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The Art of Taphonomy and the Taphonomy of Art: Layer IV, Molodova I, Ukraine

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Level IV of Molodova I, an open-air Middle Paleolithic site in the Ukraine has been described by some researchers as a possible source of evidence for early symbolic behavior. We examined bone objects from this layer that were identified by Ukrainian researchers as exhibiting possible Neandertal produced engravings including two anthropomorphic figures. While we have determined that there is no evidence of symbolic activity at Molodova I, the database we have created, with its systematic recording of traces left by taphonomic agents on faunal remains, provides a better understanding of the overall site taphonomy.

KEY WORDS: Middle Paleolithic; Taphonomy; Molodova; Mousterian; Neandertal; Symbolism.

BEHAVIORAL MODERNITY AND A TAPHONOMY OF ART

There has been a resurgence of interest in the emergence of behavioral modernity (McBrearty and Brooks, 2000; Wadley, 2001; Bar-Yosef, 2002; d'Errico, 2003; Henshilwood *et al*., 2002; Henshilwood and Marean, 2003; Bower, 2005; Zilhão *et al*., 2006.) and whether or not the sets of behaviors that comprise behavioral modernity are unique to anatomically modern humans or are more widely shared amongst hominin species. Twenty years ago it was argued that modern anatomy and modern behavior evolved in tandem. Modern humans were believed to have evolved in Europe 40,000 years ago coinciding with a revolution in art and technology and the introduction of "modern" behaviors (e.g., language, art, trade networks etc.). As mounting evidence pointed to an

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African origin for modern humans at 130,000 BP there appeared to be a "lag" between the emergence of modern anatomy and the emergence of modern behavior (Klein, 1995, 1999). Recent studies suggest modern anatomy emerged even earlier by at least 160,000 BP (White *et al*., 2003) thereby increasing this gap.

Symboling behavior as evidenced through regional artifact styles, self adornment, burials, and the use of pigment, for example, is argued to be one of the hallmarks of behavioral modernity (McBrearty and Brooks, 2000). At the site of Blombos in South Africa researchers uncovered evidence for early symboling in the form of engraved ochre pieces dating to 70-75,000 BP (d'Errico *et al*., 2001; Henshilwood *et al*., 2001a,b, 2002) and perforated tick shells (*Nassarius gibbosulus)* dating to 70-75,000 BP that may have been used as personal ornaments (Henshilwood *et al*., 2004, d'Errico *et al*., 2005). Even older evidence of personal adornment comes from the Aterian site of Oued Djebbana and the Mousterian site of Qafzeh in Israel where a total of three beads have been dated to >35,000 BP and 100,000–135,000 BP respectively (Vanhaeren *et al*., 2006). Interestingly, the beads are manufactured from shells of the same genus as those utilized by hominins at Blombos. As White (1992) argues, personal adornment in modern societies is one of the most powerful and persuasive ways humans construct meaning and represent beliefs and it now appears that we have evidence of this behavior in association with modern humans dating to the Middle Stone Age. Even with the Qafzeh finds, however, there remains at least a 30,000 year gap between the initial appearance of modern anatomy and the appearance of a handful of geographically dispersed artifacts that are unquestionably symbolic in nature. At the same time, results of research conducted outside of Western Europe (see d'Errico *et al*., 2003 for a review) suggest that the behavioral revolution may have been more incremental than previously understood even if the pace of change seems to increase dramatically 35,000–40,000 years ago. Thus, many questions remain concerning the relationship between modern anatomy and modern behavior, the degree to which this behavior is shared among hominin species, the developmental rate of symboling behavior as one aspect of behavioral modernity and the mechanisms underlying symbol use, creativity and innovation.

The answers to these questions depend in large part on the strength of the evidence for symboling behavior prior to the transition to the Upper Paleolithic at ca. 35,000–40,000 BP and for symboling behavior amongst hominin species other than modern *sapiens* at any point in our evolution. As in other areas of archaeology, taphonomy and experimental and behavioral archaeology have impacted Paleolithic studies dramatically. For instance, new understandings of site formation processes have resulted in the re-evaluation of evidence for home base construction, the primacy of hunting in human evolution, lithic and bone tool manufacture and use, and the controlled use of fire (e.g. Brain, 1969, 1981, 1993;

Binford and Ho, 1984; Schick, 1986; Brain and Shipman, 1993; Toth and Schick, 1993; Chase *et al*., 1994; Lyman, 1994; Dibble *et al*., 1997; Bartram and Villa, 1998; Bartram and Marean, 1999; Backwell and d'Errico, 2001; Pickering, 2002; Pickering *et al*., 2004).

It is only within the last two decades, however, that taphonomic and experimental approaches have been systematically applied to symboling and music (e.g., d'Errico, 1988a,b, 1991, 1992a,b, 1996, 2001; Chase, 1990; Davidson, 1990; d'Errico and Cacho, 1994; d'Errico and Villa, 1997; Chase and Nowell, 1998; d'Errico *et al*., 1998a,b; d'Errico and Vanhaeren, 1999, 2002; d'Errico and Nowell, 2000; Vanhaeren *et al*., 2006; see also discussion in Chase and Dibble, 1987). These types of studies include projects that are oriented toward understanding techniques of manufacture (e.g., White, 2001, 2006; Henshilwood, 2004; d'Errico *et al*., 2005) including the chronological ordering of marks in notation systems (e.g., Marshack, 1991; d'Errico, 1995, 2001) and those that are concerned with discerning anthropogenic from naturally produced "art objects" (e.g. d'Errico and Nowell, 2000). In this paper we take a taphonomic approach to the study of purportedly engraved objects from the Middle Paleolithic site Molodova I in the Ukraine in order to evaluate the potential of these objects to contribute specifically to our understanding of the capacity of Neandertals to engage in symbolic behavior and more generally to the behavioral modernity debate.

ARCHAEOLOGICAL CONTEXT

The open-air Middle Paleolithic site of Molodova I forms part of a cluster of Mousterian sites along the southern bank of the Dnestr River in the Ukraine (Fig. 1). There are few published dates for Molodova 1 (see Meignen *et al*., 2004: for a discussion of this issue) but Layer IV from the site has been dated by radiocarbon to more than 44,000 BP (Chernysch, 1982). Molodova I was excavated under the direction of the late A. P. Chernysch (1975, 1982, 1983) (Fig. 2) from the 1950's through the 1980's. These excavations resulted in large horizontal exposures of Mousterian artifacts and faunal remains. In Layer IV of Molodova I, for instance, approximately 1200 square meters were exposed (Fig. 3). This excavation strategy facilitates the study of activity synchrony and hominin use of space which may have been more complex during the Middle Paleolithic than previously thought (Henry, 1995; Speth, 2006). It should be noted that while no Neandertal remains have been found at Molodova I it is assumed that these hominins were the occupants of the site and responsible for the Mousterian assemblages uncovered there (but see Brantingham *et al*., 2004).

Layer IV is best known for its traces of dwelling structures. In this layer are several large rings constructed mainly of mammoth bones that are thought to represent the foundation of habitation structures. They are littered with dense concentrations of artifacts and faunal remains and contain hearths. The exact nature

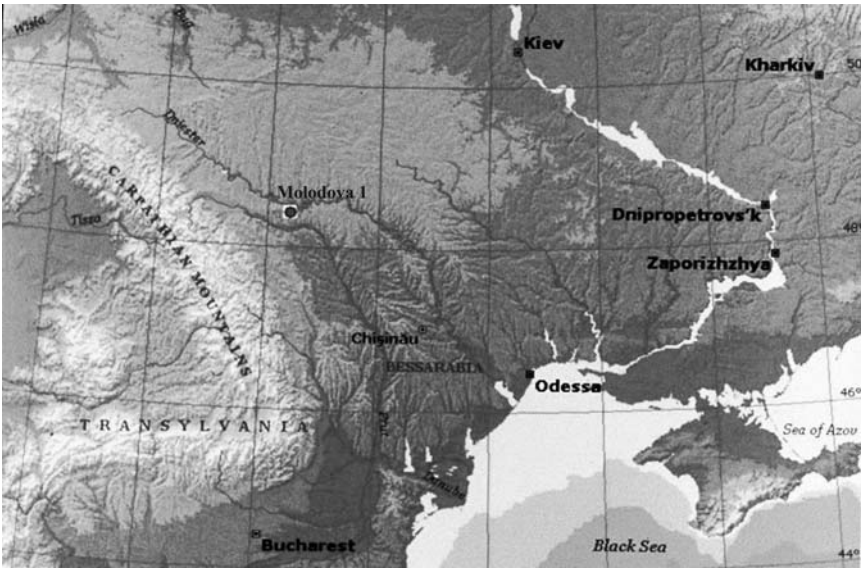

Fig. 1. Location of Middle Paleolithic site Molodova 1(Ukraine).

Fig. 2. Historic photograph of excavators working at Molodova 1, Layer IV.

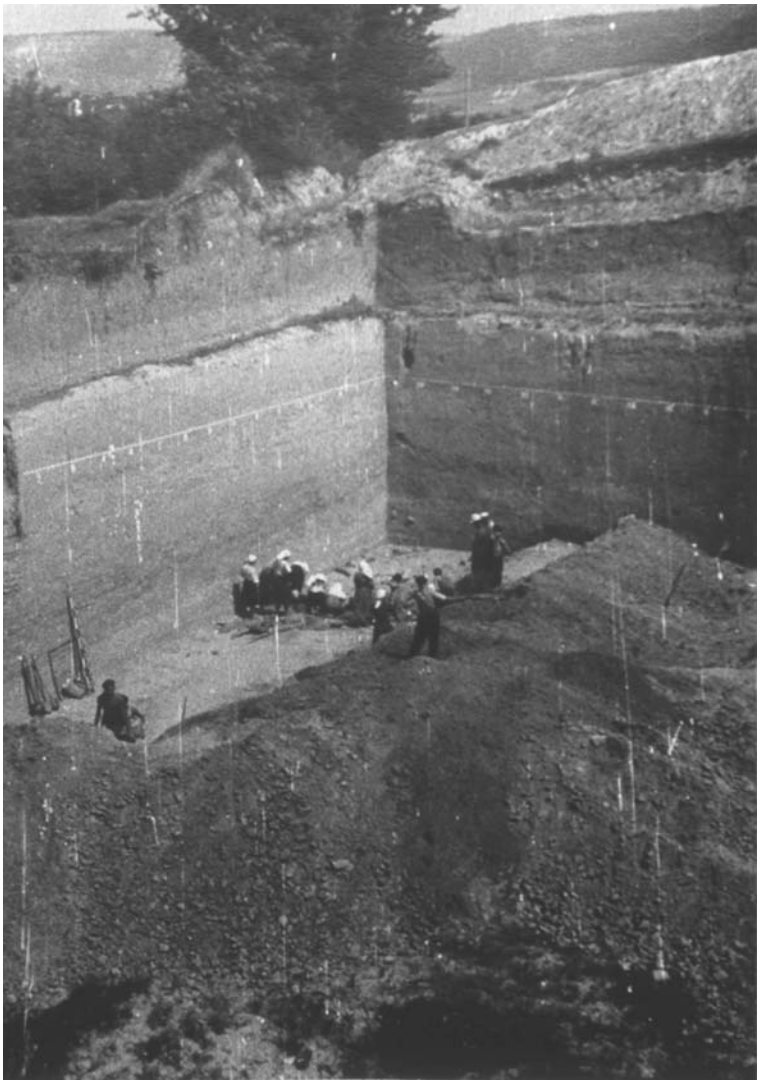

Fig. 3. Historic photograph of excavations at Molodova 1, Layer IV.

of these structures remains controversial, however, as they have been interpreted in numerous ways including natural accumulations as the result of slope wash (Klein, 1999:447); hunting blinds similar to ones documented in ethnographic contexts (Binford, 1983), wind breaks (Hoffecker, 2002:107), terrestrial nests (Stringer and Gamble, 1993) and as 'centrifugal living structures.' (Kolen, 1999). Kolen uses

the term 'centrifugal' because he believes they are constructed from the inside outward by pushing piles of debris out of the center toward the sides to make spaces to live in; 'living' because Neandertals are not just sleeping in these spaces which distinguishes them from nests including chimpanzee-like day nests; and "structures" because they are more permanent than nests. He argues that these structures are never finished but that they are constantly modified and remodeled during use.

Stringer and Gamble (1993) further argue that the Molodova structures lack a symbolic dimension and thus differ fundamentally from habitation features found at Upper Paleolithic open-air village complexes. For example, at Kostenki I in Russia excavators uncovered two rows of hearths running down the center of a circle of semi subterranean dwelling structures. Numerous storage pits were associated with these dwellings. Several of the pits contained ochre and carved animal and female figurines. These researchers (1993:204) suggest that it was not until the Upper Paleolithic that "architecture [embodied] cultural, symbolic behavior [rather than] purely expedient survival behavior." While the nature and meaning of the mammoth bone rings at Molodova I remain equivocal, it is possible that other evidence for Neandertal symboling behavior exists at this site. It is within this context that we initiated a study of putative symbolic artifacts from Layer IV of Molodova I.

METHODOLOGY

Each specimen was examined with a reflecting light microscope in order to check its state of preservation and identify anthropogenic and natural traces of modification. Selected areas were replicated with Provil L impression material (Bayer, Germany). Positive casts, made in RBS resin (T2L Chimie, France), were observed with a scanning electron microscope (SEM; Jeol 840A). Transparent replicas obtained using the same replication technique were also observed and photographed digitally with a Nikon Coolpix 990 camera in transmitted light through a Wild M3C stereomicroscope.

THE FAUNAL COLLECTION FROM MOLODOVA I, LAYER IV

Two to three thousand faunal remains were collected from layer IV (see Agadzhanian, 1982). The majority of the remains are mammoth bones. A small number of these bones have been referred to in the literature as being clearly engraved (Chernysh (1975, 1982, 1983) and thus Molodova I, as Klein (1999:440) notes, is often described as a source of evidence for early symboling behavior among Neandertals (but see Hoffecker, 2002:127).

We were unable to examine the entire faunal collection from layer IV, as portions of it are distributed among a number of museums throughout the Ukraine.

Furthermore, some of the bones are still encased in plaster while other pieces have been inadvertently lost or discarded (pers. obs.; Sytnyk, pers. com. 2001). It is also important to note that many of the remains from smaller species were not recovered during the excavation (Sytnyk, pers. com., 2001). This situation may have resulted in a significant overrepresentation of mammoth bones in the assemblage.

We examined 321 identifiable pieces from Layer IV including all bones that were considered to be possibly engraved. This sample represents 10%–15% of the excavated assemblage. In our sample, mammoth remains comprise 55% of the bone assemblage while horses account for roughly 23% and bison 18%. The remaining 4% are accounted for by several species including reindeer. In terms of skeletal elements, ribs account for 56% of our sample, long bones 17% and pelves 7%. It should be noted that we did not record the minimum number of skeletal units, therefore the percentage of ribs in our sample could be inflated.

Based on our observations of the faunal sample available to us we were able to identify at least four factors that influenced the character of the faunal assemblage from Layer IV. First, some of the bones were affected by erosional processes. Many of the bones were heavily weathered and 49% of our sample exhibited root marks (Fig. 4). Second, some of the markings on the bone were the result of carnivore activity. Specifically, 15% of the bones bear traces of carnivore pitting, puncturing and scoring (Fig. 5) and a few exhibited crenulated edges as a result of carnivore gnawing. It is clear from our observations that large carnivores, probably wolves, were involved in at least the displacement, if not the accumulation, of the bone assemblage from Layer IV. Third, up to 16% of the bones have hominin cutmarks on them, Interestingly, individual bones exhibited either cutmarks or carnivore traces or no traces at all but never both cutmarks and gnaw marks on the same bone.

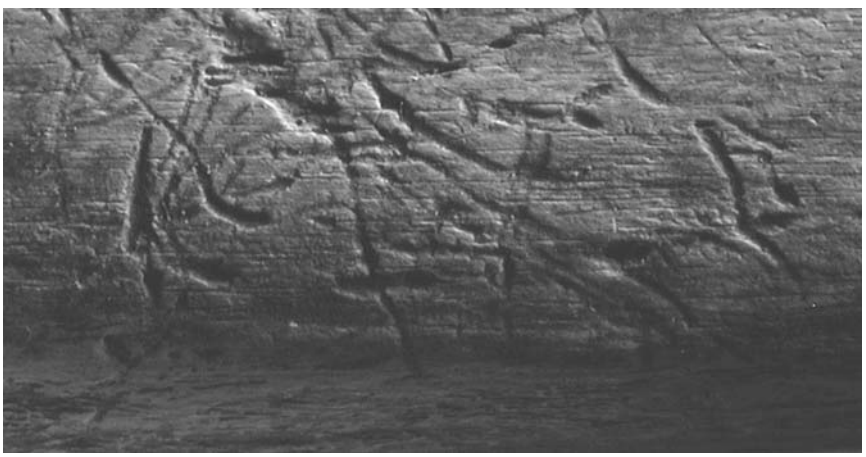

Fig. 4. Example of marks left by plant roots on bone from faunal assemblage at Molodova 1.

Fig. 5. Example of marks left on a mammoth femoral head by carnivore gnawing known as scoring. Large carnivores played a significant role in the displacement and possibly the accumulation of faunal remains at Molodova I.

Fourth, the faunal collection exhibits other examples of excavation induced trauma. For instance, more than half of the bones (53%) exhibit shovel marks (Fig. 6) and the trampling of loess or other fine sediment into the surface of the bones. It is possible that the bones may have been just below the excavated surface and that excavators walked over them during the process of excavation. Furthermore, close to 60% of the remains in our sample have post-depositional breaks (Fig. 7) while only 12% have breaks that were made when the bone was fresh. Other post-depositional transformations to the bone include the use of conservation glue that turned either a dark brown mimicking an ancient patina or a red mimicking ochre. This further complicated attempts to distinguish between old and recent modifications to the bones.

WAS THERE SYMBOLING AT MOLODOVA I DURING THE MP?

Included in our sample were ten to fifteen pieces that have been described (Chernysh, 1975, 1982, 1983) as evidence of symboling behavior including two anthropomorphic figures. Found upon a cranial fragment of a bison or horse, the

Fig. 6. Excavation induced trauma is another factor affecting the faunal assemblage from Molodova I. (*top*) shovel marks; (*bottom*) pick marks.

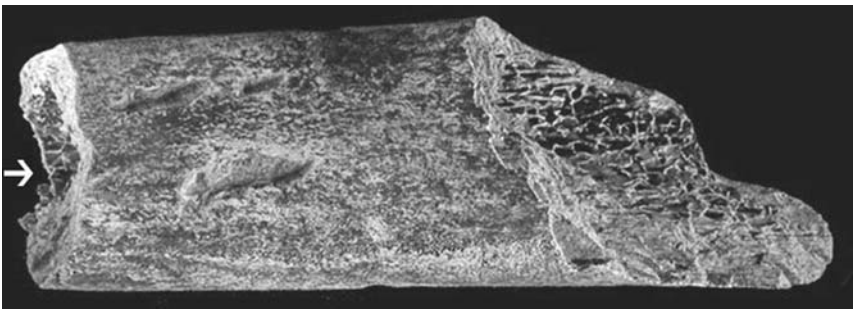

Fig. 7. Post-depositional fractures account for the majority of breaks in the Molodova 1 assemblage. Nearly two thirds of bones in our sample have post-depositional breaks. The break on the left is certainly post-depositional while the one on the right may be either post-depositional or the result of a spiral fracture made on fresh bone that has been post-depositionally damaged as is suggested by the microflaking on its edge.

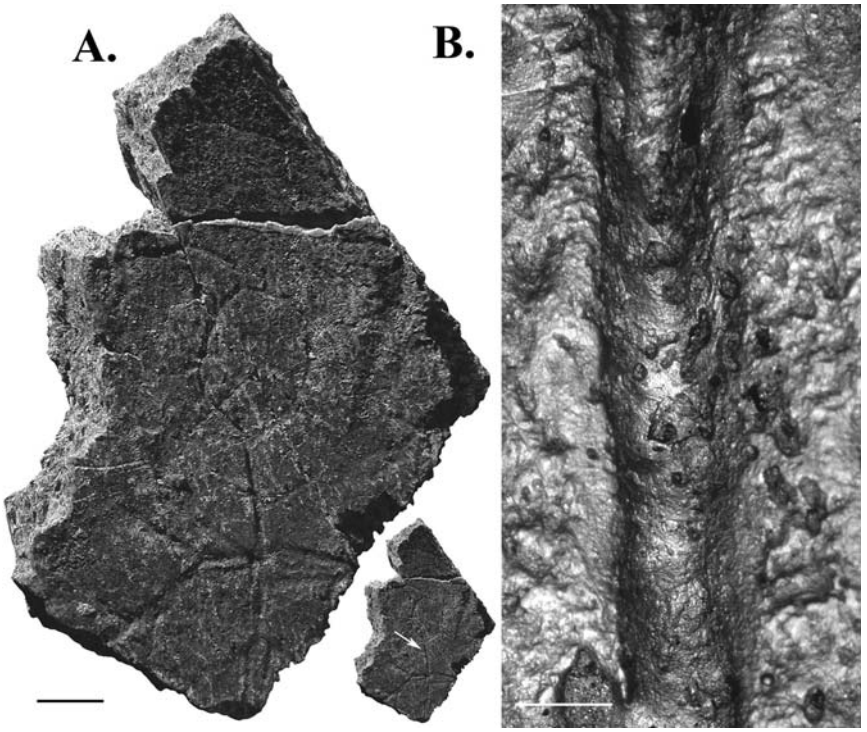

Fig. 8. (a) Blood vessel "anthropomorphic" figure from layer IV, Molodova 1 on cranial fragment of bison or horse. Scale is 1 cm. (b) Close-up of vascular grooves. Scale is 1 mm.

first anthropomorph (Figs. 8a,b) resembles a roughly drawn human figure with a head and stick-figure like body. Macroscopically, the figure is quite striking, but microscopic inspection of the lines forming the figure reveals an absence of internal striations and clean or fractured edges typical of tool produced grooves. Furthermore, the grooves of the lines forming the "figure" are characterized by a U-shaped section with no evidence of chemical alteration of the bone's structure. There are also numerous vascular openings (Fig. 9) for capillaries on the grooves. Finally, the texture and porosity of the grooves is very similar to the rest of the bone. Taken together, these observations clearly indicate that this anthropomorphic-like figure was produced by blood vessel impressions (see d'Errico and Villa, 1997).

The second anthropomorph was manufactured on a bison rib fragment and is reminiscent of the first "anthropomorphic figure." The image is of a human-like figure (Fig. 10) with a schematic body and round head but in this case there are lines radiating from the head. This figure is clearly tool produced. This is evidenced by striations in the engraved lines that are the result of dragging a tool across the softer bone matrix . There are, however, three reasons to suggest

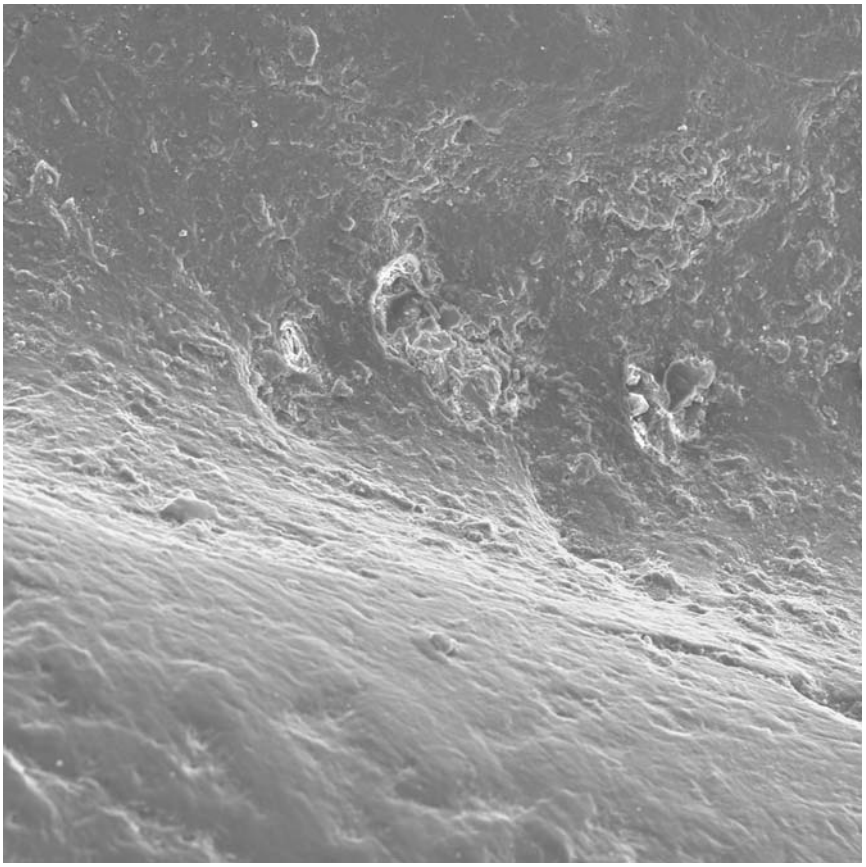

Fig. 9. Scanning electron microscopy image of vascular channels with openings on grooves of blood vessel "anthropomorphic" figure. Scale is 1 mm. Width of the photo is 1 mm.

that these engraved lines are, in fact, of recent origin. First, the bone's surface is heavily root-marked with the engraved lines clearly cutting through the root marks and modifying their trajectory to follow surface discontinuities (Fig. 11). Second, the freshness of the engraved surfaces contrasts noticeably with the state of erosion that characterizes the remainder of the bone's surface. Specifically, the edge of the engravings exhibit numerous, irregular breaks indicating that the bone was considerably weathered when the lines were traced. Furthermore, the inner surface of the engravings (Fig. 12) exhibit features such as striations and perpendicular microfractures that would have not survived if the engraved surfaces had been subjected to the same erosional processes documented on the remainder of the bone surface. Finally, there is a marked difference in patina between the engraved lines and both the bone's natural surface and surface of the root marks.

Fig. 10. Tool produced "anthropomorphic" figure on a bison rib fragment, layer IV, Molodova 1. Scale is 1 cm.

The former are quite light in color while the latter exhibit a dark brown patina suggesting they are of greater antiquity.

The engraved lines of this second anthropomorph are similar to those found on a number of other pieces including an engraved "leaf or arrow" (Fig. 13) and an engraved "A" (Fig. 14). In the latter example, graphite is detectable inside the lines where excavators went back over the engraving with a pencil. It appears

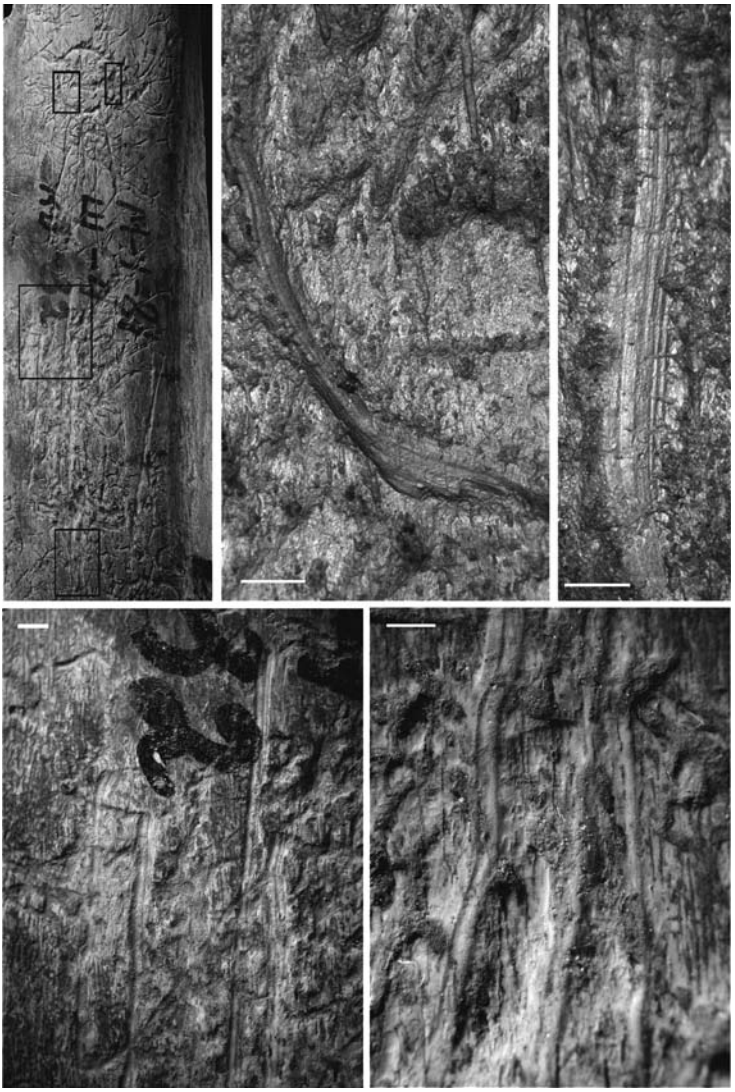

Fig. 11. Tool engraved "anthropomorphic" figure. Note engraved lines cutting through root marks. Scale is 1 mm.

to have been a fairly common practice to engrave the provenience on the bones themselves.

The section of the lines on the second anthropomorph indicate that they were made by a point with a complex morphology. Points with a symmetrical vertical cross section produce lines that do not change their section after a change of

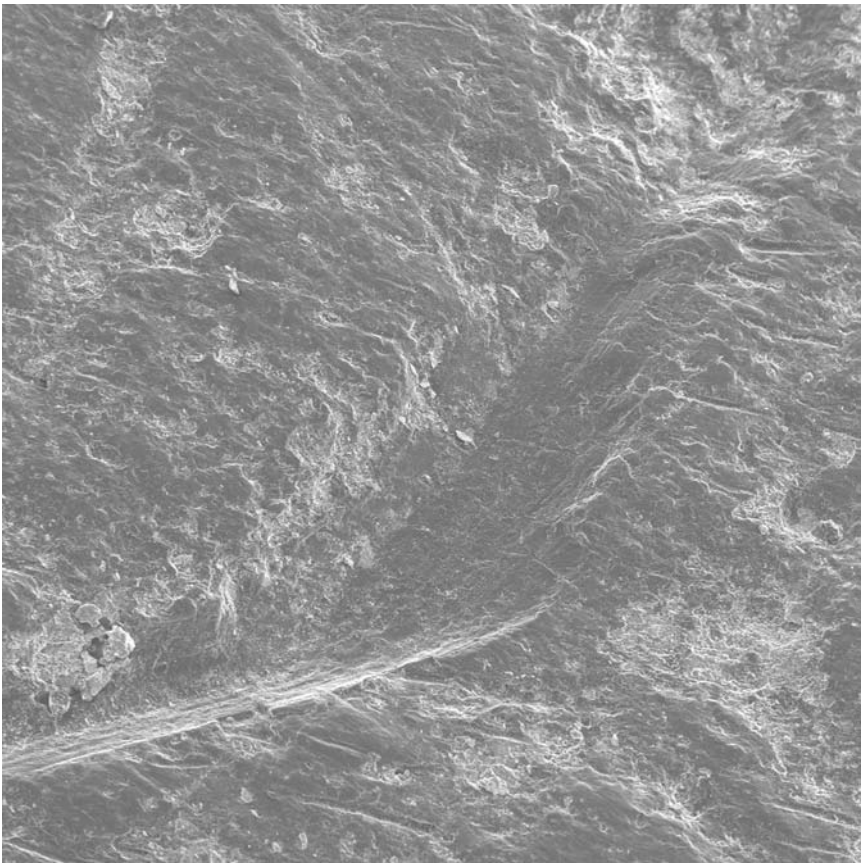

Fig. 12. Scanning electron microscopy image of bottom left of circle making head of tool engraved anthropomorph. Scale is 2 mm. Width of the photo is 2 mm.

direction; the opposite occurs, as observed in this case, with asymmetrical points (d'Errico *et al*., 2002). Although we cannot rule out that a lithic point was used to make the engravings, the absence of striations on the side of the main groove that are typical of stone tool made grooves, renders the use of a metal point more probable. All of these observations suggest to us that the engraving may have been made during excavation or subsequently while cleaning and/or labeling archaeological finds in a laboratory setting.

Also uncovered in Layer IV were 8 ribs exhibiting series of short parallel striations that have been interpreted as abstract symbolic representations (Figs. 15 and 16). While few comparable markings are signaled at other Middle Palaeolithic sites (d'Errico and Villa, 1997; d'Errico *et al*., 2003) they are abundant in Upper Paleolithic contexts (Marshack, 1964; 1991; d'Errico, 2001; but see also Knight

Fig. 13. Example of modern tool produced engraving on bone from Molodova 1, Layer IV.

et al., 1995). It has been suggested that these types of objects were used to record the passage of time or to more generally store information outside the body (Marshack, 1964, 1991; Robinson, 1992; d'Errico, 1995) and their discovery at a European Middle Paleolithic site would be of great significance. What is unusual about the Molodova bones is that not only are the lines on these ribs evenly spaced but they are, in fact, perfectly equidistant. Furthermore, the dark brown patina of the bone's surface is absent inside these lines and each line has an identical regularly curved section with no striations inside it. These features indicate the lines are recent in origin and were produced by a metal tool scraping the bone surface. The equidistance between the marks and their identical morphology suggests a rake tool was responsible for them. Alternatively they may be chatter marks produced when excavating the ribs or cleaning them during or just after the excavation. In the field of bone technology chatter marks are often the product of a burin edge scraping a bone surface in order to remove bone shavings. This produces flat elongated parallel facets crossed perpendicularly by undulations corresponding to the vibration of the tools during the work. Similar marks can be produced on bone when using metal tools with a burin-like edge.

When the provenience of each of these ribs is plotted on a map of the site, it is apparent that they were excavated from contiguous squares, all from the same year of excavation. This favors the hypothesis that the marks were produced by a single excavator during a single field season using a peculiar excavation tool. Since, however, no record exists in the museum or in the photographs taken during the excavation of the use of such a tool, an experimental reproduction of the proposed kinematics is needed to support our interpretation.

One of the most intriguing and perhaps best known of all the pieces from Layer IV is a mammoth scapula that has been extensively analyzed and published

Fig. 14. Example of a modern tool produced engraving on bone. Scale is 5 mm. The width of the photo is ca 5 mm.

by Chernysh (1975, 1982, 1983) (Fig. 17). Chernysh argued that Middle Paleolithic hominins engraved a number of lines on this bone including some that formed a deer in the center of the scapula. We reanalyzed the lines on the scapula and compared our drawing with the one drawn by Chernysh. Both macroscopic and microscopic analyses failed to discern many of the lines noted in Chernysh's drawing including those forming the deer. Specifically, the lines making up the muzzle, stomach and rear leg appear to be nonexistent. In a least five instances, the engraved lines that do exist cut and remove the manganese staining on the surface of the piece. This suggests that at least these engraved lines are of recent

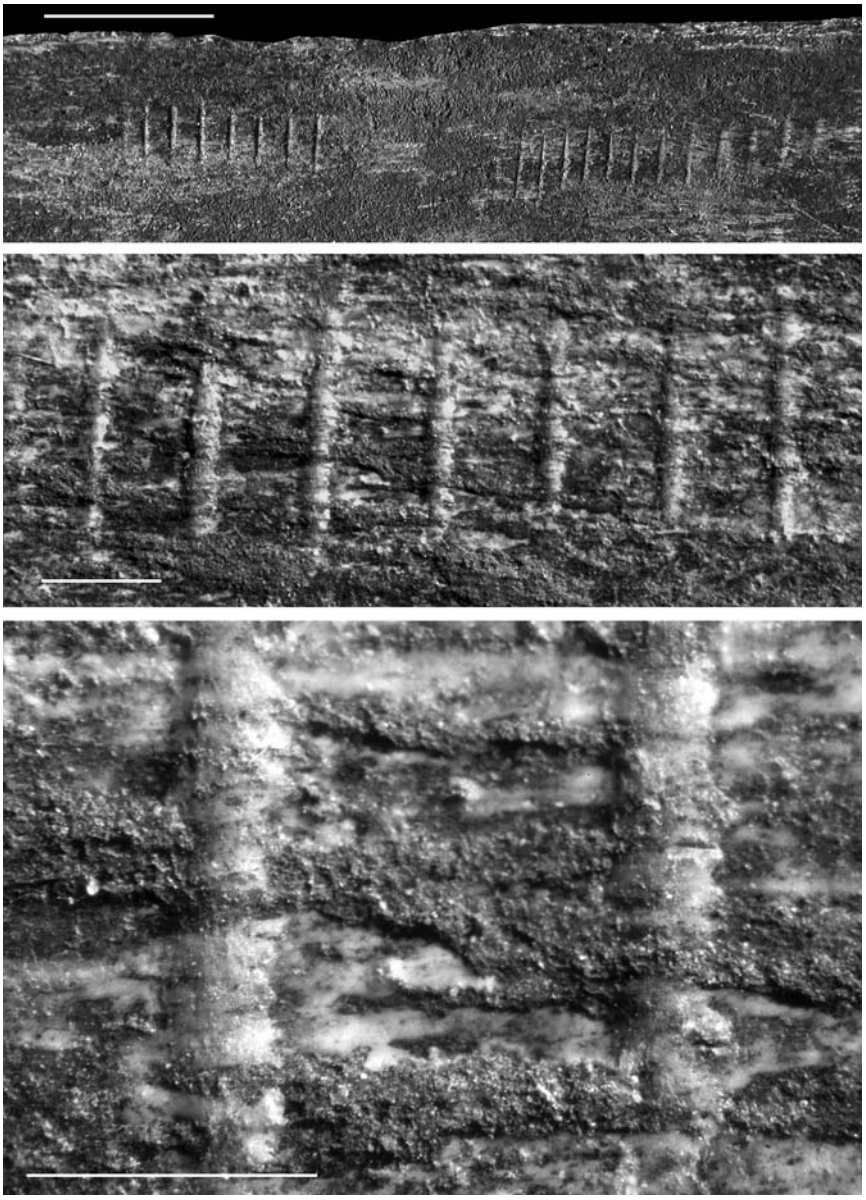

Fig. 15. Example of rib from Molodova I, Level 4 exhibiting fine parallel striations. These striations are most likely the result of a rake or are chatter marks. All striations on same rib at different levels of magnification. *Top*: Scale is 1 cm. Middle and *Bottom*: Scale is 1 mm.

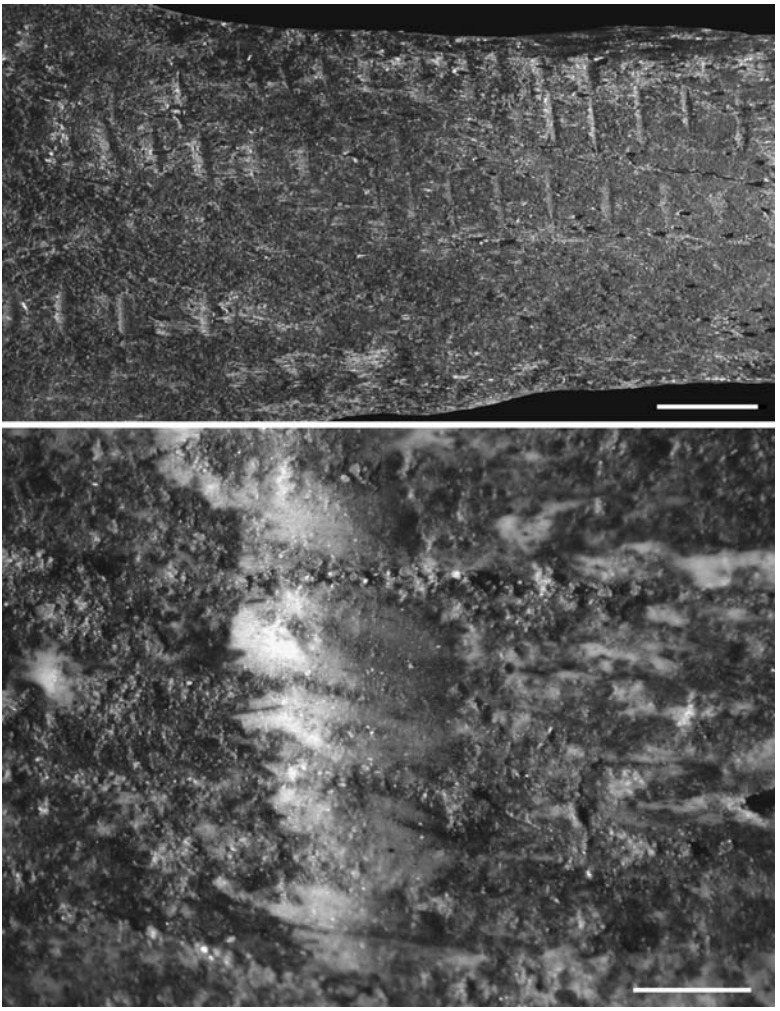

Fig. 16. Another example of a rib from Molodova I, Level 4 exhibiting fine parallel striations. *Top*: Scale is 1 cm. *Bottom*: Scale is 1 mm.

origin. Furthermore, the cross section of a number of the incisions on the scapula is consistent with the use of a knife or large metal tool used tangentially to the surface of the bone. This technique produces the flat bottom grooves observed on the scapula (Fig. 17). A few groups of parallel lines have the same patina as the bone surface and may be old. They are better explained, considering their location, orientation and morphology as cut marks or the byproduct of the use of the scapula to cut soft material.

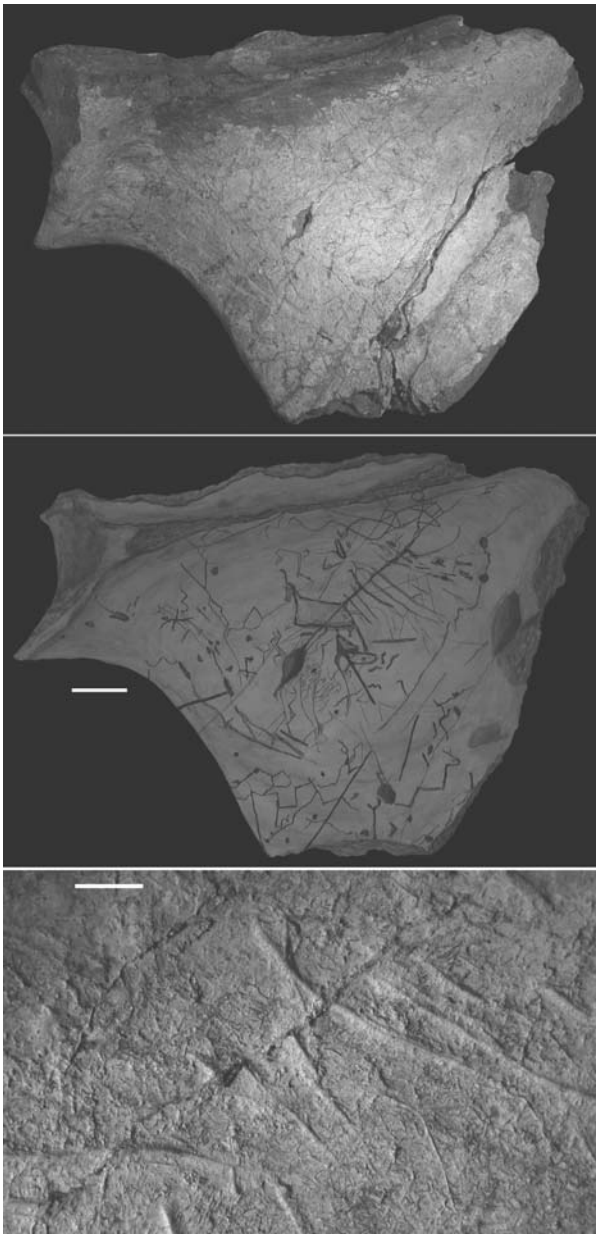

Fig. 17. (a) Engraved scapula from Molodova I, Layer IV(b) Drawing of an engraved scapula by Chernysh. (c) Close up of engraved lines on scapula. *Top* and *Middle*: Scale is 10 cm. *Bottom*: Scale is 10 cm.

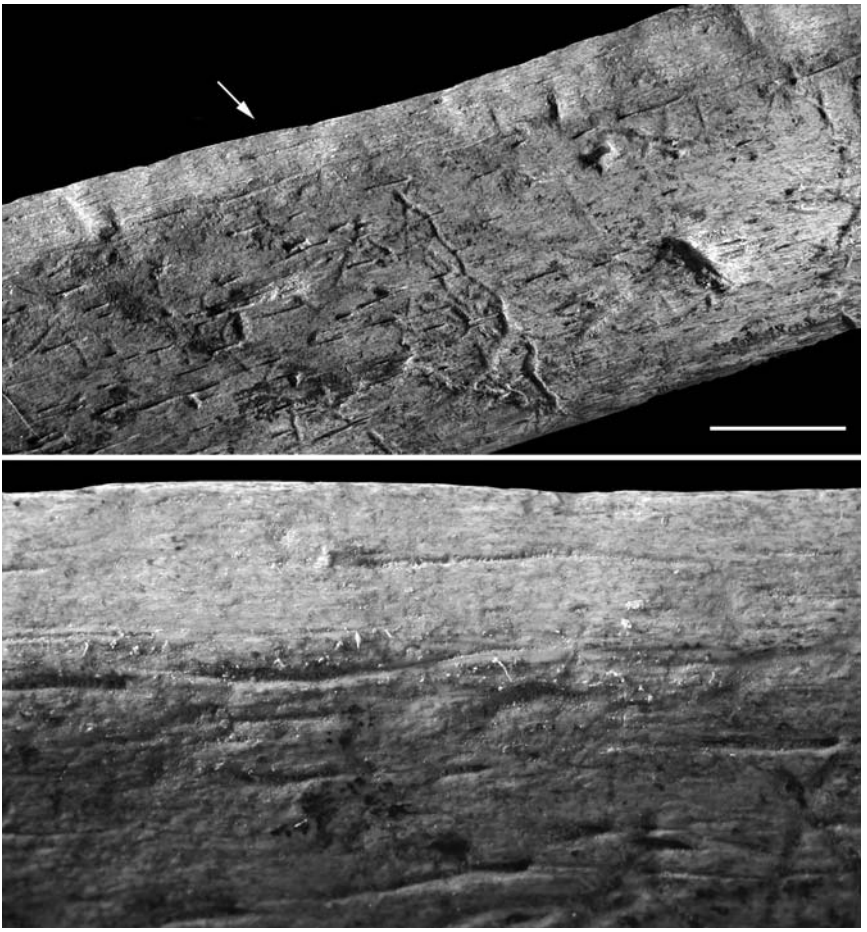

Fig. 18. Rib with elongated facet produced by longitudinal scraping. Notice the clear appearance of the facet and the absence on it of root marks. Scale is 1 cm.

Similarly, ribs with distinct wear facets upon them (Fig. 18) were observed in the Molodova I, Layer IV faunal collection. While these facets could not be used as evidence for symbolic behavior they would be clear evidence of the working of bone by Neandertals. While the use of bone by hominins dates to at least the Oldowan (Backwell and d'Errico, 2001), it is not until the Upper Paleolithic that the modification of bone, antler and ivory becomes widespread and thus the extensive working of bone in a Middle Paleolithic context would be a significant finding. Macroscopic inspection of the facets revealed that on the majority of them there was a clear difference in patina between the light colored facets and the darker color of the remainder of the bone, indicating the facets were of recent

origin. On some of the bones the surface was covered by roots marks but the root marks never covered the facets. The results of a microscopic analysis of the facets suggest that a knife or large metal tool used tangentially to the surface of the bones is also responsible for the modification exhibited by the ribs.

DISCUSSION AND CONCLUSION

In summary, a detailed macroscopic and microscopic study of the purported symbolic artifacts from Molodova I, Layer IV strongly suggests that the markings on these objects are not the product of Mousterian Neandertals but rather are the result of natural processes or recent human intervention. In fact, with the exception of the anthropomorphic figure that is the result of blood vessel impressions, all of the markings are of recent origin. This observation begs the question of why there is such heavy recent bone damage at Molodova I.

The answer lies in the historic documents and photographs of Chernysh's excavations. It appears that significant damage to the bones was incurred during excavation and subsequently as many of the excavators were young farmers from nearby areas with little or no excavation experience. The farmers employed large butchering knives to excavate the site. Some of the knives are visible on photos taken during the excavation and are now on display at the museum in Lviv (Fig. 19). While these kinds of tools are useful for removing loess sediments from bone they can damage it extensively. The tips of these knives are ideal for producing the grooves we observed both on the scapula and the second "anthropomorph." The location and direction of the grooves on the scapula, in particular, are consistent with this interpretation as they occur in groups of sub-parallel lines. It is likely that the wear facets on the "worked" ribs were also produced by these knives in the process of cleaning the bones.

It is clear that a detailed, systematic study of the entire faunal collection remaining from Molodova I must be conducted before the site's taphonomic history can be determined with certainty and the bias introduced into the faunal assemblage as a result of the excavation techniques employed, post excavation treatment of the bones and the selective destruction of the collection can be quantified. Nonetheless, in this preliminary study we have been able to identify the primary taphonomic factors influencing this assemblage. These factors are carnivores, weathering, roots and, perhaps most importantly for the production of pseudo symbolic objects—the excavators themselves.

It should be emphasized that while there is no evidence at Molodova I to suggest that Neandertals engaged in symbolic behavior at *this* site, there is evidence that Neandertals made burials, used pigments and were involved in the production and use of symbolic material culture toward the terminal phase of their existence as a distinct human population. Neandertals produced beads and pendants

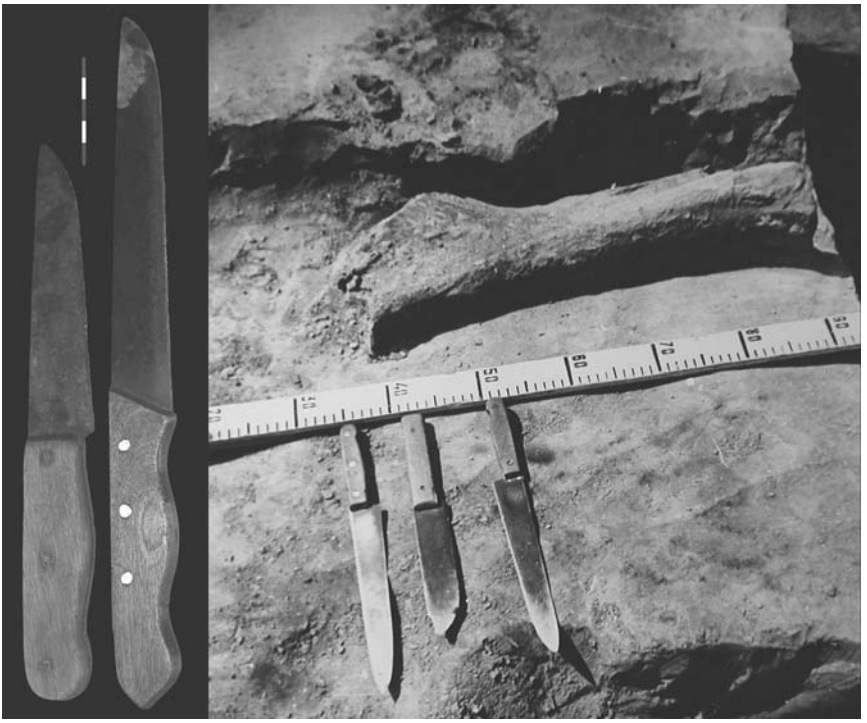

Fig. 19. (Left) Knives used for excavation currently in storage in the Lviv museum and (Right) depicted in a photo taken during the excavation at Molodova.

employing manufacturing techniques that differed from those utilized by contemporary populations of modern humans (d'Errico *et al*., 1998).

This evidence, however, is embroiled in the contentious debate surrounding the relationship between Neandertals and modern humans in Western Europe and the effects of this relationship on Neandertal cognitive abilities including symbolic behavior (see for example, White, 1992; d'Errico *et al*., 1998 [and comments therein]; Zilhão and d'Errico, 1999; d'Errico, 2003; Mellars, 1999; Zilhão *et al*., 2006). For instance, some researchers have argued that Neandertals manufactured the beads and pendants by mimicking modern humans and that they would have been at a loss to use items of personal adornment in a socially meaningful way. In other words, Neandertals were not participating in a symbolic culture. Others have argued that the encroachment of modern humans on traditional Neandertal territories would have motivated Neandertals to actively demarcate their territories and to use items of personal adornment to promote group cohesion while still others contend that "modern behavior" developed independently in Neandertal populations. Taphonomic and experimental approaches are integral to

the evaluation of evidence for Neandertal symboling behavior and these studies will allow researchers to contribute to the increasingly heated debate surrounding the origins and development of behavioral modernity.

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