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SPY CAVE

125 years of multidisciplinary research
at the Betche aux Rotches
(Jemeppe-sur-Sambre, Province of Namur, Belgium)

Edited by Hélène ROUGIER & Patrick SEMAL

Volume 1

2013

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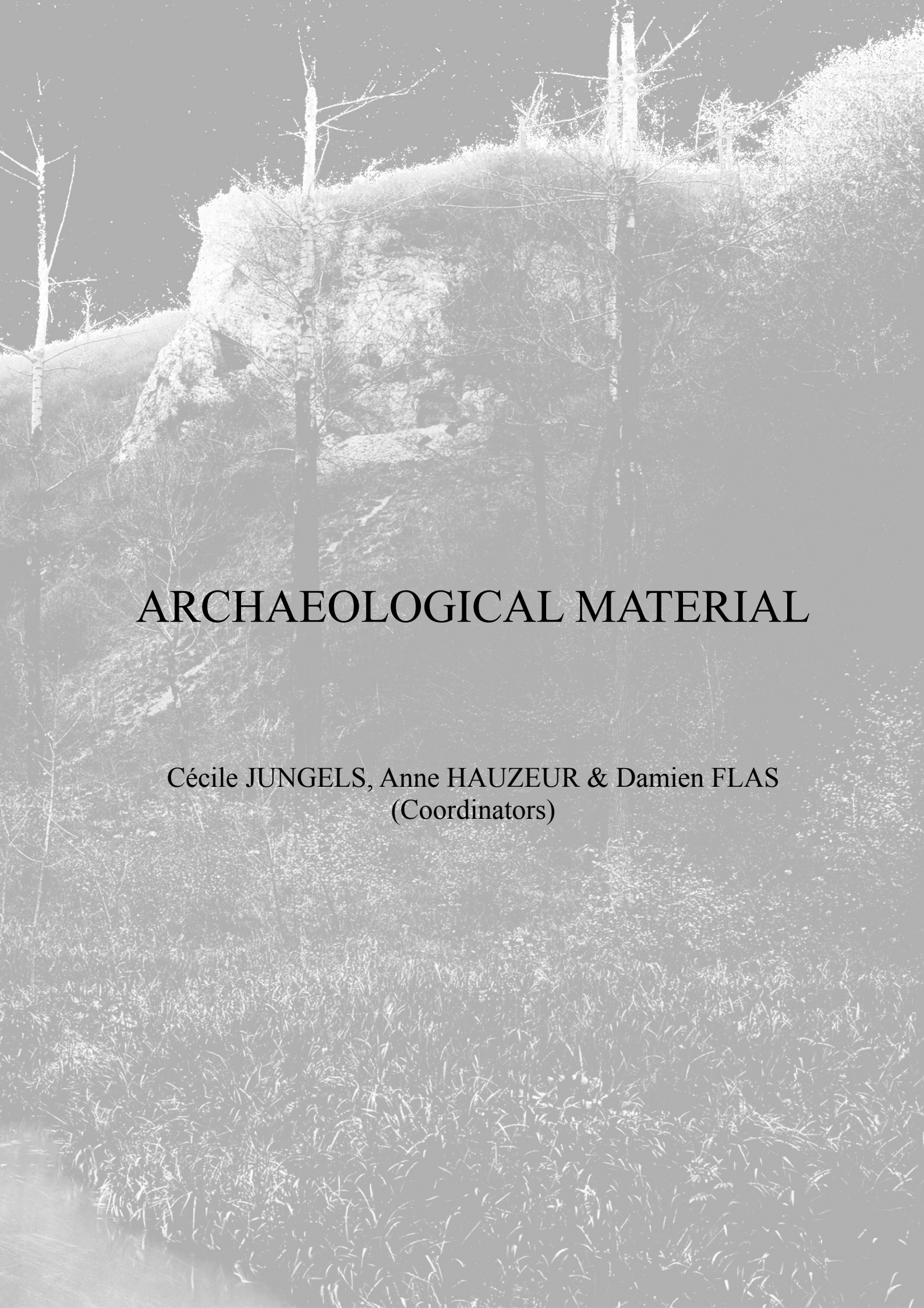

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CHAPTER XIV

CULTURAL AND CHRONOLOGICAL ATTRIBUTION OF THE OBJECTS OF MAMMOTH IVORY FROM SPY CAVE: A LOOK FROM EASTERN EUROPE

Gennady A. KHLOPACHEV

Abstract

Excavations at Spy cave provided one of the richest collections of Upper Palaeolithic ivory artefacts from the territory of Belgium. The main part of the collection originated from a slope, where materials of different archaeological cultures are mixed. Technological and typological analyses of ivory materials from the collection of the Royal Belgian Institute of Natural Sciences, which included ready-made objects, rough-outs, preforms as well as products related to primary ivory knapping, allow us to make a cultural attribution of artefacts and to define relations to Aurignacian, Gravettian and Magdalenian technological traditions of mammoth tusk processing.

INTRODUCTION

Excavations at Spy cave provided one of the best-representative collections of Belgian Upper Palaeolithic artefacts made of mammoth ivory. Nowadays the main part of the bone industry collection from the cave is in the Royal Belgian Institute of Natural Sciences (RBINS), Brussels. Here there are objects from excavations of the cave terrace from the end of the 19th, and beginning of the 20th century, which are few but the most informative in regards to stratigraphical localisation. There are also numerous and various ivory artefacts obtained during excavations on the slope between Spy cave terrace and the Orneau River. The excavations were conducted in 1952-1954 by Professor F. Twiesselmann from the Section of Anthropology and Prehistory of the RBINS in Brussels (see Semal *et al.*, this volume: chapter II).

The most characteristic and most expressive types of bone artefacts from Spy cave were published by the members of the excavation teams (Rucquoy, 1886-1887; De Puydt & Lohest, 1887; de Loë & Rahir, 1911; Angelroth, 1953; Éloy, 1956). Information on bone industry from Spy cave was generally summarised in the research "*Le paléolithique supérieur ancien en Belgique*" by Professor M. Otte (Otte, 1979).

Artefacts of mammoth ivory were found in both the "first fauna-bearing level" (Gravettian) and the "second fauna-bearing level" (Aurignacian). But the main collection of such objects originates from the excavation on the slope, where artefacts from different periods became mixed (SF1). Ivory objects of types similar to those in both the "first and second fauna-bearing levels" are present in the same lithological layers.

At the same time there are several categories of finds which hardly found any parallels either in the Aurignacian or in the Gravettian levels. Some of them are obviously much younger, such as a crucifix made on a piece of mammoth ivory from the Pleistocene deposits. It is also possible that the materials from the slope excavation include some ivory artefacts of Magdalenian age. Typological analysis of materials from Spy revealed evidence in support of the presence of ancient people in the cave during Magdalenian times (Otte, 1979: 310).

Therefore it is hardly possible to make a cultural attribution of the ivory artefacts from the RBINS collection without looking for analogies in collections from Upper Palaeolithic sites in Belgium and in other countries as well. The use of mammoth ivory for making the artefacts of

our study was a reason to take in comparison not only Palaeolithic materials from France, but also from Central and Eastern Europe. Many archaeological sites with numerous and various ivory artefacts are situated in those territories, and traditions of mammoth ivory processing were developing there for the whole Upper Palaeolithic epoch (Khlopachev, 2006: 10-11).

Technological analysis of ivory artefacts from the Spy collection was also very important for their cultural attribution. The presence of objects in different stages of production in the collection gave us an opportunity to define several technological contexts based on technological but not on typological characteristics.

There are 221 total objects of ivory industry kept in the RBINS. Only 6 of them are connected to the stage of mammoth tusk primary knapping. The greater part (215 objects) consists of preforms in different stages of processing and completed artefacts−projectile points, beads, pendants, needles, polishing tool, spatula, wedges, as well as different rods and their fragments (Table 1).

ANALYSIS OF IVORY ARTEFACTS

Products of mammoth ivory primary knapping

Primary knapping of mammoth ivory at Spy is represented by a tusk fragment with negatives of several narrow blade-like spalls more than 4 cm long (terminated with a break), 1.2 cm wide and 0.3-0.4 cm thick. This ivory core fragment was found in unit 9-10F, ZJM layer, at a depth of 0.9-1.15 cm from the surface. The technique used for spalls production is very specific. They can be obtained only by using a punch for indirect percussion from a stepped platform at the edge of a tusk butt. Judging on shape and proportions of these blade-like spalls, they could be split only from frozen, naturally wet tusk. This was verified by recent experiments conducted by the author together with E. Girya (Khlopachev & Girya, 2010: 45-49). They defined that it was possible to knap naturally wet ivory without problems only if it was frozen below -25ºC and over. In this case there is no need to use enforced blows, and it is necessary to follow only one rule; the ventral surface of any spall with its platform on a tusk butt should be tangential to the tusk growing cones. Three larger, transversally fragmented pieces of narrow blade-like spalls were found in unit 14F and another one in unit 10A-E. All of them were produced with the same technology. This can be considered as evidence that tusk knapping took place on the site, and it was during times of cold.

At the same time, materials from Spy demonstrate that very different techniques of mammoth tusk splitting for rough-out production were used at the site as well. Those techniques were oriented towards using conventionally "dry" mammoth tusk, which had already lost part of its natural wetness. It is a technique involving the removal of a flat rod from the surface of the tusk.

A large flattened rod is indicative of this technique. Its length is 34.4 cm, width 1.7-2.4 cm, and thickness 1.0-0.5 cm; its edges are sub-parallel. The outer surface of the rod keeps the tusk's natural roundness; the inner surface was formed by knapping. The uneven knobby and delaminated shape of this surface is evidence that the rod was split from "dry" tusk which had partially lost its natural wetness. The shape of the rod and its thickness were predefined by two parallel grooves, which were cut perpendicular to the tusk surface before the rod was split away. Remains of such grooves were preserved at the largest distal part of the object. According to the depth of the grooves and proportions of the rod it was split away by being blown from a striking platform, which was located on a butt break at the distal end of the tusk.

Such a technique of large flat preforms production is well represented in materials of Epi-Gravettian sites in the centre of the Russian Plain (Khlopachev, 2002) as well as at some Magdalenian sites in Central (Bosinski, 2007: 159-160) and Western Europe (e.g. I have mentioned such a technique when studying the ivory collection from the La Madeleine rock-shelter).

The most simple way for tusk primary splitting recorded on Spy cave materials was just to take ivory plates off from delaminated tusk, which had lost part of its natural wetness. The

Cat. No.	*Categories of objects*	*Number of items*	*Cultural attribution*		
			Aurignacian	*Gravettian*	*Magdalenian*
1.	Projectile points	**16**			
1.1	Massive-base points	3	+		
1.2	Point rough-out	1	+		
1.3	Large fragment of point with cut-marks at the base	1		+	
1.4	Points with chopped and cut base	3		+?	+
1.5	Point fragments	8		unidentified	
2.	Flat tools with rounded end	**2**	+		
3.	Wedge	**1**		unidentified	
4.	Spatula	**1**		unidentified	
5.	Needle	**1**		unidentified	
6.	Rods	**61**			
6.1	Rods of small diameter with chopping-cutting traces	41	+		
6.1	Rods of small diameter with traces of sawing around the whole circumference			+	
6.2	Rods of big diameter with chopping-cutting traces	20	+		
6.2	Rods of big diameter with traces of sawing around the whole circumference			+	
7.	Rough-outs and preforms for making beads and pendants	**33**	+		
8.	Ivory beads	**70**			
8.1	Beads of drop-like shape	45	+		
8.2	Bead of flattened cylinder shape with a hole on one end	1	+		
8.3	Beads of reduced reindeer fang shape with a hole at the end	3	+		
8.4	Beads of ellipsoid shape with an isthmus	3	+	+	
8.5	Saddled barrel-shaped beads	2		+	
8.6	8-shape beads	5		+?	+?
8.7	Beads of roundish and oval shape	9	+		
8.8	Bead of rectangular shape	1		+?	+?
8.9	Bead of oval shape with a double side hole	1		+?	+?
9.	Balls	**10**	+	+?	
10.	Pendants	**15**			
10.1	Pendants with an ear-shape	3	+		
10.2	Flat ring-shape pendants	5	+		
10.3	Perforated disc	1			+
10.4	Rod-shape pendant with a double-sided hole at the end	1	+		
10.5	Pendant on a thin blade with deep notches on the edge	1			+?
10.6	Pendants of undetermined form with perforation	4	+		
11.	Inner tusk growing cone, decorated	**1**	+	+?	
12.	Mammoth tusk fragment with splitting traces	**1**			+
13.	Lengthwise ivory blades	**4**		+	+
14.	Narrow lengthwise spalls	**4**			+
15.	Long flat rod	**1**	+?		+
TOTAL		*221*			

Table 1. Typological categories of studied ivory artefacts and chrono-cultural attribution of Palaeolithic ivory artefacts from Spy cave (collection of the Royal Belgian Institute of Natural Sciences, Brussels).

existence of such a technique is proven not only by the presence of plenty of naturally delaminated tusk products in the collection; rods are also present which were cut out from naturally delaminated pieces of so-called "growing cones"−the structures which develop when the tusk is growing. The ends of such rods usually keep traces of grooves which were cut from the natural, wide surfaces of the products of tusk delamination. Such a technique of achieving a

flat ivory rough-out was widely-spread and actively used on Aurignacian sites in Western and Central Europe (Otte, 1974: 93, 1995; Hahn, 1995), but was rarely used on Eastern Gravettian sites (Khlopachev, 2006: 130-132).

Thus, we have technological evidence for the presence of ivory artefacts during the Magdalenian, as well as the Aurignacian, in the materials from the excavation on the slope. Unfortunately, there were no securely Gravettian artefacts with traces of primary splitting found in the collection.

Each of the techniques described above, of primary knapping/splitting, enabled three possible types of rough-outs, all of flat form but different in shape and proportion. Those rough-outs were then transformed into complete implements of flat shape, or used for producing rod-shaped preforms for beads and projectile points. Many of such objects−both preforms and ready-made−usually keep macro-traces good enough to define the type of rough-outs from which they were made (Khlopachev, 2006: 31-48). This means that many items can be related to one of the techniques of primary ivory splitting/knapping described above and that we can trace their whole *chaîne opératoire*.

Rods and their fragments

The most plentiful categories of artefacts from Spy are rods and also beads and pendants. These artefacts have round or oval cross-sections and are represented mainly by fragments. Based on diameter, the rods can be divided in two groups.

The first group consists of rods with small diameters (< 0.5 cm; 41 pieces). Rods with round cross-sections and a diameter of 0.2-0.35 cm prevail among them.

According to the surface treatment, characteristics, and size of the objects, these rods were made of products from natural delaminating ivory, which was broken off from a tusk. The traces of treatment on either ends of those rods suggest a high probability of their use as preforms for the production of beads of cylindrical and flat shapes. To separate them from a rod the following method was used: first a deep groove was made along the whole circumference of the rod and separation using oncoming chopping-cutting technique was planned. Then the rough-out was broken off from the rod (Figure 1).

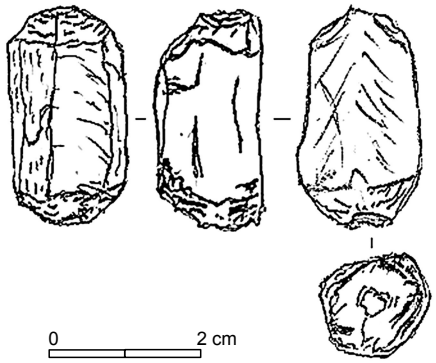


Figure 1. Spy cave (lower layer of the slope deposits). Example of a second-stage preform for button-chevrons of drop-like shape.

A very different preparation technique for the separation of the rough-out from a rod was registered in 3 cases. The groove was made by sawing along the whole circumference of the rod, or just around the half of its circumference. We did not find any primary rough-outs with traces of this method of separation in the archaeological materials from Spy excavations during our research.

The second group includes rods with bigger diameters (≥ 0.5 cm) and they are more scarce (20 pieces). Judging on peculiarities of object orientation regarding tusk laminated structure, it is clear that all of them were cut out from rough-outs of flat shape or directly from the tusk surface. As this group is represented by fragments only, it is difficult to get more information about the technology of their production. The group includes "thick" rods, mainly with diameters of 0.5-1.0 cm. Pieces with diameters of 1.5-2.0 cm are rare in the group. The rods of the second group always have a roundish cross-section. The majority are represented by large artefact fragments. It is easy to define distal (sharpened) ends (2 pieces) and medial parts (10 pieces) of points. An engraved spiral ornament was revealed in one case. Waste pieces connected with massive rod-like objects are very rare (8 pieces). They are represented by

scraps of rods with traces of transversal segmentation made by the chopping and cutting technique (7 pieces). A single trace of transversal sawing for the preparation of preform separation was defined on a fragment of a large rod (2.8 x 1.4 x 1.4 cm; Figure 2).

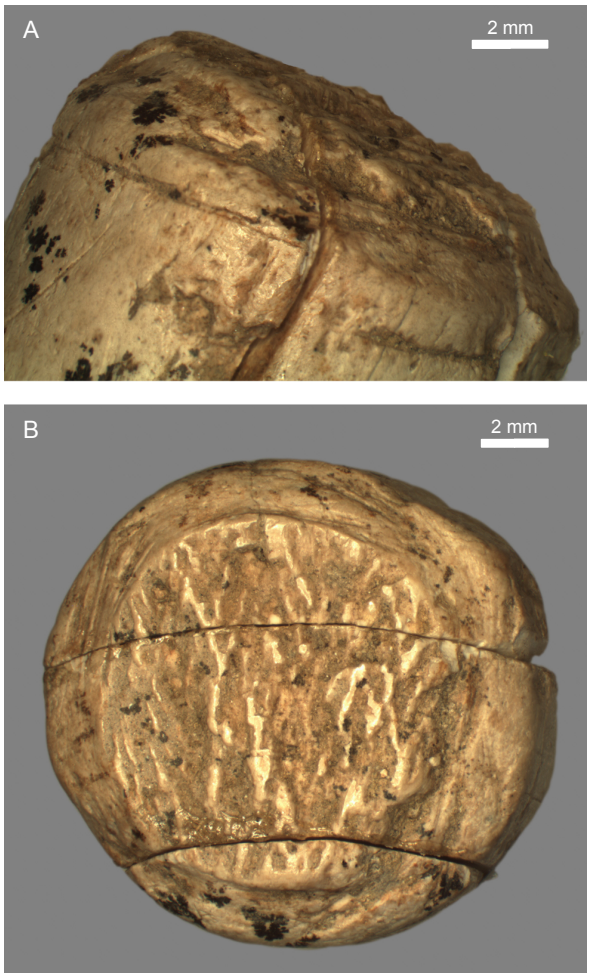


Figure 2. Spy cave. Rod with traces of sawing along its circumference.

Three small lengthwise ivory spalls (2-3 cm length, 1.1-1.5 cm width and 0.4-0.7 cm thick) can also be considered as evidence that fragments of thick rods present in the collection are pieces of completed and broken implements. All of them came from the upper layer of the slope sediments, but they are not connected with the primary stage of ivory splitting. They appeared as a result of damage or formed during the process of reshaping ready-made objects of rod-shape. This conclusion is based on the character of the outer (dorsal) surface of those spalls. This surface was carefully treated and polished before being separated. Well-treated outer surfaces of large rod-like objects with round cross-sections were preserved on the spall's surface in two cases. In one case the spall split through the point base.

Projectile points

Projectile points are one of the most important categories which can be used for the cultural and chronological attribution of bone industries. Together with antler points with split- and forked-bases, there are many complete points and point fragments made of ivory in the collection of Spy.

There are points of Aurignacian type (Aurignacian split-based points) and numerous fragments of points (for details, see Flas *et al.*, this volume: chapter XII). The technology of making the points is in some cases as interesting as the typology.

One very interesting example is a point made of ivory, intensively ash-coloured, with a broken distal end (length: 13.2 cm, width: 2.9 cm, thickness: 0.9 cm), which originated from the lower layer of the slope excavation (unit 11B, 1952). There are many shallow grooves on the wide surfaces of the point base, parallel to each other and perpendicular to the long axis of the point. The wide surfaces of the point preserve the cement cortex and also preserve traces of preparation of the preform for separating by two deep grooves directly beneath the preform rod base. Those grooves were cut from the outer surface of the tusk. According to this evidence, the point preform was cut not from a wide flat spall, but from a massive rod. Such a technique of producing rod preforms is well represented at Gravettian sites of Central and Eastern Europe, as well as at Epigravettian sites in Eastern Europe, but practically unknown in the European Aurignacian.

A point with a beveled base is represented by a base fragment, as we interpret a small part of a rather big rod-like object with a roundish cross-section (diameter 0.6 cm), sloped flattening at the end and traces of scratching. The point was made of mammoth ivory. It was found in 1950, in unit 7D-E, in the lower layer.

Figure 3. Spy cave. Point with chopped and cut base.

Also of great interest are points with chopped and cut bases (known in French literature [Mons, 1974] as "*sagaie à base raccourcie*" or "*sagaie à base découpée en gradins*"; Figure 3), which are present in the studied collection as a series of finds (2.1 x 0.5 x 0.4 cm; 3.1 x 1.0 x 0.9 cm; and 10.6 x 1.0 x 0.9 cm). They have roundish cross-sections and are coloured black. Judging from the size and proportions of these points, as well as from the peculiarities of their orientation regarding whole mammoth tusk structure, they were cut out from flat rods similar to the rod described above. Taking into account such technological peculiarities of getting rough-outs for making projectile points, as well as their typology, those points should be related to those materials that indicate the presence of humans in the cave during the Magdalenian.

Preform rods of large and small diameter were used not only for making points, but also for making beads and pendants.

Beads

There are no less than 9 different types of beads in the Spy cave collection:

1. Beads of drop-like shape (45 pieces; Figure 4; SF2): objects of cylinder shape that have a flattened end with a round hole. The size of these objects is 1-1.5 cm. This type is the best represented by finds and makes it possible to model the sequence of their production with the most possible detail.
   Ivory rods of roundish cross-section (diameter 0.35-0.8 cm) were used as a first-step preform. They were cut from ivory plates

Figure 4. Spy cave (Aurignacian). Example of a bead of drop-like shape.

Figure 5. Spy cave (Aurignacian). Uncompleted bead of drop-like shape (A); Traces of notch making by a planing-scraping technique (B) on the flattened end.

removed from delaminated tusk. Second-stage preforms were cylinders of 1-1.5 cm length (Figure 1). They were separated from rods by chopping-cutting. When a wide and thin isthmus appeared on the rod, a preform cylinder was broken off. Then one of the preform ends was flattened by two symmetrical spalls (SF3). Spalls were taken from a knob-shaped end of a preform, which appeared as a result of the chopping-cutting technique, to separate a preform from a rod. The resultant surface was treated by a planing and scraping technique (Figure 5B). The other end of the preform was also planed by shaving (SF4). Peculiarities of the cut surfaces and size provide evidence that the ivory rough-outs were wetted before processing to make them smooth. The next stage was to make a hole in the middle part of the flattened end. Two deep depressions were made in front of each other on both flattened surfaces using a planing-scraping technique (Figure 5A). Then the blank was pierced and the perforation widened with the hole expansion technique resulting in the completed hole having a sub-oval shape (Figure 4; SF5). Generally, holes are of biconic shape and measure up to about 0.3-0.1 x 0.4 cm. Beads of such a shape are very characteristic of Aurignacian sites of Western and Central Europe (Hahn, 1986; White, 1996: 32; Kölbl & Conard, 2003: 37). Thus, peculiarities of shape, the whole production sequence from a

Figure 6. Spy cave (Aurignacian?). Bead of reduced reindeer fang shape.

rough-out to finished artefact, and data about the stratigraphical position of finds in the cave terrace sediments demonstrate that this type of find undoubtedly belongs to the Aurignacian.

2. Beads of flattened cylinder shape with a hole on one end. There is only one object (1.5 x 0.8 x 0.5 cm) of such type in the collection. It was found in the lower layer of sediments on the slope. Its preform was separated from a rather large rod of oval cross-section. The method of preform separation and the technique for making a hole are the same as for making drop-like shape beads (SF5). The only difference is that the end of the type 2 bead was not flattened before making a hole. Probably this is because of the originally flat shape of the preform. This leads to the conclusion that the described type is a sub-type of beads of drop-like shape. Those peculiarities as well as the presence of similar finds in an Aurignacian layer of Geißenklösterle in Germany (Kölbl & Conard, 2003: 37, 40, 41) enable us to suggest that the origin of this type of bead is from an Aurignacian layer of Spy cave.

3. Big beads of reduced reindeer fang shape, with a hole at the end (3 pieces; Figure 6). This type is represented by two completed objects (the biggest is 2.4 x 1.5 x 0.8 cm in size) and one unfinished object (2.3 x 0.7 x 0.6 cm). Large rods were used as a primary stage preform for those objects. All the other characteristics−technique of achieving a preform of cylinder shape, technique of flattening of the preform end, technique of making a hole−were the same as for producing beads of drop-like shape. However, taking into account the far larger size of reindeer fang-like objects, these objects can be considered also as pendants. These finds originate from both upper and lower layers excavated on the slope (SF1). There are rather numerous indications of using mammoth ivory as a raw material for objects which imitate natural organic objects (reindeer teeth among them). They are present in the Aurignacian of Western and Central Europe, in the Aurignacian layers of Geißenklösterle and Hohle Fels (Kölbl & Conard, 2003: 39), and also in the Gravettian of Central Europe (Geißenklösterle; Hohle Fels, AH IIcf and AH 2b horizons) (Kölbl & Conard, 2003: 40, 41) and Eastern Europe (Avdeevo; Kostenki 1, upper layer; Khotylevo 2; Gvozdover, 1995: 86-87; Khlopachev, 2006: 66, 91).

Figure 7. Spy cave (Aurignacian?). Bead of ellipsoid shape with an isthmus.

4. Necked beads of ellipsoid shape (Figure 7): a short rod with roundish cross-section and knob-shape ends. A groove in the middle part of a rod was made by chopping-cutting along the whole circumference (3 pieces) (SF6). There are two complete objects (1.5 x 0.5 x 0.5 cm) as well as a half-broken one. The knob-shape surface at the ends of the object is a result of the making of grooves along the circumference of a preform rod before breaking off a bead preform. So, the same technique was used for separating a bead preform and for making a central groove. Nevertheless the described double-cylinders with an isthmus are obviously completed objects because the traces of cutting on their ends were carefully smoothed. The technique of making beads with an isthmus looks more simple, but it can also be considered as a part of the same technology as was used for producing the types of beads described above. Similar beads are known at the Goyet site (Otte, 1979: 412-413) and from the Aurignacian-Gravettian transition horizon at Hohle Fels (Kölbl & Conard, 2003: 39, 94).

   The relation of another type of barrel-shaped beads with an isthmus to that technology is more questionable.

5. Barrel-shaped beads with an isthmus and lengthwise grooves on a round surface (2 pieces; Figure 8; Otte, 1979: 298-299). These objects are short and massive rods of roundish cross-section, with straight vertical butts and shallow grooves made by sawing along the circumference. There is one complete artefact of this type (2.3 x 1.1 x 0.9 cm) and one broken piece in the collection. Specific of this type is the use of sawing along the circumference for separating the preform and for making a groove in the middle part of a bead, and also the presence of long deep grooves running from the ends to the middle part of an object. The only object similar to this one (but not in all details) we know in Eastern Europe is from the Gravettian site Kostenki 4 (upper layer; Rogachev, 1955: 78-79, 84, 86). This site does not belong to the Eastern Gravettian tradition, but the lithic industry of the site shows surprising similarities with the lithic industry of the Perigordian VII (Protomagdalenian; Bordes, 1978). Beads from Kostenki 4 were made of ivory and limestone with the use of the same technique.

   Finally, there is a small group of beads which were made from thin flat plates. These are 8-shaped beads, and also beads of roundish, oval and rectangular shape.

6. Beads of roundish and oval shape with a double-sided hole (9 pieces; Figure 9). Objects are flattened, their size varies between 0.9 x 0.5 x 0.2 cm and 1.4 x 1.0 x 0.5 cm. A hole is always located in the middle part of the bead. First, two pits were hollowed from two sides of a preform in front of each other, similar to types 1 or 2. Then a hole was expanded by feather-drilling. The diameter of the hole is 0.3-0.35 cm

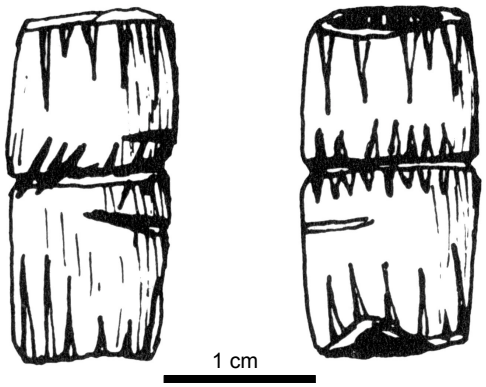


Figure 8. Spy cave. Saddled barrel-shaped bead (reproduced from Otte, 1979: 299).

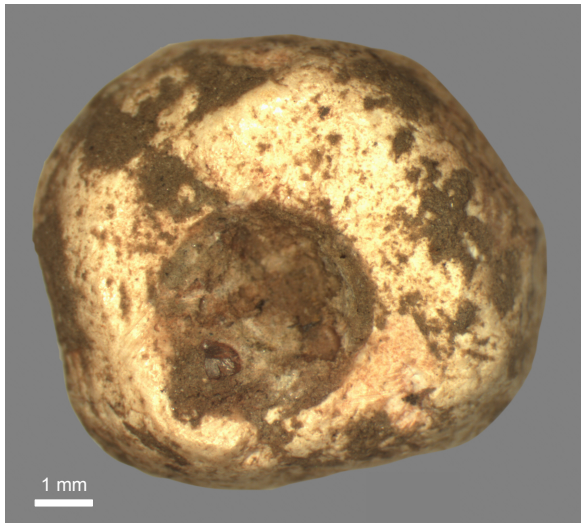
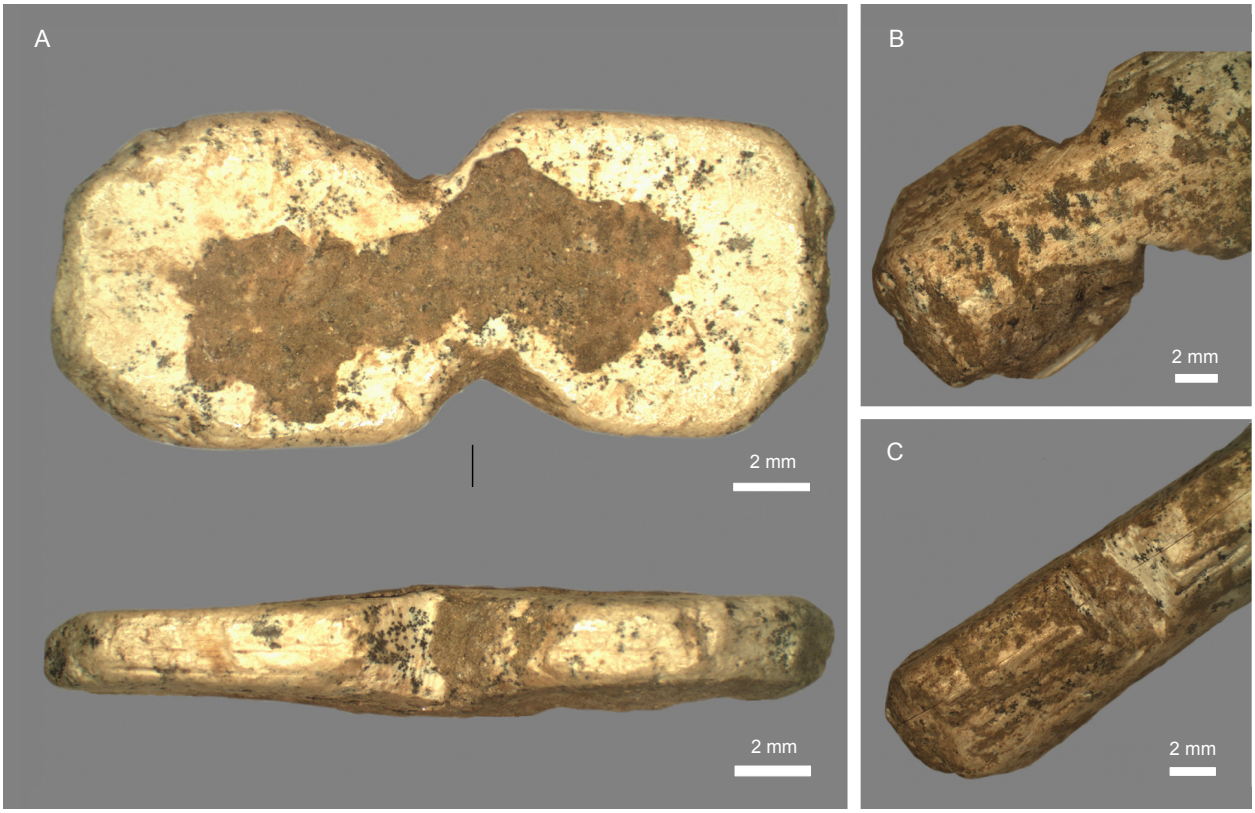


Figure 9. Spy cave. Bead of roundish and oval shape.



on almost all beads of this type. Finds of this type came from the upper, the lower and the ZJS layers of the slope. Direct analogies for those objects are present in the Aurignacian layers of Hohle Fels (Kölbl & Conard, 2003: 98). All of these data suggest an Aurignacian attribution for the discussed objects.

7. Beads of figure-of-eight shape (5 pieces; Figure 10A): flattened objects of rectangular-like or oval-like shape with an isthmus in the middle part, which divides them in two roundish segments with a hole in the centre of each segment. The isthmus was made by two grooves with a U-profile located in front of each other (Figure 10A-C). Objects of this group have quite a standard size−2.2 x 0.9 x 0.4 cm; 2.6 x 0.9 x 0.5 cm; 1.2(broken) x 0.8 x 0.4 cm; 2.5 x 1.0 x 0.35 cm; and 2.5 x 1.0 x 0.67 cm. Objects of this type are not numerous in the collection, but they allow developing a good picture of the different stages of their production. Flattened rods were used as a first-stage preform. These rods were cut out from ivory plates formed as a result of tusk dentin delaminating. The thickness of the plates determined the thickness of the finished objects. The edges of the preforms were treated very carefully. Wide surfaces preserved the natural surfaces of delaminated ivory, so the only necessary work was to make holes in each of the object segments. Holes were of biconic shape, but the technique of their making differs from that used for the making of holes on drop-like shape beads. Holes on the figure-of-eight objects types were made by scratching out from the bottom of a hole. Following this, feather-drilling is used to expand the hole. This involves moving the cutting tool back and forth at a smaller angle than when feather-drilling (Figure 10D). Unfortunately, there is no information about the stratigraphical position of these finds, but one of these objects is intensively coloured with ochre, and this can suggest their relation with the "second fauna-bearing level", from which the Aurignacian occupation(s) is the most valuable chrono-cultural attribution. Nevertheless the technical peculiarities of the production of such objects favour to exclude them from the previously suggested *chaîne opératoire* of beads production in the Aurignacian (Otte, 1974: 95). Unfortunately, we do not know any direct analogies to 8-shape beads at Aurignacian sites

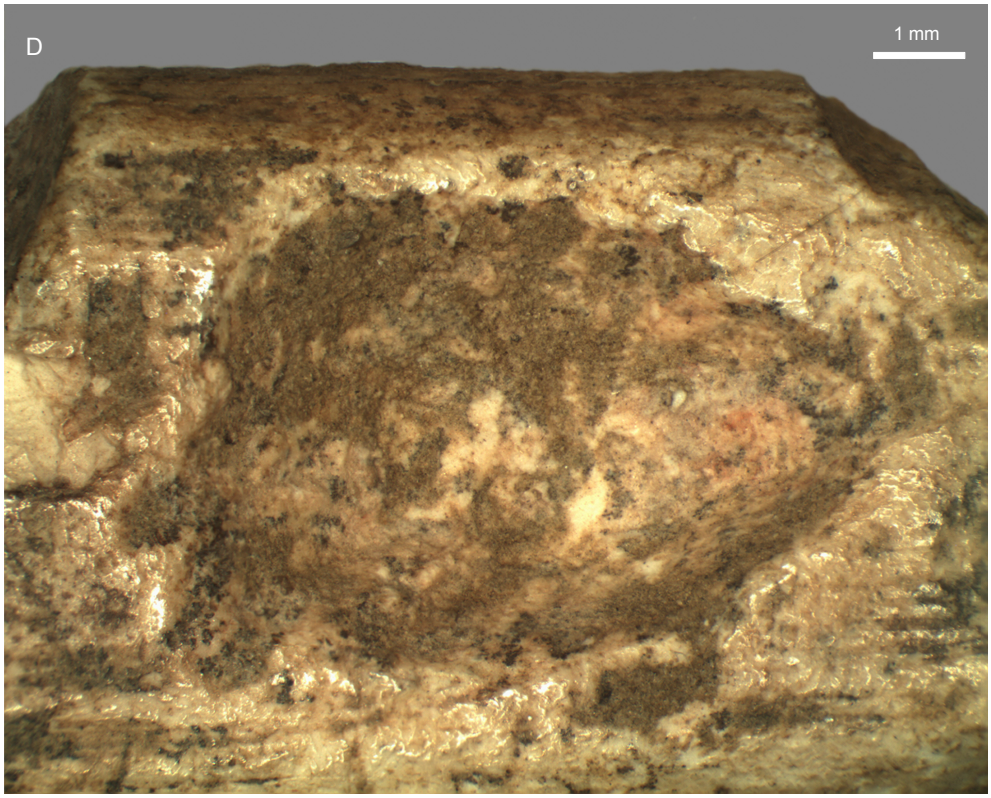


Figure 10. (opposite page and above) Spy cave. 8-shape bead.

neither in Belgium nor in Central and Eastern Europe. 8-shape beads from Spy are different from 8-shape beads from Magdalenian sites (Brillenhöhle, layer IV, and Hohle Fels, Magdalenian layer; Kölbl & Conard, 2003: 122) and from the Eastern Gravettian site Pushkari I in the upper Dnieper region (Khlopachev, 2006: 217). The neck on Magdalenian and Eastern Gravettian beads was cut not only from the edges, but along the whole or half of the perimeter. No case of hole making was reported for these objects. Gravettian and Magdalenian beads were made in series. Narrow blade-like spalls were used as rough-outs for those beads, but not rods cut from products of natural delamination.

Some types are represented by single finds.

8. Big bead of rectangular shape with a hole in the centre (1.5 x 1.1 x 0.4 cm; Figure 11). Based on its lengthwise and transversal cross-sections, the presence of transversal cut-off traces only on two opposite edges, as well as the traces of scraping when smoothing one of the wide surfaces, it is possible to suggest with a high probability that a narrow lengthwise spall was used as a preform for this object. The diameter of the hole is 0.4 cm, which is close to the object thickness. First the hole was cut through, and then expanded by feather-drilling (Figure 11B). Cutting through and feather-drilling were made from both sides of the object. There are cross-like grooves on the edges of the bead (Figure 11A). The bead surface is intensively ash-coloured. It was found in the upper layer of unit 17A'-C' on the slope. The shape and production technique of this bead are similar to those of the series of rectangular uncompleted beads from Goyet cave, which were not separated from a flat rod (Otte, 1979: 413). In Eastern Europe, such types of beads are characteristic for sites of the Epigravettian (15-13,000 BP), such as Mezin (Shovkoplyas, 1965: 212-213), Yudinovo (Grigoryeva, 2005: 41), and Eliseevitchi 1 (Khlopachev, 2006: 145, 147).

9. Big bead of oval shape with many parallel grooves on the edge and with one hole which

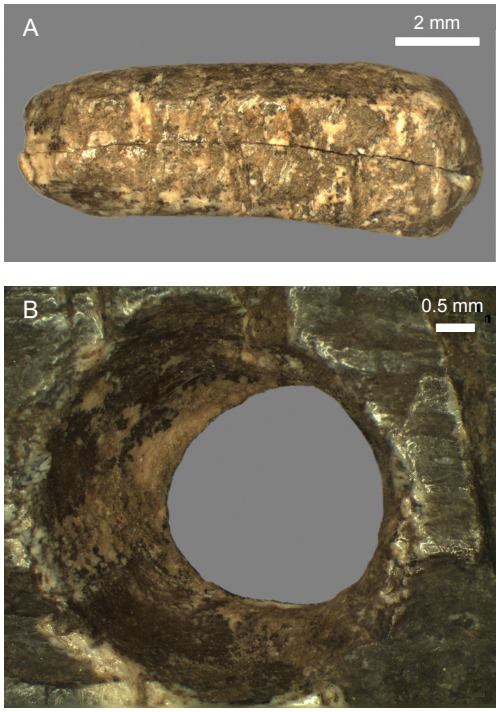


Figure 11. Spy cave. Big bead of rectangular shape with a hole in the centre (A: cross-like grooves on the edge; B: the hole in the centre).

runs through the object and one blind hole (Figure 12). This object is also ash-coloured. The wide surfaces of the object retain traces of flattening. The complete hole (0.7 x 0.5 cm) has much steeper walls and a more elongated shape compared to the hole on the rectangular bead. This is the result of the wrong positioning of drilled holes on the opposite surfaces of the preform. Nevertheless the technique of feather-drilling used here looks very advanced. This is indicated by the traces of the blind hole's feather-drilling close to the roundish edge of the object. The shape of the blind hole is close to a symmetrical circle, and the bottom is symmetrically concave.

Ivory pendants from the Spy cave collection are no less various. There are 6 types of pendants. They are described in detail by M. Otte who describes the well-known pendants of ear shape (3 pieces), flat ring-shape pendants from the Aurignacian level of the cave (5 pieces), a fragment of perforated disc, which is dated based on similar materials from the Trou de Chaleux site (Lesse valley, Namur prov., Belgium; Otte, 1979: 300, 310) to the Magdalenian (Otte & Teheux, 1986), as well as a rod-shape pendant with a hole at the end, which was not attributed. There is no difference in shape and production technique between this pendant and beads of the type 2 described above, but the size of the pendant is larger.

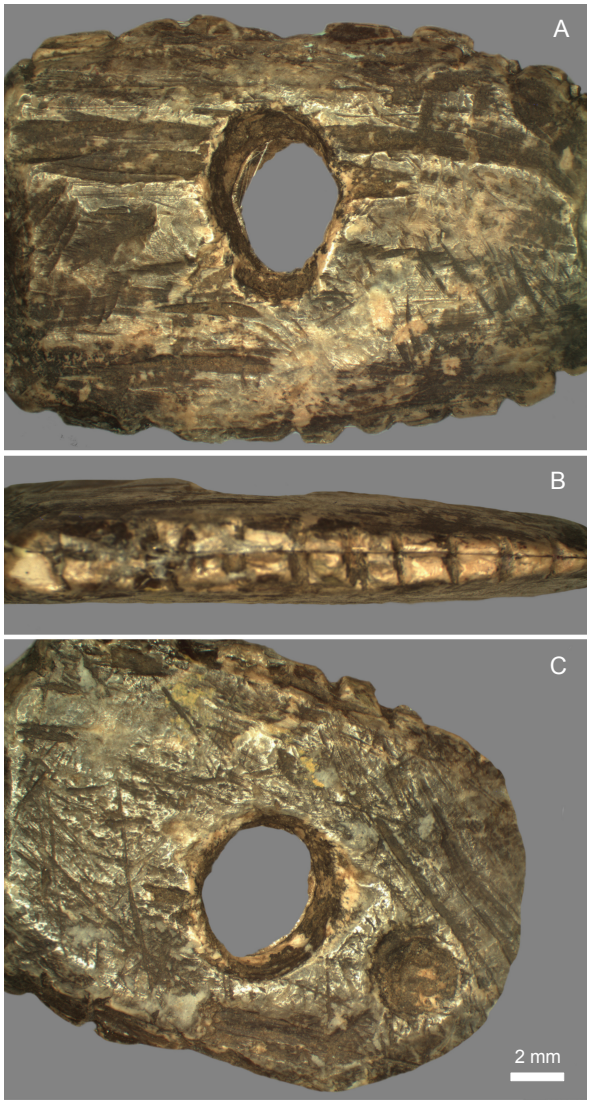


Figure 12. Spy cave. Big bead of oval shape (A) with parallel grooves on the edge (B), one through-coming hole and one blind hole (C).

Besides these, we have found a pendant fragment (1.2 x 1.0 x 0.3 cm) in the materials from the 1952-1954 excavations with a thin blade of oval cross-section, deep notches on the edge and a biconic hole at the end (Figure 13).

Figure 13. Spy cave. Fragment of pendant on a thin blade with deep notches on the edge and with a biconical hole at the end.

The hole was made by a planing-scraping technique, and then expanded by feather-drilling. The object was found in the upper layer of the slope. A series of pendants with uncertain shapes but with oncoming holes for hanging has also been discovered. We also established a similar hole for hanging on a small mammoth epiphysis, which was also used as a pendant. Pendants of this type were found in both lower and upper layers of the slope, but small bones and bone fragments were used as pendants mainly in the Aurignacian. For example, there are many of such finds in the Aurignacian layers of Abri Pataud (Bricker, 1995: 194-195).

A series of ivory balls of unknown purpose (diameter 0.4-1 cm) (Otte, 1979: 299-300; Figure 14) should also be mentioned among other ivory objects which can be used for cultural attribution. Such balls are present in materials of many Eastern Gravettian sites dated to 25-21,000 BP in Central and Eastern Europe (Gvozdover, 1995: 90). A similar surprising relation is found with the zigzag ornamentation on the end of a mammoth tusk growing cone from the Aurignacian level on the terrace of Spy cave. This ornamentation was made with a very specific technique; wedge-shape notches were cut towards each other in two staggered rows (Figure 15). Such ornamenting tradition is well represented in materials of many Gravettian sites in Eastern Europe (e.g. Kostenki 1, layer 1−context 1 and 2, Khotylevo 2, Avdeevo; Zavernyaev, 1981: 147-148; Praslov & Rogachev, 1982: 58; Gvozdover, 1985: 10-11). This is another example of how some elements of bone industry appeared first in the Aurignacian and then spread to the Eastern Gravettian of the Russian Plain.

Figure 14. Spy cave. Ivory ball.

CONCLUSION. CHRONO-CULTURAL ATTRIBUTION OF THE PALAEOLITHIC IVORY ARTEFACTS FROM SPY CAVE

The data obtained for the Upper Palaeolithic ivory industry from Spy cave suggest not only artefacts of Aurignacian and Gravettian periods, which were found in two different levels

Figure 15. Spy cave. Inside of a mammoth tusk growing cone, with a zigzag ornamentation made by cutting of wedge-shape notches towards each other in two staggered rows.

of the terrace, but also materials clearly related to the Magdalenian (Table 1). The main part of the finds is related to the Aurignacian. During the Gravettian and Magdalenian, the use of ivory by settlers of the cave was much less. The results obtained during the study allow us to define the presence of several technological traditions of ivory processing on the site. This concerns both primary splitting and secondary processing.

Different ways of secondary treatment were defined in the technique of making holes and grooves on beads and pendants. The making of biconic holes by first oncoming shaving and planing-scraping from two sides, and then hole expansion by feather-drilling is the best-represented technique among the material of ivory industry from Spy cave. This technique is characteristic of the main part of ivory beads and pendants, which can be mainly related to the Aurignacian of the site based on typological and stratigraphical data. However, there was also a slightly different technique of hole making. Holes were also made by scratching from the bottom of a hole, which was then expanded by feather-drilling. Different kinematics and tools with different shapes of working edge were used in this technique than in the formerly described technique. This technique was used for making holes in flat beads of figure-of-eight shape only. Unfortunately, the cultural attribution of these finds remains unclear. They could be related to both the Aurignacian and the Gravettian.

Differences were also defined in the technique of making necked beads and pendants, which are present in the collection of Spy cave in quite small amounts. On some of the objects a central groove was made by an oncoming chopping-cutting technique. On the other necked beads, which are bigger than the objects of the first group and morphologically different from them, a groove was made by sawing along the circumference. Differences in techniques allow dividing these objects in two technological contexts. Techniques of primary splitting and secondary processing, which were used for making beads with grooves made by

chopping and cutting, completely fit the technological context of the Aurignacian beads making. Beads and pendants with grooves made by sawing can be related to some other objects (mainly with rods of roundish cross-section). These were segmented by sawing along the circumference, and a large point made of an ivory rod was cut out from the tusk body by cutting from the outer surface.

Thus, peculiarities of secondary treatment allow for the definition of three different technologies of ivory processing. One of them can be related with a high probability to the Aurignacian cultural tradition, while the two others are of different traditions, most likely the Gravettian and Magdalenian.

There are technological differences also in the techniques of primary ivory splitting. Three different strategies of ivory primary splitting were defined in the materials of Spy cave. They can be related with certain cultural traditions.

The best-represented strategy was based on the use of ivory which lost its natural wetness. Its aim was to create first-stage preforms of flat shape by taking plates off from a delaminated and fractured tusk, as well as to knap long flat rods using two lengthwise subparallel shallow grooves. These techniques naturally supplement each other. Both of them are well represented in the Aurignacian of Belgium. Peculiarities of forms and proportions of the preforms, which were obtained by this technology, completely fit the technical and morphological peculiarities of ivory objects from the Aurignacian of Spy cave.

The other strategy is represented by completed artefacts only. Rod-like objects were obtained not from flat preforms, but massive rods were obtained directly from a tusk body. Such preforms were obtained by the cutting of two deep and wide inclined grooves which almost join under the base of the preform. Such a technique is characteristic for Gravettian ivory industries, as well as for sites of the Magdalenian period in Eastern Europe. In the Spy cave collection, this technique was found on objects which typologically relate to the Gravettian.

Finally, one more strategy of tusk primary processing was based on the use of deep frozen “fresh” (naturally wet) ivory. This allowed creating a series of regular narrow flat blades by knapping. We suggest that the technique of producing long flat rods by knapping from the drying tusk, after the grooving of two sub-parallel grooves on the tusk surface, is a part of the same technological traditions. These two techniques are good additions to each other, and they are well represented in European Epigravettian and Magdalenian sites.

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