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a.s.b.l.
Rue Vautier, 29
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Koninklijke Belgische Vereniging voor Antropologie en Prehistorie
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SPY CAVE

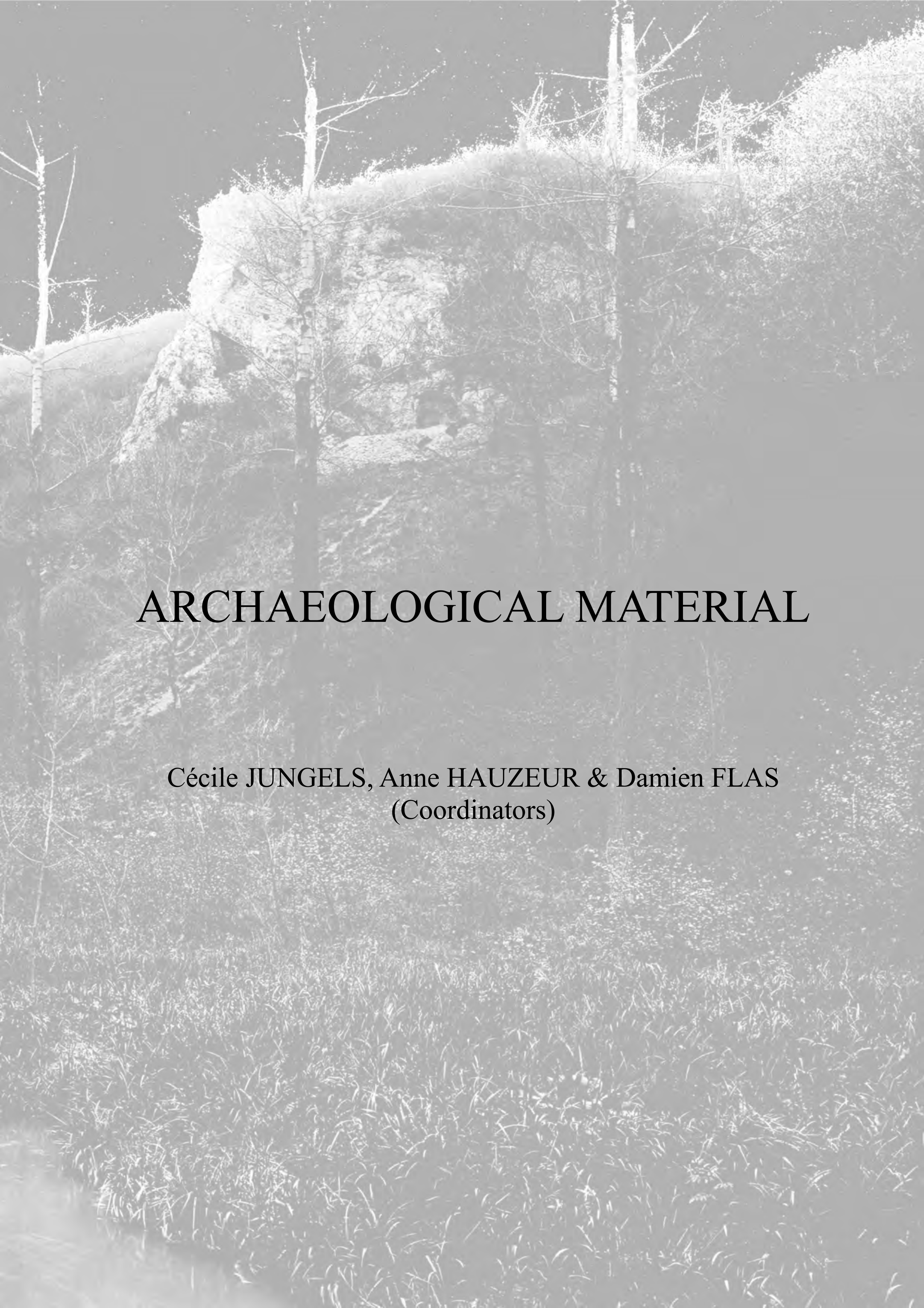
125 years of multidisciplinary research
at the Betche aux Rotches
(Jemeppe-sur-Sambre, Province of Namur, Belgium)

Edited by Hélène ROUGIER & Patrick SEMAL

Volume 1

2013

TABLE OF CONTENTS



ARCHAEOLOGICAL MATERIAL

Cécile JUNGELS, Anne HAUZEUR & Damien FLAS
(Coordinators)

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CHAPTER X

TYPOLOGICAL, TECHNOLOGICAL AND FUNCTIONAL ANALYSES OF MOUSTERIAN POINTS

Cécile JUNGELS, Aude COUDENNEAU, Anne HAUZEUR & Philippe PIRSON

Abstract

Spy cave provided the most important number of Mousterian points in Belgium. Most of them were found in the "second fauna-bearing level" (De Puydt & Lohest, 1887) and are stored at the Grand Curtius *Museum in Liège (De Puydt collection). They revealed morphological particularities and a remarkable similarity that encouraged a more detailed techno-morpho-functional analysis. Their good state of preservation allowed us to observe macro-traces and sometimes microwear polishes.*

INTRODUCTION

According to M. Ulrix-Closset (1975), Spy provided the most important set of Mousterian points in Belgium. She counted 156 pieces, among which 35 distal fragments. Most of them were attributed to a Late Mousterian industry that she defined as "*Moustérien évolué*".

Only the points supposed to come from the "second fauna-bearing level" have been taken into consideration here (see Di Modica *et al.*, this volume: chapter IX). Most of them revealed morphological particularities indeed: they are mostly offset, often towards the left, their cross-section is generally asymmetrical, and they have a prehensile proximal part (Jungels *et al.*, 2006).

Through use-wear and techno-morpho-functional analyses, we try to understand whether there is a relationship between the morphology of the different parts of the points and their function.

STUDIED SAMPLE

Among the various definitions of the "Mousterian point" (Bordes, 1954, 1979; Pradel, 1963; Ulrix-Closset, 1975; Brézillon, 1983), that of F. Bordes is commonly accepted: a triangular piece with a sharp point obtained by retouching any kind of blank. From a typological point of view, Mousterian points can be confused with convergent side-scrapers, due to their morphological similarities, and use-wear analyses indeed seem to confirm their functional relationship (Lemorini, 2000). Besides, both are often grouped into a "convergent tools" category (Tuffreau, 1993).

In the present paper, we consider only Mousterian points with two convergent retouched edges forming a sharp thin or thick apex. Convergent side-scrapers with a rounded apex are not included.

Our analysis especially concerns pieces from the De Puydt collection kept in the *Grand Curtius* Museum in Liège (1885-1886 excavations; N = 61) and attributed to the "second fauna-bearing level" (De Puydt & Lohest, 1887), as well as a few pieces kept at the Royal Museums of Art and History (RMAH) in Brussels (N = 11). As a matter of fact, this group of pieces seems to be homogeneous in what concerns their morphology, raw material and taphonomy. Therefore, our total tool sample consists of 72 pieces (ST1).

The *phtanite* Mousterian point discovered beside the Neandertal bones (De Puydt & Lohest, 1887: 234) has been integrated into our study. It is attributed to the "third fauna-bearing level" but it is similar to the points from the "second fauna-bearing level" (Figure 1). Furthermore, it shows small traces of pinkish sediment, which is considered characteristic of the "second fauna-bearing level" but could also refer to the top of the "third fauna-bearing level" (see discussion in Pirson *et al.*, this volume: chapter VI, and in Di Modica *et al.*, this volume: chapter IX).

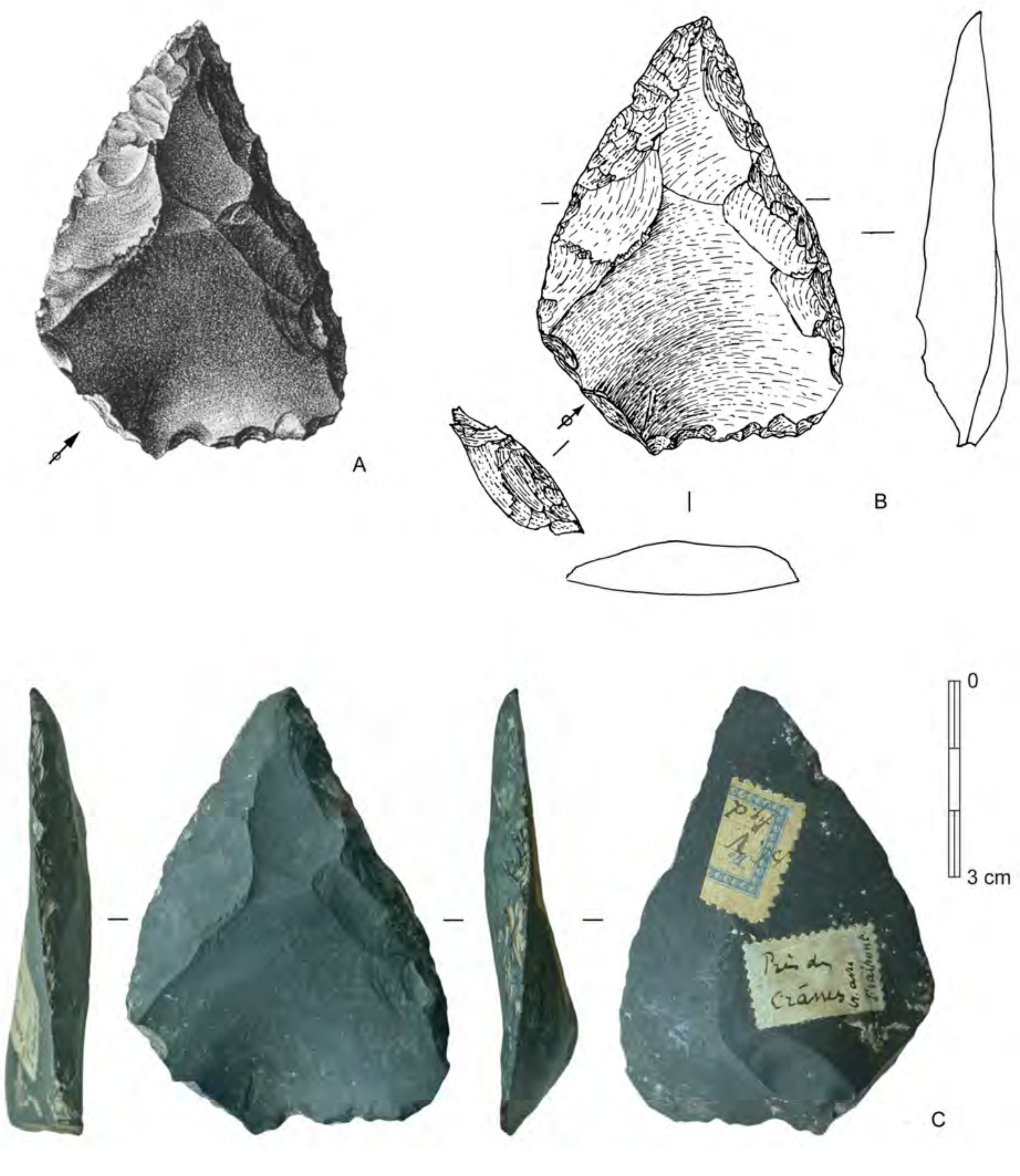

Figure 1. Mousterian point in *phtanite* discovered close to the Neandertal crania (MDP 959, *Grand Curtius* Museum, Liège). A: Reproduced from De Puydt & Lohest (1887: 234); B: Illustrations by A.-M. Wittek (ADIA); C: Pictures by A. Coudenneau.

RESEARCH GOAL

The aim of this study is to define the techno-morphological characteristics of this set of Mousterian points and to compare the morphological and techno-functional characteristics of the different tool parts (apex, edges and base). The same kind of study was performed on handaxes (Boëda, 2001; Di Modica, 2004; Di Modica & Jungels, 2009). We also examine whether there is a relationship between the morphological standardisation of the pieces and their function and/or prehensile mode (see first arguments in Jungels *et al.*, 2006).

DESCRIPTION

Most of the Mousterian points are made out of flint. Six pieces are in *phtanite*. The raw material used is generally a very fine-grained translucent greyish to brownish coloured flint with a blunt fine-grained chalky cortex. Fine-grained opaque light to dark grey flint was also used. A few Mousterian points are made out of a coarse-grained opaque brown-grey spotted flint with a blunt chalky cortex or a brownish neocortex (old patina).

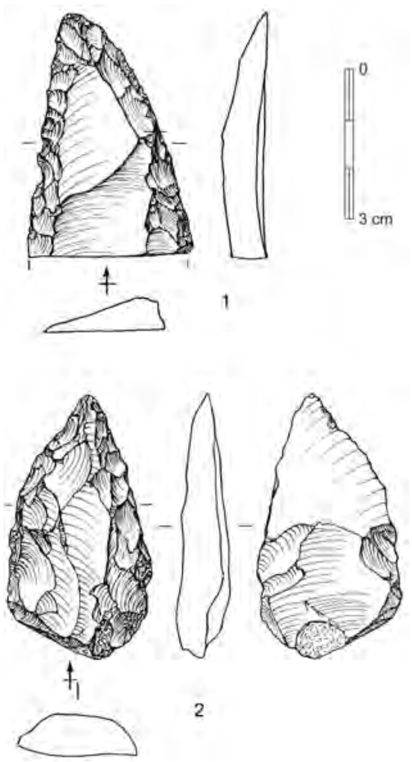

Figure 2. Distal fragment of Mousterian point and axial Mousterian point with removed bulb.
1: no number-11, RMAH, Brussels; 2: MDP 289, *Grand Curtius* Museum, Liège.
Illustrations by A.-M. Wittek (ADIA).

The pieces appear fresh at first sight due to the absence of a coloured patina, but they do show a translucent sheen and the edges of the pieces are more or less blunt. The preservation state of the Mousterian points is somewhat poorer than that of the Aurignacian artefacts from the same "fauna-bearing level". Fortunately, it nevertheless allowed an analysis of the macro- and microscopic traces.

Among the 72 Mousterian points, there are 7 distal fragments with bending fractures perpendicular to the morphological axis of the point (Figure 2; SF1: 6-7) and 2 points were broken at the proximal part before being retouched (SF2: 8).

The length of the complete points (N = 63) ranges from 42 to 105 mm (average: 62 mm). Most of the pieces are between 50 and 79 mm in length (N = 46/63; 84 %). They are quite long (average length index: 1.7) and thin (average thickness index[1]: 3.8). 16 % of the complete points are long Mousterian points (average length index ≥ 2; N = 10/63).

Table 1 shows that Mousterian points from Spy are often offset (N = 43/72; 60 %; Figure 3: 1-4; SF1; SF3-4). Points are predominantly offset towards the left (N = 30/43; 70 % of offset points; Figure 3: 1-2; SF3-4). 28 points are axial (Figure 3: 5-6; SF2) and only one point is transverse compared with the knapping axis (Figure 4).

	N	*%*
Offset left	30	42
Offset right	13	18
Axial	28	39
Transverse	1	1
Total	*72*	*100*

Table 1. Distribution of Mousterian points in the different axiality categories.

[1] The length refers to the maximum length in the morphological axis, and the width is the maximal distance perpendicular to the morphological axis.

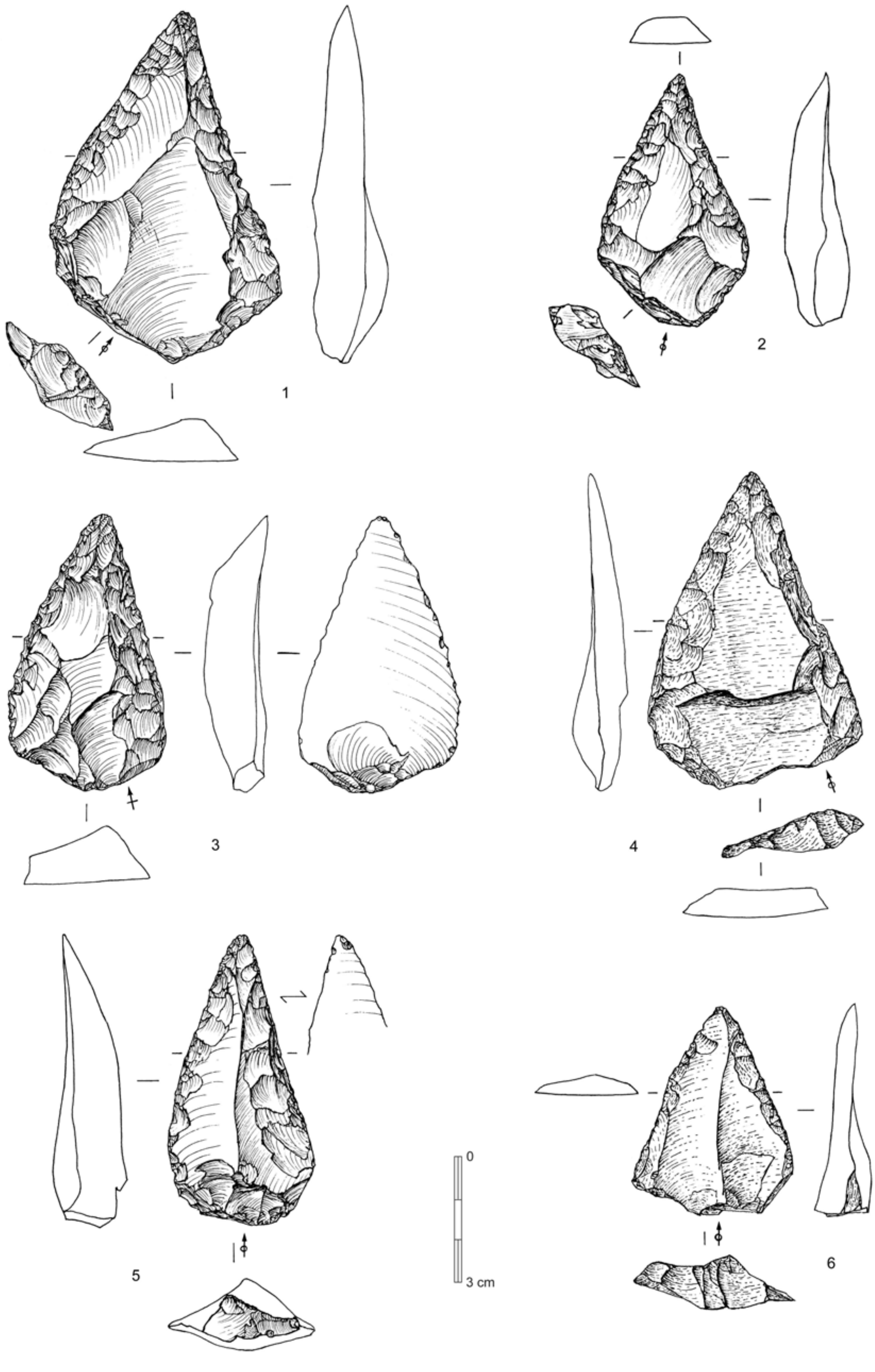

Figure 3. 1-2: Mousterian points offset towards the left; 3-4: Mousterian points offset towards the right; 5-6: Axial Mousterian points. 1: MDP 249; 2: MDP 262; 3: MDP 261; 4: MDP 798; 5: MDP 294; 6: MDP 800 (*Grand Curtius* Museum, Liège). Illustrations by A.-M. Wittek (ADIA).

Figure 4. Transverse Mousterian point with removed butt (MDP 254, *Grand Curtius* Museum, Liège). Pictures: A. Coudenneau.

Points are shaped by scalar to stepped direct retouches. They generally have an asymmetrical cross-section, with one thicker and steeper edge (right edge: 44 %), even in the case of some of the axial pieces. A light concavity on the distal or medial right edge of some of the points can also be observed (N = 24; SF1: 1, 5; SF2: 1; SF3: 3, 6, 7; SF4: 1, 3, 4). The proximal part generally remained unretouched and most often shows a facetted butt (*cf. infra*). The bulb was intentionally removed on 8 points (Figure 4; SF2: 7, 9; SF3: 8).

Is this obvious morphological similarity linked with a specific function(s) and/or hafting of the points?

USE-WEAR ANALYSIS

Methods

Analytical technique

Techniques used for examining use-wear traces may differ depending on the analyst. Some analysts base themselves only on microscopic traces observed at high magnification (Keeley, 1974; Caspar *et al.*, 2003), others only take traces observed at low magnification into account (Tringham *et al.*, 1974; Odell, 1977; Prost, 1989), while finally others take both types of observations into account (e.g. González Urquijo & Ibañez Estévez, 1994; Lemorini, 2000).

In this study, both low magnification and high magnification were combined in a staged procedure: first, a binocular microscope (magnification x10 to x40) was used, then the pieces were examined in more detail with an Olympus reflected light microscope (magnification x100 to x200). These two steps can be placed on a same level of analysis, and could be in that case, complementary into the interpretation of tool function.

Experiments

We had an experimental reference set of 307 unretouched and retouched pieces that were used in various activities on different raw materials. Among these, about thirty were used to test specific hypotheses with regard to the Mousterian points of Spy (especially those relating to prehension/hafting and tip contact actions). A more specific experimental reference set is being created in order to resolve more adequately the issues of handling/hafting mode.

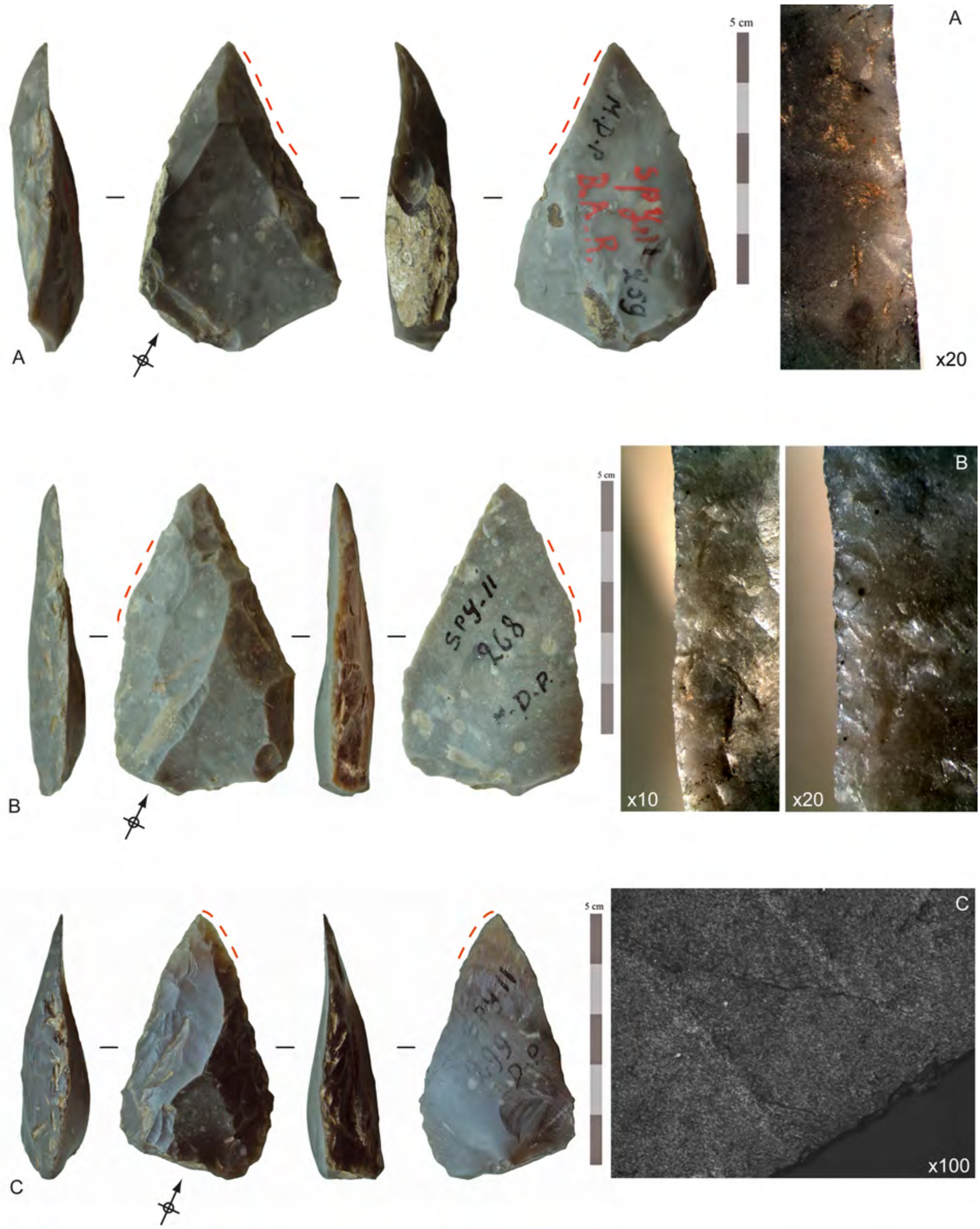

Figure 5. Mousterian points used for transverse actions on soft to medium-hard materials, and details of the use traces under low magnification (A-B) and high magnification (C: transverse action on wood). Pictures: A. Coudenneau.

The experimental reference set is kept in Aix-en-Provence, France, at the LAMPEA laboratory (CNRS). This reference set was produced between 2004 and 2008 by Aude Coudenneau within the framework of a Ph.D. research, with the support of the PCR "*Des Traces et des Hommes*" coordinated by Céline Thiébaut.

Results

Seventy-two points were examined for use traces. Twenty points show macroscopic signs of use, 9 show traces of trampling, 16 do not present particular traces except traces associated with retouching, and 27 pieces remained undetermined.

Among the 20 pieces that show use traces, 13 were used in **transverse actions** (Figure 5; SF5-9), 3 in **longitudinal actions** (Figure 6; SF10), and 4 were used in **tip contact actions** (Figure 7; SF7A; SF11). The relative hardness of the material processed varies and ranges from soft to hard. However, a greater frequency of traces associated with a use on soft to medium materials is noted. Transverse actions are related to wood-working or dry hide-working, while longitudinal ones are related to butchering activities.

Seven out of the 72 pieces we examined were **distal or mesio-distal parts of Mousterian points**. These 7 pieces present no other kinds of traces except those related to retouching. The fractures of these pieces suggest that they were broken during retouching. However, a wide variability is observed experimentally for this type of fracture which makes this interpretation uncertain.

Aside from those particular breakages, 22 points show a fracture in the distal part and one at the proximal part. The majority are bending fractures with short feathers that developed on one face or transversally to the piece (simple bending as defined by A. Fischer [Fischer *et al.*, 1984], simple facial and transverse bending fractures as defined by M. O'Farrell [O'Farrell, 1996]).

Among the fractured pieces, one displays features which could be attributed to a **projectile tip**, based on the recognition criteria that were established experimentally (Figure 7A). It is an apical and axial removal with a 10 mm long step-like end. This type of interpretation generally finds validation in recurrent occurrences within the same series, but in spite of the uniqueness of this piece within the studied assemblage, it nevertheless deserves further attention given the questions it introduces. First of all, we should wonder whether the damage could be attributed to another cause than projectile tip use. Secondly, if this is not the case, how can we explain the fact that we have only one piece with such evidence? In the present state of our knowledge, it seems that the criteria established for determining projectile fractures are relevant, criteria that are experimentally supported (e.g. Fischer *et al.*, 1984; O'Farrell, 1996; Plisson & Beyries, 1998). In the case of retouched projectiles, edges suffer very little damage. If any occurs, the length of the apical and axial removal(s), reproduced experimentally, is greater than or equivalent to 10 mm, and the removal ends in a step. Consequently, if the observed scars are indeed due to a use as projectile, the uniqueness of this piece in the examined series is ambiguous. Is it the expression of an occasional or exceptional use? Could other pieces of the series have been used in this way without diagnostic impact wear to have formed? Were other pieces perhaps discarded elsewhere? In any case, it is evident that the existence of this piece may supplement current discussions on the existence of stone projectile tips in the Middle Palaeolithic (Plisson & Beyries, 1998; Shea, 2001, 2006; Villa & Lenoir, 2006; Rots, 2009).

Despite a seemingly good state of preservation, most points (48 points, i.e. 67 % of the series) do prove to show a soil sheen that is often associated with important areas of flat polish and randomly orientated striations (SF12). This hinders the microscopic analysis. This soil sheen prevents an interpretation in 27 % of the cases, i.e. 20 undetermined pieces. Only 4 pieces (7 % of the points) show a **use polish**, three of which show macroscopic traces of use and one piece shows no particular macroscopic traces aside from those related to retouching (SF10B). The latter piece shows a rather clear use polish from cutting (in the way of a cutter) dry skin either mixed with an abrasive or in a very dirty state (presence of relatively well-marked striations along the blunt active edge). The other pieces with use polish have been used in various ways:

one for scraping rather fresh wood (SF5B), one for light butchering (Figure 6A), and a last one for piercing dry skin with an abrasive material (SF11A).

During the analysis, the issue of **hafting** was raised (Rots *et al*., 2001-2002, 2006; Rots, 2002). Traces did not allow certain interpretations regarding a potential hafting and we can only make

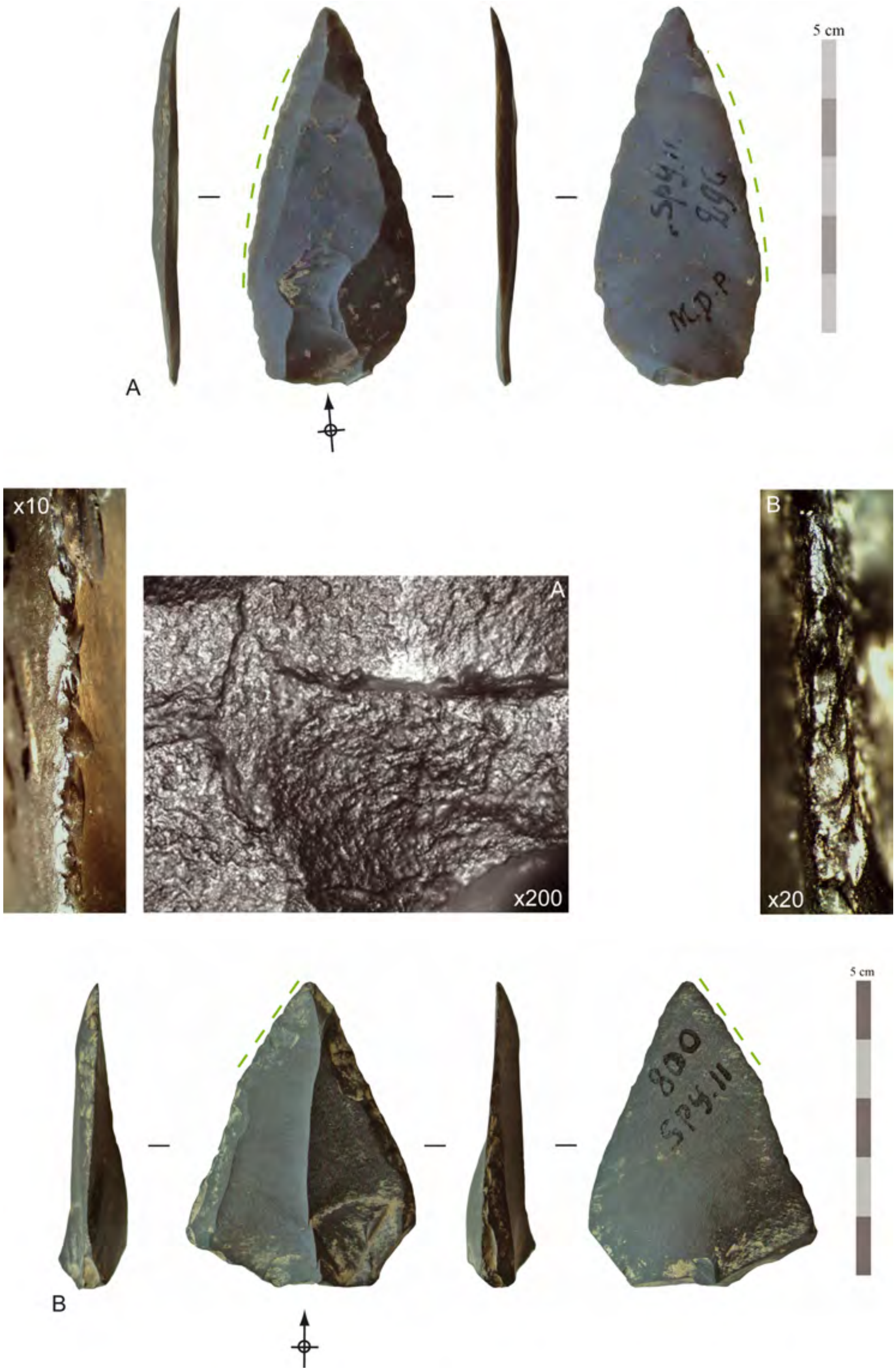

Figure 6. A & B: Two Mousterian points used for a longitudinal action on a soft to medium-hard material, and details of the macroscopic and microscopic use traces (A: x200, butchering). Pictures: A. Coudenneau.

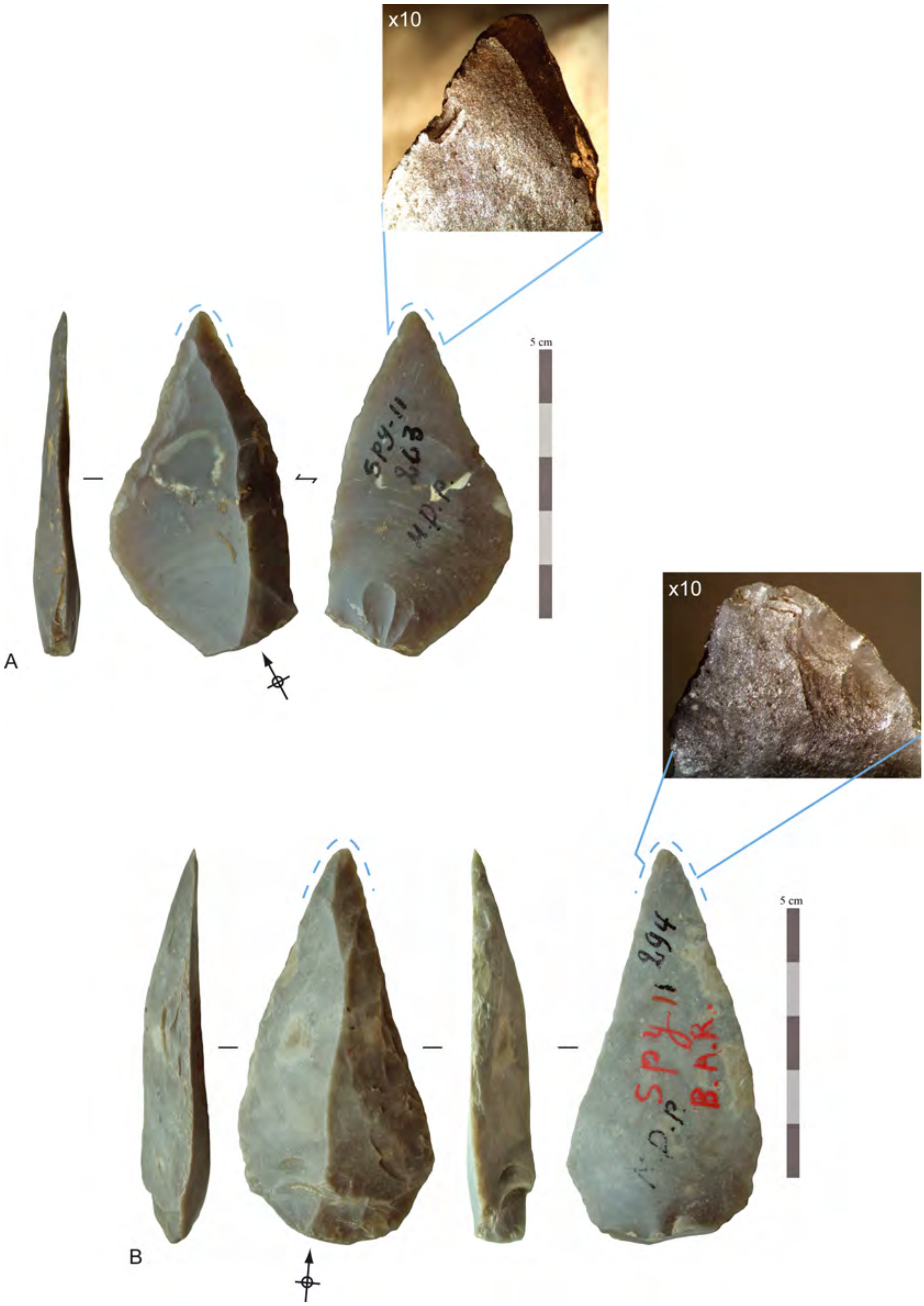

Figure 7. A & B: Two Mousterian points used for a tip contact action on a soft to medium-hard material, and details of the macroscopic use traces. The point B shows a very light polish resulting from perforating fresh wood. Pictures: A. Coudenneau.

assumptions about the prehensile mode: manual grasping or hafted use. Nevertheless, the hypothesis of hafting needs to be discussed given the great standardisation of the Mousterian points from Spy.

In fact, such morpho-metrical standardisation is quite rare in Mousterian industries, and three possible explanations have been considered:
- It could be an expression of codified production standards not responding to technical or functional reasons, but to cultural grounds;
- It could be a consequence of the functional homogeneity of the tools;
- It could be an adaptation to a future hafting, in order to facilitate the hafting process.

The use-wear analysis showed that these tools are far from being homogeneous in their function. Instead, they proved to have served various functions and even, for some of them, to be multifunctional, even if potential details of their operative mode may not have been entirely distinguished given their preservation state. Therefore, the standardisation cannot be considered as an adaptation to a single function. The functional analysis did not allow evaluating the hafting hypothesis, but the techno-morpho-functional analysis should enable to find clues to test it. The presence of a handle implies that stone tools are interchangeable, but when is an implement replaced? It is replaced when it no longer fulfils the required needs: it is either broken –but in this case the breakage appears while retouching– or exhausted. In the former case, we should see technological signs of resharpening. If so, there are two options: either the piece is resharpened in the shaft, which should result in a clear retouching limit, or the piece is removed from the shaft for resharpening. No rupture was observed in the retouch management, nor was there evidence of sharpening. Why were those pieces not resharpened in order to increase their use-life? Maybe sharpening would have altered the tool's morphological characteristics too much which would have made it less suitable for the task it was intended for?

TECHNO-MORPHO-FUNCTIONAL ANALYSIS

The technological study of the Mousterian points from Spy remains limited because of the extreme scarcity of cores in the "second fauna-bearing level", in particular cores which could have been linked with the production of Mousterian points. We can however make some comments.

An examination of the complete pieces has made clear that all the blanks for which the butt is preserved were produced by direct percussion with a hard hammerstone. The blanks used to produce those points are generally issued from full *débitage*, rarely cortical flakes (4 blanks) or semi-cortical and sometimes *débordant* flakes (5 blanks in total).

Most **butts** are facetted (39/72 butts, i.e. 54 %), but a small number shows flat butts (7/72, i.e. 10 %), splintered flat butts (3/72, i.e. 4 %), dihedral butts (3/72, i.e. 4 %), or in one case a cortical butt. Two butts are missing, 9 were removed by retouch (Figure 3: 3) –sometimes associated with a thinning of the bulb (Figure 2: 2; Figure 4; SF2: 7, 9; SF3: 8)– and one butt remained undetermined. Among the 9 blanks with removed butts, it is interesting to note that 7 were used to produce axial points, and one to produce the only transverse point in the series. Moreover, when the point axis and the butt type of a blank are compared (Figure 8A), the proportion of facetted butts and removed butts is almost equal for the studied axial point type series, whereas this is not the case for the two other point types. This observation seems to support the hypothesis of a potential hafting of these Mousterian axial points. The trend is getting stronger when the characteristics are compared for the specimens showing use traces only: on 8 axial points that were used, 4 have a removed butt, 2 a facetted butt, 1 a flat butt and 1 an undetermined butt (Figure 8B).

The quasi absence of cores for point production, and the high rate of retouching only authorised a very rough characterisation of the **knapping methods** employed for the production of these tools. However, it appears that there are three kinds of procedures that were used: unipolar, convergent and centripetal. The Levallois method is thereby present in two variations: the centripetal recurring Levallois method and the unipolar Levallois method. Despite a very high number of undetermined pieces, points offset to the left seem more readily made from blanks pro-

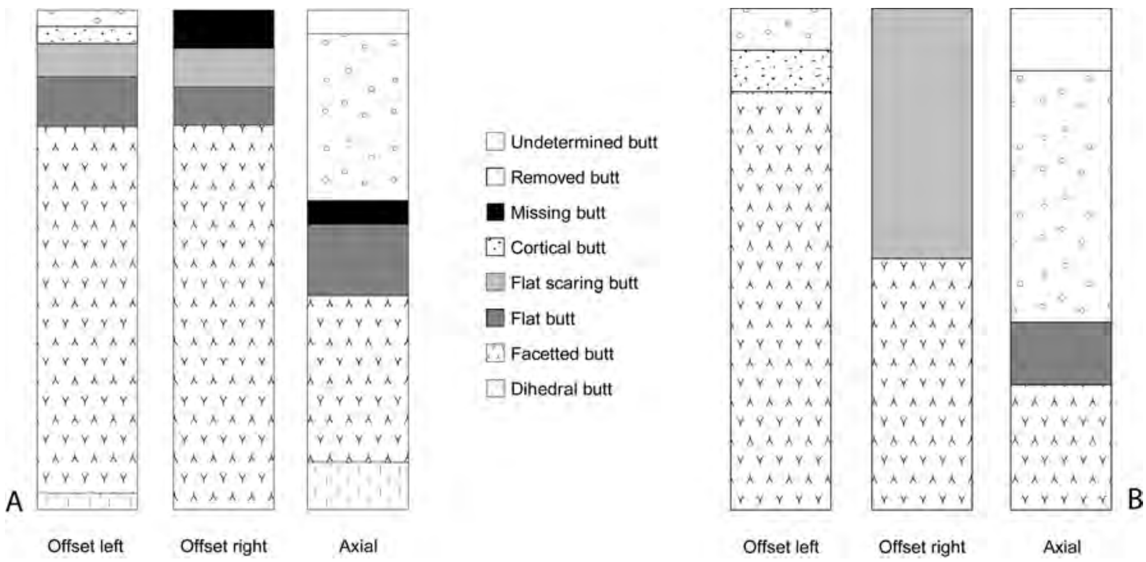

Figure 8. A: Butt morphology of Mousterian points; B: Butt morphology of used Mousterian points only.

duced from a centripetal knapping method, whereas points offset to the right and axial points seem most often made from blanks resulting from a unipolar knapping method.

The blanks are mostly (with one or two exceptions) flakes which were retouched into Mousterian points, most often offset towards the left. Only one point was made on a pseudo-Levallois point.

There does not appear to be a link between the morphology of mostly asymmetrical edges (length, angle and delineation of the left and right edges, *cf. supra*) and the active zones identified on the Mousterian points. This absence can be explained by the lack of a sufficient number of diagnostic use polishes, which limits our interpretation. As a matter of fact, a low magnification examination of use-wear traces can only identify the use motion, but it remains too vague for a deep reasoning on the distinction of different activities, and hence, the choice of a particular edge for a given activity. So, activities carried out with Mousterian points can just be outlined since they are rather readable by the use polish type.

The morphological study of Mousterian points from Spy highlighted their highly standardised morphology: there is a predominance of **points offset towards the left** (30 points on 72 or 42 % of the series), an average length of 62 ± 1 mm and an average width of 37 ± 1 mm. The distribution chart given by the ratio of length/width attests to this homogeneity (Figure 9).

The morphological analysis of Mousterian points showing use traces confirms this homogeneity, since the average length is 61 ± 2 mm and the average width 36 ± 1 mm. However, there is an under-representation/use of points offset to the right: 13 points out of 72 (i.e. 17 %) for the whole series, and only 2 points out of 22 (i.e. 9 %) for the used points. By contrast, points offset to the left are slightly over-represented in the set with use-wear traces compared to the whole series (42 % vs. 52 %). Axial points are rather equally represented (39 % vs. 38 %)[2].

The over-representation of the Mousterian points offset towards the left seems to be linked with a transverse use motion (Figure 10). Even though this over-representation may be a construction caused by the small number of pieces that were used, it nevertheless seems that these pieces could be linked to a use in transverse motions like scraping, for which the particular shape of the edges of the offset points is well adapted. Furthermore, the ergonomic shape of their proximal part seems to be adapted to manual grasping.

[2] Percentages are given only as indicators of a tendency to facilitate comparisons. They have no real statistical value, as the number of pieces with use-wear traces is low.

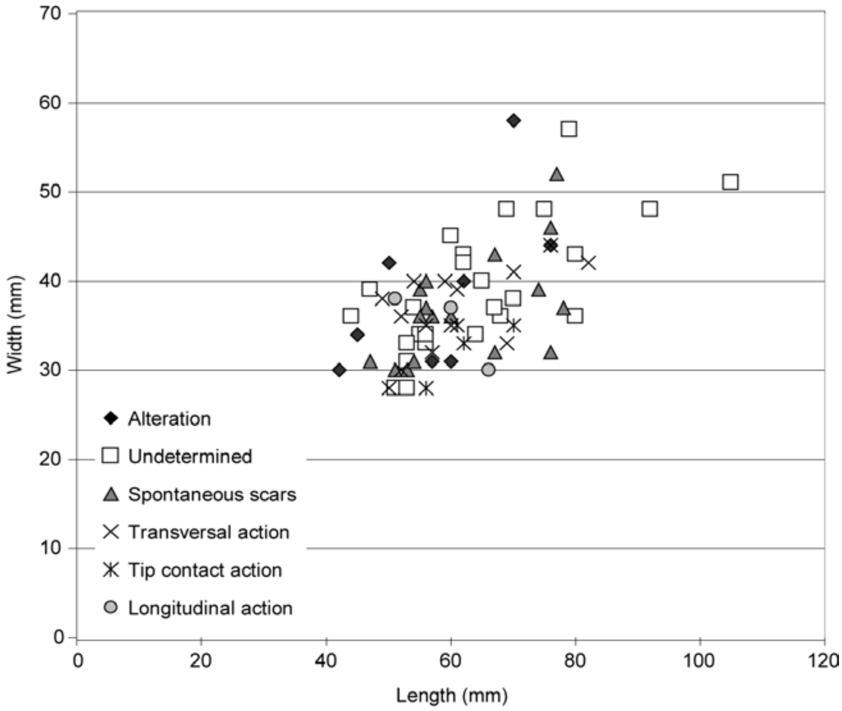

Figure 9. Length/Width ratio of Mousterian points.

In the case of axial points, 50 % proved to have been used for longitudinal and tip contact actions. Although their number is low, a technical choice could be suggested. Moreover, experiments have shown that axial pieces can be hafted differently from offset points and in the case of tip contact actions they can also be hafted more adequately. This fact is consistent with observations on butts of axial Mousterian points. In fact, a removed butt and a use in longitudinal and tip contact actions reinforce the idea of hafting for this tool type.

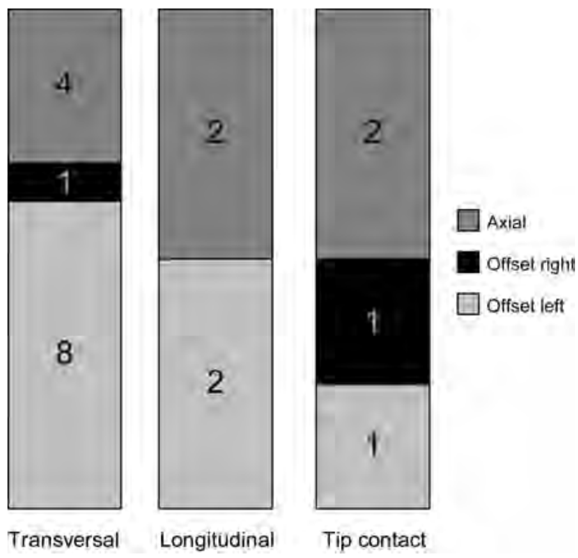

Figure 10. Types of use motions related to Mousterian point axiality.

CONCLUSION

Mousterian points from Spy cave are very standardised in form despite the wide variety of use modes. This standardisation in production is perhaps the expression of a cultural norm, but does not necessarily imply a functional aspect. However, such a standardisation could also reveal a multi-functional intention. The analysis of macro- and micro-wear traces of use indeed showed a diversity of tasks, sometimes on different parts of a single piece. Therefore, it is obvious that the morphological standardisation of pieces is not a consequence of a unique function of these objects.

The comparison between the morphology of the different parts of the Mousterian points (edges, tip) and their active zones does not show an obvious link, perhaps because of the small number of pieces showing use traces. However, we can see that Mousterian points offset towards the left have been used more often for transverse actions. From a morphological point of view, many pieces could have been adapted to manual grasping, offset points in particular.

By contrast, standardisation could also imply the use of a haft, since it allows an interchangeability of the points in a handle. After all, experiments have shown that the manufacture of a handle requests more time and energy than manufacturing Mousterian points, even if our appreciation of a time-consuming task is probably very different from that in Palaeolithic times. In this sample, hafting is especially considered for points with removed butt and with evidence for longitudinal and tip contact actions, but while suggestive evidence of hafting was observed, our study did not succeed in truly validating the hafting hypothesis on the points from Spy. The inclusion of a more detailed and specific study of hafting traces appears useful for future investigations.

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BIBLIOGRAPHY

BEYRIES S., 1987. *Probables emmanchements au Paléolithique Moyen. In*: D. STORDEUR (dir.), *La main et l'outil. Manches et emmanchements préhistoriques*. Table ronde CNRS tenue à Lyon du 26 au 29 novembre 1984. Travaux de la Maison de l'Orient, **15**: 58-62.

BOËDA É., 2001. *Détermination des unités techno-fonctionnelles de pièces bifaciales provenant de la couche acheuléenne C'3 base du site de Barbas I. In*: D. CLIQUET (dir.), *Les industries à outils bifaciaux du Paléolithique moyen d'Europe occidentale*. Actes de la table ronde internationale organisée à Caen les 14 et 15 octobre 1999. Liège, ERAUL, **98**: 51-75.

BORDES F., 1954. Notules de typologie paléolithique. III: Pointes moustériennes, racloirs convergents et déjetés, limaces. *Bulletin de la Société préhistorique française*, **51** (7): 336-338.

BORDES F., 1979. *Typologie du Paléolithique ancien et moyen*. Cahiers du Quaternaire, **1**. Paris, CNRS Éditions, 2 vol.

BRÉZILLON M., 1983. *La dénomination des objets de pierre taillée. Matériaux pour un vocabulaire des préhistoriens de langue française*. IV^e supplément à "Gallia-Préhistoire". Paris, CNRS Éditions, 3^e édition: 426 p.

CASPAR J.-P., MASSON B. & VALLIN L., 2003. Poli de bois ou poli de glace au Paléolithique inférieur et moyen? Problèmes de convergence taphonomique et fonctionnelle. *Bulletin de la Société préhistorique française*, **100** (3): 453-462.

DE PUYDT M. & LOHEST M., 1887. L'homme contemporain du Mammouth à Spy (Namur). *Annales de la Fédération archéologique et historique de Belgique, Compte rendu des travaux du Congrès tenu à Namur les 17-19 août 1886*, **2**: 207-240, 10 pl. h.t.

DI MODICA K., 2004. La Grotte de l'Hermitage: nouvelles approches et réinterprétation d'un site classique du Paléolithique ancien mosan. *Notae Praehistoricae*, **24**: 47-55.

DI MODICA K. & JUNGELS C. (dir.), 2009. *Paléolithique moyen en Wallonie. La collection Louis Éloy*. Collections du Patrimoine culturel de la Communauté française, **2**. Bruxelles, Service du Patrimoine culturel de la Communauté française de Belgique: 219 p.

FISCHER A., VEMMING HANSEN P. & RASMUSSEN P., 1984. Macro and micro wear traces on lithic projectile points. Experimental results and prehistoric examples. *Journal of Danish Archaeology*, **3**: 19-46.

GONZÁLEZ URQUIJO J. E. & IBAÑEZ ESTÉVEZ J. J., 1994. *Metodología de análisis funcional de instrumentos tallados en sílex*. Bilbao, Universidad de Deusto: 301 p.

JUNGELS C., HAUZEUR A. & PIRSON P., 2006. Réexamen du matériel archéologique de la grotte de Spy: les pointes moustériennes et les pointes pseudo-Levallois. *Notae Praehistoricae*, **26**: 65-90.

KEELEY L. H., 1974. Technique and methodology in microwear studies: a critical review. *World Archaeology*, **5** (3): 323-336.

LEMORINI C., 2000. *Reconnaître des tactiques d'exploitation du milieu au Paléolithique Moyen. La contribution de l'analyse fonctionnelle. Étude fonctionnelle des industries lithiques de Grotta Breuil (Latium, Italie) et de La Combette (Bonnieux, Vaucluse, France)*. BAR International Series, **858**. Oxford, Archaeopress: 142 p.

ODELL G. H., 1977. *The application of micro-wear analysis to the lithic component of an entire prehistoric settlement: Methods, problems, and functional reconstructions*. Ph.D. thesis, Harvard University, Cambridge (Mass.).

O'FARRELL M., 1996. *Approche technologique et fonctionnelle des pointes de La Gravette: une analyse archéologique et expérimentale appliquée à la collection de Corbiac*. Mémoire de DEA, Université de Bordeaux I: 97 p.

PLISSON H. & BEYRIES S., 1998. Pointes ou outils triangulaires? Données fonctionnelles dans le Moustérien levantin. *Paléorient*, **24** (1): 5-24.

PRADEL L., 1963. La pointe moustérienne. *Bulletin de la Société préhistorique française*, **60** (9-10): 569-581.

PROST D.-C., 1989. *Enlèvements accidentels, enlèvements d'utilisation et de retouche sur les outils de pierre taillée*. Thèse de doctorat, Paris X-Nanterre: 552 p.

ROTS V., 2002. *Hafting traces on flint tools: possibilities and limitations of macro- and microscopic approaches*. Thèse de l'Université Catholique de Leuven, 2 vol.: 649 p.

ROTS V., 2009. Prehension and Hafting Traces on Flint Tools. A Methodology. Leuven, Leuven University Press: 273 p.

ROTS V., PIRNAY L., PIRSON P. & BAUDOUX O., 2001-2002. Traces expérimentales d'emmanchement. *Bulletin de la Société royale belge d'Études géologiques et archéologiques* "*Les Chercheurs de la Wallonie*", **XLI**: 115-125.

ROTS V., PIRNAY L., PIRSON P. & BAUDOUX O., 2006. Blind tests shed light on possibilities and limitations for identifying stone tool prehension and hafting. *Journal of Archaeological Science*, **33** (7): 935-952.

SHEA J. J., 2001. Experimental Tests of Middle Palaeolithic Spear Points Using a Calibrated Crossbow. *Journal of Archaeological Science*, **28 (**8): 807-816.

SHEA J. J., 2006. The origin of lithic projectile technology: evidence from Africa, the Levant, and Europe. *Journal of Archaeological Science*, **33** (6): 823-846.

TRINGHAM R., COOPER G., ODELL G., VOYTEK B. & WHITMAN A., 1974. Experimentation in the formation of edge damage: a new approach to lithic analysis. *Journal of Field Archaeology*, **1**: 171-196.

TUFFREAU A. (dir.), 1993. *Riencourt-les-Bapaume (Pas-de-Calais). Un gisement du Paléolithique moyen*. Documents d'Archéologie française, **37**. Paris, Éditions de la Maison des Sciences de l'Homme: 127 p.

ULRIX-CLOSSET M., 1975. *Le Paléolithique moyen dans le bassin mosan en Belgique*. Wetteren, Éditions Universa: 221 p.

VILLA P. & LENOIR M., 2006. Hunting weapons of the Middle Stone Age and the Middle Palaeolithic: spear points from Sibudu, Rose Cottage and Bouhehen. *Southern African Humanities*, **18** (1): 89-122.

AUTHORS AFFILIATION

Cécile JUNGELS
Anne HAUZEUR
Department of Palaeontology
Section of Anthropology and Prehistory
Royal Belgian Institute of Natural Sciences
29, Vautier Street
1000 Brussels
Belgium
cecilejungels@yahoo.fr
jungels@ramioul.org
ahauzeur@yahoo.fr

Aude COUDENNEAU
LAMPEA, UMR 7269
Université de Provence
Maison Méditerranéenne
des Sciences de l'Homme
5, rue du Château de l'Horloge - BP 647
13094 Aix-en-Provence cedex 2
France
coudenneau@mmsh.univ-aix.fr

Philippe PIRSON
Centre d'Étude des Techniques et de Recherche
Expérimentale en Préhistoire
Les Chercheurs de la Wallonie
128, rue de la Grotte
4400 Flémalle
Belgium
pirson.ph@skynet.be