PAVLOV I - NORTHWEST
CONTENT:

Editorial note 9

PART I: THE SITE AND THE BURIAL 11

B. Klima: Excavation History, Stratigraphy and Context - Grabungsgeschichte, Stratigraphie und Fundumstände 13
E. Vlček: Human Remains from Pavlov and the Biological Anthropology of the Gravettian Human Population in South Moravia 53
E. Trinkaus: Cross-Sectional Geometry of the Long Bone Diaphyses of Pavlov I 155

PART II: THE ARTIFACTS 167

L. Jarošová: Spatial Distribution of Artifacts 169
J. Svoboda: Lithic Industries of the 1957 Area 179
A. Verpoorte: Along the Peripheries of a Radiolarite Concentration: The Lithic Industry of 1956/ABC and 1958 211
B. Klíma: Bone Industry, Decorative Objects, and Art - Knochenindustrie, Zier- und Kunstgegenstände 227

PART III: THE TECHNOLOGIES 287

B. Klíma: The Question of Microindustry from Pavlov - Zur Frage der Mikroindustrie aus Pavlov 289
P. Škrda: Pavlovian Lithic Technologies 313
P. Vandiver: Pavlov I Pigments and their Processing 373
O. Soffer and P. Vandiver: The Ceramics from Pavlov I - 1957 Excavation 383
J. M. Adovasio, D. C. Hyland and O. Soffer: Textiles and Cordage: A Preliminary Assessment 403

PART IV: THE INTERDISCIPLINARY CONTRIBUTIONS 425

J. van der Plicht: The Radiocarbon Dating 427
F. Damblon: Anthracology and Past Vegetation Reconstruction 437
R. Musil: Hunting Game Analysis 443
THE PAVLOVIAN LITHIC TECHNOLOGIES

Petr Škrdla

This chapter summarises the evidence on refittings from Pavlov I, the excavations of 1957, and other parts of the Pavlov I area. In addition, it incorporates comparisons with other, previously studied assemblages of both Pavlovian age: Dolní Věstonice II, units 1-3, unit 4 (Svoboda, Škrdla and Jarošová 1993), Pavlov I, excavations 1952-1953 (Škrdla 1994), and Bohunician age: Stránska skála III and IIIa (Svoboda and Škrdla 1995, Škrdla 1994).

In the process of conjoining artifacts back into the blocks of raw material, three main groups of refittings are separated (Cziesla 1985):
- production sequences
- breaks
- reutilisations, resharpenings and rejuvenations

The series of blades and flakes (refitted one to another) from different stages of the core reduction are production sequences. All cases of broken artifacts are summarised in the category of breaks. Reutilisations represent a small group of refitted pieces from tools production, and resharpening or rejuvenation of tools (in the most cases burins). The burins on broken blades are not included in this group, but in the category of breaks (reutilisation after breakage).

The percentage of the above-mentioned groups varies among the Upper Paleolithic cultures, as well as within individual sites. The production sequences are dominant in Bohunician collections from Stránska skala III, IIIa, and in Gravettian collections from Dolní Vestonice II, units 1-3 and Pavlov I, excavation 1957; on the other hand the breaks are dominant in the Gravettian collections from Dolní Věstonice II, unit 4, and Pavlov I, excavation 1953.

Refitted Cores and Other Sequences (Radiolarite Only)

The most complete and important cores

This section describes the most complete reconstructed cores and other important production sequences.

P-I:RC1 (Fig. 1-3)

This core is made of a special type of radiolarite. A change from yellow-brown to dark brown colour with numerous yellow stripes is typical for this raw material. In some instances the colour change is sudden and different colours are separated by a thin dark line. The surface is patinated into a light-brown colour. In some less resistant pieces, the patination goes up to 1 cm into the inner part of raw material. Before the reduction of this core, the raw material was already patinated. On the basis of
these unvarying characteristics, it was possible to separate out artifacts made of this block of raw material. Two assemblages are more important: a core residual conjoined with several blades and flakes (Fig.3), totaling 10 pieces, and the "blade cover" of a core (Fig.1-2) reconstructed from 16 pieces. The residual core morphologically resembles a discoid core (Fig.3:1). To this residual is joined a series of five blades. One of them is transformed into an atypical endscraper (Fig.3:1A); the other, broken, is only partly retouched (Fig.3:1B). Two more flakes from the reduced platform (rejuvenation?) and one flake from the preparation stage of the core reduction were also joined. Fig.3:3 shows the probable position of the core residual and blade cover. The cover consists of 10 artifacts, 4 of which are reconstructed from several pieces. With the exception of two flakes, all other artifacts were transformed into tools. After the breakage of the terminus, the blade with splintered edge retouch (Fig.2:2A) on its basal part was reutilized by the retouching of both terminal corners of blade fragment (into endscraper?). The reciprocating blade fragment, with the splintered edge retouch of the basal part, was reutilized as a burin on broken blade (Fig.2:2B). It is important to note the "aurignacoid" artifact in Fig.2:2C. This probably bilaterally, steeply retouched endscraper was reutilized as a combined burin. The removal of three burin spalls made a burin on truncation on terminal part of artifact, while several more burin blows subsequently made a polyedric dihedral asymmetrical burin on the basal part of artifact. The tool in Fig.2:2D may be interpreted as a double splintered edge, although negatives of chips on its terminal part typologically indicate a burin. The break, however, indicates loading by two opposing forces. The tool with a combination of an endscraper with a burin (Fig.2:2H) could have been broken by the same mechanism. These cases (O,H) cannot necessarily be interpreted as intentional burin blows, but more likely as the splintered working edges created by opposing forces. Further conjoins include a burin on truncation located on the basal part of blade (Fig.2:2F), a partly retouched terminal part of blade (Fig.2:2E), and a combination of a ventrally retouched point with splintered edge retouch on its basal part (Fig.2:2G).

From this particular raw material, few more assemblages were refitted: three series of 2 blades (Fig.3:2), one series of 3 blades, a series of 4 blades (Fig.3:4), two broken blades, and two flakes. The high degree of the desirability of the raw material for tool production is visible.

P-1:RC2 (Fig.4-5)
This "archaic" core with a discoid residual is composed of a red radiolarite and consists of 11 pieces. The discoidal shape is determined by several flakes knapped from both sides (dorsal and ventral) of this core. Only one of these flakes was refitted - broken and reutilized (retouched) into an undetermined tool (Fig.5:5). This core yielded a series of blades produced from the same platform. All of them were chipped from the wide face of core. All of them were only partly retouched, while one broken blade was retouched steeply (Fig.5:5). Two blades have splintered edge retouch at the base (Fig.5:B,C).

P-1:RC3 (Fig.6)
This unilateral core is composed of a special (red-green and partly patinated) sort of the radiolarite and consists of 29 pieces. On the basis of the residual cortex, the original shape of raw material nodule is visible in the cross-section. A core residual was not found within the excavated area. Several important tools were made from this core: a blade with splintered edge retouch on the base (Fig.6:4) and a remnant of the core ridge was broken with a type Ia break. The terminus of this artifact was reutilized again as a splintered piece. Two blades (Fig.6:B,C) were retouched into a point. Three other blades (Fig.6:E,F,G) were partly retouched. A burin on a broken blade (Fig.6:D) was twice reutilized after breakage. In these cases, the breaks may be interpreted as the resharpening of a burin. The production of another, ventrally retouched burin on truncation (Fig.6:H), was also reconstructed. Many of the artifacts (blanks) made from this core were utilized (blank blades with utilisation retouch) or transformed into a tool. Some of them were broken and reutilized. Regarding the absence of the core residual, only approximately 50% of the original block of raw material was utilized for tools production within the Pavlov site.

P-1:RC4 (Fig.7)
This core which is composed of a reddish-orange sort of the radiolarite was reconstructed from 19 pieces. The first joined blades produced (Fig.7:4-A-D) from this unilateral core were relatively long. Reduction continued by the removal of several shorter blades. The latter were not found within the excavated area. The final stage of core reduction is represented by relatively small and short blades (Fig.7:E,F). Some of these were transformed into tools. A partly retouched blade with splintered edge retouch on its base has traces of impacts on the dorsal side of the terminus (Fig.7:4). Another partly
retouched blade was transformed into a polyedric transversal burin (Fig.7:B) at its base, while another (Fig.7:C) was transformed into a terminal splintered edge. One small blade was retouched (Fig.7:E), while another was transformed into polyedric dihedral burin (Fig.7:F). The terminal part of the core residual was shaped by scraper-like retouch for possible further reduction (a new crest?).

P-I:RC5 (Fig.8:1)

Another unilateral core is made of high quality, black radiolarite and consists of 25 pieces. Some preparation flakes and a part of the crested blade (Fig.8:1A) represent the initial stage of this core reduction. More than half of the artifacts produced from this core were not found within the excavated area. The following artifacts were retouched: a blade with the splintered edge retouch at the base (Fig.8:1A), a partly retouched blade (Fig.8:1B), and a flake (Fig.8:1C). Significantly, the core residual (Fig.8:1D) can be defined typologically as a microcore. The reduction of this core started with the production of long blades (ca. 10cm) and smoothly continued to the production of microblades.

P-I:RC6 (Fig.8:2)

This small unilateral core reduced from a narrow platform is made of a special striped variety of the radiolarite and consists of 7 pieces. This core yielded splintered edge retouch on the basal part of a blade (Fig.8:2G) and a burin (Fig.8:2H).

P-I:RC7 (Fig.9:1)

This red radiolarite core consists of 20 pieces. A sequence of multiple platform preparations totals 8 pieces. The core was not strictly unilateral as two flakes were knapped from an opposite platform. A steeply retouched, broken blade (Fig.9:1A) and a splintered edge of basal part of another blade were produced from this particular core. On the basis of the residual cortex, we are able to reconstruct the original shape of the block of the raw material as prismatic.

P-I:RC8 (Fig.9:2)

This core, which is composed of red radiolarite with several thin lines of white chalcedony and with yellow-green spots, consists of 19 pieces. While both of the platforms (top and bottom in the picture) were prepared multiple times, only the bottom platform was actually utilized, based on the dorsal scars on the core residual and the refitted pieces. Only three blades and several flakes from production stage were refitted.

P-I:RC8a (Fig.12:2)

Even though it was not directly joined, a series of eleven blades and one flake (mostly from the 1957 area and 1956 nw. trenches - see chapter Spatial distribution ...) represents another part of the refitted core P-I:RC8 on the basis of the exceptional nature of the raw material and a similar shape. This sequence yielded several retouched blades and one borer (Fig.12:2H). Another sequence of two blades (one of them crested), probably also part of above mentioned refitting, was not joined.

P-I:RC9 (Fig.10-11)

A relatively complete core, composed of the very nice red-green-yellow striped variety of radiolarite, consists of 32 pieces. Another five assemblages made from this particular core were not joined. The core is strictly unilateral and reduced from the narrow face (see cross-section). Reduction began with preparation of the reduction platform, and continued with ridge blade removal without precise decoritification. The ridge blade was restored a few times (3 ridge blades were refitted) during core reduction. The inner part of this core was not refitted and a core residual was not found within the excavated area. Six tools (a relatively small number in contrast to the attractiveness of the raw material) were refitted: splintered retouch on the terminal part of the 2nd ridge blade (Fig.11:A), a terminal part of the polyedric dihedral burin (Fig.11:B), a blade with splintered retouch on its base (Fig.11:C), a partly retouched blade (Fig.11:D), a retouched blade (Fig.11:E), and another partly retouched blade reconstructed of three pieces (Fig.11:F). The latter blade was probably reutilized as a splintered edge.

P-I:RC10 (Fig.12:1)

This core, indicating multiple preparations and rejuvenations of the reduction platform, is composed of black-red-green radiolarite and consists of 18 pieces. Two other assemblages (three and two refitted flakes) made on this particular raw material were not joined. Four flakes of the preparation stage have the character of blades (with length at least twice the width). Reduction began with the removal of a ridge blade and continued with the production of a series of flakes. A laterally retouched blade tool (Fig.12:A) was produced from this core. On the basis of the residual cortex (opposite to ridge blade) and the ridge blade, we are able to reconstruct the original shape of the nodule. The ridge
blade, however, cannot indicate the beginning of reduction stage (see P-I:RC9). When we subtract the size of core residual and the size of the series of flakes of the preparation stage of the core reduction, the extraction of raw material as usable products does not amount to 50%.

P-I:RC11 (Fig.13:1)

Three assemblages of this unilateral core are composed of the green radiolarite with red stripes. The core part consists of 5 pieces, the first blade sequence is of 4 pieces, and the second sequence of 4 pieces. In contrast to the cores in Figs.9:1;12, the reduction platform was simply prepared by one flake removal. The core was broken and the top part was subsequently further reduced. One blade with splintered retouch on the base (Fig.13:1C), another blade with splintered retouch on the terminus (Fig.13:1B), and other retouched blades (Fig.19:1A) were also produced from this core.

P-I:RC12 (Fig.14:1)

This block of raw material, consisting of 17 pieces, contains many inclusions and cracks. One quarter of the block was prepared as a core. This unilateral core yielded several usable blades but none of the refitted blades, however, were transformed into a tool.

P-I:RC13 (Fig.15:1)

This assemblage, consisting of 10 pieces, is composed of an excellent variety of the red-brown-yellow-white striped radiolarite. In contrast to the majority of Pavlov I (1957 exc.) radiolarite cores, this core is not unilateral: one-half of the refitted artifacts were removed from the opposite platform marked in the cross-section. The most important tool among this particular sequence is an endscraper (Fig.15:1A) due to the possibility to reconstruct the original length of the blade-blank. For the production of a 6 cm long endscraper, the 6.8 cm long blade blank was utilized, indicating that 12% of the blank length (measured in the middle, 26% on the edge) was removed while producing and possibly resharpening this tool. Other typical endscraper-like tools (Fig.15:1B,C), one of them with splintered retouch on its base and another pointed blade (Fig.15:1D), were made from this core.

P-I:RC14 (Fig.15:2)

This core is composed of the red radiolarite and consists of 5 pieces. The first refitted blade was crested. On the basis of the dorsal scars, several blades was produced before this partly crested piece. Three other blades were produced from this particular core, two of them being modified into endscrapers (Fig. 15:2I,J). The first endscraper was made on the basal part of a blade and during its production, and possible resharpening, 26% of its length (measured in the middle, 50% on the edge) was removed. In the contrast, the other endscraper was made on a terminal part of the blade and for its production, and possible resharpening, only around 1% of length was removed.

P-I:RC15 (Fig.17:2)

This core is composed of the red radiolarite with green spots and consists of 16 pieces. This particular core represents the most important specimen of the bidirectionally-reduced cores from Pavlov I (1957 exc.). The symbols in cross-section indicate that artifacts marked by crossed rings were produced from the bottom platform, while artifacts with a point inside the rings were struck from the top platform. Artifacts were reduced alternatively from both platforms; however, in the final stage of core reduction, one series was removed from the right side of the core, while another series was removed from the left side. Both of the series were reduced from a different platform. A burin on truncation with splintered retouch on its basal part (Fig.17:2D), several splintered pieces (Fig.17:2B,E), a truncated piece (Fig.17:2A), and two partly retouched blades (Fig.17:2C,F) were also produced from this core.

Tool production

Splintered retouch can be placed on the terminal or basal part of the artifact - it is not a rule here (e.g., see differences in Fig.16:4. and Fig.2; 5).

With one exception (Fig.15:2I), the endscrapers were made on the terminal part of the blade. In 6 cases we are able to reconstruct the length of the original blades. In two cases (Fig.15:2J;16:5), the blade was practically not shortened. In four
other cases, endscraper production removed 0.5 cm of the blank length on two pieces (Fig.16:3), 1 cm on another (Fig.15:1A), and 2 cm on a fourth (Fig.15:2I).

Production of several other tool-types was reconstructed: mostly of splintered pieces (eg., Fig.16:4A-D; 17:1M,2B,E; 18:1B,2E,3,5), burins (eg. Fig.16:4G; 17:2D; 18:5,6), pointed blades (eg. Fig.13:2; 18:4), a point (eg. Fig.14:2), a borer (Fig.12:2H), and retouched blades (eg. Fig.17:1K,L).

Similarly to endscrapers, some tools were made by sharpening of working edges without the shortening of the blades (Fig.18:4). Other tools (Fig.18:3, 12:2H) were shortened by more than one third.

Breaks

A significant part of the refittings represent breaks (for Gravettian and later cultures). For example, these represent 73% of the total refittings from site DV-II, unit 4 (Tab.5.).

Theoretical introduction

Theoretically, breaks can be dealt with as two basic categories:

- intentional (technological matter)
- unintentional (random factor)

Practically, however, it is difficult to separate these categories accurately.

When the result is the production of a tool, the breakage is intentional. The production of burins on broken blades (36.5% of the total burins from site DV-II, unit 4) represents the main part of this group. It is necessary to say, however, that the majority of the burins made on broken blades (from the studied collections) was probably made on unintentional breaks (for example defect of raw material, or on broken retouched tools). The broken-off basal parts of blades (65 pieces in DV-II, unit 4 collection) may also belong to this group. The conjoining of these blade fragments is difficult due to the continuation after breakage of production of splintered edges from the bases of each blade (with one or more of percussions).

An unintentional breakage is a consequence of the defect of raw material (in the time of production or using of a tool) or the result of use. The breakages of the working part of tools (the largest number of breakages) such as endscrapers, splintered pieces, points, burins, borers, and retouched blades probably belong to the group of breakages due to use. For breakages due to use (with the exception of the breakages influenced with a defect of raw material), there is the typical shape of broken surface ("S"- curve). On the basis of this curve, and especially on the study of the lift of break shape, one may determine the direction of the breaking force.

It is difficult to separate intentional and unintentional breakages accurately. Use-wear analysis, however, can be used as a separation criterion. A broken piece would have no traces of use-wear if the breakage is intentional, and vice versa. But
the possibility of reutilisation after some period of use is not eliminated (Svoboda, ed. 1994, p. 66, Fig. 16:3).

The experimental breaking

Under the auspices of the grant project "UP site of Pavlov," a comparison of all breakages was made. The same types of raw material as used for the archaeological tools were used for the experiments, i.e., northern flints. Differences between northern flints and radiolarites were not found out experimentally.

Several basic mechanisms of loading were separated (Fig. 20:1):

I - bend of blade, with additional pressure in axis, with a bend in a direction of:
   a - a less thick of the blade
   b - a more thick of the blade

II - torsion of blade with contemporary pressure

III - pressing as splintered edge (loading with two opposed forces)

IV - a random fall to a hard surface

On the basis of the experiments carried out during this comparison, it is possible to identify accurately breaks of categories I (a and b), II, and III. For the variable breaking surfaces of category IV, no consistent separation can be made. For categories I, II, and III, it is possible to determine the direction of the affecting force on basis of the special characteristics (the lift of break) of the breaking surfaces (Fig. 20:4).

A size of the lift of break is directly proportional to additional pressing in the axis (Fig. 20:3) and to the thickness of the artifact. Fragile materials are more resistant to pressure than to tension: breakage is influenced by tensile stress. Lift of break is influenced by compressive stress. With an increase of additional force on the axis, the space and value of tensile stress decrease and the space and the value of compressive stress increases. This indicates that the dimension of the lift of break increases.

A large force is necessary for a breakage of type Ib. The tools with this type of break must have been hafted in a handle.

Survey of the breaks from Pavlov I, 1957 area

One half of the raw material in the collection from Pavlov I, 1957, area is represented by northern flint. The second half consists of radiolarites - red (brown), green and special varieties. Broken microliths are described separately. On the basis of the experiments carried out here, the broken artifacts were divided to the following groups:

   a - break of type Ia
   b - break of type Ib
   c - break with chipped-off part of the broken surface (grading to types Ia or Ib)
   d - break of type II
   e - break of type III
f' - straight breaking surface or undetermined

g - breakage by a fire

h - breakage by a frost

A. Non-microlithic industry

Northern flints. For the group of northern flints, only breaks on retouched tools could be refitted given the current limitations. Thirty-three tools were reconstructed - 1 tool of four pieces, 6 tools of three pieces, and 26 tools of two pieces.

One artifact was broken by fire (Fig.22:10) and two artifacts by frost (Fig.22:6). Twenty-three breaks can be added to group "a" (Fig.21:2,3,8,10,12; 22:1:5,9,11-14), 2 artifacts to group "b" (Fig.21:7), 1 artifact to group "d" (Fig.21:11), 1 artifact to group "e," 6 artifacts to group "f" (Fig.21:1,13), and 5 breaks to group "c" with its profilation of a broken surface of type Ia (Fig.21:4-6,8-12).

In 5 cases one part was reutilized (Fig.21:8,10; 22:12,13) while in 3 cases two parts were reutilized (Fig.22:11,14). From 82 possible reutilisations (one tool broken into two parts creates two possible reutilisations), eleven were actually made (13.75%).

Two double points were reconstructed. One of them (Fig.21:3) was broken twice by a break of type Ia while the other (Fig.21:1) is less thick (straight broken surface - breakage undetermined). Two other points (Fig.21:2,5) with a break of type Ia were reconstructed.

Four bilaterally retouched blades (Fig.21:4,8,10), in two cases with an atypical scraping end (Fig.21:4,10), were broken with a type Ia breakage.

A burin on broken blade (Fig.21:11) was broken with the breakage of type II, i.e., torsion.

Several broken endscrapers was reconstructed. All of them, save one frost break (Fig.22:6), were broken with a breakage of type Ia (Fig.22:1,2,4,5,9). A thick endscraper (Fig.22:2) was combined with a point while another endscraper (Fig.22:13) was combined with a dihedral burin and after breakage reutilized as a combination of endscraper with burin on broken blade. The profilation of the broken surface of these reconstructed endscrapers indicates that the affecting force was applied at the area at the edge of the intersection of the ventral side of an artifact with the retouch on the scraping end. From two of these combinations, it is evident that the scraping end probably does not represent the working part of tool, only the hafting part.

A tool reconstructed from three parts (Fig.22:11) was originally a retouched blade with an atypical scraping end. One part was reutilized as the burin on broken blade, another part was retouched after breakage, possibly into a notch.

A narrow and relatively thick pointed blade with steep retouch (Fig.22:12) was broken with the breakage of type Ia upon a high value of the axis strength (long lift of break). This tool was reutilized as a burin on broken blade.

Both parts of another burin on broken blade (Fig.22:14) were again reutilized after breakage as burins on broken blade.

<table>
<thead>
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<th>Table 1. Breakages. According to groups</th>
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<tbody>
<tr>
<td>Group</td>
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<tr>
<td>Type</td>
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<tr>
<td>Radiolarite (187 aft.)</td>
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<tr>
<td>%</td>
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<tr>
<td>Flint (33 tools)</td>
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<tr>
<td>%</td>
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Radiolarite. Total of 193 breaks were conjoined. Eighty-six pieces were refitted into single artifacts and a further 101 pieces were refitted into the inner parts of more complex refittings. One hundred eighty-seven artifacts were reconstructed, only in one case was an artifact of four pieces reconstructed while 4 cases produced a tool from three pieces; in all other cases a tool of two pieces was reconstructed.

One hundred pieces (52%) of the reconstructed artifacts were tools or were retouched. One hundred nine breaks belong to group "a" (Fig.23:2,6,8,10; 24:1,3-10; 26:2,4,6,8,9,11, 13,14), 7 pieces to a group "b" (Fig.26:5,12), and 18 pieces to a group "c" (16 pieces with the profilation of a type Ia - Fig.23:1,3,9; 26:1,10, and 2 pieces with Ib - Fig.23:7; 24:2). One break belongs to group "d" (Fig.25:10), 7 to group "e" (Fig.25:1,4,7,8; 2:D), and 43 to group "f" (Fig.23:4; 26:7). Five artifacts were broken by fire (Fig.25:12) and 3 by frost (Fig.25:11).

Thirty (8%) broken-off pieces was reutilized (from 386 possible reutilisations). The most frequent case of reutilisation is the burin - 15 pieces (Fig.25:7; 26:3,6), and in 2 further cases (Fig.25:9) burins were made on two edges of broken-off piece. In one case the broken artifact was reutilized as a burin and retouched contemporaneously (Fig.26:1). In two cases both parts of a broken artifact were reutilized (Fig.26:2,4), one part as a burin and the other as a retouched piece. In 6 cases (Fig.23:5, 24:10; 26:9,13,14) the broken piece was reutilized through retouching (mostly laterally). One broken blade was retouched on both sides of the broken edge (Fig.2:A). Another artifact was reutilized to an atypical endscraper (Fig.26:7).

Four non-retouched pointed blades were reconstructed (Fig.23:1-4). Macroscopically, all of them shows traces of use - utilization retouch. One (Fig.23:2) is broken with a break of type Ia while to two (Fig.23:1,3) have part of breaking surface removed by retouch, the remaining surface of the break indicating the profilation of a type Ia. One (Fig.23:4) has a straight broken surface (break undetermined).

The most frequent large break is that of splintered pieces. With two exceptions being breaks of type Ib (Fig.23:7; 24:2), all of them are broken with a type Ia break (Fig.23:5,6,9; 24:1,3,7,9; 26:2,3,9). Several of them have splintered retouch on the basal and terminal parts at the same time. These must have been used as splintered pieces due to the loading from two opposite axis forces.

With respect to the refitting of the flint, a small number of endscrapers was reconstructed. All are combination tools: with the burin on truncation (Fig.25:1) and with the splintered edge (Fig.23:6; 25:2; 26:8).

In the inner part of the sequence in the Fig.18:2 is reconstructed an important blade. A splintered edge was made on its terminal part. Splintered retouch was used twice on the base of this artifact and, after last break, a burin on broken blade was created.

A burin on broken blade (Fig.6:D) was restored twice (intentionally - resharpening?) after the break.

Morphologically, these two last cases lie between breakage and reutilisation. With several exceptions (e.g., the two superimposed splintered retouch events or the three burin sequence), it is not possible to document the reutilization of a broken artifact as the same tool as before the break. In all other cases, we must ask the question: is it an intentional resharpening or reutilization after unintentional break?

<table>
<thead>
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<th>Table 2. Reutilisations after breakage</th>
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<tr>
<td>One reutilized part</td>
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<tr>
<td>burin</td>
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<tr>
<td>-------</td>
</tr>
<tr>
<td>Radiolarite</td>
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<tr>
<td>%</td>
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<td>Flint</td>
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320
B. Microliths

Only seven microliths were reconstructed - five made on northern flint and two made on radiolarite.

Reconstructed flint microliths (Fig.22:3,7,8) represent typologically the same type - little ventroterminally retouched double points (not always with a sharp point). Three of them are bilaterally retouched. The break is placed in the middle of the tool, and the profilation of the broken surface indicates a break of type Ia. On the basis of the breakage experiments, the following reconstruction is possible: one point (usually the blunter of the two) was put in a handle while the other was used as an awl. For the less thick of the radiolarite microliths (Fig.25:5,6), it is not possible to define the types of breaks as they have straight broken surfaces.

Summary of breakages

As only retouched tools made on northern flint were refitted, large differences between the use of northern flint and radiolarite were not observed. The breaks of group "a" (type Ia) are the most frequent among reconstructed artifacts - more than 50% cases. The instances of the breaks of group "b" (type Ib) are rare. On the basis of the experiments carried out here, group "c" can be added to the basic groups "a" and "b." The breaks of group "d" (type II) were observed rarely. Group "e" (type III or breakage by opposite axis forces) is, however, important. This break can represent a consequence of an impact (in the direction of the long axis) on the tool or an unsuccessful burin blow. On the basis of typology, these two cases cannot be separated. Some artifacts were broken by fire or frost. Group "f," undetermined breaks, is relatively large. This group represents breaks produced by inclusions within the raw material as well as the breakage of thinner artifacts without the profilation of a broken surface (the mechanism of loading is the same as Ia).

The percentage of breaks is proportionate to the increase of the use-wear on tools. The high presence of use-wear is typical for Pavlov I, 1953 excavations (Svoboda, ed. 1994), and the breaks dominate at the extremely small number of refittings from this site. On the other hand, the site of Dolni Vestonice II, units 1-3, (with its less frequent occurrence of use-wear) produced more refittings of production sequences.

Apparently, the large number of breaks in the collection is a characteristic of the settlement, the lithic production economy, and/or the intensity of tool use.

The reutilisation of tools after breakage amounts to five percent of cases (DV-II, unit 4; Svoboda, Škrدلa and Jarošová 1993) and 13.75% cases (Pavlov I, 1957 area). A burin on broken blade is the most frequent case of reutilisation; however, lateral retouch, endscraper, and splintered retouch were also observed.
Reutilizations (Radiolarite Only)

As stated in the introduction, this group represents refitted pieces from the stage of tool production or tool modification. Reutilisations after breakage are not present in this group. These were described in the chapter 3.

Majority of this group represents chips of burin production (burin spalls) joined with burins. The preparation of the lateral burin edge by retouch is a typical step for the burin production. Similar to ridge blade preparation, it has a possible influence upon the course of chopping and the final shape of the burin spall. The effort to keep a constant cross-section may be a mechanical interpretation. A burin is made by one or several chips; however, the multiple resharpenings, known from other sites (eg. Stratzing), were not reconstructed at Pavlov.

In three cases (Fig.19:1-3) among the reconstructed burins, an endscraper was made on the opposite end of the artifact. In one case (Fig.19:8), the burin was made on a convex truncation and combined with a splintered piece. After the terminal part of this burin broken off (due to inclusions in the raw material), the splintered edge was reutilized as a burin on a broken blade. It is also important to note a burin (Fig.2:C) with steep retouch. This piece was originally a bilaterally retouched endscraper which was transformed into a multiple burin. A joined burin spall of a burin on the base of a blade (Fig.19:5) demonstrates resharpening of a splintered edge/truncation on the opposite side of an artifact (the burin spall has a splintered edge while the resharpened edge has the character of a truncation).

Refittings of the Non-Flint "Heavy Duty" Implements

Generally, these refittings can be separated into following groups:

- refitted plaques - sandstone
  - others
- refitted broken pebbles
- refitted flakes

In several cases, pieces of sandstone plaques were conjoined (Fig.27:2). This raw material with highly abrasive character is probably connected with stone grinding technology (see chap. Stone grinding and polishing technology). Two other plaques, made of crystalline slate, probably had something to do with ochre working (Fig.28:1,2). Traces of red ochre are preserved on the surface of the one of these plaques.

An elongated pebble with the shape of a club or cudgel (Fig.27:3) was reconstructed from three pieces and similarly concerns processing ochre. Unfortunately, the surface of this pebble is corroded. Remains of use-wear, however, and traces of red ochre fixed under a CaCO₃ coating suggest that the tool was used for rubbing and crushing ochre. While plaques were used as passive pads for rubbing the ochre, this pebble represents an active rubbing tool. This rubber was broken twice but further utilized after the breaks. There are negatives of chips (indicating impacts from a hard hammer) along the broken surface of the resulting residual piece. This indicates that the tool was utilized in its final stage for further ochre preparation, this time, however, for crushing. Both breaks have profilation of broken surface of type Ia (see chap. Breakages). It indicates that the breaking force was inclined from along axis of the pebble.

The last group of non-flint refittings represents refitted flakes (Fig.27:1).
Spatial Distribution of Refittings (Whole Pavlov I Area)

Essential differences between the spatial distribution of broken pieces of flint and radiolarite were not observed. For broken radiolarite as well as flint tools, the western part of the excavated area represents the peripheral area of the aforementioned "radiolarite-workshop" unit. A part of the joined pieces (broken) jumps over the area surrounding sector 14.

The spatial distribution of reutilisations cannot be analyzed in detail due to the small size of the group of joined pieces.

The spatial distribution of the most complete cores (sequences), i.e., joinings of inventoried artifacts, could have been analyzed in some cases (Fig. 33-36). No universal distribution pattern useable for the majority of cores exists; this signifies that each core was reduced independently at a different place than the others. Similar to the group of breakages, minimum communication was observed with the western part of the excavated area (periphery). Passing the aforementioned area (Sector 14), as with the spatial distribution of broken tools, is rarely visible.

The sequence of eleven blades (seven of them inventoried) and one flake (Fig.12:2;36:a) made from red radiolarite with significant lines of white chalcedony joined a borer from the 1953 area (Svoboda, ed. 1994; p.75, Fig.25:23), a blade from the upper part of the Pavlov I site (1954 excavation), a blade from the middle part of site (1961 excavation), and eight blades and one flake from the lower part of site (1956 and 1957 excavations). The maximum distance of the joined pieces is approximately 50 m. This sequence was not joined to the sequence in Fig. 9:2 which probably came from the same core and consists of 19 pieces (5 inventoried) from the 1957 excavation and 1 piece (uninventoried) from the 1961 excavation.

In three cases (Fig.36:c,d), the area excavated in 1957 communicates with the eastern border of the area excavated in 1960. In one case (Fig.14:2;36:c), a point (1960) is joined with a series of blades (1957). In another case, a second refitting (Fig.14:1;36:d) represents a core (1960) joined with other cores, blades, flakes (1957 and 1956), and one burin (1960) joined with core and blades (1957 and 1956B,C).

Other refittings joined the 1957 area with the most northern trench 1956A. In one case, a burin on a broken radiolarite blade (1956A) was joined with a blade and a flake (1957) while in a second case, a broken flint blade (partly retouched) and a flint burin (burin spall of 1957, sector 19, and burin of 1956A - a distance more than 16 m) was joined. The conjoining between adjacent parts of the 1960 and 1958 areas was observed; in two cases (Fig.35:d,36:b), the trench 1956B,C is joined with the 1958 excavation.

Conjoins between the 1957 and 1956B,C areas (artifacts inventoried together without the separation in square grid) are the most frequent. The area excavated in 1957 and the trenches 1956B,C represent two parts of one unit - the radiolarite workshop. The western part of the 1957 excavation represents a periphery of the settled area. Human burial was located in the centre of the aforementioned radiolarite workshop.

Fig.32 shows a spatial distribution of the refitted pieces of the non-flint "heavy duty" implements. Three fragments of a broken sandstone plaque were found on the
peripheral areas surrounded by the main concentration of artifacts concerned with probable huts (cf. with Klíma’s reconstruction, Part I). On the other hand, fragments of the crystalline slate plaques and of the pebble rubbing tool (all indicating ochre use) were concentrated inside and below this central area. These pieces could have been redeposited by the water stream after abandonment of the site.

Comparing the spatial distribution of refitted pieces with location of the features, as defined by Klíma (Part I), shows that most of the connections, logically, avoid the sheltered area of the upper feature (XIII). In the light of this, the refittings seem to confirm the reconstruction of the featurtrue XIII.

Stone Grinding and Polishing Technology

Ground limestone discs

It is clear that Paleolithic people had worked wood, bone, and antler tools by grinding. Further development of this grinding technology allowed the application of this behavior to stone (Klíma 1994).

K. Valoch (1960) described a series of ground sandstone artifacts excavated in Předmostí u Přerova. In these cases it is better to talk about abrasion created by the utilization of an active tool rather than traces of purposeful grinding, intentionally changing the shape. Other worked artifacts were made from soft materials: the discs of Brno II (Oliva 1996) or the Petřkovice and Willendorf venuses. The latter pieces represent decorative and ritual objects.

In 1956-62, during the excavation of the northwestern part of the Pavlov I site, B. Klíma found a series of worked limestone pebbles (Klíma 1959). Recently, we found another comparable pebble at Dolní Věstonice III (Škrdla 1996). The used raw material, an attractively-coloured limestone of Austrian origin (Mrázek 1996), was selected for both its technological and aesthetic qualities. The limestones are differently silicified, so that some of them must be classified as radiolarite. The source of this raw material lies about 8 km to the west of the site, in Miocene Paleoanube gravel terraces. There is still possible to collect similar pebbles to those which were ground in Pavlovian.

The majority of the pieces from Pavlov have a discoidal shape, while the artifact from DV-III has egg shape. The artifact surfaces are corroded due to the affect of humic acids. Several pieces, however, have well-preserved traces of grinding and polishing on their whole surface. The surfaces are composed of many facets, each of them with differently oriented striations. The natural gravel pebbles have a patinated cortex, while the inner part of pebble retains a good quality. For this reason, cracked and soft cortex was ground away, probably on sandstone plaquettes also present within site. Obviously, grinding of a limestone-radiolarite artifact was a long-time process, and with respect to the wealth of the excavated artifacts, this product was relatively scarce.

Pounding marks (in Pavlov I) suggest that the discs were used as retouchers. The pebble from DV-III has traces of impacts from two opposite sides and scratches of use as well, suggesting a hammerstone.
Table 3. Catalogue of the discs from Pavlov I

<table>
<thead>
<tr>
<th>Inv.no.</th>
<th>sector</th>
<th>shape</th>
<th>surface</th>
<th>colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>1956</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>899356</td>
<td>B,C</td>
<td>fragment</td>
<td>traces of grinding and red ochre</td>
<td>brownish grey</td>
</tr>
<tr>
<td>1957</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1057</td>
<td>4</td>
<td>circle segment with discoidal cross-section</td>
<td>corroded, partly preserved traces of grinding and polishing</td>
<td>brownish red with yellow spots</td>
</tr>
<tr>
<td>1157</td>
<td>27</td>
<td>ovoid disc</td>
<td>traces of polishing and use-wear</td>
<td>pinkish white</td>
</tr>
<tr>
<td>1257</td>
<td>30</td>
<td>ovoid disc</td>
<td>corroded, partly preserved traces of grinding and use-wear</td>
<td>red and brownish grey strips</td>
</tr>
<tr>
<td>161657</td>
<td>14</td>
<td>fragment</td>
<td>corroded</td>
<td>brown-grey-pink</td>
</tr>
<tr>
<td>239957</td>
<td>19</td>
<td>fragment</td>
<td>corroded</td>
<td>grey</td>
</tr>
<tr>
<td>352057</td>
<td>30</td>
<td>chip</td>
<td>traces of grinding and polishing, and use-wear</td>
<td>yellowish pink</td>
</tr>
<tr>
<td>369857</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>409657</td>
<td>4</td>
<td>fragment with discoidal cross-section</td>
<td>traces of grinding and polishing</td>
<td>red, yellow, grey and pink mozaic</td>
</tr>
<tr>
<td>410857</td>
<td>21</td>
<td>fragment</td>
<td>traces of grinding and polishing</td>
<td>red, yellow, grey and pink mozaic</td>
</tr>
<tr>
<td>433057</td>
<td>P03</td>
<td>fragment</td>
<td>corroded</td>
<td>brownish grey with red lines</td>
</tr>
<tr>
<td>uninvent.</td>
<td></td>
<td>fragment</td>
<td>traces of grinding and polishing</td>
<td>red</td>
</tr>
<tr>
<td>1958</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>758</td>
<td>4</td>
<td>circular disc</td>
<td>traces of grinding and polishing, well preserved use-wear</td>
<td>light brown, grey and yellowish brown strips</td>
</tr>
<tr>
<td>858</td>
<td>4</td>
<td>circular disc</td>
<td>traces of grinding and polishing, well preserved use-wear</td>
<td>light brown, grey and yellowish brown strips</td>
</tr>
<tr>
<td>958</td>
<td>4</td>
<td>ovoidal disc</td>
<td>traces of grinding and polishing, well preserved use-wear</td>
<td>red, grey, yellow mozaic</td>
</tr>
<tr>
<td>22258</td>
<td>3</td>
<td>fragment with discoidal cross-section</td>
<td>traces of grinding and polishing</td>
<td>reddish brown with grey spots</td>
</tr>
<tr>
<td>22758</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25758</td>
<td>4</td>
<td>fragment with discoidal cross-section</td>
<td>traces of grinding and polishing</td>
<td>red, grey, brown, and yellow breccia</td>
</tr>
<tr>
<td>54658</td>
<td>6</td>
<td>pebble</td>
<td>traces of grinding and polishing</td>
<td>red with yellow, pink, and grey spots</td>
</tr>
<tr>
<td>1960</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>124360</td>
<td>m183</td>
<td>ovoid disc</td>
<td>corroded</td>
<td>redish grey with white lines</td>
</tr>
<tr>
<td>245060</td>
<td>surface</td>
<td>fragment</td>
<td>corroded</td>
<td>red, brownish grey, and greenish grey mozaic</td>
</tr>
<tr>
<td>430860</td>
<td>m156</td>
<td>thick ovoid disc</td>
<td>corroded</td>
<td>brownish grey with red spots</td>
</tr>
<tr>
<td>481960</td>
<td>m165</td>
<td>fragment</td>
<td>corroded</td>
<td>brownish grey with yellow and greyish blue spots</td>
</tr>
<tr>
<td>535060</td>
<td>m207</td>
<td>fragment</td>
<td>corroded</td>
<td>pink</td>
</tr>
<tr>
<td>560860</td>
<td>water groove</td>
<td>fragment of the pebble</td>
<td>corroded</td>
<td>light brownish red</td>
</tr>
<tr>
<td>1961</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48361</td>
<td>15a</td>
<td>disc of the spheric-triangular shape</td>
<td>traces of grinding and polishing, and use-wear</td>
<td>brownish grey with red spots</td>
</tr>
<tr>
<td>100361</td>
<td>21a</td>
<td>ovoid disc</td>
<td>corroded</td>
<td>brownish grey with red spots</td>
</tr>
<tr>
<td>126561</td>
<td>22a</td>
<td>ovoid disc</td>
<td>traces of grinding and polishing, and use-wear</td>
<td>light red, yellow, and grey mozaic</td>
</tr>
<tr>
<td>145361</td>
<td>27a</td>
<td>ovoid pebble</td>
<td>corroded, partly preserved traces of grinding and polishing, and use-wear</td>
<td>red, greyish blue and yellow mozaic</td>
</tr>
<tr>
<td>271261</td>
<td>37a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>506261</td>
<td>1961-62 section</td>
<td>fragment of the massive disc</td>
<td>corroded, partly preserved traces of grinding and polishing, and use-wear</td>
<td>red, pink, grey , and greyish green mozaic</td>
</tr>
<tr>
<td>uninvent.</td>
<td></td>
<td>fragment</td>
<td>corroded</td>
<td>red with white chalcedony lines</td>
</tr>
<tr>
<td>uninvent.</td>
<td></td>
<td>fragment</td>
<td>corroded</td>
<td>brownish grey with red and yellow spots</td>
</tr>
</tbody>
</table>

325
Similar artifacts were found by K.Absolon (1938a,b) at DV-I and by B.Klima at DV-I (1963a) and Pavlov I (unpublished). The egg shaped pebbles of other raw materials (siltstone, sandstone, quartzite, rock crystal, etc.) were coated by red ochre (K.Absolon talk about "Osterei") and found in the assemblage together with plaquettes and ochre. These artifacts were used for the preparation of ochre, and the scratches of use as well as the traces of ochre are present on the surface. The red ochre is visible on the surface of the hammerstone of DV-III as well (Škrďla 1996).

A map of the spatial distribution (Fig.39) shows space the occupied by the ground limestones. The distribution is limited only in the northwestern part of the site Pavlov I, and a relationship with the radiolarite distribution (Fig.38) may be observed. In the 1961 excavation, where the Gravettian occupation was observed in two layers separated by a layer of loess (Klima 1962,1963b), ground stone artifacts were limited to lower layer.

There are artifacts similar to the Pavlov ground discs in Lower Austrian Gravettian sites (col. Museum of Natural History, Vienna). Pieces made of the same coloured reddish limestone as in Pavlov were excavated in Aggsbach. The surface of these pieces, however, is corroded and traces of grinding as well as of use (i.e., pounding marks) are not visible. Other pieces were excavated in Willendorf II, mainly within the two uppermost layers. In contrast to Pavlov, these pieces were ground from green serpentine. Traces of grinding on these pieces are not visible because of polishing. Only several non-ground retouchers were made from limestone pebbles.

An analogous collection of pieces similar to the Pavlov siltstone were excavated at the site of Kostenki IV - Alexandrovka (Rožačev 1955), which lies at a distance of about 2000 km from Pavlov. Similarly to Pavlov, this site exhibits raw material selection influenced by aesthetic criterion. This special type of artifact and its observed occurrence may represent one of the crucial elements for tracking the movement of hunting groups in time and space.

The ground limestone pebbles of the Pavlovian represent an origin for stone-grinding technology. While this unique technology was first observed in the Upper Paleolithic, it was lost for thousands years after the Gravettian period, only to appear again as a widely used technology in the Neolithic.

Microscopic observations

Selected pieces with well preserved, macroscopically visible traces of grinding were studied under Leitz metalographic light microscopy.
Even though these pieces are slightly corroded, there are still macroscopically visible systems of parallel striations covering the facets. In the area of the intersection of two neighboring facets, the direction of striations differs.

Two kinds of striations may be separated:
- grinding striations (visible macroscopically)
- polishing striations (visible using magnification 100x and more).

While grinding striations are distributed in one regular parallel system, polishing striations are distributed more irregularly; several differently oriented systems of parallel striations overlie one another.

The mean width of the grinding striae is 0.02-0.04 mm and the mean width of the polishing striae is 0.001 mm.

In order to determine the Gravettian grinding technology, a similar artifact made of the same raw material as that utilized in Paleolithic was ground using a fragment of an original sandstone plaque (excavated in 1957). As the operation was progressed, it was observed that the use of water for cleaning the contact surfaces (grinding of sandstone and limestone) was necessary. As no essential differences between the original and experimental surfaces were observed, it is possible to say that the experimental technology was very similar to original one. The main difference was observed in the grainy texture of grinding tool: the experimental one has smaller grains and smaller distance between them. Here, it is necessary to take into account the documented corrosion of the surface as well as the extension of the grooves.

**Conclusion**

The raw material for the chipped-stone industry did not include river pebbles but blocks of radiolarite from primary sources.

On the basis of refitting, it is possible to define a technology (cf. Owen 1989). There are sometimes the negatives of large, wide cortical flakes on the surface of cores. By means of these flakes, the cortex was removed and the narrow face of the core was prepared. Decortication was not pursued at times when a suitable natural shape could be utilized. The reduction platform was prepared with the removal of one (Fig.13) or a series (Fig.9:2;12) of flakes. A crested blade removal usually followed. Another crested blade was sometimes produced after several blades had already been removed. The reduction continued with the production of a series of blades, the length of which become smaller and smaller so that the exploitation can continue into the production of microblades. The residual is, in that case, typologically a microcore. The residuals of some cores were not found within the excavated area - were they thrown away from the central (excavated) part of the site? Were they modified in the final stage of reduction by the production of small flakes which are not possible to refit or were they reutilized (into retouchers and hammerstones)?

The Pavlovian cores are mostly unilateral but not always reduced from the narrow platform. In several cases, the other (opposite, accurately) platform was
initiated. The reduction then continued only from this new platform, although one exception was documented.

As at Dolní Věstonice II, units 1-4, the large, wide cortical flakes were not refitted (here, with several exceptions, they were not even found). Were cores prepared at another part of the site, or out of the site (e.g., at a primary source)? Several sequences, however, of the smaller cortical flakes were found and several cores were reconstructed into almost complete cortical blocks or nodules of raw material.

For intersite comparison, the indices "Ic" (the ratio of the number of joined pieces minus the number of refittings over the total number of artifacts) and "In" (the ratio of the number of refittings to the number of joined pieces) were defined (Svoboda, ed. 1994). The inverse value of "In" (1/In) shows the size (number of joined pieces) of the "average refitting." On the basis of these indices, we are able to compare differences between intensity of the transport of products from the sites.

<table>
<thead>
<tr>
<th>Site</th>
<th>Dolní Věstonice II</th>
<th>Pavlov I</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>units 1,2,3</td>
<td>unit 4</td>
</tr>
<tr>
<td>Raw material</td>
<td>radiolarite</td>
<td>radiolarite and northern flint</td>
</tr>
<tr>
<td>Ic (%)</td>
<td>14.8</td>
<td>5.6</td>
</tr>
<tr>
<td>In (%)</td>
<td>35.6</td>
<td>41.7</td>
</tr>
</tbody>
</table>

It is possible to compare sites (Tab. 4.) to primary workshops (with relatively high values of "Ic" and "1/In") and special working places where tools are used (with lower values of "Ic" and "1/In"). The collection of Dolní Věstonice II, objects 1-3, can be classified as a primary workshop while Pavlov I, 1953 excavation, and Dolní Věstonice II, unit 4, on the other hand, can be added to the second category. On the basis of the values "Ic" and "In" for Pavlov I, 1957 excavation, this site represents a transition between the extreme values of indices.

Three main groups of refittings are compared in Tab. 5. The production sequences dominate over the breaks while the group of reutilisations is relatively small in the collection from Pavlov I, 1957 excavation. The intersite comparison is similar to that one based on the indices. Two extremes were separated again: Dolní Věstonice II, units 1-3 (not in the table because we have no exact values) and Pavlov I, 1957 excavations on the first side, and Dolní Věstonice II, unit 4 and Pavlov I, 1953 excavation on the other side. The high value of the production sequences is typical for the first extreme - these locations can be interpreted as primary workshops. In Pavlov I, 1957 excavations, the occurrence of broken artifacts (in my opinion more than half of them were broken through use) shows that other activities took place at the location as well, not only tool production. On the other hand, the locations with a dominance of breaks (the second extreme) can be interpreted as special working places, the result being broken tools. These differences between the ratios of the groups of refittings may be influenced by the lack of raw material - it was necessary to put to use all raw
material. Broken artifacts were often reutilized and it is not possible always to rejoin them.

In the case of the Pavlov I, 1957 excavation, all activities connected with the utilisation of lithic raw material were concentrated in the same space: preparation of cores, production of blades and tools, use of tools, and their resharpenings and reutilisations. The tools, however, may have been transported as already finished from a primary workshop to other locations, e.g., the tools made in the radiolarite primary workshop in the lower part of the site (excavation 1957) were probably transported into the upper part of the site (excavation 1953).

The study of use wear shows a dependence between the decrease of values of the indices and the decrease of the ratio of production sequences (first of all, due to an increase in breaks) to the increase of tools with traces of utilization (Svoboda, ed. 1994). Unfortunately, the collection of Pavlov I, 1957 excavation, has not yet been analysed for use wear.

The trend to remove the final tools from the place of their production has been observed. But the question "to where" is an open one for the next excavators. The original shape of the nodule of raw material can be reconstructed in the case of some cores. For most complete cores (Figs.6;7;9:1;11;12:1), the absent part of the raw material represents 35-50%.

Table 5. Three main groups of refittings

<table>
<thead>
<tr>
<th></th>
<th>Reutilizations</th>
<th>Breakages</th>
<th>Sequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-I, 1953 rad</td>
<td>50%</td>
<td>40%</td>
<td>10%</td>
</tr>
<tr>
<td>P-I, 1957 rad</td>
<td>40%</td>
<td>50%</td>
<td>10%</td>
</tr>
<tr>
<td>DV-II rad</td>
<td>30%</td>
<td>40%</td>
<td>30%</td>
</tr>
<tr>
<td>DV-II all</td>
<td>20%</td>
<td>30%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Due to the large size of the square grid (2 m), the spatial distribution of the 1957 excavation was not analysed. Only artifacts conjoined over more than one cell of the square grid (with a distance of more than 2 m), most complete cores, and conjoining with other parts of Pavlov I area were contemplated. In most cases (62 inventoried and 28 un inventoried pieces), the artifacts of trenches 1956B,C were conjoined with the area excavated in the 1957 season. Three inventoried artifacts joined the 1957 area with trench 1956A. Some artifacts of the excavations of 1958 (6 inventoried pieces), 1960 (12 inventoried and 2 un inventoried pieces), 1961 (1 inventoried and 2 un inventoried pieces), 1953 (1 inventoried piece), and 1954 (1 inventoried piece), were combined with artifacts from the 1957 excavation.

On the basis of the radiolarite distribution map (Fig.38), we can separate the Pavlov I site into two parts - the northwestern (1957 exc.) and the southeastern (1953
exc.), which are not necessarily contemporaneous. On the basis of the stratigraphical
and typological comparison, B.Klima (e.g. 1962, 1963b) was the first to give voice to
this theory. For the lower (after Klima, earlier part), a high ratio of radiolarites is
typical, as well as an increase in splintered pieces above all else. Ground limestone
discs are distributed only within the lower part (in several cases B.Klima specified its
position within the lower layer). It is also possible, that the lower part represented a
technological area, a concentration of radiolarite knapping (see the different
proportion of reduction sequences and breaks for the radiolarite between the lower and
upper parts of the site) and other activities (grinding, ochre use, etc.) for huts in the
upper part of the site (cf. a lack of the settlement structures in lower part of the site).

On the other hand, even though several artifacts were transported from the
lower part of the site to the upper one, it does not mean beyond a doubt that the both
parts of the site were contemporaneous. At the time when the lower part was settled,
the space of the upper part may have represented a periphery, and settlement activities
in the lower part may have touched this area as well.

Afterwords

In order to produce the long and regular blades with parallel edges from suitable rocks
(especially northern flints and radiolarites), a fully developed UP technique of
prepared core reduction, starting from the narrow platform (Svoboda, Klima and
Škrdla 1995), has been developed.

The typical Pavlovian geometric microliths prove the usage of composite tools
of several different types, and, in fact, they represent the origin of modern machining
composite tools of today.

It is significant that the mammoth hunters at the foot of the Pavlov Hills, were
the first people in the world to observe and employ the advantages of stone-grinding
technology, more than 25,000 years ago. This important observation was documented
at the same time at the site of Kostenki IV - Alexandrovka in Russia as well (Rogačev
1955). It is improbable that this special technique would be developed independently
in the two regions (distance about 2,000 km). Ground limestone retouchers from
Pavlov as well as ground siltstone ones from Kostenki represent the possible proof of
high mobility and the long distance contacts of hunting-gathering groups at the time
before the second glacial maximum.

The bone-working technology as well as the ceramic and textile technology,
that demonstrate other aspects of the technological complexity of this period, are
described in the following chapters.

Unfortunately, the Pavlovian culture was possibly destroyed by the natural
changes before the second glacial maximum (20,000 B.P.). Unique technological
procedures such as stone-grinding technology, and ceramic and textile production
were lost for thousands of years. B.Klima (1994) wrote: "The techniques of polishing
and perforating were soon adapted to lithic material as well, even if the mass
employment of polished stone is not observed before the Neolithic", and, "It was
recognized ... that clay is able to keep its form after being dried and particularly if it is
backed ...". The same author continued: "... people discovered physical and chemical laws. They were not able to explain these, but they could use them empirically."

In conclusion, the Pavlovian technology represents the peak in Upper Paleolithic technological developments.

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References


Fig. 1. Refitted core N* P-I:RC1
Fig. 2. Artifacts produced from the refitted core № P-I:RC1
Fig. 3. Probable residual of the refitted core № P-I:RC1
Fig. 4. Refitted core № P-1:RC2
Fig. 5. Schemes and artifacts produced from refitted core № P-1:RC2
Fig. 6. Refitted core No P-I:RC3
Fig. 9. Refitted core N° P-I:RC7 (1) and N° P-I:RC8 (2)
Fig. 10. Reftted core N° P-I:RC9
Fig. 11. Schemes and artifacts produced from refitted core No P-I:RC9
Fig. 12. Refitted core No. P-I:RC10 (1) and No. P-I:RC8a
Fig. 13. Refitted core № P-I:RC11(1) and production sequence (2)
Fig. 14. Refitted core N° P-I:RC12(1) and production sequence (2)
Fig. 15. Refitted core № P-I:RC13 (1) and № P-I:RC14 (2)
Fig. 16. Production sequences
Fig. 17. Production sequence (1) and refitted core № P-I:RC15 (2)
Fig. 18. Production sequences
Fig. 19. Reutilizations
Fig. 20. Experimental breaking
Fig. 21. Breakages - northern flint
Fig. 22. Breakages - northern flint
Fig. 23. Breakages - radiolarite
Fig. 24. Breakages - radiolarite
Fig. 25. Breakages - radiolarite
Fig. 26. Breakages - radiolarite
Fig. 27. Refitted non siliceous "heavy duty" implements
Fig. 28. Refitted non siliceous "heavy duty" implements, hatched traces of the red ochre
Fig. 29. Pavlov I/57: Spatial distribution of refitted broken flint artifacts

Fig. 30. Pavlov I/57: Spatial distribution of refitted broken radiolarite artifacts
Fig. 31. Pavlov I/57: Spatial distribution of refitted reused artifacts

Fig. 32. Pavlov I/57: Spatial distribution of refitted "heavy duty" implements
Fig. 33. Pavlov I: Spatial distribution of refitted cores
Fig. 34. Pavlov I: Spatial distribution of refitted cores N° P-I:RC1 (a), P-I:RC2 (b), P-I:RC4 (c), P-I:RC15 (d)
Fig. 35. Pavlov I: Spatial distribution of refitted cores N° P-I:RC3 (a), P-I:RC11 (b), P-I:RC9 (d)
Fig. 36. Pavlov I: Spatial distribution of refitted cores N° P-I:RC8a (a), N° P-I:RC12 (d)
Fig. 37. Pavlov I: Spatial distribution refitted radiolarites joined with the 1957 area
Fig. 38. Pavlov I: Spatial distribution of radiolarites in nw. part
Ground limestone discs
Distribution map

Fig. 39. Pavlov I: Spatial distribution of the ground limestone discs
Fig. 40. Ground limestone retouchers. Refitted inv. № 758 and № 858 (top), inv. № 1257 (middle), and inv. № 22162 (bottom). Longer axis of the disc № 22162 is 38 mm.
Fig. 41. Ground limestone retoucher (inv. N° 758 and N° 858) in detail: Traces of use (pounding marks and scratches)
Fig. 41. Ground limestone retouchers (microphotos). Top left: uninventoried artifact from 1957 area - boundary between two facets with differently oriented striations and scratches, probably from use (magnification 30x); top right: detail of the same area (magnification 60x); bottom left: artifact inv. N° 118562 - traces of polishing (magnification 120x); bottom right: experiment (magnification 30x)