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Tool Use and Hafting in the Western European Middle Palaeolithic

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1. Introduction

Functional studies have been performed on a systematic basis since the eighties (Keeley, 1980; Plisson, 1985; Vaughan, 1985; Beyries, 1987[b]), but while much attention was devoted to the Middle Palaeolithic period in the early days (Beyries, 1987[b] ; Anderson-Gerfaud, 1990), this drastically changed when the impact of post-depositional processes on use-wear traces was discovered. Both mechanical and chemical processes proved to have an impact on the preservation and appearance of use-wear traces (Levi-Sala, 1986; Plisson & Mauger, 1988), and analysts became discouraged to examine Middle Palaeolithic assemblages which appeared to have been affected the most. Attention shifted to later assemblages, in particular Neolithic ones. Meanwhile, insight into the effect of post-depositional processes gradually improved, and assemblages appeared to be variously affected. Even within one assemblage, preservation of the artefacts could vary significantly (Caspar *et al.*, 2003).

Gradually Middle Palaeolithic assemblages enjoyed a renewed interest, with attention being focused on the best-preserved assemblages / artefacts first (Vallin *et al.*, 2001; Locht, 2002; Claud, 2008). In Belgium, the functional analysis of Remicourt–*En Bia Flo I* can be viewed in this light (Bosquet *et al.*, 2004). More recently, also residue analysis has started to contribute to insight in tool use activities in the Middle Palaeolithic (Hardy, 2004). While functional data remain too sparse, both geographically and chronologically, I will nevertheless attempt to propose some general trends based on analyses performed up to now. The focus will be on Western Europe, Belgium and its neighbouring countries in particular.

2. Current state of research

In spite of the numerous Middle Palaeolithic sites in Belgium, only few of them were analysed functionally. Among them are Remicourt–*En Bia Flo I* (Bosquet *et al.*, 2004) and Spy–*grotte de la Betche aux Rotches* (analysed recently by A. Coudenneau, largely unpublished up to now). Preservation issues are obviously an important factor. While the material from Remicourt–*En Bia Flo I* is overall well-preserved, the preservation of the material of Spy–*grotte de la Betche aux Rotches* is variable. For Spy, about 72 Mousterian points were examined for traces of use (Jungels *et al.*, forthcoming), 20 of which showed evidence of use. Woodworking, dry hide working and butchering were identified, while one projectile may be present among the fractured items. For Remicourt, 186 pieces were examined, 6 of which only for technological wear (Bosquet *et al.*, 2004). From the 180 pieces that were studied for signs of use, 50 showed evidence of particular use motions, while an approximate worked material could be identified for 40 pieces. Scraping activities dominate, next to some cutting , grooving and perforating activities. Woodworking and a use on an unidentified hard material dominate, while soft animal matter as well as hide are rarely attested.

In neighbouring countries, more sites were analysed for evidence of use: the early site of Maastricht–*Belvédère* in the Netherlands (Van Gijn, 1988; Rots, in press), Biache-St-Vaast (Beyries, 1987[b]; Rots, in press), Payre (Moncel *et al.*, 2009), La Quina (Hardy, 2004), Hermies (Vallin *et al.*, 2001; Vallin *et al.*, 2006), Bettencourt (Locht, 2002; Rots, in press), and the bifaces from La Graulet, La Conne de Bergerac, Combe Brune 2, Fonseigner and Chez-Pinaud / Jonzac (Claud, 2008) in France; Bilzingsleben, and some tools from Neumark–*Nord* and Wallertheim (Conard & Adler, 1997; Steguweit, 2003), Inden–*Altdorf* (Pawlik & Thissen, 2011), Sesselfelsgrotte (Rots, 2009), Hohle Fels (in progress, by Hardy and Rots) in Germany.

For the majority of these sites, it could be demonstrated that woodworking and butchering were important activities. The identification of spear tips appeared less straightforward and varying results have been obtained. While the above set of sites can hardly be considered as representative for the entire Middle Palaeolithic of the region, a lot more insight has nevertheless been obtained in the subsistence strategies of Neandertals.

The general patterns that can be observed in the Middle Palaeolithic are supplemented based on the functional analyses I performed myself. Three sites are included in more detail: Biache-St-Vaast (France), Bettencourt (France), and Sesselfelsgrotte (Germany) (tabl. 1; Rots, 2009, in progress, in press).

Biache-St-Vaast

Biache-St-Vaast (Pas-de-Calais, France) is a Middle Palaeolithic site situated on the terraces of the valley of the river Scarpe (Tuffreau & Sommé, 1988). Different archaeological horizons were identified, of which level

Site	Level / area	Number of tools	Sample	%
Biache-St-Vaast	Level IIa	722	157	*22*
Bettencourt	Levallois points, N2b	128	27	*21*
Sesselfelsgrotte	A06 & A08 mainly	1585	692	*44*

Tabl. 1
Sites and samples analysed.

IIA is the richest one with abundant flint artifacts and bone remains. It has an average age of 175.000 ± 13.000 B.P. (TL date; Sommé *et al.*, 1988) and of 253.000 + 53.000/- 37.000 (ESR date; M.I.S. 6 and 7; Guipert *et al.*). The continental flora and fauna, which are of "moderate" type, permit to assume that this level dates to the beginning of M.I.S. 7 (7a), with an age closer to 200.000 B.P. than to 150.000 B.P. (Sommé *et al.*, 1988). Level IIA is the only level considered here. The convergent side scrapers of level IIA were part of previous functional analyses (Beyries, 1987[a], 1988[b]). On a total of 722 tools, 157 tools were analysed in this study (22%).

Bettencourt

The site of Bettencourt–*Saint-Ouen* (France) is situated in the Somme basin, west of the large European loess zone (Locht, 2002). Five successive Palaeolithic occupations were identified and date to the beginning of the last glaciation (M.I.S. 5a-d; Weichselian Early Glacial). Only level N2b is considered here, it dates to about 75/85.000 B.P. (TL-IRSL on sediment, ESR on teeth; Antoine *et al.*, 2002). Previous functional analyses were performed by Caspar (Locht *et al.*, 2002). Only Levallois points are considered: a total of 128 Levallois points were recovered for the three sectors of level N2b: 4 pieces for sector 1, all of which proved alterated, 7 for sector 2, 4 of which were analysed by Caspar and proved unused, and 117 for sector 3, 49 of which were analysed by J.-P. Caspar, 12 of which proved to have been used (Locht, 2002). In total, 27 Levallois points from the ones analysed by J.-P. Caspar from sector 3 were available for this functional analysis. Results are thus necessarily partial.

Sesselfelsgrotte

Sesselfelsgrotte (Bavaria, Germany) is situated in the valley of the lower Altmühl River, a tributary of the Danube (Richter, 1997; Freund, 1998). The site has a unique sequence of 22 Middle Palaeolithic occupations and several Upper Palaeolithic occupations (Richter, 2001). Excavations by the University of Erlangen were mainly carried out in the 1960s and 1970s (Freund, 1968, 19988). The so-called "G-complex" consists of thirteen Mousterian and Micoquian assemblages postdating the first glacial maximum of the last cold stage (ca. 65.000 B.P.) (Jöris, 2002). Layer G itself consists of up to six over-lying horizons, which represent actual living floors with several fireplaces, many burnt faunal remains and abundant stone artifacts. About 85.000 stone artifacts and numerous animal remains (mainly mammoth, reindeer and horse) were recovered, as were remains of a hominin foetus / neonate (Street *et al.*, 2006). A small functional analysis was performed on the microliths but remained unpublished (Lass, 1994). The functional analysis was focused on units A06 and A08 mainly, corresponding to layers G2 (Late Micoquian) and G4 (Early Micoquian) respectively (Rots, 2009). The total assemblage consists of 1.585 tools (544 tools for units A06 and A08). In total, 692 pieces were screened macroscopically (44%), out of which 292 pieces were selected for closer analysis (209 from units A06 and A08).

3. Tool use in the Middle Palaeolithic

Wood use-wear has been frequently observed on Middle Palaeolithic tools, in particular in functional analyses from the eighties. Based on current knowledge, it is likely that at least part of these traces are alterations. Some correspondence in appearance exists indeed between wood polish and some alterations, and alterations were not yet well-understood at the time. A possible cause for this type of alterations has been proposed (Caspar *et al.*, 2003). Nevertheless, a predominance of woodworking seems to prevail, as also more recently performed functional analyses, including residue studies, attest to its importance (fig. 1-3; Hardy, 2004; Rots, 2009, in press). A remarkable feature that was observed at both Biache-St-Vaast and in particular at Sesselfelsgrotte is the existence of a kind of wood shaving tools (rabots), similar in concept to the Australian tula adzes (McCarthy, 1976). It generally concerns tools with a more or less triangular morphology, and typologically these are often transverse or side-scrapers.

While butchering is generally difficult to identify, following a slow trace development, evidence was nonetheless observed on the majority of sites (e.g., Spy, Maastricht–*Belvédère*, Biache-St-Vaast, Bettencourt, Sesselfelsgrotte; fig. 4-5). Whether this should be interpreted as a confirmation of a highly carnivorous diet can be questioned. The focus of Neandertals on animal foods has been stressed frequently, as a consequence of results from isotope studies (Richards *et al.*, 2001), but recently, contrasting results indicate the importance of plant foods for Neandertal subsistence. This was demonstrated based for instance on an analysis of Neandertal teeth, including those from Spy (Henry

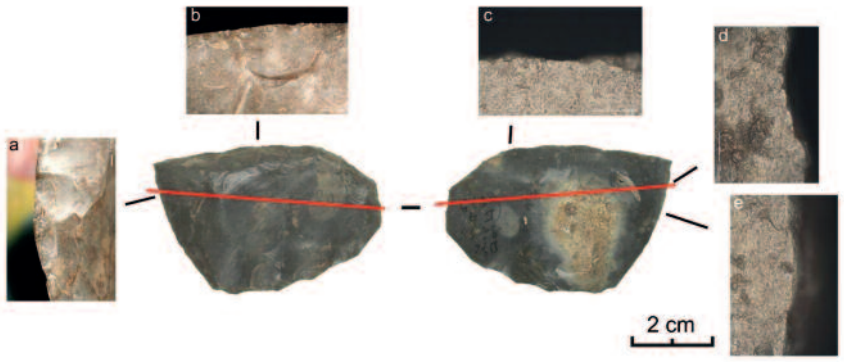

Fig. 1
Biache-St-Vaast (F), woodworking tool (B76 9i 56 IIa; transverse scraper) with wear evidence: a. hafting edge damage (8×); b. use damage (8×); c. remnants of wood use polish (200×); d. small hafting friction bright spots at haft limit associated with negative of dorsal scar (200×); e. hafting polish (200×).

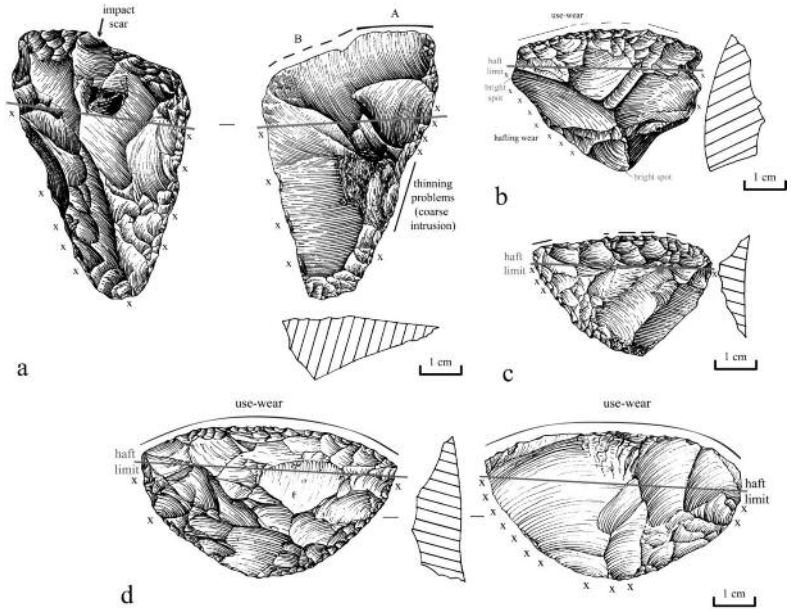

Fig. 2
Sesselfelsgrotte (D), woodworking tools: a. hafted axe/adze (*cf.* tranchet) (P4155/S65; triangular, leafpoint-like scraper, one edge with La Quina-like steep retouch, Richter, 1997); b. hafted scraper/rabot (P3049/S65; transverse scraper on thick flake with Quina retouch; Richter, 1997); c. hafted scraper/rabot (S1428/68; asymmetrical point on flake with some lateral cortex remains; Richter, 1997); d. Hafted adze (S1713/68; leaf form transverse scraper on flake, ventral only partially retouched; Richter, 1997).

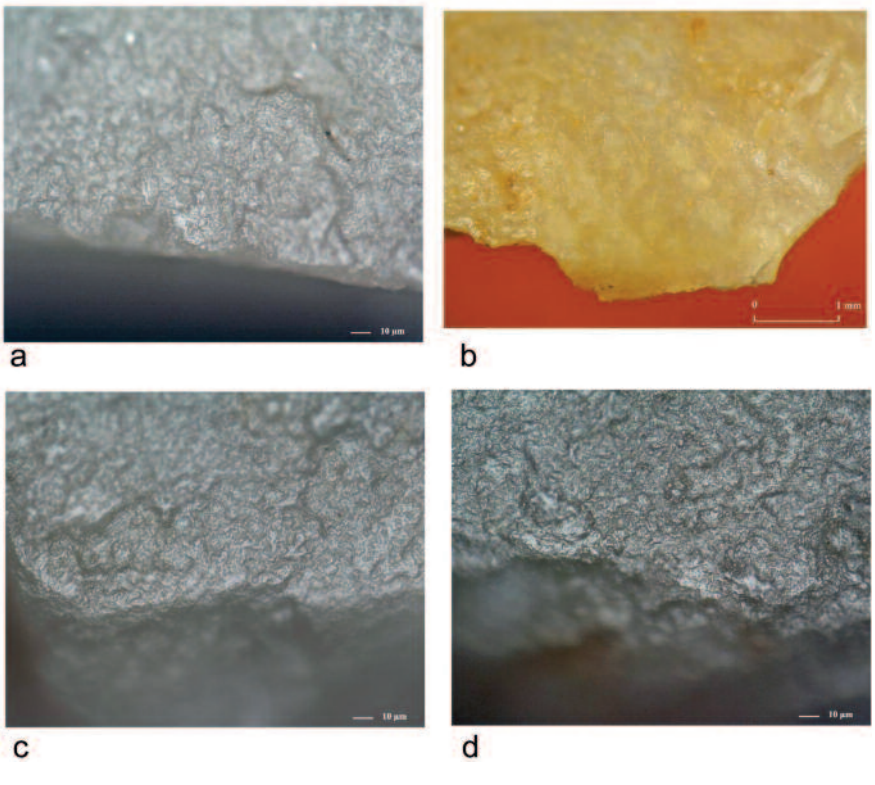

Fig. 3
Sessefelsgrotte (D), microscopic evidence of woodworking tools: a. limited use polish on left distal extremity of P4155/S65 (axe/adze) (200×); b. hafting edge scarring on the ventral left haft limit of S1428/68 (scraper/rabot) (25×); c. hafting wood polish on the ventral medial ridge of P4155/S65 (axe/adze) (200×); d. hafting wood polish on the ventral medial ridge of P4155/S65 (axe/adze) (200×).

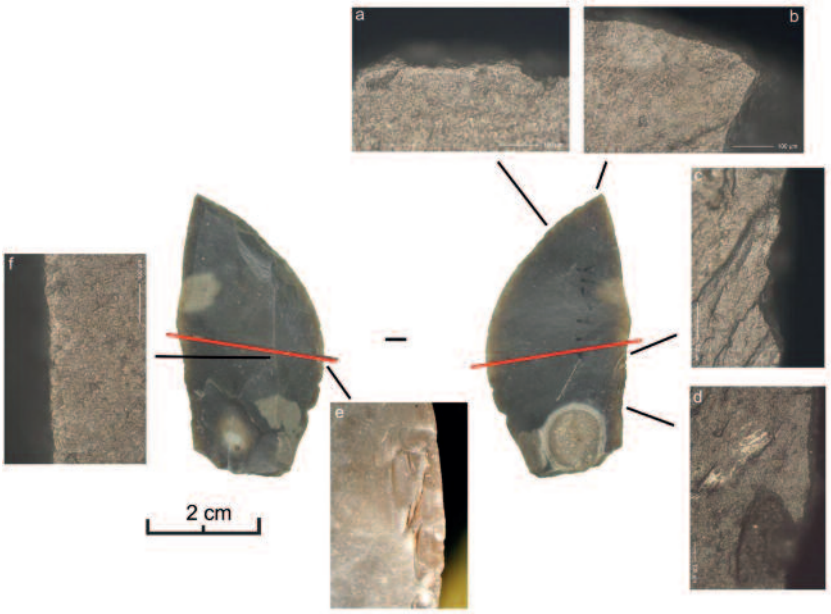

Fig. 4
Biache-St-Vaast (F), butchering knife (B76 15Y IIa; convex sidescraper): a. use polish (200×); b. use polish on edge of use scar (200×); c. hafting wear (200×); d. friction striation and hafting scar (100×); e. hafting edge damage at haft limit (10×); f. hafting polish on dorsal ridge (200×).

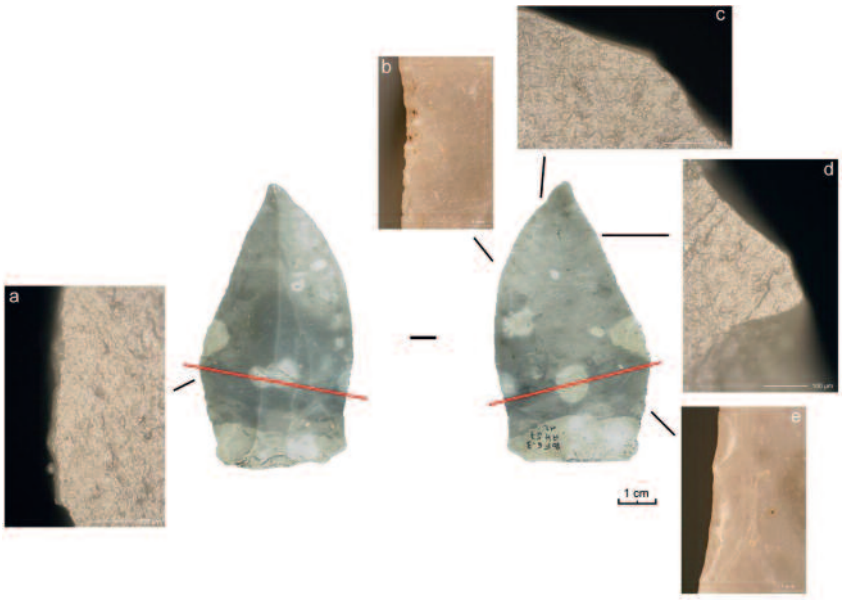

Fig. 5
Bettencourt (F), butchering knife (AH57/12; Levallois point): a. hafting polish (200×); b. use damage (16×), c. use polish (200×); d. use polish (200×); e. hafting damage, sliced scars (20×).

et al., 2011), and on residue analyses (Hardy, 2004; Hardy & Moncel, 2011).

Identifying spear tips has appeared to be rather complicated, and as stated, varying results have been obtained. This is in part caused by the diverse opinions about which features may be considered to be diagnostic of impact; impact generally being equalled with hunting tools. While some authors are satisfied with one kind of fracture occurring on the tip of a potential spear point, others minimally demand a combination of different features, both macro- and microscopic. These differences in analytical approach have a major impact on the kind and reliability of the results. Conflicting results (Shea, 1988; Plisson & Beyries, 1998) have demonstrated that a restriction to an analysis of macrofractures is not reliable for the identification of hunting tools, and that rigorous procedures are essential. Also TCSA/TCSP values (Shea, 2006; Shea & Sisk, 2010) can never be considered as diagnostic indications of hunting tools, let alone of their projecting mode. While these measurements have become widespread in archaeological analyses given the very straightforward way in which they supposedly shed light on the existence of hunting tools, they actually only witness the potential suitability of a piece to be used as a spear tip or projectile and they do not demonstrate that a piece was actually used as such. Moreover, it does not exclude the possibility that other pieces, with "inapproporiate" TCSA/TCSP values may have been used for hunting. Therefore, one should always treat identifications of hunting tools with caution, and rigorously examine the analytical basis.

In this study, several spear tips could be identified for each of the three sites (tabl. 2). These interpretations were always based on a combination of different macro-

Site	Sample	Subsistence				Briquet	Tool manufacture						Uncertain
		Animal hunting	Animal processing	Vegetal processing	*% of identified tool uses*		Wood percussion	Woodworking	Grooving / drilling activities	Scraping hide	Other scraping	*% of identified tool uses*	Other cutting
Biache-St-Vaast	157	16 or 20	18		*44*		6	3	13		5	*31*	19
Bettencourt	27	7 or 9	8		*89*			1				*5*	
Sesselfelsgrotte	292 (692)	28	9		*27*		24	19	16	2 or 6	18 or 22	*60*	18

Tabl. 2
Site function (also pieces with identified tool use but unidentified prehensile mode are included).

and microscopic impact wear traces, located on the tip, the edges, or the proximal part (counter-pressure in the handle), and the observation of hafting traces that are diagnostic of high impact activities (Figures 6-9; Rots, 2002, 2010).

Aside from identifying worked materials and tool motions, it is also important to evaluate the kind of activities that were performed at Middle Palaeolithic sites, in particular the balance between subsistence-related and maintenance activities. Based on these interpretations, insight can be obtained in a site's function.

In general terms, stone tools prove to have an important role in animal procurement and processing activities (tabl. 2). Up to now, few flaked stone tools have been reliably linked with the processing of plant foods, even though these foods were part of the Neandertal diet (Hardy & Moncel, 2011; Henry *et al.*, 2011). Either the corresponding tools were rarely included in the samples analysed for wear traces or other tools (e.g., out of organic material) were used for the task. The important fraction of wooden implements that appear to have existed based on the abundance of wood use-wear may perhaps account for this.

Based on the functional results, Biache-St-Vaast clearly appears to be a hunting camp with an important focus on animal hunting and processing activities, a predominance that would even be more explicit if the more general non-specified cutting activities would prove to be linked to similar tasks. The extensive associated faunal assemblage (bovids) evidently confirms this interpretation (Tuffreau & Sommé, 1988). The manufacturing activities are less dominant and appear to be of secondary importance, in the sense that they could for instance be related to maintenance activities that are performed in preparation to a hunting episode, or to kill time while waiting for the herds to pass. For Bettencourt, the examined sample, in addition to the sample analysed by Caspar (Locht, 2002), allows a tentative interpretation of the site's function. The Levallois points prove to be linked with subsistence-related activities mainly, either for hunting or animal processing. Also the remaining assemblage shows a predominance of butchering activities, while adding woodworking as another important activity performed at the site, next to knapping activities (Locht, 2002). It is currently impossible to determine whether the woodworking and knapping

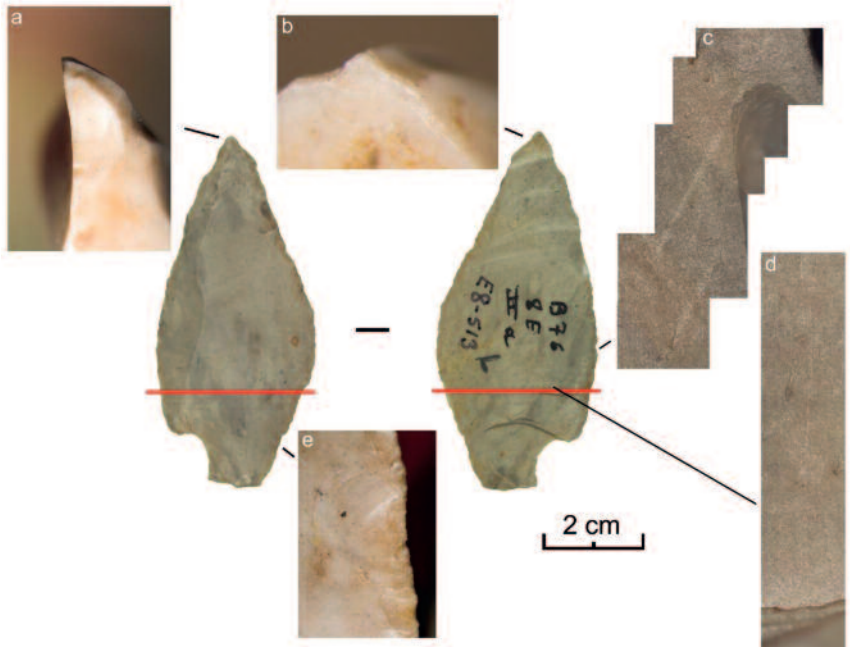

Fig. 6
Biache-St-Vaast (F), spear tip (B76 8E IIa; elongated Moustier point): a. step-terminating spin-off on dorsal tip (16×); b. step-terminating impact scar on ventral tip (50×); c. impact striations (MLIT) orientated oblique on edge (100×); d. impact striation initiated from scar termination due to the friction with the scar flake that detached due to counter-pressure within the haft upon impact (100×); e. hafting edge damage on dorsal proximal right edge (8×).

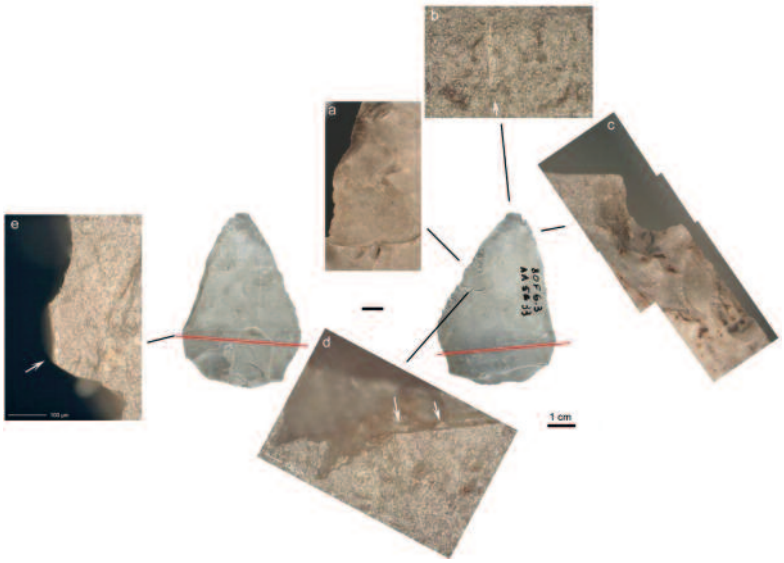

Fig. 7
Bettencourt (F), spear tip (AA56/33; Levallois point): a. impact damage (8×); b. Impact striation in prolongation of tip fracture (MLIT) (100×); c. impact damage (25×); d. impact striations (MLIT) in prolongation of large impact scar (100×); e. friction spot due to friction with scar flake detached within the haft (200×).

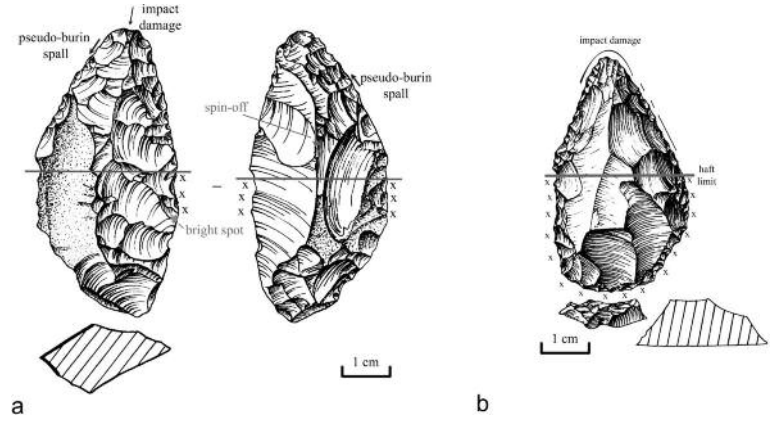

Fig. 8
Sesselfelsgrotte (D), spear tips: a. hafted projectile (S1477/68; *Keilmesser* with angular working edge, thinned base; Richter, 1997); b. possible thrusting spear point (P5773/S65; slightly asymmetrical point with dorsally thinned back on Levallois flake; Richter, 1997).

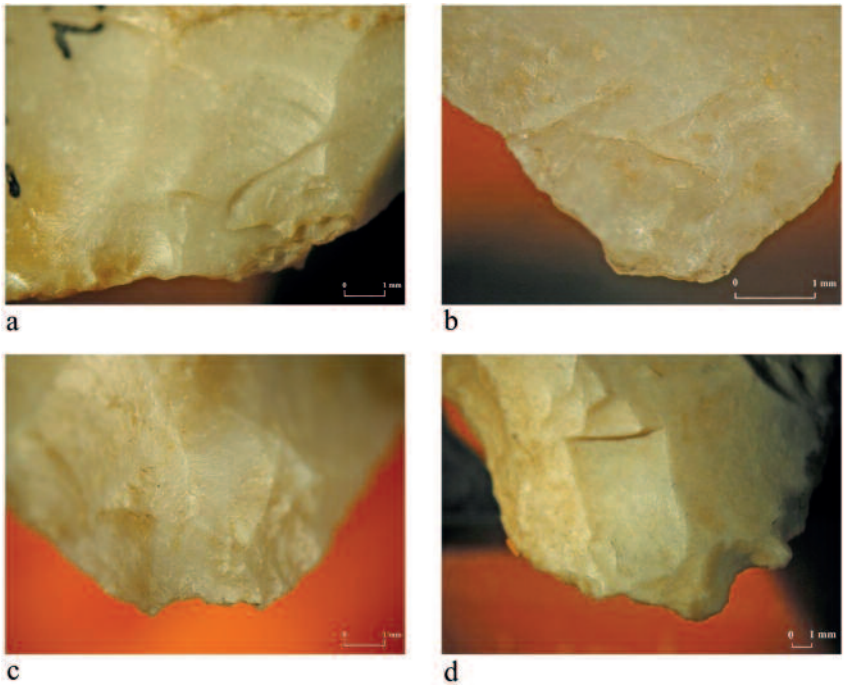

Fig. 9
Sesselfelsgrotte (D), microscopic evidence of spear tip use: a. hafting damage on the ventral medial left edge of P5580/S65 (12×); b. possible impact damage on ventral tip of P5773/S65 (25×); c. Impact damage on dorsal tip of P5773/S65 (12×); d. impact damage on dorsal tip of S3947/69 (6×).

activities could have been linked to a gearing-up episode before the hunt. Sesselfelsgrotte by contrast, appears to be a domestic site, with general subsistence-related activities, but where tool maintenance activities visibly dominate (Rots, 2009). The strong dominance of woodworking implements stresses this focus on tool repair or gearing-up activities. In this regard, the high number of hunting tools could be a consequence of intense retooling activities instead of elaborate hunting activities around the site itself.

4. Hafting in the Middle Palaeolithic

Different lines of evidence exist for the identification of hafted stone tools in Palaeolithic assemblages. The most evident direct evidence consists of recovered organic handles, but these are only documented from the Magdalenian onwards (Jelinek, 1982; Buisson & Peltier, 1993) and most finds date to the Neolithic period (e.g., Swiss lakes; e.g., Müller-Beck, 1965; Ramseyer, 1985). Adhesives preserved on stone tool surfaces form another line of direct evidence even though one has to remain careful not to automatically interpret adhesives as being used to attach a stone tool to a handle. After all, it has been documented that balls of adhesives (e.g., resin) represent the actual handle (Müller-Beck, 1965; Stordeur, 1987), as they equally well protect the hands from the sharp edges of a stone tool. In many cases, of course, adhesives were indeed used as a glue to attach a stone tool to a handle. This is demonstrated based on imprints of the organic handle in the adhesives, or more indirectly, based on the stone tool's function (e.g., spear tips and projectiles necessitate a handle). Adhesives have been recovered at several sites, such as at the late Middle Pleistocene site of Campitello (Italy; Mazza, 2006). Most finds date from about 70.000 B.P. onwards, such as those at Umm el Tlell (70.000 B.P.; Boeda *et al.*, 1996; Boëda *et al.*, 2008) and Königsaue (45.000 B.P.; Hedges *et al.*, 1998). Other direct evidence is available in the form of hafting wear observed on stone tools under magnification (Rots, 2002, 2003, 2010). This wear evidence is sufficiently diagnostic to make valid distinctions between hand-held and hafted tools. If preservation is sufficient, also the hafting arrangement may be interpreted (Rots, 2002, 2005, 2010).

The most convincing example of indirect evidence of hafting concerns a few particular use-wear identifications. After all, a haft is a necessity for some tool functions, such as the use of stone tools as spear tips or projectile points. If the tip / projectile function can be convincingly argued based on reliable use-wear evidence (macro- and microscopic), hafting is a necessary consequence. The same counts for percussion implements, such as axes or adzes. Other indirect evidence is merely suggestive of hafting. The organisation of use-wear traces for instance may provide clues: if one takes the example of scraping tools, centralised use-wear was only observed experimentally on hafted tools, while off-centred use-wear traces occur on both hand-held and hafted tools (Rots, 2002, 2010). Also certain fractures proved diagnostic of hafting, in particular when associated with a high degree of scarring (Rots, 2002, 2010). They tend to be initiated from the main ridge, but this is not a diagnostic feature in itself as knapping or retouch fractures may also initiate from the main ridge. Initiations from the ventral corners are more diagnostic, but these occur in grooving or perforating motions mainly. Morphological adaptations, including notches, tangs, proximal thinning, etc., form other examples of potential indirect (merely suggestive) evidence of hafting even though a systematic link of most of these features with hafting still needs to be established.

Based on current evidence (e.g. tabl. 3), it is clear that hafting is performed from a very early stage onwards (Rots, in press). Already in the early Middle Palaeolithic, hafting stone tools is not merely anecdotic. Interestingly, no evident increase in the frequency of hafting can be observed within the Middle Palaeolithic, based on the small number of sites analysed up to now. At both sites for which reliable tool samples were examined (Biache-St-Vaast and Sesselfelsgrotte), around 30% of the tools within the sample showed evidence of hafting (with various degrees of certainty). While tool functions that have to be performed hafted out of necessity dominate in this early stage (projectiles, percussion tools), hafting is not exclusively performed for such tools only. It suggests that we may not be dealing with the first attempts to haft tools; expertise may already have been accumulating to some degree.

If the pattern observed at Biache-St-Vaast / Bettencourt and Sesselfelsgrotte are contrasted, it appears that hafting is an explicit choice driven by the frequency of a task and thus the site's function. While butchering knives proved to be frequently hafted at Biache-St-Vaast and Bettencourt, two sites focused on hunting and butchering activities, this appears to be rarely the case at Sesselfelsgrotte in spite of evidence of animal procurement activities. By contrast, woodworking is very important at Sesselfelsgrotte, which appears to be reflected in an elaborate hafted tool assemblage for woodworking. This pattern implies that even when expertise regarding hafting is available, it is not necessarily applied in every situation. The decision to invest in hafting appears to be linked with the frequency of an activity, and

Tabl. 3
Proportions of hand-held and hafted implements per sample.

Site	Sample	Hand-held	%	Possibly hand-held	%	Hafted	%	Possibly hafted	%
Biache-St-Vaast	157	6	*4*	11	7	26	*17*	29	*19*
Bettencourt	27	1	*4*	1	4	11	*41*	5	*19*
Sesselfelsgrotte	292	8	*3*	11	4	39	*13*	57	*20*

thus with the site's function and specialisation. Obviously, a far larger set of sites needs to be included in order to further evaluate this pattern.

While exact hafting arrangements were overall difficult to identify, some valid data could nevertheless be produced. In the first place, only terminal hafting arrangements were identified: stone tools were mounted at the extremity of a handle (in a split or juxtaposed haft). Secondly, attachments were made with bindings mainly, even though resin use cannot be excluded, in particular for Sesselfelsgrotte. Thirdly, all handles were probably manufactured out of wood, no indications for handles out of animal matter were observed.

5. Hunting technology in the Middle Palaeolithic?

The first evidence for the existence of a spear technology is available from about 400/300.000 B.P. onwards with the wooden spears and tools recovered at Schöningen (Germany; Thieme, 1997) and the wooden spears found at Clacton-on-Sea (UK, Oakley *et al.*, 1977). Other evidence was discovered at Lehringen (about 125.000 B.P.; Thieme & Veil, 1985). While the use of these wooden spears in hunting activities is evident thanks to their association with animal remains (e.g., Schöningen: minimally 20 horses; Thieme, 1997), there is, however, no evidence at this time that stone tips were mounted on these spears. The first direct evidence in this regard is formed by the Levallois point embedded in a vertebra, found at Umm ell Tlel (Syria; Boëda *et al.*, 1999). Also functional studies have suggested the use of Levallois points as stone tips in hunting arrangements in the Levant (Shea, 1988), even though this function was clearly not as predominant as initially assumed (Plisson & Beyries, 1998). The importance of stone spear points in the Middle Palaeolithic is an issue that has been heavily debated over the years, and a resolution will require far more functional analyses to be performed. Nevertheless, the results from the study of Plisson and Beyries (1998) clearly demonstrate that Levallois points should in any case not be equated with a use as spear point, or hafting, which is unfortunately frequently done (McBrearty & Tryon, 2006). The functional analysis of the three sites included here also confirms the existence of stone spear tips (tabl. 2) and the fact that Neandertals actively engaged in hunting activities. In addition, the high frequencies of these points confirm that active hunting was not merely anecdotic or opportunistic.

While the results confirm the existence of hafted spear points in the European Middle Palaeolithic, it is generally difficult to make a distinction between thrusting and throwing spears. Some pieces were identified as thrusting spear points based on the combined presence of an end-on and rotating impact (see Rots, 2009). I believe this pattern to be a consequence of the use of these spears in killing-off animals during which the spears are twisted upon insertion. This wear pattern was observed on one piece for Bettencourt and on 2 pieces for Sesselfelsgrotte. It does not imply that the remaining points were all mounted on thrown arrangements, they simply do not show the combined wear pattern. The reliability of the above wear pattern for identifying thrusting spear points is currently under more detailed experimentation. On a more general level, I believe that both hunting techniques are complementary and must have frequently occurred simultaneously instead of one being replaced by another. Whether one spear was used interchangeably for both functions is however questionable as both have different requirements on the level of weight and balance. I would expect stone points to be more effective for throwing spears than for thrusting spears and in evolutionary terms, I would thus expect thrown spears with stone tips to co-occur with pointed wooden thrusting spears. The absence of identified thrusting points at Biache-St-Vaast is in support of this assumption. The wooden spears from Schöningen (Thieme, 1997) were also likely used for thrusting, which in a sense confirms the above assumption and would imply that the associated horses were probably already wounded or trapped.

6. Discussion

In spite of the limited number of functional studies that have been performed on Middle Palaeolithic assemblages from Belgium and neighbouring countries, it is clear that an increased insight was obtained over the years in the subsistence mode of Neandertals. Spear points were present on a systematic basis, which attests to the practice of hunting in some form at least, which was already indicated by finds of wooden spears. The discovery of clear macro- and microscopic indications of spear point use demonstrates that stone-tipped spears were in use during the Middle Palaeolithic, which adds to other evidence. Spears were both thrust and thrown (i.e., presumably hand-thrown). While stone tools proved to have an important role in animal hunting and processing tasks, it is clear that also various manufacturing and maintenance tasks were performed with stone tools. Woodworking is an explicit example, which indirectly points at the existence of a substantial assemblage of wooden tools that unfortunately remained unpreserved.

Functional data leave no doubt about the fact that Neandertals were capable of anticipating tool use and producing hafted tools. From a cognitive point of view, it is important to remark that next to spear points and percussion tools, tools were also hafted for which hafting is not a condition for their use, such as scrapers and knives. In the future, it will need to be examined whether there is temporal or geographical variation in the hafting patterns emerging from different Neandertal sites.

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