Origin and Development of Aurignacian Osseous Technology in Western Europe: a Review of Current Knowledge

Elise Tartar

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directed by

Randall WHITE
Raphaëlle BOURRILLON

with the collaboration of
François BON

AURIGNACIAN GENIUS

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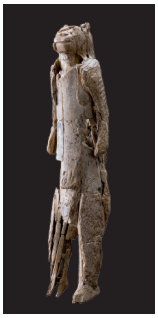
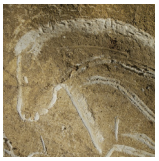

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Contributions should be addressed to:

P@LETHNOLOGY REVIEW
Vanessa LEA, Research associates

CNRS / UMR 5608 – TRACES
Maison de la recherche
5 allées Antonio Machado
31058 Toulouse cedex 9, FRANCE

Phone: +33 (0)5 61 50 36 98
Fax: +33 (0)5 61 50 49 59
Email: vanessa.lea@univ-tlse2.fr

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ORIGIN AND DEVELOPMENT OF AURIGNACIAN OSSEOUS TECHNOLOGY IN WESTERN EUROPE:

a Review of Current Knowledge

Élise TARTAR

Abstract

The exploitation of osseous materials is one of the main innovations associated with the advent of the Upper Paleolithic in Europe. The concept of the Aurignacian, as defined by Abbé Breuil, was used for a long time as a strong argument in favor of a cognitive revolution: its "sudden" appearance was linked to the rapid and systematic diffusion of the Aurignacian culture and the widespread distribution of split-based points in Europe, and upheld the idea of a clear biological and conceptual rupture with the Middle Paleolithic. Since then, several factors have contributed to undermining this model. Renewed studies of Aurignacian osseous technology in Western Europe contribute to the ongoing redefinition of the mechanisms behind the construction of the Upper Paleolithic in Europe.

Early Aurignacian osseous production was by no means limited to split-based points, and involved a wide variety of activities. The production of the different materials was already well structured and centered around three main spheres: reindeer antlers were mainly used for weapons, bone for the fabrication of domestic equipment and ivory was mostly reserved for ornaments.

Although osseous technology was identified in some "transitional" groups, it spread and was durably integrated into techno-economical systems during the Aurignacian. It developed gradually in Europe and based on currently available knowledge, appears to have emerged in the Protoaurignacian societies of Western Europe. The emergence of this new technical domain seems to result from the transfer of wood working techniques to osseous materials, undoubtedly partly linked to a sudden shift in environmental conditions in Europe around 40 000 BP. The evolution of osseous production during the course of the first phases of the Aurignacian provides evidence of profound techno-economic changes, which, backed up by data from lithic studies, reveals powerful sociological changes during the transition between the Middle and Upper Paleolithic.

Keywords

Osseous industry, Early Aurignacian, Protoaurignacian, technical transfer, functional autonomy, technical investment, personal tools, social change.

The generalized working of osseous materials (cervid antler, ivory and bone) in Europe is one of the major innovations at the start of the Upper Paleolithic, and following the definition of the Aurignacian by Abbé Breuil at the beginning of the 20th century, was soon associated with this concept. This provided a strong argument in favor of the migrationist model, whereby the Aurignacian culture would have been spread very quickly and in a very uniform way across Europe by Modern Humans, leading to the demise of Neanderthal populations and their industries (Mellars, 1989; Demars, Hublin, 1989; Kozlowski, 1993; Davies, 2001; Harrold, Otte, 2001). Indeed,

in the same way as other innovations attributed to the Aurignacian, osseous technology seems to have appeared very suddenly in Europe, which buttressed the idea of a clear technological and conceptual rupture with the Middle Paleolithic. Moreover, the widespread distribution of split-based points (from Spain to the Near East), considered to be the key index fossil for the early phase, reinforced the notion of a swift diffusion across Europe and the marked unity of the Aurignacian culture. However, over the past years, several factors have undermined this model, in particular, the absence of human remains from the beginning of the Aurignacian unanimously attributed to Modern Humans (Orschiedt, 2002; Conard *et al.*, 2004; Henry-Gambier *et al.*, 2004; Street *et al.*, 2006), the identification of the Protoaurignacian (or archaic Aurignacian), evidencing the early arrival and gradual development of the techno-complex in Europe (Laplace, 1966; Bazile, Sicard, 1999; Bon 2002; Bon, Bodu, 2002; Bordes, 2002; Teyssandier, 2007; Teyssandier *et al.*, 2010) and the multiplication of "transition" industries, suggesting an autonomous evolution of Neanderthals towards the Upper Paleolithic (Pelegrin, 1995; d'Errico *et al.*, 1998; Zilhão, d'Errico, 1999, 2003; Slimak, 2004).

Today, it is thus timely to redefine the mechanisms underlying the construction of the Upper Paleolithic in Europe and the place of the Aurignacian in this process. As part of this reflection, osseous industries first remained in the background, probably due to past emphasis on these industries in models arguing for a rupture between the Middle and Upper Paleolithic. But over the past few years, renewed studies have provided new insights. The present article proposes a review of existing data relating to Aurignacian osseous production. The first part will deal with osseous production in the Aurignacian *type-assemblage*, the Early Aurignacian, as some of these materials are still little known. Then the question of the emergence and development of osseous technology in Western Europe will be approached, to discuss the social implications of techno-economic changes recorded for the first phases of the Aurignacian.

1 - Osseous technology of the Aurignacian *type-assemblage*

It is still widely believed that the Early Aurignacian osseous toolkit consists mainly of antler working – "... Early Aurignacian organic technology is primarily an antler working technology" (Knecht, 1993: 140) – for making hunting weapons – "While most Aurignacian bone tools are deer antler sagaie points..." (Zilhão, 2011: 336). This stems from the emphasis placed on split-based points for a long period of time. These emblematic Aurignacian tools were identified very early on (Lartet, 1861) and were used as characteristic fossils for dating the archeological assemblages containing them well before Peyrony's classification. The latter definitively acknowledged them as a strong marker of the early phase of the Aurignacian (Peyrony, 1933). The function of these pieces as projectile points also contributed to this situation. Up until the 2000s, the role of lithic bladelets in hunting weapons was widely ignored and contributed to maintaining the notion of the economic and functional complementarity of the lithic and osseous industries. The first was considered to supply domestic tools and the second was believed to be reserved for hunting (Rigaud, 1993). Since then, the increase in technological studies and the economic and functional reinterpretation of several categories of remains have resulted in a reappraisal of the functional spheres of lithic and osseous productions (Tartar *et al.*, 2006; Tejero 2010).

A - A rich and diversified industry

Osseous technology during the Early Aurignacian is by no means limited to split-based points. As shown by the composition of the assemblages from south-western France, and in particular the rich assemblages from Abri Castanet (Dordogne), Grotte des hyènes at Brassempouy (Landes), Gatzarria (Pyrénées-Atlantiques) and les Abeilles (Haute-Garonne), split-based points are well represented but still only account for a minority of the total number of pieces (figure 1); representing between 4 and 22% of the finished objects in osseous materials. The proportions of finished ivory pieces vary widely from one assemblage to another whereas bone technology is always very well represented.

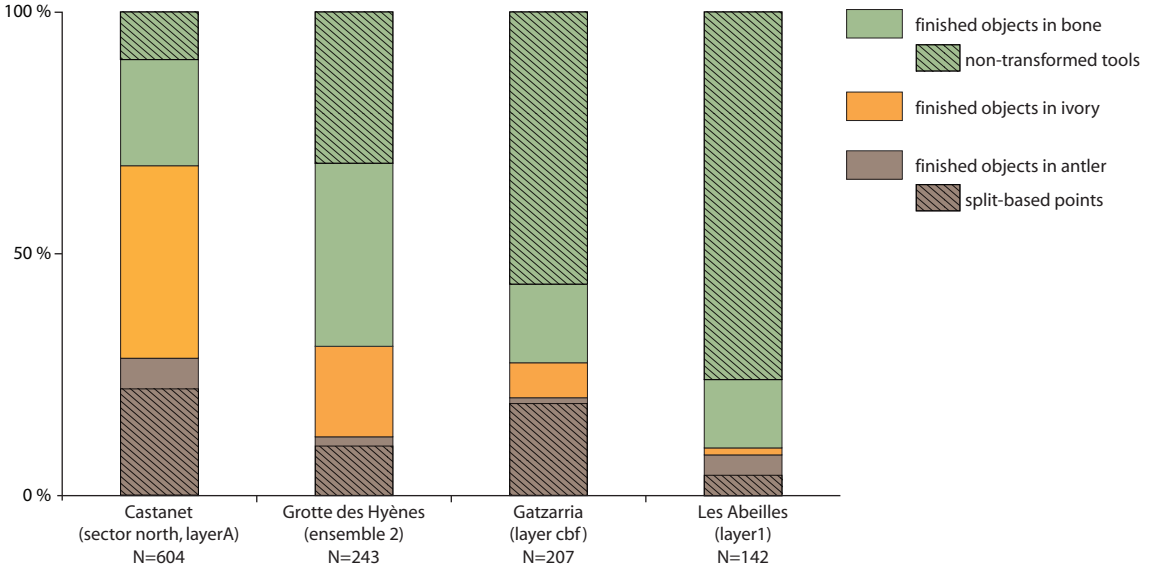

Figure 1 - Relative proportions of finished objects in cervid antler, ivory and bone in osseous industries from four Early Aurignacian assemblages.

Antler technology during the Early Aurignacian is mainly centered on the production of split-based points (Liolios, 1999; figure 2[1-2]). Antler was also used for making tools, such as wedges used for splitting and *bâtons percés*, which were probably used for straightening points (Lompré 2003; figure 2[3-4]). Antler tools are generally scarce, apart from in assemblages with very abundant material (Castanet, Blanchard, Isturitz).

In south-western France, ivory technology is mainly made up of ornaments:[1] mostly of beads and in particular, the famous basket-shaped beads, but also headbands, pendants, etc. (White, 2007, figure 3).

1. In other Aurignacian provinces, ivory exploitation is much more diversified and abundant. This is the case in particular in the Swabian Jura (Germany) where it was used for personal ornaments, portable art and abundant tools (Conard, Bolus, 2006; Floss, this volume; Wolf, Conard, this volume).

Figure 2 - Early Aurignacian equipment made from cervid antler. 1-2: split-based points; 3: beveled tool; 4: *bâton percé* – 1: Abeilles (layer 1); 2: abri Castanet (north sector, layer A); 3: Gatzarria (layer cbf); 4: abri Blanchard (photos: É. Tartar [1-3], R. White [4]).

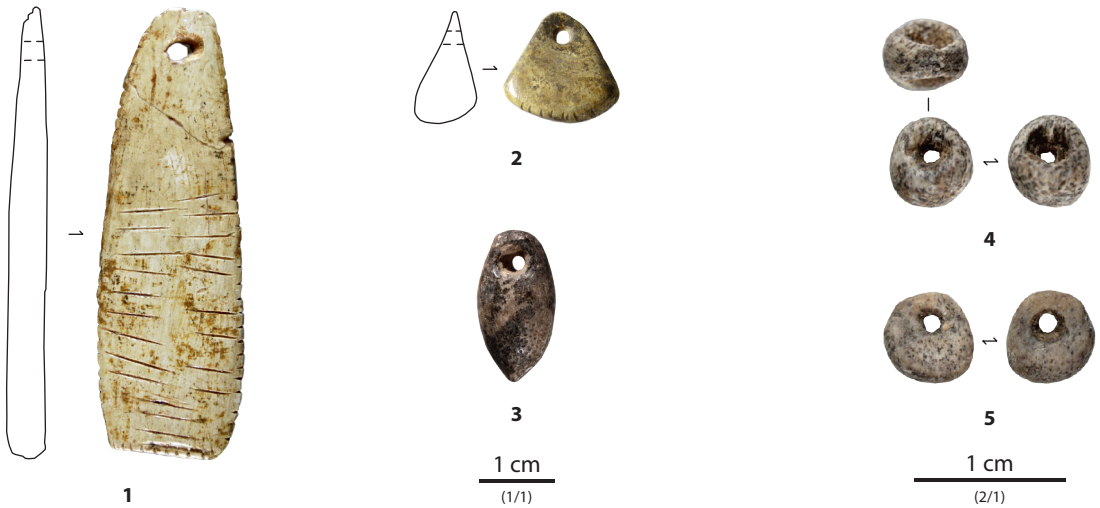

Figure 3 - Early Aurignacian personal ornaments in ivory. 1: pendant with decorative incisions; 2: bead with decorative incisions; 3: bead with decorative dots; 4-5: basket-shaped beads – 1: Abeilles (layer 1); 2: Gatzarria (layer cbf); 3: abri Cellier; 4-5: abri Castanet (photos: É. Tartar [1-2], R. White [3-5]).

Bone industry on the other hand, is much more diversified. It includes the classical Upper Paleolithic tools associated with processing skins: *lissoirs* or smoothers made on ribs, some of which are decorated with incisions (figure 4[1-2]), as well as a variety of awls made on different anatomical parts (figure 4[3-5, 13]). Other pieces, such as small pointed elements (double points, awls, etc.), sticks and tubes, with as of yet enigmatic functions, complete the assemblage (figure 4[6-12]). But the bone industry also includes a significant quantity of non-transformed tools, or bone fragments retrieved after butchery operations and used without any further modification. These tools are less well known. Until recently, they went largely unnoticed in these assemblages as no comprehensive studies of all the remains were conducted. As they often bear subtle use marks, they were generally not identified during excavations and must thus be sought out among faunal remains. In recently and extensively excavated sites (Grotte des Hyènes, Gatzarria and Abeilles)[2], these tools represent 30 to 77% of the finished bone objects (figure 1)! They include different functional categories. The most represented are the retouchers, identified a long time ago (Leguay, 1877; Henri-Martin 1907-10), but which are still often associated with the Middle Paleolithic (figure 5[1]). They are very well represented in the Early Aurignacian assemblages where they were used for retouching lithic tools and undoubtedly also for bladelet debitage (Tartar, 2012a). The non-transformed tools also include intermediate tools, which were totally ignored until quite recently (figure 5[2]). The Aurignacians selected bone fragments with naturally beveled ends to use as wedges for splitting sections of antler and wood (Tartar, 2012b). Other non-transformed tools are also present in variable quantities in these assemblages. At Abri Castanet, for example, excavations yielded picks and objects with blunted and abraded points. These tools may have been used for engraving limestone, as shown by the abundant graphic representations documented at Castanet and Blanchard (White *et al.*, 2012; Bourrillon, White, this volume): the picks could have been used to prepare the stone surface by pecking and the blunted objects to regularize the engraved lines. Ongoing experiments are currently testing these hypotheses (research program, R. Bourrillon).

Thus the osseous industry is by no means limited to split-based points and involves a wide range of activities. It is noteworthy that the functional analysis of the sites used as examples suggests residential camp type occupations (Grotte des Hyènes, Gatzarria, Abeilles)[3], or even *aggregations* (Abri Castanet?), which are, by definition sites with varied activities. The high representation of domestic equipment (as well as the important quantity of waste from diverse fabrication) is perfectly coherent with this view. Tool composition would undoubtedly be very different in hunting camps, but no such occupations have as of yet been identified for the Early Aurignacian (Bon, 2006; Bachellerie *et al.*, 2011).

2. The percentage of pieces from the north sector of Abri Castanet is not included here considering the drastic selection of artefacts during the excavations conducted by D. Peyrony.
3. Apart from several debitage workshops, this is the case for the majority of occupations attributed to the Early Aurignacian (Chadelle, 1990; Bordes, Tixier, 2006; Bachellerie *et al.*, 2011).

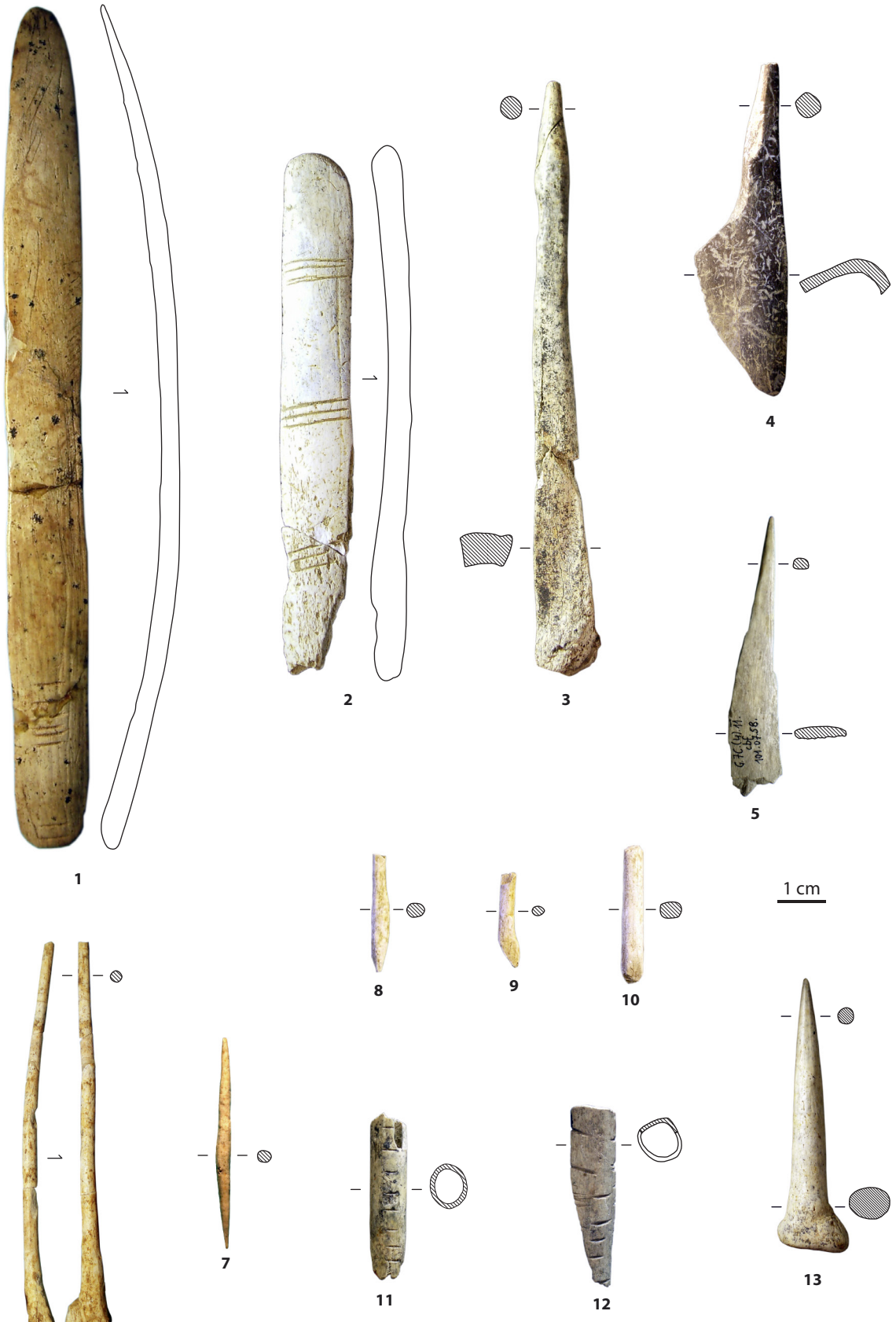

Figure 4 - Early Aurignacian bone equipment. 1-2: lissoirs (smoothers); 3-5, 13: awls; 6: pin; 7: double point; 8-10: sticks; 11-12: decorated tubes – 1, 5, 11, 12: Gatzarria (layer cbf); 2, 3, 6, 7, 13: grotte des Hyènes (complex 2); 4, 8-10: abri Castanet (north sector, layer A) (photos: É. Tartar).

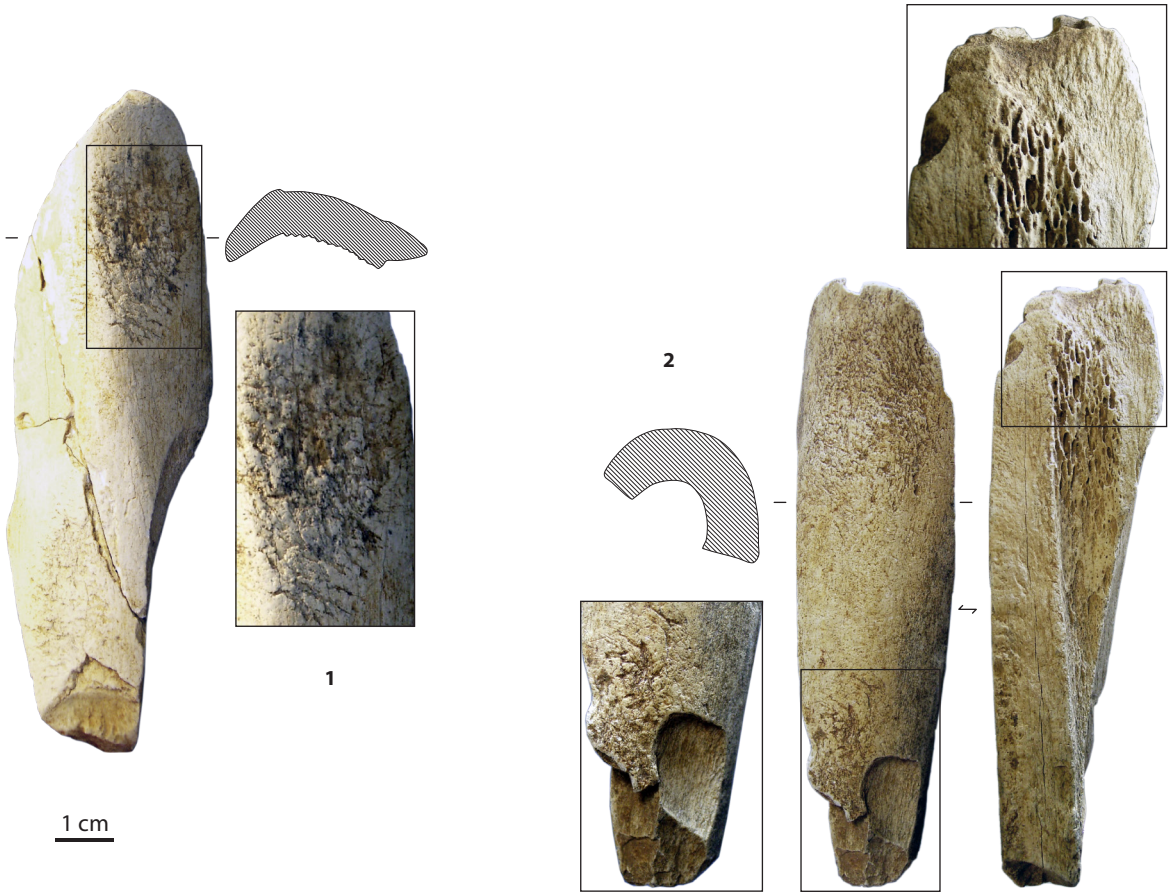

Figure 5 - Non-modified bone tools from the Early Aurignacian. 1: retoucher; 2: intermediate tool used as a wedge (the piece also bears traces of use as a retoucher). 1-2: abri Castanet (north sector, layer A) (photos: É. Tartar).

B - Characterizing the different sectors of activity

The exploitation of the different osseous materials during the Early Aurignacian is very well structured and centered around three main spheres: antlers (mostly reindeer antlers) were used mainly for weapons, bone for the fabrication of domestic equipment and ivory was mostly reserved for ornaments (Liolios, 1999; Tartar *et al.*, 2006). This differential treatment of the different materials can be linked to their unique physical and mechanical properties. Reindeer antler, for example, is the most resistant osseous material to impact (Albrecht, 1977). In the same way, many bones or bone fragments are naturally pointed and only require minimum transformation to be used as awls. The properties of the raw materials thus play a predetermining role and also imply that there is flexibility in this partition. This is illustrated by the occasional use of antler for making tools (beveled pieces, *bâtons percés*, etc.), as the morphology and resistant qualities of this material make it suitable for making beveled pieces to be used as wedges, for example. However, the possibility of a more symbolic choice cannot be ruled out, as the use of reindeer antler for making hunting tools to be used on reindeer themselves must be significant (Liolios, 1999; Otte, 2001). A symbolic dimension was also invoked for ivory, as the use of this material for personal ornaments may be linked to subjective, esthetic considerations, and to the image of the animal itself (Hahn, 1986; Jelinek, 1988; Liolios, 1999).

This differential treatment of antler, bone and ivory during the Early Aurignacian indicates the clear economic structuring of osseous technology, which is also manifest in the lithic domain (Tartar *et al.*, 2006). During the Early Aurignacian, the lithic equipment was based mainly on the independent production of two categories of blanks: blades, widely used for the diversified domestic toolkit (mainly endscrapers and retouched blades) and bladelets, used for making hunting weapons such as lateral armatures for equipping projectiles (Bon, 2002; O'Farrell, 2005; Pelegrin, O'Farrell, 2005).

C - Differentiated technical investment

Depending on their sphere of activity, productions were not all subject to the same level of technical investment during the course of fabrication.

The highest level of technical investment was reserved for split-based points. The experimental production of replicas of pieces from Abri Castanet and Blanchard, conducted as part of the *Aurignacian genius* research program, showed that these points are the outcome of a long operational sequence involving several sequences and techniques, as well as a certain know-how (Tartar, White, 2013). At Castanet, Blanchard and most of the Early Aurignacian sites, reindeer antler used for making points derives from large and medium-sized shed antlers. The antlers were processed by separating the beam into sections: It consists in chopping the antler beam perpendicular to its long axis in order to extract roughly cylindrical segments and then to split these by use of wedges to obtain semi-cylindrical blanks (Liolios, 2003; Tejero *et al.*, 2012). These blanks were of variable size and shape and were then roughly shaped by regularizing the edges and surfaces. The following stage consisted in splitting the base, following a procedure called the *IFC* (for Incision, Flexion and Cleavage). It will not be described in detail here (see Tartar, White, 2013), but it is important to note that this rather complex procedure is based on a series of precise operations and requires previous preparation (prolonged soaking) and the use of specific equipment (wedging system for bending the rod). Once the base was split, points were then shaped by scraping to give them their final shape.

Ivory productions, and particularly basket-shaped beads, were also subject to a high level of technical investment. According to R. White (2007), the ivory used is sub-fossil and was thus collected. It was sectioned by cleaving following the desiccation lines of the raw material. The obtained fragments were shaped by scraping to produce rods, then sectioned by circular incision and snapping by flexion. Rough-outs were scraped, perforated and abraded to obtain the final bead shape.

The bone industry, on the other hand, displays much more variable technical investment. Raw material acquisition is less restrictive as bone comes from hunting by-products, and is widely available in the sites. Tools can be extremely basic. This is the case for non-transformed tools, which are simple bone fragments selected from food waste and used directly. However, other tools, such as *lissoirs*, or smoothers, are from more complex operative sequences. They were obtained from ribs with broken ends to produce sections, then split lengthwise to produce half-ribs. These reduction processes are not fundamentally different from those used for making points. The half-ribs were then totally shaped and often decorated with incisions. Some of the awls were also more complex and were made from horse metapodials, although most of them were made from simple, rapidly pointed bone flakes. The horse metapodials were split in order to obtain blanks with specific morphometric criteria: sturdy, regular, elongated blanks retaining a portion of the joint to be used as a prehensile zone.

If we classify the various products in terms of technical investment, split-based points and basket-shaped beads are at the highest end of the scale. This does not necessarily imply that these products were more highly valued than the others, but indicates that strict standards governed

their fabrication (Tartar *et al.*, 2006). Split-based points are part of a composite system of hunting weapons and as projectile points, they require careful and complete shaping and must be interchangeable on wooden shafts. Ivory beads are ornamental elements and bear a message with social connotations to be seen and understood by all. These requirements entail morphometric standardization. On the other hand, for bone technology, there is much more diversity in terms of the level of technical investment. Generally speaking, the use of these pieces involves fewer restrictions and food practices produce a wide range of suitable forms for the rapid shaping of standard tools. However, some tools were given special technical care which cannot necessarily be explained in functional terms. These tools with added value provide, as we shall see, precious information for appraising the socio-economic structure of Aurignacian groups.

2 - Advent and development of working osseous materials in Western Europe

In the light of current knowledge, the work of osseous materials in Europe can no longer be considered to be an Aurignacian innovation. Several assemblages from distinct transition techno-complexes (Szeletian, Bohunician, Uluzzian, etc.) have yielded a variable quantity of artefacts in osseous materials. Thus, in Western Europe, some Uluzzian and Châtelperronian groups were already transforming bone, as well as ivory for the latter, before the arrival of the first Aurignacian populations (Gioia, 1990; Gambassini, 1997; Baffier, Julien, 1990; d'Errico *et al.*, 1998). On the other hand, the generalized spread of osseous technology is a unique Aurignacian feature (Liolios, 2010). It is during the Aurignacian that production becomes systematic and is permanently integrated into the techno-economic system. This new technical domain does not appear suddenly, but develops gradually during the early phases of the Aurignacian.

A - Protoaurignacian osseous technology

The generalization of osseous technology seems to occur during the Protoaurignacian, a technical tradition considered by recent lithic technology studies to be the first expression of the Aurignacian in Europe (Bon *et al.*, 2006; Teyssandier *et al.*, 2010). Up until now, the Protoaurignacian has been identified at about twenty sites, extending from the north of Spain to the Balkans, but only the western sites (most of which are French) have yielded osseous productions.

In the current state of knowledge,[4] assemblage composition sometimes displays marked differences. Although the majority of the corpuses are small, some of them contain more abundant artifacts (particularly Trou de la mère Clochette, Grotte du Renne and Isturitz). From a qualitative viewpoint, we also note differences in raw material representation (no cervid antler industry in Abeilles, a lot of ivory working in Trou de la mère Clochette) and documented functional spheres (strictly domestic equipment in Grotte du Renne, etc.), which could in some cases, reflect regional differences and different types of site occupation. Nonetheless, the corpuses display a number of common typo-technological characteristics.

4. The data presented here are mainly based on studies by M. Julien and her colleagues for Grotte du Renne (Yonne, layer VII, Julien *et al.*, 2002), N. Goutas for Isturitz (Pyrénées-Atlantiques, layers C4d1 and C4III, Soulier *et al.*, 2014) and our study of the material from Gatzarria (Pyrénées-Atlantiques, cjn1 and cjn2), Abeilles (Haute-Garonne, layer 2), and Grotte du Renne (*ibid.*) and Trou de la mère Clochette (Jura, red serie) (unpublished data).

Antler working (mostly reindeer antler) is similar to that of the Early Aurignacian. It is centered on the production of blanks by splitting beam segments and applied to making points, as well as intermediate tools or burnishers. Split-based points (figure 6[1-2]) were identified in the collection from Trou de la mère Clochette (5 pieces and 3 wings), in addition to those already identified in Spain (Arbreda, Ortega Cobos *et al.*, 2005) and Italy (Fumane, Broglio *et al.*, 1996). Mesial-distal

Figure 6 - Protoaurignacian objects in osseous materials. 1-2: split-based points (in cervid antler); 3-4: ivory points; 5: ivory rod; 6: bone awl; 7: bone smoother; 8: decorated bone tube; 9: ivory ring – 1-2 and 8: Trou de la mère Clochette (red series); 3-4 and 6: Gatzarria (complex cj); 7 and 9: grotte du Renne (layer VII) (photos: É. Tartar [3-7, 9], C. Weber © CNRA-MNHA Luxembourg [1, 2], P. Guenat © Musée des beaux-arts de Dole [8]).

fragments with a flattened section suggesting this type of point were also identified in the material from Isturitz (Soulier *et al.*, 2014), Grotte du Renne (Julien *et al.*, 2002) and Gatzarria (*pers. obs*). It is also important to note that tongued pieces, which are characteristic waste products associated with point manufacture (Peyrony, 1928; Tartar, White, 2013), were identified at Trou de la mère Clochette and Isturitz.

The transformation of bone is also similar to Early Aurignacian bone technology. It is mainly geared towards the production of domestic tools, such as *lissoirs* (smoothers) and awls (some of which are decorated), double-pointed objects and tubes (figure 6[6-8]), completed by a variable quantity of non-transformed blanks (retouchers and intermediate tools). These pieces were made from bones gathered from food waste. As for the Early Aurignacian, some blanks were subject to specific debitage (cleaving ribs for smoothers, controlled fragmentation of metapodials for some awls).

As far as we can judge, ivory working also followed similar modalities to Early Aurignacian methods (splitting of sub-fossil ivory). However, ivory products are more diversified and are used for hunting (points), domestic activities (tools), as well as symbolic purposes (ornaments). The structural and mechanical properties of ivory indicate that the fragmentary points are not split-based (figure 6[3-4]), as the low elasticity of ivory makes it impossible to make splits in this way (Flas *et al.*, 2013)[5]. The tools consist mainly of intermediate tools and perforating tools. Personal ornaments are rarer and include several beads and rings (figure 6[9]). Note also that several assemblages contain long, very regular rods with a circular to oval section and an as of yet enigmatic status (Trou de la mère Clochette, Arcy-sur-Cure, Abeilles), with no equivalents in more recent Western European Aurignacian assemblages (figure 6[5]).

B - A gradual evolution during the first phases of the Aurignacian

This brief overview of Protoaurignacian osseous technology highlights the typo-technological similarities between this production and Early Aurignacian technology. These parallels are manifest in the transformation modalities applied to the different materials, but they are most obvious for cervid antler working, for which the most characteristic element is the presence of split-based points as early as the Protoaurignacian, having been considered for a long time to be an exclusive marker of the Early Aurignacian (*cf. supra*). These data corroborate the comparisons made on the basis of the study of lithic industries (see in particular Bon, 2002; Bon *et al.*, 2006; Teyssandier, 2007; Teyssandier *et al.*, 2010).

During the course of the first phases of the Aurignacian, osseous technology developed gradually in Europe, as shown by richer assemblages and an evolution in raw material processing (Teyssandier, Liolios, 2008). In the early phase, each raw material is reserved for a specific functional domain, whereas during the Protoaurignacian, production is not yet clearly structured, as shown by ivory manufacture, which shifts from a diversified range of pieces (points, tools, ornaments) to the almost exclusive fabrication of personal ornaments. This individualization of the functional spheres also extends to the lithic domain, where lamellar and laminar productions are respectively reserved for hunting and domestic activities. Initially, these two technologies were part of the same operative sequence before separating completely during the Early Aurignacian. This confirms an important modification of the economic structure of groups and also undoubtedly major sociological changes. Before broaching this aspect, we will first of all evaluate the factors that might have contributed to the emergence of osseous technology.

5. In this respect, the base of the only currently known split-based ivory point was made by sawing and not splitting (El Castillo; Liolios, 2006; Tejero, 2013).

C - Underlying factors

The reconstruction of the exact circumstances underlying the emergence of osseous technology in Europe presents us with an intricate challenge. However, the different techniques used imply that a sudden change in environmental conditions may have contributed to the emergence of this new technical domain.

This reflection is based on the hypothesis of D. Liolios, stating that the work of osseous materials is the result of the transfer of wood working techniques (Liolios, 1999, 2003, 2010). The author accurately demonstrates the fact that the transformation of osseous materials during the Aurignacian is based on techniques applied to wood working for a long time (sawing, scraping, chopping, splitting, etc.). The exceptional discoveries of javelins in Schöningen (Germany) and spears at Clacton-on-sea (Great Britain) and Lehringen (Germany) provide proof of this (Oakley *et al.*, 1977; Thieme, Veil, 1985; Thieme, 1997). Although evidence of this type is rare, micro-wear analyses of lithic equipment (use-wear on working edges and hafting marks) show that wood has long been a frequently used material (Keeley, 1980; Anderson, 1980; Beyries, 1987; Marquez *et al.*, 2001). Several other elements from the early phases of the Aurignacian, apart from data from use-wear studies, show that wood played an important role in the Aurignacian economy. The first is the need to make shafts onto which projectile points were hafted. In addition, in spite of a very wide geographic distribution, Early Aurignacian split-based points are only really abundant in certain sites of the Franco-Cantabrian region (Isturitz, la Tuto de Camalhot, Castanet, la Quina) and Central Europe (Geißenklösterle, Vogelherd, Istallösko). Beyond these regions, they are often only represented by a handful of pieces (Liolios, 1999). As these corpuses cannot be representative of actual production, it is likely that they coexisted with wooden points. This hypothesis is also backed up by lithic studies suggesting that some of the Aurignacian bladelets would have been used as lateral projectile components (Bon, 2002; O'Farrell, 2005; Pelegrin, O'Farrell, 2005). Indeed, due to the elliptical cross-section and the absence of grooves on split-based points, it is unlikely that they were equipped with bladelets. It appears more plausible to attach bladelets to wooden points.

Given these different elements, it seems likely that the fabrication of projectile points, tools and ornaments in osseous materials developed from a progressive transfer of wood working techniques, alongside well-established wood working and the use of bone with no further transformation. According to this model, the use of osseous raw materials would initially have seconded wood working and would have progressively become more dominant. The work of osseous materials would not thus result from new competences or even from technical innovation, but would rather be rooted in early know-how. The main innovation concerns the technical transfer and the incorporation of osseous material in the corpus of the raw materials worked during the Upper Paleolithic.

However, the question of the causes prompting this transfer remains unanswered. As access to vegetal and animal resources is directly regulated by climatic conditions, a sudden change in environmental conditions could provide a first element of response. Between 40 and 30ka BP, Western Europe underwent rapid climatic fluctuations, including a particularly cold phase, the Heinrich 4 event, between 40.2 and 38.3ka BP (Sánchez Goñi, Harrison, 2010). This phase marks a major decline in forest species and the concomitant progression of a grassland steppe with a high concentration of *Artemisia*. The rarity of forest species could account for the technical transfer of wood working to osseous materials. Furthermore, this steppic environment with *Artemisia* is conducive to the development of reindeer, which are increasingly hunted between the end of the Mousterian and the beginning of the Aurignacian complex (Discamps *et al.*, 2014). The wider availability of reindeer antler, which plays a central role in the Aurignacian economy, could have facilitated this technical transfer. It is imperative to further evaluate this hypothesis through a more detailed correlation of archeological and environmental data.

3 - Techno-economic changes and their social implications at the onset of the Upper Paleolithic

The evolution of osseous and lithic technology during the first phases of the Aurignacian confirms the autonomy of the different functional spheres. The functional partition of osseous material into hunting equipment, domestic equipment and personal ornaments mirrors the separate production of flint blades and bladelets, respectively devoted to domestic tool making and elements for projectiles (Tartar *et al.*, 2006). F. Bon and his colleagues (Bon, 2009; Bon *et al.*, 2010) suggested that this techno-economic independence of the different spheres of activities denotes sociological changes whereby the individualization of the spheres of activity would be a response to the individuation of group members. Up until now, this hypothesis was almost exclusively applied to lithic equipment, and in particular to projectiles, which are considered to be one of the driving forces behind the technical evolution initiated during the course of the Middle to Upper Paleolithic transition (Bon, 2005; Teyssandier, 2007; Teyssandier *et al.*, 2010). In this way, the individuality of Early Aurignacian (lithic) weapons would be linked to the individuation of the hunter (Bon, 2009; Bachellerie *et al.*, 2011).[6] Besides the aforementioned raw material economy, data relating to the equipment in osseous materials will contribute to this discussion.

The study of the bone tools associated with processing skins points to a clear individualization of this activity and also to the individuation of those involved in this work. Within the different Early Aurignacian osseous series, a significant fraction of smoothers (*lissoirs*) and a specific category of awls (awls on horse metapodials) were subject to particular technical attention with no functional corollary, implying that this equipment was part of personal toolkits (figure 7) (Tartar, 2009). Apart from the technical investment involved in the fabrication of these tools, the incised decorative lines frequently observed on the smoothers (figure 7[4-5]) tend to back up this hypothesis. As with all modifications of the aspect of an object, this decoration is visible and destined to be: it is a sign and bears a message with social connotations (White, 1992; Taborin, 2004). There is only one decorative theme, but this can consist of a variety of different configurations. In this way, the frequent smoothers in the Grotte des Hyènes all bear different decorations. These decorations thus appear to denote individual initiatives in order to mark property, so that personal belongings displayed the identity of the person who made them. Note that in this respect, no purely ornamental decoration is present on any other production apart from certain personal ornaments, the medium par excellence used to convey social identity. Moreover, these smoothers record a high rate of recycling: they were frequently reused as small wedges, retouchers or awls, even though these tool types can easily be made from non-transformed blanks (figure 7[5]). This recycling denotes a desire to prolong the life cycle of these tools, which is also clear in the care involved in maintaining awls on horse metapodials. Micro-wear analysis of surfaces and the evolution of

6. « Cette interprétation s'inspire de réflexions ethnologiques, selon lesquelles il existe une relation étroite entre la nature des armes et la sociologie de la chasse (Testart, 1985). À partir de cette idée, on peut en effet suggérer que les armes moustériennes – s'il s'agit bien d'épieux utilisés en armes de hast (Shea, *op. cit.* ; Villa, Lenoir, *op. cit.*) – étaient employées dans le cadre de chasses collectives, tandis que des armes de jet, dont l'invention pourrait avoir justement entraîné le développement d'armatures en pierre ou en os, sont de nature à favoriser la pratique de chasses plus individuelles ».
["This interpretation is inspired by ethnological reflections, which point to a close relationship between the nature of the weapons and the sociology of the hunt (Testart, 1985). Based on this, we can suggest that Mousterian weapons – if they were indeed spears used as hast weapons (Shea, *op. cit.*; Villa, Lenoir, *op. cit.*) – were used in the sphere of collective hunting, whereas projectiles, which could have given rise to the development of projectile elements in stone or in bone, tend to favor the practice of individual hunting"] (Bachellerie *et al.*, 2011: 134).

the morphometric characteristics of these awls show regular and multiple cases of resharpening (figure 7[1-3]). This will to make tools last is part of behavior reserved for high yield, familiar, ... and personal tools (referred to by A. Choyke as "*individual favorite tools*": Choyke, 2001, 2006).

If we acknowledge the existence of personal and individual toolkits devoted to skin processing, then that implies the recognition of a certain identity of the group members practicing this activity, or even a certain autonomy. In this respect, smoothers and awls on horse metapodials are the only tools to have been used frequently for different tasks in a versatile way. The study of

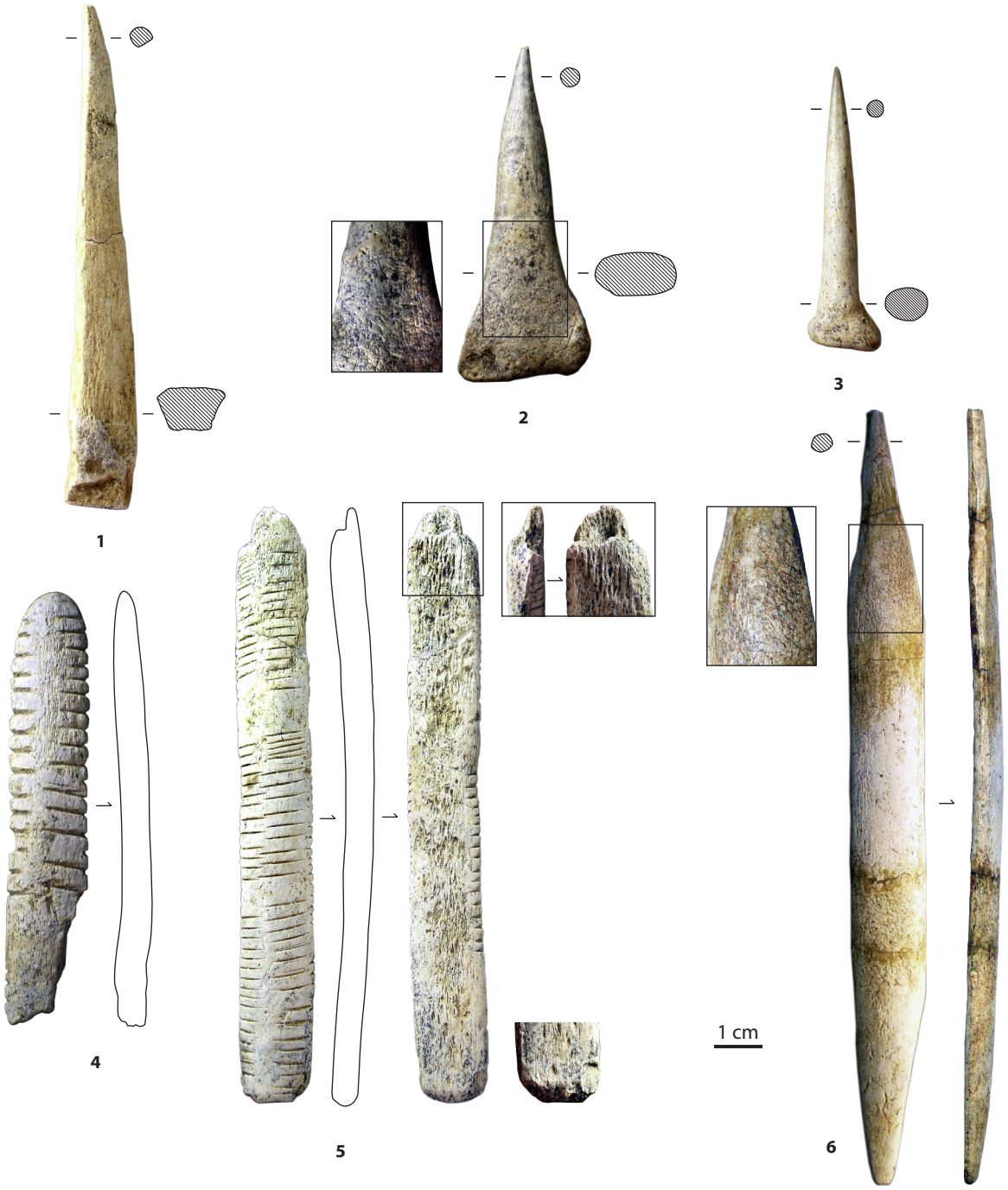

Figure 7 - Awls on metapodials and smoothers: personal tools? 1-3: awls at different stages of use, no. 2 was occasionally used as a retoucher; 4-6: smoothers, no. 5 was recycled as a wedge, no. 6 was occasionally used as a retoucher and one end was pointed for used as an awl. 1, 6: abri Castanet (north sector, layer A); 2-5: grotte des Hyènes (complex 2) (photos: É. Tartar).

the chronology of the fabrication, use and maintenance marks on tools has shown that several awls and smoothers could have occasionally been used as retouchers (figure 7[2]). A piece from Abri Castanet was even used alternately as a smoother, an awl and a retoucher (figure 7[6]). Yet these different uses are all part of the sum of actions involved in skin processing: the use of the retoucher for making and resharpening endscrapers used for scraping skins, the use of the smoother and the awl for softening and assembling (sewing) skins. This implies that the same individual could carry out all the technical operations involved in the same operative sequence autonomously. Naturally, this does not imply the craftsmanship in the strict sense of the term, but suggests a similar tendency to the presumed individuation of the hunter: other technical activities can also be part of a comparable and complementary process.

Work organization and the social division of tasks are still difficult themes to broach for prehistoric periods. However, the study of Aurignacian lithic and osseous equipment points to powerful sociological changes during the course of the transition between the Middle and Upper Paleolithic.

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Élise TARTAR
UMR 7041 - ArScAn, Ethnologie préhistorique
21 allée de l'Université, 92 023 Nanterre cedex, FRANCE
elise.tartar@mae.u-paris10.fr

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