Ancient and Modern Bone Artefacts from America to Russia
Cultural, technological and functional signature

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BAR International Series 2136
2010
Reconstructing the “Chaîne Opératoire” of Skin Processing in Pavlovian Bone Artifacts from Dolní Věstonice I, Czech Republic

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Abstract

The article deals with the technological and socio-cultural strategies of the Moravian Pavlovian culture. Based on the industry from hard animal tissues, a possible “chaîne opératoire” of the skin processing practiced in Dolní Věstonice I is reconstructed. Using ethnographical analogies, tools are matched to a concrete phase of the process and their probable functions are described. The presence of different tools, considering their positions in the process, also provides ideas about the final products. Completing this information with other analysis from the site, a more complex picture of the life strategies of the Pavlovian people will be given.

Introduction

Bone industry plays an important role in the material culture of the Pavlovian. Since the time of the first excavation in the 1920s, it has been obvious that the utilization of hard animal tissues was an important feature of this Upper Palaeolithic culture. The composition of the assemblage in the context of the site provides interpretative possibilities for the technological and socio-cultural strategies of Pavlovian hunters-gatherers.

The archaeological site of Dolní Věstonice I (southern Moravia, Czech Republic) belongs to the complex of Pavlovian settlement extending to the east from the municipality of Dolní Věstonice on the arched slope above the road to Pavlov, 180 – 230m above sea level. The first excavations were coordinated in the 1920s by K. Absolon (Absolon 1938a; 1938b; 1945) and are connected with the discovery of a famous statue - the Venus of Dolní Věstonice. During World War II excavation was carried out under the leadership of A. Bohmers (1944). Crucial damage was done to many of the finds by the Nazi army transferred from Mikulov in 1945. The army burned down the castle where a large part of the collection was deposited. Fortunately the movable art and the bone industry were at that time housed in Brno. The aim of post war excavations, mainly conducted by B. Klima (1963; 1981; 1983), was to compensate for the great loss.

Dolní Věstonice I is a rich and a complex site bearing evidence of Gravettian life strategies. The site is divided into the lower, middle, upper, and the uppermost parts. The lower part of the settlement belongs to the early Pavlovian stage dated 30 – 27 000 BP. The middle and the upper part belongs to the evolved Pavlovian which is dated 27 – 25 000 BP (Svoboda et al. 2002).

Material and methodology

The studied collection, consisting of more than 400 pieces, originating from excavation years 1924 – 1952, is deposited in Anthropos Institute, the Moravian Museum, Brno. General information about bone, antler, and ivory artifacts was previously published by K. Absolon (Absolon 1938a; 1938b; 1945) and B. Klima (1963; 1981; 1983). However, less attention has been paid to the techno-economical and socio-cultural aspects.

The structure of the artifacts informs us about the main activities performed on the site. In a further study we will focus on one of these pursuits. The abundant presence of bone tools probably related to skin processing gives us the opportunity to reconstruct the “chaîne opératoire” of this skill. Using ethnographic analogies we will evaluate the position of various bone tools in the “chaîne opératoire” and, on the basis of represented tools, considering their functions, we will try to determine the probable final products.

Reconstructing the “chaîne opératoire” of skin processing

The strategic position of the site in the context of hunting game gave the Pavlovian people a stable source of animal raw materials which had to be processed. In the time of the Pleistocene glaciation, Moravia was situated in the most narrow part of the periglaciated zone, which permitted the connection between periglaciated areas in the east and the west. In warmer periods, Moravia created a passage from northern European lowlands to the south. This north-south path facilitated movement of the typical glacial fauna (Ložek 2002). Osteological analysis of faunal remains from the site (Musil 1958) has documented the abundant presence of fur animals as reindeer (Rangifer tarandus), hare (Lepus sp.), both species of fox (Alopex lagopus, Vulpes vulpes), wolf (Canis lupus), wolverine (Gulo gulo), rarely also remains of lion (Panthera spelaea), lynx (Lynx lynx) and bear (Ursus spelaeus). The use of a woolly mammoth (Mammuthus primigenius) as a fur animal can be also presumed. Hunting of these animals can be indirectly documented by the presence of projectile points,
關注 distal 部分的造型。distal 边缘以及可能的功能可以从这些工具中确定。由于这些工具受到强烈的自然侵蚀，因而完全的骨化。虽然，但是，尽管某些‘pronghoes’强烈地显示了工具的形态，但这些工具可能与折断工具在第二类的的拔毛工具相关。这些工具的工具类型被描述为具有尖锐的边缘，以及由锯齿组成的切口。这些工具是尖锐的骨质工具，可以被用作磨具，以避免意外的击穿。在实际操作中，工具的使用和工具的定位可以根据工作区域来推测。根据工具的形态，可以推测工具的用途。这将使操作者能够快速而稳定地处理皮肤。}

**Fleshing**

The first step in the process of skin dressing is the removal of the hypodermal layer, including muscles, fat, and membrane from the interior surface of the skin. In the ethnographical literature three main categories of tools made of hard animal tissues are described – beveled tools (sometimes equipped with serration), elbow-shaped scrapers, and “beamers”. All these tool types are considered as very efficient and much safer than the tools used for dry scraping (Wiederhold 2004), when a hide is processed stretched on a frame. The working motion consists of downward strokes (Figure 1-3), the longer, the better (Belitz 1973) and the contact spot is again in the middle of the tool. With regard to the morphology of antler “pronghoes” combination of thrown percussion and pulling motion can be presumed.

Beveled tools are, in general, considered as suitable for fleshing hides which are still “green” or damp (Schultz 1989). A typical beveled tool is a borer from moose metapodial (Beyries 1999; Schultz 1992; Steinbring 1966; Wiederhold 2004). Its distal end is shaped to an acute angle and equipped with serrations. These tools are used with one hand and often have a thong for the wrist, which increases the power of the operator by keeping the worker’s hand from slipping on the tool during the action (Wiederhold 2004). The contact spot with the processed material is in the middle of the tool (Beyries 1999; Beyries et al. 2002).

Within the studied collection, several artifacts can be hypothetically placed into the category of fleshing tools. Whole horse ribs were utilized for the manufacture of simple beveled tools. Selection of the raw material for the production of these tools seems to follow two principles. Besides the morphological suitability of the original bone shape, the mechanical properties of the material could be important. Experiments show that beveled scrapers made from ribs wore out at a slower rate than those made from long bones (Christidou and Legrand 2005). Because of the raw material selection, the tool’s production schema is rather simple. Ribs were shaped only by an oblique to transversal abrasion into the unifacial bevel. Although these artifacts are strongly damaged by weathering, their probable function can be determined from the morphology of the distal parts. The distal edge as well as a bevel is convex and worn-down. From this morphology the applied movement can be deduced. With regard to the convexity, thrown percussion (Leroi-Gourhan 1971) applied on a hide stretched in the frame can be presumed. This kind of movement should be quick and steady, almost perpendicular to the hide (Beyries 1999).

Elbow-shaped scrapers, so called antler “pronghoes” (Figure 1-5), which were originally considered by B. Klíma (1955; 1963; 1981; 1983; 1987; 1994; 1997) as tools for digging soil, can be possibly matched to the second category of the fleshing tools. Shed reindeer antler was used for the manufacture of Pavlovian “pronghoes”. The bez tine was shaped to a functional unifacial bevel with a convex edge, while the main beam was conserved as a handle (Figure 1-1). All the useless tines were, for comfortable handling and manipulation, separated by nicking. Although some “pronghoes” show strong alteration of the functional tine, well preserved pieces have extensively smoothed bevels (Figure 1-7), which can indicate contact with a fine abrasive material such as hide. From the morphology of the functional part the applied movement and probable positioning of the processed material can be deduced. Morphologically identical ethnographical elbow-scrappers (Figure 1-2) are used for dry scraping (Wiederhold 2004), when a hide is processed stretched on a frame. The working motion consists of downward strokes (Figure 1-3), the longer, the better (Belitz 1973) and the contact spot is again in the middle of the tool. With regard to the morphology of antler “pronghoes” combination of thrown percussion and pulling motion can be presumed.

A 32.5cm long artifact (medio-distal part) from a horse rib (Figure 2-6) was marked as a probable “beamer”. The rib was modified into a dulled tip and one part is missing due to postdepositional breakage. On the natural convex edge (crista costae), 21 transverse serrations were created. Teeth were made by convergent cutting in regular spacing and the serration area of the edge is rather straight. The use of ribs as “beamers” is known from ethnographical sources (Mooney 1910). These tools are held by both hands, and the motion consists of pushing the tool downward across the hide placed on the beam (Figure 2-1) so the membrane is pushed down (Wiederhold 2004). Teeth could help in grabbing the tissue to pull it off. The artifact was recently interpreted as a “batten” intended for textile production (Soffer and Adavasio 2004), in the context of evidence of the textile and basketry crafts practiced at the site. Nevertheless, its function has to be verified by a use-wear analysis. In the collection there are two similar tools.

Longitudinally split ribs with totally smoothed cancellous bone (segments with polish - McComb 1989/smoothers - lissoirs - Leroy-Prost 1975; de Sonneville-Bordes 1960), could be used for the fleshing of small skins (cf. Figure 18-2, 5-3). A cancellous bone could have an abrasive function, while bone marrow could (even though not very abundant) serve as a processing additive at the same time.
A. Villon (1889) noticed that skins processed with marrow are 35% more durable than those processed by vegetal oil. Ethnographical analogy can be found in pebbles used in British Columbia for cleaning the hypodermal layer and softening the hide of squirrels at the same time (Beyries et al. 2002).

Hair removal

Unlike fleshing, not all skins require hair removal to be further processed (Wiederhold 2004). Nevertheless, it is necessary to obtain hide without hair for some purposes. The process with which the epidermal layer is scraped down can be done with the same tools suitable for fleshing (Beyries et al. 2002). In Dolní Věstonice, as mentioned, beveled tools from horse ribs and antler “pronghoes” could be used. Direct analogy to the Pavlovian “pronghoes” can be seen in wahintke (cf. Figure 1-4), a tool used by Sioux to perform dry hair and grain scraping. Wahintke is usually made from deer or elk antler with a 45° working edge made from metal (Belitz 1973). With regard to the contact material – animal hair – it is necessary to resharpen the blade time after a time, which means the longer blade at the beginning, the longer usable life (Belitz 1973).

In the collection from the neighboring Pavlovian site Pavlov, where antler “pronghoes” are more abundant, a large metrical variability of functional tines can be seen (Klima 1987; 1994; 1997). This variability can reflect different “life stages” of tools — a gradual shortening of tine because of the resharpening.

Drying

Before the process of softening begins, hide has to be almost completely dry. Although direct evidence of skin drying is hard to find, this activity can leave traces in the archaeological record (Beyries et al. 1999; 2002; Debout 2007). Considering the climate of the Gravettian, utilization of special fireplaces intended for hide drying has to be taken into account. In British Columbia, the Athapaskan and the Salish construct a quadrangular frame over a sunken fireplace. The hide is stretched over the frame and exposed to intense heat with a minimal amount of smoke for several minutes (Beyries et al. 2002).
In Dolní Věstonice dished sunken fireplaces surrounded by smaller holes were recovered (Klíma 1983). Frames could be fixed through the use of hollow bones of very large mammals, such as mammoth. This type of artifact was firstly described in the Gravettian settlement in Předmostí by K. Valoch (1982). According to K. Valoch (1982; 1987; 1988) these hollowed bones of different sizes could serve as support for the fastening of dwellings and other constructions when stuck to the soil. As such structures could also have other functions such as cooking or smoking places, the interpretation of these fireplaces is hypothetical.

**Softening**

A phase of softening has cardinal importance for production of quality hide or fur. Three kinds of softening could be hypothetically used in Dolní Věstonice I — simple physical manipulation, vegetal- or bark-tanning, and brain softening.

The vegetal-tanning is based on the tannin’s astringent properties reducing the water content, imparting thermal stability to the fiber network. Tannins give water-resistance and durability to the hide (Wiederhold 2004). Palynological analysis show the presence of trees which include tannins (Svoboda et al. 2002) in the vicinity of the locality, but no direct evidence of this method was found.

In contrast, the method using fat as a softening agent can be probably indirectly documented by several bone tools. A large variety of mixtures of fats (brain, liver, marrow, fish head oil, eggs etc.) applied in a variety of ways is known from ethnographical sources (Beyries et al. 2002; David et al. 1998; Mason 1895; Villon 1889; etc.). While smaller hides with removed hair could be immersed in a mixture (Ritzenthaler and Ritzenthaler 1969), on larger hides the mixture had to be manually applied. Beside hand applying (for example, Tchouktches, David et al. 1998), the use of tools is also ethnographically documented.

In Dolní Věstonice I the mixture may have been rubbed into a flesh side using longitudinally split mammoth ribs with smoothed cancellous bone (segments with polish/smoothers/lissoirs) (Figure 5-1, 5-3). A cancellous bone may have had the function of an abrader (Figure 5-5). The contact with fat material can be also documented with the smoothness of the upper side (a compact bone) which can be caused by holding in greasy hands (McComb 1989). An analogy can be found in smooth stones called “slickstones” which are used as embrocating tools (Abbott 1881; Mason 1895; Schultz 1989). The function of “slickstones” could have been performed by flat to oval shaped “tools” from cancellous bones recovered in Předmostí (Valoch 1982). The smoothness of these bones may indicate their embrocating function. During the process of embrocating and scraping down the mixture of fat, beveled bone tools from longitudinally split horse ribs with a unifacial bevel and convex edge could be useful (Figure 3-1, 3-2). These artifacts are also known from Russian Gravettian sites Kostenki I and Avdeevo as “bone burnishers” (Semenov 1964). S. A. Semenov (1964) noticed: “Sometimes during the Palaeolithic period burnishing would have been combined with greasing, that is rubbing fat into the pores of the skin to make it elastic and impermeable…” (Semenov 1964, 178). The same author reconstructed the method of their use (Figure 3-3) on the basis of contemporary rubbing machines: “The compression of the skin and the polishing to a sheen on its outer face is only possible by concerning the pressure on limited areas, and then moving the instrument over the skin at such the pressure.” (Semenov 1964, 178-179). The contact angle of beveled tools from Dolní Věstonice can point to this kind of movement. Moreover, the smoothness of the beveled part shows contact with greasy and fine abrasive material. This process is usually, according to ethnographic sources, accomplished on the ground, with the hide fixed by pegs (Beyries et al. 2002; David et al. 1998).

**Physical manipulation**

Skins and thin hides could be also softened by simple physical manipulation such as pulling the skin across a twisted rawhide cable, a thin semi-sharp object (Schultz 1989), or by simple tumbling with hands and legs (Beyries et al. 2002; David et al. 1998). If the pelt was allowed to dry without physical manipulation, it would dry stiff even though adequate penetration of the softening agents was done. The fiber network has to be open, the fibers separated when the pelt is drying to obtain soft and flexible results (Wiederhold 2004).
The physical softening in Dolní Věstonice I may have been accomplished with spatula-like tools with a convex edge from longitudinally split mammoth ribs and rhinoceros shoulder-blades (Figure 4-3, 4-7). These artifacts were made mostly from straight and wide ribs from the cranial-thorax range, and they were extensively modified from an internal part of the bone by smoothing the cancellous bone layer. *Collum costae* and *caput costae* were used as a natural handle, while the blade embodies a lenticular cross section ended by a convex beveled edge. One spatula-like artifact from Dolní Věstonice I was also made from a baby rhinoceros shoulder blade. To produce the blade the *fossa supraspina* including *spina scapulae* were taken out and the handle was modified by taking out the *tuberculum supraglenoidale* and *processus coracoideus*. Based on ethnographical analogies, these artifacts can be associated with wooden “staking tools” (Figure 4-2) used for physical softening – “stripping” (Schultz 1989) – which includes squeegeeing off the fat mixture and fluid remaining in the hide (Figure 4-1) when the hide is stretched in a frame (Riggs 1982).

The abrasive efficiency of a cancellous bone was already mentioned. For this purpose “smoothers” as well as “grainers” from mammoth molars (cf. Figure 5-4) could be utilized. In Dolní Věstonice these were found with totally worn out and smoothed crowns, probably after contact with finely abrasive material. Contact with hide is also presumed for the above-mentioned flat and oval artifacts from cancellous bone. Utilization of the joint end of a large bone as a hide grainer is documented for American Indians. Usually a large leg bone of a bison was trimmed or abraded, whereby a large flat area of the cancellous bone was exposed. This flat surface was used as an abrader to rub and smooth the hide surface (Bell 1980). In the Plains, cancellous portions of bones were also used as paint applicators. These artifacts are smaller in size and more carefully shaped (Bell 1980). In recent hide tanning, porous stones (Schultz 1989) such as pumice are useful for removing bits of membrane from the flesh side and eventually also grain from the grain side (Edholm and Wilder 1997).

One of the finishing operations, following stripping, is “graining” (Schultz 1989), when the hide is grained to smooth any rough spots and give an overall smoothness to the hide (cf. Figure 5-6). In the collection from Dolní Věstonice I several artifacts could be useful for graining.

**Figure 4:** 1) Stripping/staking a hide (after Riggs 1982, 74); 2) staking tool from wood (after Riggs 1982, 70); 3) spatula-like tool from Dolní Věstonice I; 4-6) fragments of spatula-like tools from Dolní Věstonice I.

The final step – smoking – plays a very important role in the whole process, because while unsmoked hide will dry out and become stiff after wetting, smoked hide will dry out and stay soft (Wiederhold 2004). Another reason for smoking could be to color the hide. Different types of fuel produce different shades of color, and the darkness of a particular shade can be also adjusted by time spent in smoke (Albright 1984; Wiederhold 2004). The main character of smoking fires is a lot of smoke, but low heat. Therefore these fireplaces are countersunk (20-30cm deep) to avoid danger of burning a hole in the hide from sparks. Special constructions are placed around the fireplaces (Albright 1984; Beyries *et al.* 1999; 2002).

**Figure 5:** 1-3) Smoothed split ribs from Dolní Věstonice I; 4) smoothed mammoth molar from Dolní Věstonice I; 5) experimentally used replica of smoothed rib for greasing; 6) experimentally used replica of smoothed rib for graining.

**Smoking**

The final step – smoking – plays a very important role in the whole process, because while unsmoked hide will dry out and become stiff after wetting, smoked hide will dry out and stay soft (Wiederhold 2004). Another reason for smoking could be to color the hide. Different types of fuel produce different shades of color, and the darkness of a particular shade can be also adjusted by time spent in smoke (Albright 1984; Wiederhold 2004). The main character of smoking fires is a lot of smoke, but low heat. Therefore these fireplaces are countersunk (20-30cm deep) to avoid danger of burning a hole in the hide from sparks. Special constructions are placed around the fireplaces (Albright 1984; Beyries *et al.* 1999; 2002).
Hypothetically some of the fireplaces from Dolní Věstonice I could be connected with smoking, but clearer evidence will require further analysis of fireplaces.

**Utilization of ochre**

The position of ochre in the process of hide tanning is often a subject of discussion (Audoin and Plisson 1982; Debout 2007; Philibert 1993; 1994). The astringent, antiseptic, and deodorizing properties of iron salts are well known from natural medicine (Wilcox 1911). W. J. Sollas (1924) noticed that ochre could have performed the function of a subsidiary agent for better conservation and, as an insect repellent, it could avoid insect egg-laying which causes spoilage of the skin. C. Peabody (1928) speaks about the impermeability which ochre gives to hide.

A large number of colored bone tools can be found in the archaeological record. Ochred bone tools are, for example, known from Altamira (Breuil and Cartailhac 1906). Some authors actually identified spatulae as tools intended for ochre application on the skin (Dechelette 1908). S. A. Semenov (1964) noticed that ochre mixed with animal or plant fats applied on a skin make the hide impermeable and more lasting. According to his opinion bone “burnishers” were ochred because of their probable contact with a previously colored skin or utilization for rubbing the mixture to the skin (Semenov 1964). The role of ochre in the process of hide tanning was experimentally tested by F. Audoin and H. Plisson (1982) who demonstrated its antiputrefaction, repellent, and drying function, but no direct role within the hide dressing process was proved. By contrast, S. Philibert (1993; 1994), who analyzed Epipalaeolithic and Mesolithic lithic tools, found that ochre was not used in the tanning process itself but played a part in the finishing process.

In Dolní Věstonice I most of the tools related to skin dressing are ochred, so it is not possible to distinguish in which phase ochre entered the process. With regard to the amount of ochre found on the site, the possibility of post depositional coloring has to be taken into account. Mostly red ochre, hematite, of local origin was processed, but pieces of white calcified slate and deep-grey hematite also were found. The processing of hematite to ochre powder is documented by colored stone plates and pebbles which were used for rubbing iron ores after rapid oxidation by calcination or burning in the fire (Klíma 1983).

**Final products**

The application of every single phase of the whole process and the additives used result in products of different qualities and properties. By summarizing possible intermediate and final products, an important feature of Pavlovian life can be discovered.

After simple fleshing and air drying, the hide became fairly stable, ready to be stored or transported without damage (Thorstensen 1985). Certain qualities suitable for special functions (production of sacks, ropes, lassos etc. David et al. 1998) are possessed by “rawhide” produced after the process of hair removing. Wet scraping results in softer, extremely flexible, thicker skin, easily manipulated and thus more desirable for winter clothing (Edholm and Wilder 2001), while dry scraping produces thinner, harder skin with less stretch, more suitable for summer clothing (Ladd 1999).

The manner of use of different kinds of hide can be found in the ethnographical literature. Fur can be used for covering settlement structures, for interior furnishing, or bedding. The favorite utilization of fur is for clothing and shoe production. In Siberia, children’s clothing is often made from hare or fox killed in November. Underwear or the liner for coats also can be made from these fine hides (David et al. 1998). On the basis of recovered skinning traces on reindeer phalanges the use of kamous (skin from the limbs) for boot production can be inferred. The nomad says “putting my feet in the boots of reindeer, I can go where it goes” (David et al. in press).

Various sacks or containers (from rawhide) can be produced from fur or hide. An indirect evidence of rope production can be seen in flat mammoth bones, especially shoulder blades; the surface of which is covered with continual cut marks. These could originate from cutting a hide into strips. In the process of rope production, cutting is usually followed by softening and twinning of strips together (David et al. 1998). In Dolní Věstonice knowledge of twinning is documented by the presence of negative impressions in fired clay (Adavasio et al. 1997; 1999; Soffer and Adavasio 2004; etc.). Although the authors point out that the imprints from Dolní Věstonice I originated from plants rather than animal fibers (Soffer and Adavasio 2004), the twinning of hide cannot be excluded.

**Conclusions**

Based on preliminary research of the industry from hard animal materials, one part of the daily life of the Pavlovian people was reconstructed. The rich presence of tools related to skin processing (Table 1) points to the importance of this craft in the socio-cultural context. From the recovered faunal remains and projectile points the intentional hunting of fur animals can be presumed. The presence of specific cut marks found on faunal remains bears evidence for the skinning of hunted animals. The representation of various hide dressing tools informs us about the possible organization of this skill (Figure 6). Simple unifacial beveled tools from horse ribs as well as antler elbow-shaped scrapers were probably used for fleshing hide stretched in a frame. Serrated horse rib can bear evidence of processing hide on a beam. The morphology of elbow-shaped tools from reindeer antler...
## Table 1: Representation of tools and its probable position in „chaîne opératoire”.

<table>
<thead>
<tr>
<th>Position in „chaîne opératoire“</th>
<th>Process</th>
<th>Placing of a hide</th>
<th>Artefact type</th>
<th>Raw material</th>
<th>Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>fleshing</td>
<td>defleshing</td>
<td>frame, bevelled ribs</td>
<td>horse rib</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>frame, antler “pronghoes”</td>
<td>reindeer antler</td>
<td>7</td>
<td></td>
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<tr>
<td>hair removal</td>
<td>wet scraping</td>
<td>frame, bevelled ribs</td>
<td>horse rib</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>beam, serrated horse rib</td>
<td>horse rib</td>
<td>1 + 2?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dry scraping</td>
<td>frame, antler “pronghoes”</td>
<td>reindeer antler</td>
<td>7</td>
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<td>beam, serrated horse rib</td>
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**Figure 6:** Schema of possible hide processing performed in Dolní Věstonice I. (pictures of hide positioning after Beyries 1999 – drawing M. Ballinger; pictures of tools after Klima 1981, 1983).
points to the utilization of a sort of a dry-scrapping method. The evidence of usage of a fat as a softening agent can be seen in smoothness of some tools such as “smoothers” or “bone burnishers”, which could be possibly used for rubbing the mixture of fat into the hide. Stripping of a hide could be accomplished by spatula-like staking tools and for final graining mammoth molars as well as tools from cancellous bone could be utilized. Presence of probable dehairing tools can show evidence of the production of buckskin and thus also other skin products, such as ropes or underwear. With regard to the possible utilisation of tools with smoothed cancellous bone for graining, its abundant representation can point to production of high quality hides. Important feature of the studied collection is its coloring with ochre, which can indicate important position of hematite within process of skin dressing.

While important data from the field of taphonomy, pollen analysis, use-wear analysis and spatial distribution has to be completed, it is already possible to say that skin dressing performed in Dolní Věstonice I was deliberate process indicating high level of work organisation and illustrating cognitive abilities of the Upper Palaeolithic people.

Acknowledgements

I would like to thank Martin Oliva and all scientists from Anthropos Institute, the Moravian Museum Brno. My thanks also belong to Isabelle Sidéra, Alexandra Legrand, Aliette Lompré and Nejma Goutas for all what they taught me and to Francine David and Claudine Karlin for friendly consultations. My thanks also belong to my husband for his patience.

This project was supported by scholarship of French government, grant GÂUK n°252179 and by a special scholarship of Masaryk university Brno n°1237.

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RECONSTRUCTING THE “CHAÎNE OPÉRATOIRE” OF SKIN PROCESSING IN PAVLOVIAN BONE ARTIFACTS


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