper platform, was again transformed into a burin (Fig. 11: b). As in the case of the preceding artifact, this burin was resharpened several times (the length was reduced by about 5 cm). During resharpening, it was transformed from a dihedral into a truncated burin . At this stage, a series of four massive, partly cortical blades was removed (lengths from 11 to 17.5 cm). Consequently, a massive Levallois point was produced from the lower platform (Fig. 11: c). Its dimensions can be reconstructed as



Fig. 10. Boker Tachtit, Level 2: Core IAA No. 2001-7. Adapted from Volkman 1983.

follows: 13 cm in length, 7.5 in width and up to 2.5 cm thick. This artifact was also modified into a polyhedral burin or micro-core. The frontal face of the core was narrowed and prepared for Levallois point production (Fig. 11: d). Its shape was determined by a series of blades produced from the upper platform. The frontal face is again narrowed and another point was produced (Fig. 11: e). This particular sequence was repeated once again and the last point was produced (Fig. 11: f).

Abandonment. After the last point removal, a short flake was produced (see its negative on the core, Fig. 11: g) and the core was abandoned.

This sequence represents a bi-directionally reduced core. Three artifacts were reutilized as burins. In the final stage of this core reduction a series of three Levallois points was produced. The core was predominantly reduced from one of the opposed platforms. The resulting core is bidirectional.



Fig. 11. Boker Tachtit, Level 2: Core IAA No. 2001-7. Adapted from Volkman 1983, additions by author.

Core "K", IAA Inv. No. 2001-6 (Fig. 12)

This sequence is another of the most completely reconstructed cores. The raw material used was a nodule of characteristic brown chert. Its dimensions may be reconstructed as follows: more than 13 cm in length, more than 6 cm wide, and more than 6.5 cm thick. The set consists of a core and *ca*. 25 refitted artifacts. The following reduction phases can be recognized: preparation stage (preparation of two opposed platforms), production stage (production of blades and points), and abandonment (final modification of residual core).



Fig. 12. Boker Tachtit, Level 2: Core IAA No. 2001-6.

Preparation stage. The decortication of the nodule as well as the crest preparation were not reconstructed in detail. The natural frontal crest was shaped only by a short series of cortical flake removals. Two opposed striking platforms were prepared.

Production stage. The nodule was initiated from its narrow edge with a series of several cortical blade removals, probably including a crest blade (some of the blades are missing). The frontal face of the core was shaped by a series of blade removals from both opposed platforms. The frontal face obtained an elongated triangular shape and a series of two Levallois points were produced from the same (lower) platform (Fig. 12: a, b). The blade produced from the upper platform narrowed the wide frontal face of the core and another Levallois point was produced (Fig. 12: c). The same strategy probably continued but artifacts are missing and the reduction cannot be further reconstructed.



Fig. 13. Boker Tachtit, Level 2: Core IAA No. 2001-8.

Abandonment. The use of this core ended with a bi-directional reduction of short artifacts. One of the last ones was a short pointed flake produced from the lower platform.

This sequence represents a bi-directionally reduced core and yielded a series of at least three Levallois points (refitted). The residual core is a flat bi-directional one.

Core "no name", IAA Inv. No. 2001-8 (Fig. 13)

This is one of the most important sequences from this level, even if not completely reconstructed. The raw material used was a nodule of dark brown chert. The nodule dimensions may be reconstructed as follows: more than 9.5 cm in length, more than 8.5

cm wide, and more than 4.5 cm thick. The set consists of a series of 17 refitted artifacts. The following reduction phases can be recognized: preparation stage (preparation of two opposed platforms), and production stage (production of blades and points).

Preparation stage. The decortication as well as possible crest preparation was not reconstructed. Only the preparation of two opposed reduction platforms was documented.

Production stage. Even if the beginning of the production stage was not reconstructed, according to the dorsal scars on the first refitted artifacts, a series of blades with faceted striking platforms was produced from both opposed platforms. Based on the negative scars, two missing Levallois point-like artifacts were produced, the first of them from the upper platform (Fig. 13: a) and the second from the lower one (Fig. 13: b). The latter, followed by a flake produced from the upper platform, shapes the frontal face of the core for the production of another Levallois point-like artifact (Fig. 13: c). This artifact, produced from the upper platform (Fig. 13: b) artifact, a Levallois point was produced from the lower platform (Fig. 13: d). The resulting frontal face of the core was narrowed by a series of two blades produced from the upper platform, and another Levallois point was produced from the lower one (Fig. 13: e). This missing point was reconstructed based on its negative scar. Two blades again narrowed the frontal face of this core; each was removed from a different platform and another Levallois point was produced from a different platform and another Levallois point was produced from a different platform and another Levallois point was produced from a different platform and another Levallois point was produced from a different platform and another Levallois point was produced from a different platform and another Levallois point was produced from a different platform and another Levallois point was produced. The residual core is missing.

This set represents a part of a bi-directionally reduced core. In the reconstructed part of this core reduction, three Levallois points followed by two probable ones were identified.

Core "RRR", IAA Inv. No. 2001-5 (Fig. 14)

This sequence is one of the more completely reconstructed cores from Boker Tachtit, Level 2. The raw material used was a nodule of high quality light gray chert. The nodule dimensions may be reconstructed as follows: more than 9 cm in length, more than 4 cm wide, and more than 4.5 cm thick. The set consists of a core and 20 refitted artifacts. The following reduction stages can be recognized: preparation (preparation of two opposed platforms), and production (production of blades and points).

Preparation stage. The decortication as well as possible crest preparation was not reconstructed. Only the preparation of two opposed reduction platforms was documented.

Production stage. According to the dorsal scars of the first refitted artifacts, a series of blades with faceted striking platforms was produced from both opposed platforms (mainly from the upper, only two negatives document reduction from the lower platform) in order to shape the frontal face of the core for Levallois point production (only two blades were actually refitted). At this moment, the first elongated Levallois point with an



Fig. 14. Boker Tachtit, Level 2: Core IAA No. 2001-5.

opposite directional dorsal scar pattern was removed from the lower platform (Fig. 14: a). Because the resulting wide frontal face lost the shape necessary for further point production, a series of two blades, which narrowed the frontal face of the core was removed using the upper platform. Then a second Levallois point (in fact an Emireh point) was removed (Fig. 14: b). Following, a blade produced from the upper platform narrowed the core, and a final Levallois point was removed (Fig. 14: c). The core was then abandoned. All the Levallois points are broken (tips are missing and in the illustrations they are reconstructed based on the negative scars). However, the surrounding artifacts produced in order to shape the points allowed their reconstruction. The first and second points do not have the characteristic "Y" pattern.

The beginning of this particular core reduction was not reconstructed. The frontal face of this core was shaped predominantly from the upper platform, while three opposed directional points were produced from the lower one. The residual core is prismatic, bidirectional with a crested back.

Level 4

Core "C", IAA Inv. No. 2001-129 (Figs. 15-16)

This assemblage represents one of the important sequences from Boker Tachtit, Level 4, even if it is not too completely reconstructed. The raw material used was a nodule of dark brown chert. The nodule dimensions may be reconstructed as follows: more than 10 cm in length, ca. 10 cm in width, and more than 7 cm thick. The set consists of a core joined with a series of ca. 20 refitted artifacts. The following reduction phases can be recognized: preparation stage (decortication and platform preparation), production stage (production of blades and points), and core abandonment.

Preparation stage. The decortication as well as platform preparation were not too successfully reconstructed. The core was probably decorticated by a series of cortical



Fig. 15. Boker Tachtit, Level 4: Core IAA No. 2001-129. Adapted from Volkman 1983, additions by the author.



Fig. 16. Boker Tachtit, Level 4: Core IAA No. 2001-129.

blade removals. A frontal crest was not formed. One platform was prepared most probably by a short series of flake removals.

Production stage. Even if the beginning of the production stage was not reconstructed, according to the negatives of two blades with massive distal ends, a frontal crest with distal convexity and convergence had been shaped. The removal of a pointed artifact (missing), 8.5 cm in length and 1.5 cm in width (Fig. 15: a), was followed by a series of three pointed blades (Fig. 16: b-d). Another missing pointed artifact, 5.5 cm in length and 3 cm in width (Fig. 15: e). was produced from the right side. A blade with a massive

distal end followed (Fig. 15: f). The missing pointed artifact, 7 cm in length and 1 cm in width, was followed by a point with a broken tip (Fig. 16: g). Another pointed artifact (Fig. 16: h) was produced. Two pointed artifacts were detached from the resulting frontal ridge (Fig. 16: i,j), the frontal face was shaped by flake removal (Fig. 16: k), and two pointed blades were produced (Fig. 16: l,m). The frontal face of core was narrowed and another series of pointed artifacts was removed (Fig. 16: n-p).

Abandonment. The core was again narrowed and a series of artifacts was produced.

This assemblage represents a uni-directionally-reduced core from the wide edge. The pointed shape of the artifact was achieved by removing blades with massive distal ends. The striking platforms of several artifacts were prepared; the intensity of preparation is distinctly lower in comparison with that observed in Levels 1 and 2. The resulting residual core is a unidirectional prismatic core with a cortical back (Fig. 15).

Core "F", IAA Inv. No. 2001-10 (Fig. 17)

The raw material used was a flat nodule of dark brown chert. The nodule dimensions may be reconstructed as follows: more than 12.5 cm in length, 10 cm in width, and up to



Fig. 17. Boker Tachtit, Level 4: Core IAA No. 2001-10. Adapted from Volkman 1983, additions by author.

4 cm thick. The set consists of a core refitted with a series of *ca*. 15 artifacts. The following reduction phases can be recognized: preparation stage (preparation of the platform), and production stage (production of blades and points).

Preparation stage. The platform was shaped by a series of flake removals. The core was initiated from a natural crest. This resulted in a series of four short cortical blades, therefore the distal part of the core was crested, and a series of three crested blades was removed.

Production stage. A missing blade with a massive distal end was followed by a characteristic *pièce outrepassé* and another blade shaped the convergent frontal face of the core, which allowed the production of a missing pointed artifact (7.5 cm in length, max. 1.8 cm in width, *cf.* its negative on the core residual). A removal of a semi-cortical blade ends this core reduction sequence.

This set represents a uni-directionally reduced core from the narrow edge. The pointed shape of the aforementioned artifact was determined by removing the blades with massive distal ends and a characteristic *pièce outrepassé* removed from the same platform. The striking platforms of several artifacts were prepared; the intensity of preparation is distinctly lower in comparison with that of Levels 1 and 2. The resulting residual core is a unidirectional and elongated prismatic core (see the frontal face of the residual core in Fig. 17). Several artifacts were marginally retouched.

Core "H", IAA Inv. No. 2001-181 (Fig. 18)

The raw material used was a nodule of grayish chert. The nodule dimensions may be reconstructed as follows: more than 12.5 cm in length, 7 cm in width, and 7 cm thick. The set consists of a core refitted with a series of *ca*. 15 artifacts. The following reduction phases can be recognized: preparation stage (preparation of two opposed platforms, decortication), production stage (production of blades and points), and abandonment (final modification of the residual core).

Preparation stage. The core was initiated from a natural (unprepared) platform and a series of cortical blade and flake removals decorticated and shaped its frontal face. An opposed platform was prepared by a single flake removal, however it was not utilized until the final stage of this core's use.

Production stage. The preparation stage resulted in a core with a convergent frontal face, and a series of pointed artifacts was produced (up to 8 cm in length). With the exception of the final artifact (Fig. 18: c), these *ca.* 3 artifacts are missing (the shape of only one of them can be reconstructed, Fig. 18: b). The core was narrowed in accordance with the methods used in Levels 1 and 2, and the two following artifacts were produced: a blade, and a wide and pointed artifact (missing) with bi-directional dorsal scars. The semi-cortical blade, originally some 10 cm in length, was transformed into an endscraper (Fig. 18: a).



Fig. 18. Boker Tachtit, Level 4: Core IAA No. 2001-181. Adapted from Volkman 1983, additions by the author.

Abandonment. In the final stage of this core reduction, a series of short flakes was removed from both opposed platforms.

This core was reduced predominantly from one platform, only one flake which shapes the final missing flake was produced from the opposed platform.

Core "KK", IAA Inv. No. 1993-2311 (Figs. 19-20)

This set represents one from the almost completely reconstructed cores from Boker Tachtit, Level 4. The raw material used was a nodule of fine brown chert. The nodule dimensions may be reconstructed as follows: *ca*. 14 cm in length, more than 8.5 cm in width, and 6 cm thick. The set consists of a core refitted with a series of *ca*. 30 artifacts. The following



Fig. 19. Boker Tachtit, Level 4: Core IAA No. 1993-2311. Adapted from Volkman 1983, additions by the author.

reduction phases can be recognized: preparation stage (platform preparation and frontal face preparation), production stage (production of blades and points), and abandonment (final modification of the residual core).

Preparation stage. Even if not reconstructed in detail, it seems there was no frontal crest. The core was initiated from a natural (unprepared) platform and a series of cortical blade and flake removals decorticated and shaped the frontal face of the core (these artifacts are missing). After the first cortical flake removals, the core platform was refreshed by a series of tablet flake removals.

Production stage. The frontal face was shaped by a wide blade and another blade (missing) with a massive distal end (Fig. 19: a). At this moment, a missing pointed



Fig. 20. Boker Tachtit, Level 4: Core IAA No. 1993-2311. Adapted from Volkman 1983, additions by the author

artifact (Fig. 20: b), followed by a blade transformed into a dihedral burin (Fig. 20: c), were removed from the frontal ridge. The frontal face was narrowed and decorticated by a semi-cortical blade removal. A series of pointed artifacts was produced (Fig. 20: d-g). A blade (Fig. 20: h) was produced from the frontal face and another pointed artifact (Fig. 20: i) was produced from the resulting ridge. Another semi-cortical blade was removed in order to decorticate and narrow the frontal face of the core. It allowed the production of another pointed artifact (Fig. 20: j). A missing pointed artifact was produced in this way from the opposed side of the core front (Fig. 19: k) and a blade with a massive distal end was removed from the resulting ridge (Fig. 20: 1). At this stage other blades, flakes, and pointed artifacts were produced (Fig. 20: m-u), with two points missing (Fig. 19: v, w). For the dimensions of the latter, see negatives on the residual core. All the artifacts were produced from the same platform. During the reduction sequence, the distal convexity and convergence necessary for pointed artifact production were maintained by removing blades with massive distal ends. This technique shaped the distal end and allowed the production of pointed artifacts. Using this technique, the blades and points were produced simultaneously. Another series of tablet flakes aimed at rejuvenating the platform was produced during the core's reworking.

This assemblage represents a uni-directionally reduced core from the narrow edge. The pointed shape of artifacts was determined by removing blades with a massive distal end. The core was not predestined for point production (as the target artifacts, *cf.* Levels 1 and 2). The points produced are distributed irregularly throughout the volume of the core (see the cross section, Fig. 19). The residual core is a uni-directional prismatic core with a cortical back (Fig. 19). The core yielded series of blades and pointed artifacts. One blade was transformed into a dihedral burin (Fig. 20: c), one point was retouched on its ventral side (Fig. 20: j).

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