New Data on the Middle Paleolithic in Lorraine, France

Guillaume Asselin[1,2], Jean Detrey[1], Simon Diemer[1], Serge Béguinot[3], Marc Griette[4], Sébastien Schmit[5]

with contributions from Bernard Hamon[6] and Christophe Bonnet[5]

1 UMR 7044 ArcHiMèdE du CNRS (Strasbourg)

2 Pôle archéologie préventive de l'Eurométropole de Metz

3 Cercle d'Etudes Locales de Contrexéville

4 ADRAL, Association pour le Développement de la Recherche Archéologique en Lorraine

5 Société d'Histoire et d'Archéologie de Lorraine, section de Bitche

6 Société d'Histoire Naturelle de Moselle

ABSTRACT

The study of three open-air assemblages with bifacial tools and Levallois debitage from Lorraine (France) has allowed us to identify the first *Keilmesser* artifacts recorded in the Grand-Est region. These assemblages present varied knapping methods and a relatively homogeneous typology, along with the exploitation of very different raw materials.

The first assemblage was collected in the area of Metz, on alluvial terraces overlooking the Moselle at "Bois Jacquemignon" in Norroy-le-Veneur. Consisting of more than 700 artifacts, this find assemblage was essentially produced from quartzite pebbles which outcrop locally. Two methods of knapping, recurrent centripetal and SSDA, coexist here for the production of flakes. Linéal Levallois debitage is less common. A bifacial reduction sequence is observed to a lesser extent on the local Bajocian chert, with scrapers and notched tools being the dominant tool types among the finds.

The second assemblage, consisting of 152 artifacts, originates from the site of "Rehbrunnenwald" in Erching, located on a hill in the Bitche Region. Here the dominant raw material is Muschelkalk oolitic flint which outcrops near the site. Two knapping methods have been identified, the *linéal* Levallois and the recurrent-centripetal techniques. The most common tools include scrapers, foliate pieces and bifaces.

The last assemblage, consisting of 83 artifacts, originates from a lower alluvial terrace of the Meuse at the site of "sur Conraux," Neufchâteau, on the Vosges Plain. The site is located near outcrops of Oxfordian chert. Finds manufactured from chert and quartzite pebbles dominate the assemblage, with an exogenous flint also present. Recurrent-centripetal, linéal Levallois and laminar knapping methods have been identified here. The tools are dominated by scrapers and bifaces.

The finds from these sites complement older data for the "Micoquian with Charentian influence," a probable marker of the diffusion(s) of the *Keilmessergruppen* in Western Europe.

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RÉSUMÉ

L'étude de trois séries de surface à pièces bifaciales et débitage Levallois, issues de trois zones géographiques éloignées les unes des autres en Lorraine, a permis l'identification des premiers *Keilmesse*r de la région Grand-Est. Ces séries présentent des modalités de débitage assez variées et une typologie relativement homogène, avec des matériaux très différents.

La première série a été collectée dans la région de Metz, sur les moyennes terrasses alluviales de la Moselle, à Norroy-le-Veneur "Bois Jacquemignon". Composée de plus de 700 pièces, elle a été essentiellement réalisée sur des galets de quartzite exploités sur place. Deux types de débitage, récurrent centripète et SSDA, coexistent pour la production d'éclats. Le débitage Levallois linéal est plus discret. Une chaîne opératoire bifaciale est observée dans une moindre mesure sur de la chaille bajocienne locale. Les outils sont dominés par les racloirs et les encoches.

La seconde série (une centaine de pièces) provient d'une colline du Pays de Bitche, à Erching "Rehbrunnenwald". La matière première dominante est le silex oolithique Muschelkalk qui affleure à proximité du site. Deux méthodes de débitage d'éclats sont appliquées : Levallois linéal et récurrent centripète. Les outils les plus fréquents sont les racloirs, pièces foliacées et biface.

Enfin, la dernière série, composée d'une centaine de pièces, provient d'une basse terrasse alluviale de la Meuse à Neufchâteau "sur Conraux" dans la plaine vosgienne. Le site est localisé à proximité des affleurements de chaille oxfordienne. La chaille et les galets de quartzite prédominent l'assemblage, quelques silex exogènes sont aussi présents. Les débitages récurrent centripète, Levallois linéal et laminaire sont avérés. Les outils sont dominés par les racloirs et les bifaces.

Ces séries viennent compléter les données anciennes du "Micoquien à caractère Charentien", probable témoin de la (ou des) diffusion(s) des *Keilmessergruppen* dans la partie occidentale de l'Europe.

ZUSAMMENFASSUNG

Die Untersuchung dreier sich aus bifazialen Stücken und Levallois-Abschlägen zusammensetzenden Lesefund-Serien, die aus weit voneinander entfernten geografischen Räumen in Lothringen stammen, hat die Identifizierung der ersten Keilmesser in der Region Grand-Est ermöglicht. Diese aus sehr unterschiedlichen Materialien bestehenden Serien weisen deutlich voneinander abweichende Fazies-Ausprägungen, aber eine relativ homogene Typologie auf.

Die erste Serie von Artefakten wurde in der Gegend von Metz aufgesammelt, auf der alluvialen Mittelterrasse der Mosel bei Norroy-le-Veneur, in der Flur "Bois Jacquemignon". Sie besteht aus mehr als 700 Objekten, die hauptsächlich aus den vor Ort abgebauten Quarzitkieseln hergestellt wurden. Es koexistieren vor allem zwei Schlagtechniken, der gegenläufige zentripetale Abschlag und Schläge mit Formgebungsmerkmalen des Clactoniens. Die gerade Levallois-Technik ist dagegen weniger verbreitet. Auf dem lokalem Bajocium-Hornstein werden Hinweise auf die bifaziale Bearbeitungskette in nur geringerem Maße beobachtet. Bei den Werkzeugen dominieren Schaber und Einkerbungen.

Die zweite Serie, bestehend aus152 Artefakten, stammt von einem Hügel bei Erching (Flur "Rehbrunnenwald") im Pays de Bitche. Das hier vorherrschende Rohmaterial ist der oolithische Muschelkalk-Silex, der in der Nähe der Fundstelle zu Tage tritt. Zwei Abschlagsmethoden kommen zur Anwendung: die gerade Levallois-Technik und der gegenläufige zentripetale Schlag. Die gebräuchlichsten Werkzeuge sind Schaber, Blattspitzen und Faustkeile.

Die letzte, aus 83 Objekten bestehende Serie stammt von der alluvialen Niederterrasse der Maas bei Neufchâteau, Flur "Sur Conraux", im Vorland der Vogesen. Der Fundplatz befindet sich in der Nähe von Hornstein-Aufschlüssen des Oxfordiums. Hornstein und Quarzitkiesel dominieren die Serie, aber auch einige exogene

Feuersteine sind vorhanden. Gegenläufige zentripetale Abschläge, sowie geradlinige und laminare Levallois- Abschlagen sind nachgewiesen. Die Werkzeuge werden von Schabern und Faustkeilen dominiert.
Die genannten Fundserien vervollständigen ältere Daten zum sog. "Micoquien mit Charentien-Einfluss", bei dem es sich wahrscheinlich um einen Marker für die Verbreitung der Keilmessergruppen im westlichen Teil Europas handelt.

INTRODUCTION

The Middle Paleolithic of the Grand-Est region, and more particularly of Lorraine, has suffered from a lack of interest on the part of researchers since the death of C. Guillaume in 1993. During the 1970s and 1980s, she undertook an important series of research projects and publications, most notably arising from the excavation of the "Clair Bois" doline in Chavelot (Vosges), a site attributed to the Eemian interglacial (see, among others, Guillaume 1982, 1986, 1992). The development of rescue archaeology did not lead to the discovery of new stratified sites that could have revitalized research in the region, as was the case in other areas of northern France. Only one site has been discovered recently: Coussey, in the Department of the Vosges, which was discovered in 2014 (Delaunay, this volume). In 2007, a collaborative research project entitled "Settlements and territories in Lorraine from the Ancient Palaeolithic to the Mesolithic," coordinated by H. Beaudouin, brought together a dynamic team of voluntary surveyors, archeozoologists, geologists and technologists. However, this important interdisciplinary work (Beaudouin et al. 2008) did not lead to the publication of a review article that might otherwise have kick-started a new phase of research.

Despite an absence of visibility, due to a lack of publication, research on this period continued thanks to the surface surveying carried out by volunteer surveyors. As a result, nearly 275 sites have been identified and added to the archaeological map (Fig. 1). The work, which is the subject of this publication, is the result of regular exchanges between professionals and surveyors through the UMR 7044 ArcHiMedE run by the University of Strasbourg within the framework of a research axis entitled "The Middle Paleolithic in the Upper Rhine region" and coordinated by J. Detrey. This article intends to provide an initial assessment of the results for the Middle Paleolithic of Lorraine through three lithic assemblages obtained from the gathering of surface finds.

PRESENTATION OF THE SITES

The former administrative region of Lorraine is located geologically between the Paris Basin and the Vosges Mountains. It is crossed from south to north by the Meuse and the Moselle rivers. The latter belongs to the Rhine catchment zone. The studied assemblages come from three open-air surface sites located in three distinct areas which are geomorphologi-

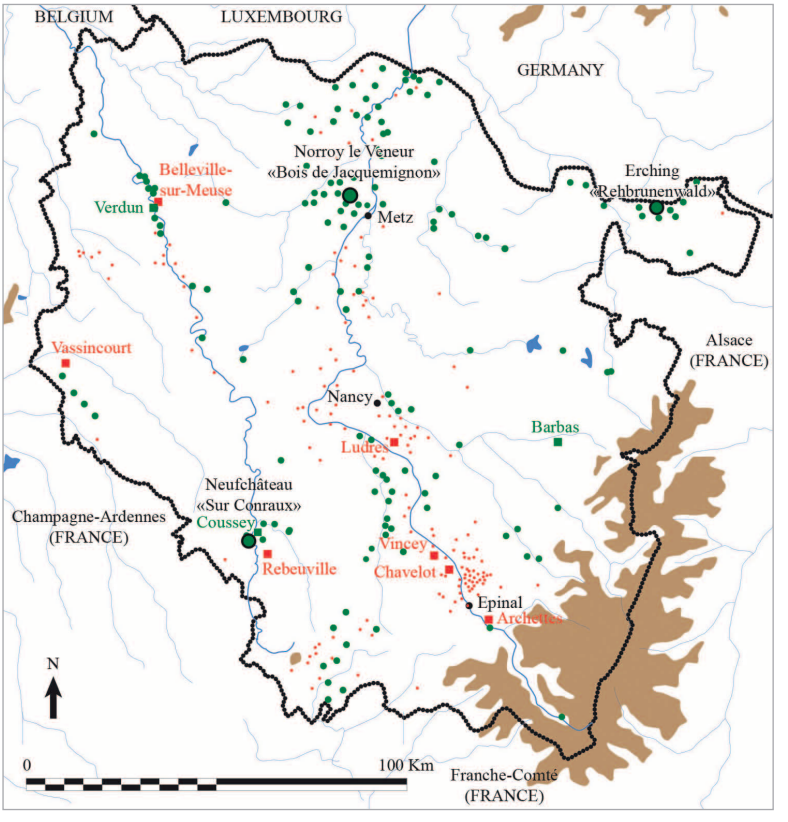


Fig. 1.
Distribution map of the Early and Middle Paleolithic sites in Lorraine. The red color represents the sites identified before 1992, the green color those identified after 1992. The squares correspond to stratified sites (after Guillaume 1982; Guillaume et al 1992; Vermard et al 2010; Le Brun-Ricalens et al 2013; Meyer et al 2015; Archaeological map of Lorraine 2014; Conception B. Hamon, G. Asselin, after CNRA Luxembourg background map).

cally similar but geologically quite different (Fig. 1). They were chosen because of their technological homogeneity, their quantitative importance and the presence of bifacial backed tools.

a) "Le bois Jacquemignon" in Norroy le Veneur (Moselle)

The "Bois Jacquemignon" site in Norroy le Veneur was discovered in 2008 during investigations focusing on the Paleolithic and led by M. Griette, a surveyor attached to the SRA Lorraine and the ADRAL (Association pour le Développement de la Recherche Archéologique en Lorraine) (Griette 2013, 2014). The site is located about 2 km south-west of the center of Norroy le Veneur, a village in the "Côtes de Moselle," located about 7 km north-west of Metz. At an altitude of 206 m NGF, the site is overlooked to the west by the Bajocian cuesta which culminates at 376 m NGF and to the east by an old alluvial terrace (+ 40-45 m above the Moselle) which has a maximum altitude of 211 m NGF (Fig. 2). The alluvial terrace provides numerous quartz and quartzite pebbles, which originate from Vosges sandstone (types 4 to 6, and 14 to 16; Rebmann et al. 2001), while the siliceous limestone of the Bajocian, to the west, yields a chert of variable quality in the form of parallelepipedic blocks or nodules (Blouet et al. 2009;

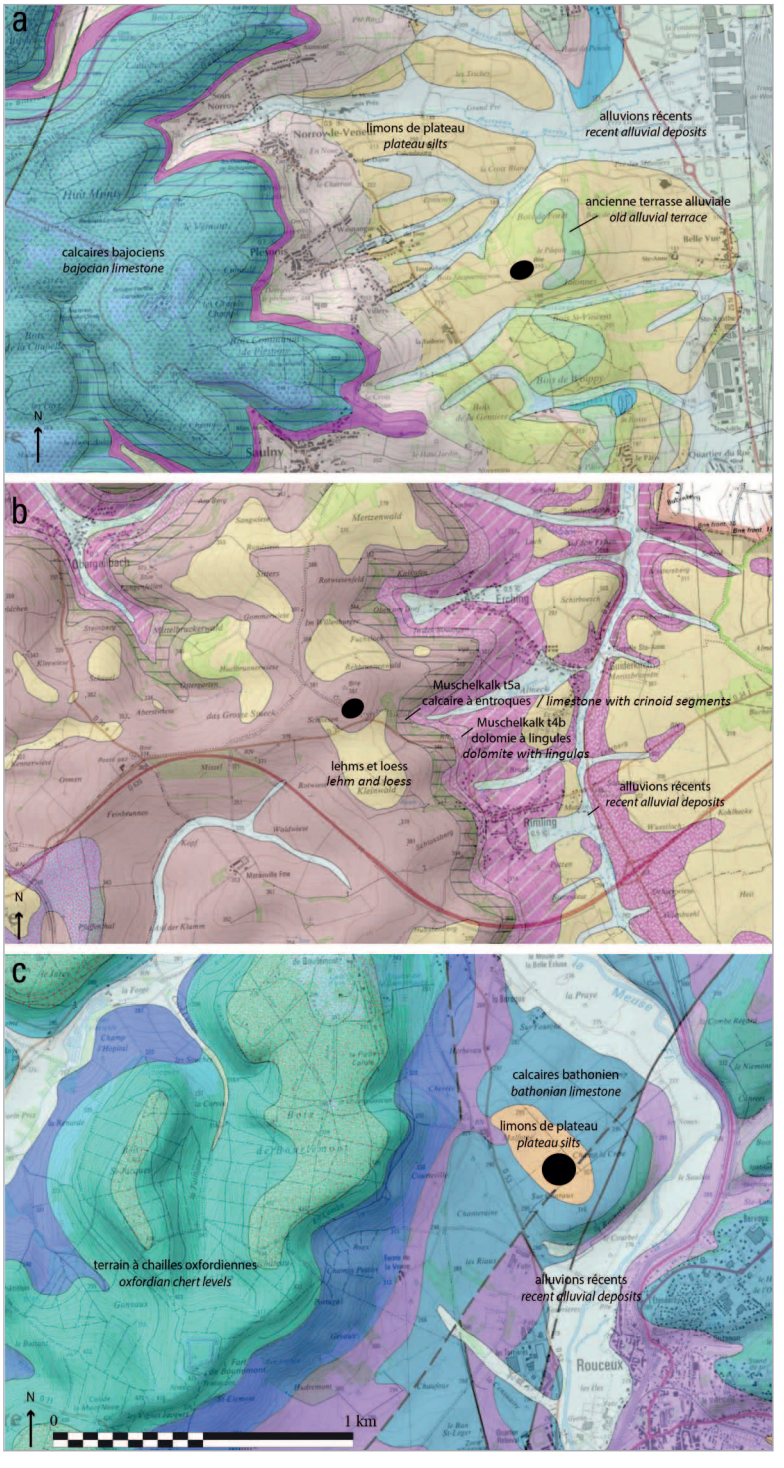


Fig. 2.
Extracts from the geological maps of the different sites (circles in black) (Source BRGM after Roger 2007; Chèvremont et al 2008; image: G. Asselin). a) Norroy le Veneur "Bois Jacquemignon," b) Erching / Rimling "Rehbrunenwald," c) Neufchâteau "Sur Conraux."

Hamon 2014). This M-MT5 terrace (Cordier 2004) has not been directly dated, but may have been deposited by the "Paléo-Meurthe" during the Elsterian Pleniglacial, with an erosion phase during the Holsteinian Interglacial (Dutch terminology; Tuffreau 2010), i.e., MIS 10 and 9 (362,000-309,000 BP) (Cordier, personal communication). This dating thus provides a *terminus post quem* for the assemblage.

The site is located in a slight depression covered by plateau silts of eolian and/or alluvial origin(s). The assemblage is currently composed of approximately 745 artifacts discovered on the surface over an area of 1000 m^2, making it one of the richest assemblages in Lorraine. The appearance of the artifacts, which is relatively fresh, with little evidence for wind erosion or water rolling, seems to indicate rapid burial, with little or no transport, apart from the agricultural plowing which brought the artifacts to the surface.

Several refits reinforce this impression. The site has also yielded some flint pieces attributable to the Neolithic and fragments of basalt grinding stones from the Bronze Age or Iron Age.

b) Erching / Rimling "Rehbrunenwald" (Moselle)

The Erching / Rimling site of "Rehbrunenwald" lies between the territories of two communes of the Pays de Bitche. It is located 1.5 km south-west of Erching, a village on the Lorraine Plateau, 23 km south-east of Saarbrücken (Saarland, Germany). The site is located on a summit of the Côtes de Lorraine at 391 m NGF, 110 m above the current course of the Bickenalbe, a tributary of the Saar. The hilly relief dominating the small valley is the result of the alternation of limestone and clay formations of the Muschelkalk, (t4b and t5a levels; Fig. 2). They provide a variable quality oolithic flint in the form of slabs, nodules and pebbles (Hamon 2005; Blouet et al. 2009). These two levels are situated approximately 500 m to the east of the site. The nearest quartz and quartzite pebbles are found in the valley of the Blies, about 5 km to the northwest. The site itself is located directly on the Muschelkalk limestone levels. Loess veneers, suitable for the preservation of archaeological remains, have been noted nearby.

The site was discovered in 2006 by S. Schmit, a surveyor attached to the SRA Lorraine and the Société d'Histoire et d'Archéologie de Lorraine (Asselin et al. 2016) and continues to be surveyed in collaboration with C. Bonnet (SHAL Pays de Bitche). The corpus is currently composed of 152 artifacts, often very patinated and showing traces of alteration due to alternating freezing and thawing actions. In addition to the Paleolithic assemblage, the site has also produced Mesolithic and Neolithic remains as well as material dating to the Second World War.

c) Neufchâteau "Sur Conraux" (Vosges)

The site of "Sur Conraux" in Neufchâteau was discovered in 2014 by S. Béguinot, a surveyor attached to the SRA Lorraine and a member of the

"Cercle d'Etudes Locales de Contrexéville." It has already yielded 83 artifacts, despite a lack of prospecting in 2016, and is therefore a very promising site.

The site is located within the municipal territory of Neufchâteau, about 2 km north of the city center and about 50 km south-west of Nancy (Meurthe-et-Moselle). Located at an altitude of 316 m NGF, it overlooks the current course of the Meuse which flows east to north at an altitude of 279 m NGF. It is dominated by the Butte de Bourlémont, a residual butte belonging to the "Côtes de Meuse," which stands to the west and reaches a height of 434 m NGF.

Oxfordian levels/deposits (Fig. 2) outcrop at the foot of the Butte de Bourlémont, yielding large nodules or slabs of an excellent quality chert (Blouet et al. 2009; Béguinot 2015). The closest in situ outcrops are located 1.5 km west of the site. However, blocks can be collected in colluvial deposits about 1 km to the west. A portion of the alluvial terrace (not recorded on the geological map) located about 600 m to the north, at a location called "la Grevinotte," provides quartz and quartzite pebbles which are probably native to the Vosges. The site is located on agricultural land consisting of plateau silts; archaeological levels may well be conserved beneath this layer.

The assemblage is patinated but not thermally altered. In addition, the site has yielded remains attributed to the Upper Paleolithic and Mesolithic.

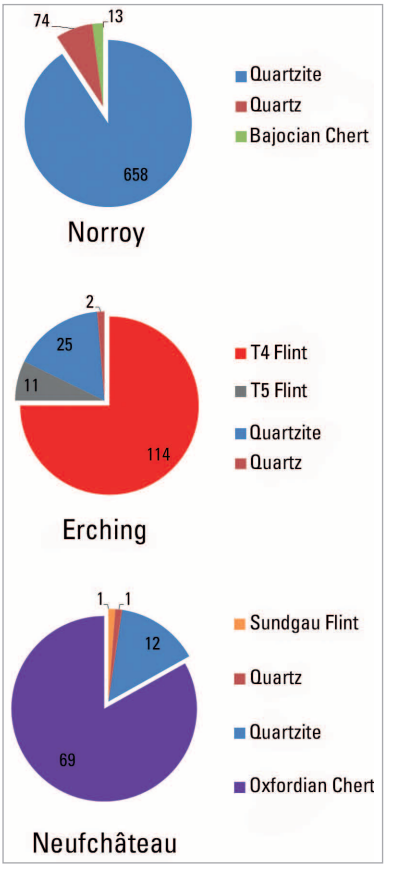


Fig. 3.
Proportions of the different raw materials identified at the three sites. The quantities are indicated on each diagram (image: G. Asselin).

RESULTS

The lithic industries are described below following the various phases of the lithic *chaîne opératoire* previously described by J. Pélegrin, C. Karlin and P. Bodu (1988).

a) Supply of raw materials

Raw material: provenance

Local raw materials largely predominate at the three sites. Thus, at Norroy, a site located at the foot of an ancient alluvial terrace, the quartzite and quartz pebbles present *in situ* constitute more than 98% of the assemblage; the remaining 2% is composed of Bajocian chert from the Côtes de Moselle, from a location about 1 km to the west (Fig. 3).

At Erching, t4 and t5 Muschelkalk flints, which are spread over an area of about 500 m, account for 82% of the assemblage, while quartz and quartzite pebbles from the Blies Valley, situated 5 km to the north-west, constitute the remaining 18%.

Lastly, in Neufchâteau, Oxfordian chert from outcrops at least 1 km away dominates the assemblage (83%), while quartz and quartzite from a

terrace located about 600 m away is much less common (16%). The remaining percentage corresponds to a single scraper, potentially native, made from flint from Sondersdorf (Alsace, France) in the Sundgau region (identification: S. Diemer); outcrops of this flint are located about 140 km to the south-east.

Raw material: selection

Before debitage began, the blocks of raw material underwent an important selection process. This is particularly the case in Norroy and Erching where pebbles of asymmetric cross-section, with a flat surface opposite a convex one, were preferentially selected. In Norroy, when the initial section of the pebble was not satisfactory, the Paleolithic knapper split the pebble in two to achieve the desired configuration (Table 1). This technique has also been observed on the sites of Hellange and Lellig in Luxembourg (Le Brun-Ricalens et al. 2012a, 2013).

In Neufchâteau, flat and elongated blocks were mainly selected for the debitage of Levallois blades.

b) Cortex removal

Tested and abandoned pebbles were only discovered at Norroy. Both the Norroy and the Erching sites yielded first flakes (Table 1); these correspond to the very first phase of the *chaîne opératoire*, aimed at creating a striking platform.

Fragments that have more than 50% cortex on their upper face are counted as cortical flakes. These are present in large quantities at the sites of Norroy and Erching, while in Neufchâteau only two examples have

Table 1.
Technological count of the artifacts collected at the three sites.

Technological determination	Norroy		Erching		Neufchâteau	
	n	%	n	%	n	%
hammers	5	0.7				
split pebbles / tests	19	2.6				
starting flakes	15	2.0	3	2.0		
flakes with cortex	92	12.3	16	10.5	2	2.4
preparation of striking platform flakes			7	4.6		
debitage flakes	370	49.7	78	51.3	40	48.2
debitage blades					11	13.3
cores	162	21.7	26	17.1	18	21.7
retouching and shaping flakes	2	0.3	7	4.6	5	6.0
natural shaped blanks	6	0.8	7	4.6	7	8.4
debris	74	9.9	8	5.3		
Total	**745**	**100**	**152**	**100**	**83**	**100**

been recorded. However, it is important to remember that there are only 86 recorded artifacts from Neufchâteau where the assemblage is only beginning to be revealed.

This seems to indicate that the initiation and cortex removal phases took place on site at Norroy and Erching. Indeed, these sites are located near sources of raw material, whereas in Neufchâteau, because of the distance to the outcrops, it seems (in the current state of knowledge) that pre-selected and preformed raw material was brought on site.

A nuance can be observed from a functional point of view. The initial and cortical flakes on a quartzite pebble have the advantage of already being sharp due to the hardness of the fluvial neocortex (Tavoso 1978); this is in contrast to Muschelkalk flint and Oxfordian chert. Thus, the quartzite cortical removing phase could be related to full debitage.

c) Debitage

Several flaking methods seem to have been employed on these three sites. The use of hard hammerstones is attested on each site, but only Norroy has produced direct evidence in the form of five hammerstones and hammerstone fragments (Table 1).

At all three sites, the reduction sequences took place *in situ*, as underlined by the numbers of cores found (cores represent around 20% of each assemblage).

i) The cores

Each site has yielded cores with recurrent centripetal flaking and whose surfaces are ranked: a flaking surface opposed to a striking platform (cortical or prepared).

The dominant type of core is flat with or without preparation of the striking platform (Fig. 4a and b, Fig. 5). These cores sometimes resemble the type obtained by the recurrent centripetal Levallois technique (Boëda 1994) (Table 2). This method yields rounded cores with a flat flaking surface (Bosinski 1967, 2004) and can be defined as a "concrete volumetric structure of type F," as defined by E. Boëda (2013).

However, there is a continuum between flat and secant cores. In fact, the secant unifacial cores, with or without preparation of the striking platform, are defined by a pyramidal flaking surface. These are also observed at Norroy and, to a lesser extent, at Neufchâteau and Erching. This production is similar to Discoid unifacial production (Jaubert and Mourre 1996; Mourre 2003; Slimak 2003) and can be defined as a "concrete volumetric structure of type E1" (Boëda 2013).

The continuum between these two types of recurrent centripetal cores, and the possibility that the knapper could switch from one concept to another (Lenoir and Turq 1995), leads us to refer to these cores as flat or secant unifacial cores (Table 2) without making reference to any debitage concept.

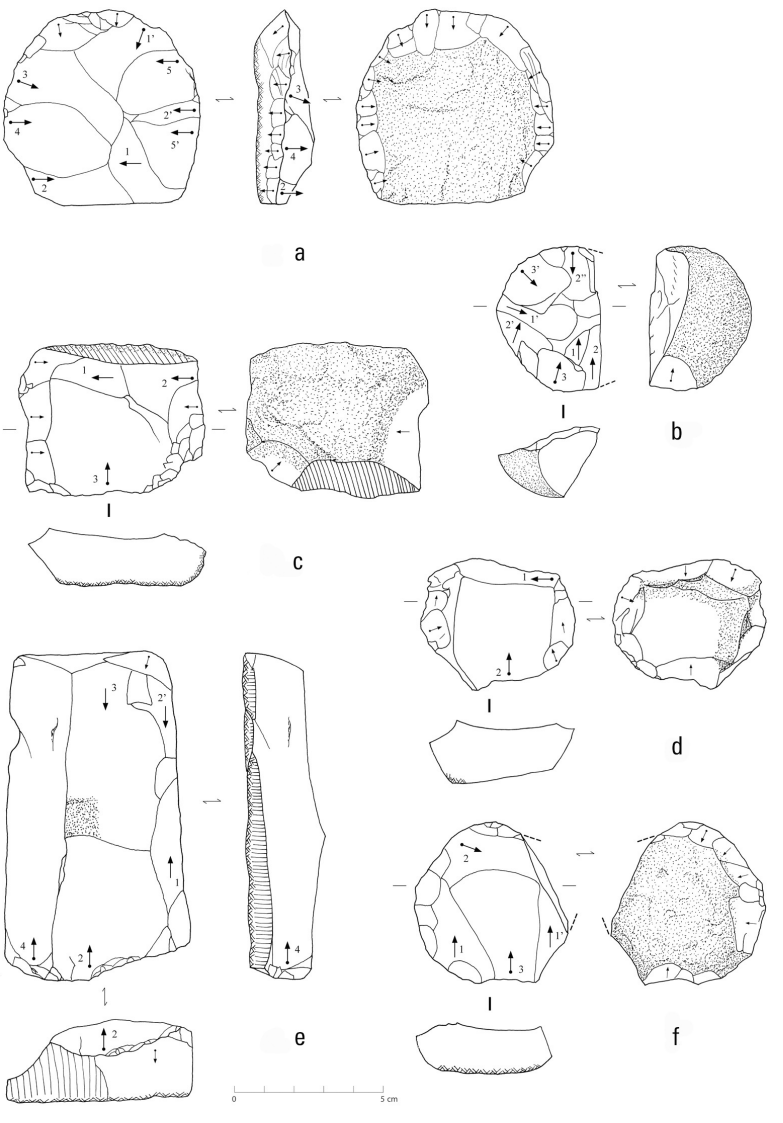


Fig. 4.
Different cores from Erching (b, d and f) and Neufchâteau (a, c and e) (drawings: J. Detrey). a) and b) unifacial reccurent centripetal flat cores with preparation of striking platform in Oxfordian chert (a) and quartzite pebble (b), c) and d) Linéal Levallois cores in Oxfordian chert (c) and t4 Muschelkalk flint (d), e) bipolar Levallois blades core in Oxfordian chert, f) Levallois bipolar core in t4 flint.

In Neufchâteau and Erching, "linéal Levallois" debitage (Boëda 1994) is well represented, accounting for between 16 and 19% of the cores (Fig. 4c and d), while at Norroy it represents only about 2% of the cores. A bipolar Levallois core (Boëda 1994) is also present at Erching (Fig. 4f) and two bipolar Levallois blade cores (Fig. 4e) have been found at Neufchâteau (Revillon 1995).

In addition, the SSDA ("Système de Surfaces de Débitage Alternées," Forestier 1993) and "chopper" debitage types are well represented at Norroy. The SSDA flaking technique provides cores that are morphologically similar to chopping tools, but the removal organization is closer to that of

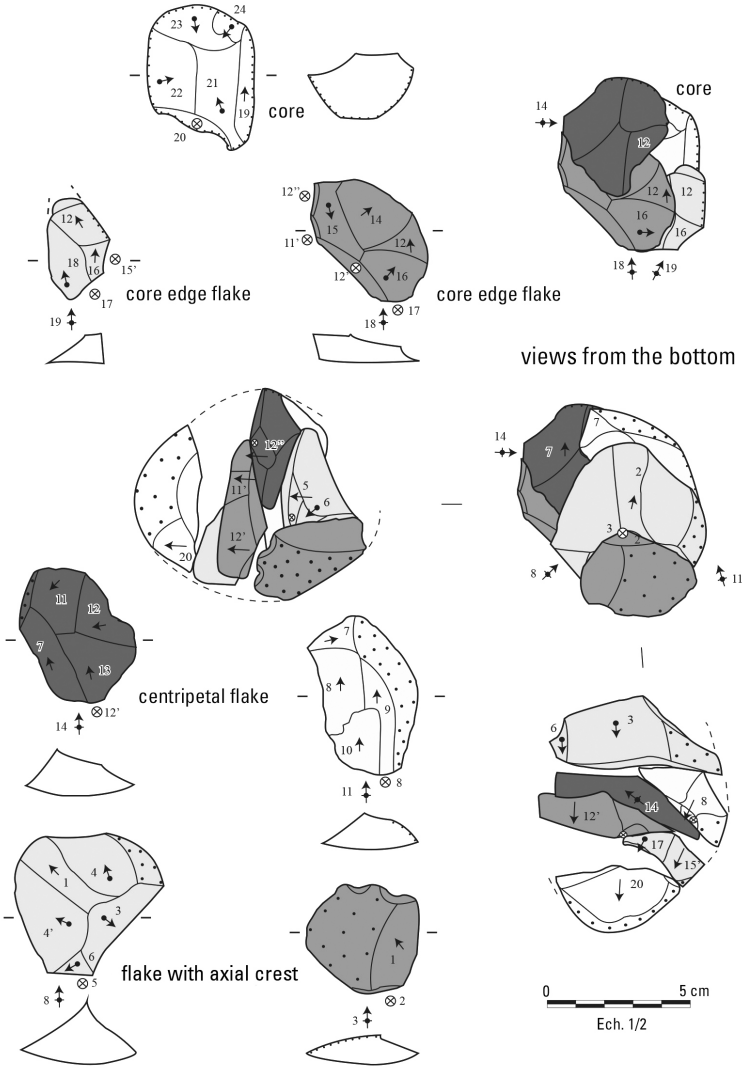


Fig. 5.
Refits of a series of flakes with a unifacial recurrent centripetal core with prepared striking platform on quartzite pebble discovered in Norroy (drawings G. Asselin).

bifacial Discoid debitage (Boëda 1993) with a reserved cortical zone at the end of exploitation. The "choppers" discovered on the site correspond to cores. A single natural striking platform was flaked unipolarly in the thickness of the pebble. As in the "Le Pucheuil" type debitage (Delagnes 1993), the removal of a series of flakes culminated in the opening of the angle of the nucleus, thus preventing the debitage of new flakes.

On-anvil flake cores (Mourre et al. 2010) are also documented at Norroy and Erching; these are bipolar cores with angles close to 90°. Kombewa mode 1 cores (Tixier and Turq 1999), knapped on the lower face of flakes, also occur in non-negligible quantities at Norroy (Table 2).

Cores determination	Norroy		Erching		Neufchâteau	
	n	%	n	%	n	%
non achieved	4	2.5	4	15.4	1	5.6
bipolar on anvil	4	2.5	1	3.8		
preferential Levallois	4	2.5	5	19.2	3	16.7
bipolar Levallois			1	3.8		
bipolar unifacial blades					2	11.1
secant unifacial recurrent	40	24.7	1	3.8	2	11.1
parallel unifacial recurrent	50	30.9	10	38.5	9	50
bifacial Discoïd	5	3.1				
SSDA	22	13.6			1	5.6
on flake	8	4.9				
chopper like	11	6.8				
indetermined	14	8.6	4	15.4		
Total	**162**	**100**	**26**	**100**	**18**	**100**

Table 2.
Determination of the cores collected at the three sites.

ii) Full debitage products

At the sites of Neufchâteau and Erching, flakes with plain and prepared butts (facetted, dihedral) dominate, while in Norroy cortical butts are in the majority (Fig. 6). This is probably due to the raw material used at Norroy; the neocortex of quartz and quartzite pebbles is more regular than a plain or facetted surface (Tavoso 1978; Mourre 1994), unlike flint and chert.

Only the Erching site yielded elements that could correspond to striking platform preparation flakes (Table 1).

The products obtained at the three sites vary (Table 3). At Norroy and Erching, centripetal flakes (Boëda 1993; Thiébault 2013) dominate (Fig. 5: flake 14; Fig. 7c) along with core-edged flakes (Fig. 5: flake 18, Fig. 7a) and pseudo-Levallois points (Fig. 7b). These products are likely to be related to the recurrent centripetal cores, and more precisely to the Discoid concept. Flakes with axial (Fig. 5: flake 8) and transverse crests (Sli-

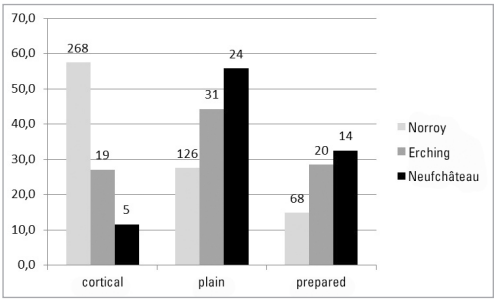


Fig. 6.
Diagram showing the various butts observed on the full debitage products (graphic: G. Asselin).

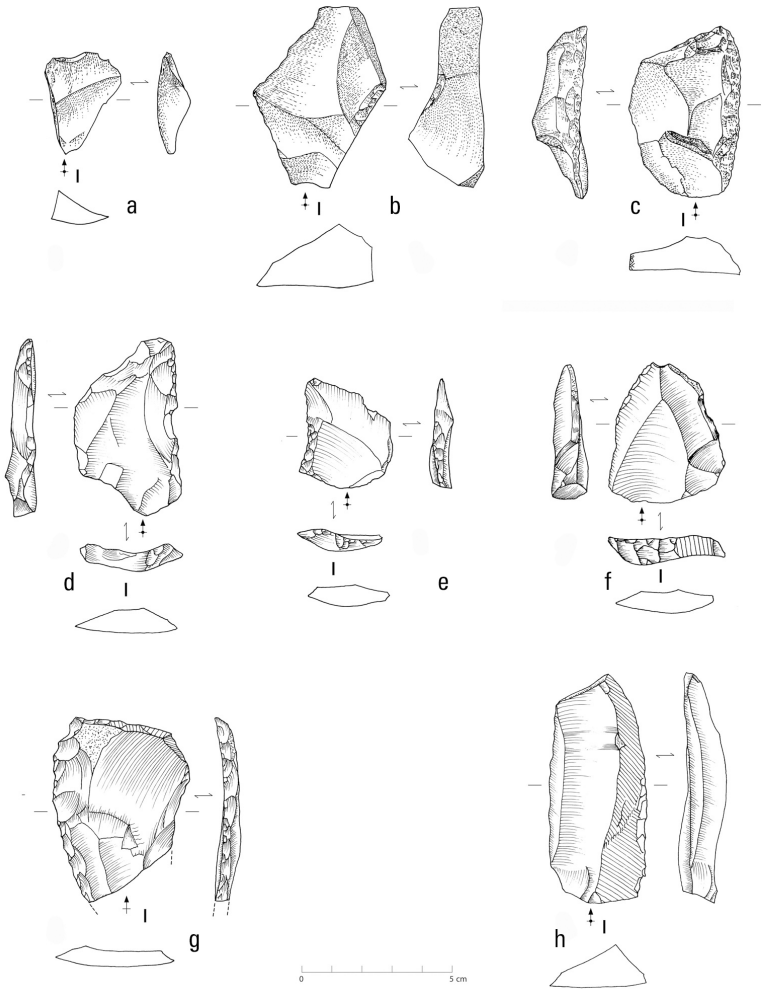


Fig. 7.
Products observed at Erching (a, b, c, d and e) and Neufchâteau (f, g and h) (drawings: J. Detrey).
a) core-edge flake in quartzite, b) quartzite pseudo-Levallois point, c) long centripetal flake in quartzite retouched as a convex simple scraper, d) Levallois flake retouched as a straight simple scraper in t4 flint, e) Levallois point retouched as a concave simple scraper in t4 flint, f) Levallois point in Oxfordian chert, g) distal fragment of a Levallois flake retouched as a convex simple scraper in Oxfordian chert, h) Levallois blade in Oxfordian chert.

mak 2003; Thiébault 2013) present at these two sites result from the action of cutting back the overhang of the core in order to obtain longer flakes or to change the debitage modality.

At Neufchâteau, Levallois flakes (Fig. 7g) and blades dominate the assemblage. These products are consistent with the high rate of striking platform preparation, as well as with the predominant recurrent centripetal and Levallois cores. During the cortex removal phase, when the core was not yet fully shaped, it is clear that there was a desire to produce blades from the outset. Figure 7h depicts a complete example with a portion of cortex from this phase. The lateral convexity shaping and the bipolar flaking were carried out afterwards.

The presence of Levallois points (Fig. 7e and f) at Neufchâteau and at Erching is noteworthy but no associated cores were discovered. Bipolar flakes associated with on-anvil debitage (Mourre et al. 2010) are present at Norroy and Erching.

Cores determination	Norroy		Erching		Neufchâteau	
	n	%	n	%	n	%
non achieved	4	2.5	4	15.4	1	5.6
bipolar on anvil	4	2.5	1	3.8		
preferential Levallois	4	2.5	5	19.2	3	16.7
bipolar Levallois			1	3.8		
bipolar unifacial blades					2	11.1
secant unifacial recurrent	40	24.7	1	3.8	2	11.1
parallel unifacial recurrent	50	30.9	10	38.5	9	50
bifacial Discoïd	5	3.1				
SSDA	22	13.6			1	5.6
on flake	8	4.9				
chopper like	11	6.8				
indetermined	14	8.6	4	15.4		
Total	**162**	**100**	**26**	**100**	**18**	**100**

Table 3.
Tally of the full debitage products discovered at the three sites.

d) Tools

A total of 47 tools were collected at Norroy (representing 6.3% of the assemblage), 30 at Erching (19.7% of the assemblage) and 33 at Neufchâteau (39.7% of the assemblage) (Table 4). Retouch and shaping flakes were uncovered at all three sites, albeit in different proportions (Table 1).

Scrapers dominate on all three sites; however, at Norroy convex transverse scrapers are the most common type, while at Erching and Neufchâteau, simple convex scrapers are in the majority. In a more general way, using the method based on typological groups developed by A. Turq and star diagrams (Turq 1979; Debénath and Dibble 1994), Group 2 with single, double and thinned-back scrapers (typical Mousterian), and the Group 3 with transverse scrapers (Quina Mousterian) predominate (Fig. 8).

For example, in Norroy, Groups 2 and 3 are in the majority, while Groups 5 with convergent and *déjeté* scrapers (Ferrassie Mousterian) and 6 with notches and denticulates (denticulate Mousterian) are less represented. Finally, Group 4 with bifaces and Group 8 with Upper Paleolithic-type tools are scarce. The latter is represented by only two atypical *perçoirs*.

In Erching, Group 2 with single scrapers (Fig. 7c, e and g; Fig. 9d, e and g), double scrapers (Fig. 9b and c) and thinned-back scrapers clearly predominates, while Group 3 with *limaces* and transverse scrapers (Fig. 9a and f) is poorly represented. Bifacial elements (Group 4) are well represented, while convergent and *déjeté* scrapers (Group 5) (Fig. 9c), notches and denticulates (Group 6) and Upper Paleolithic-type tools (Group 8) (Fig. 9h and i) are rare.

	Norroy	Erching	Neufchâteau	Bordes' typology (1961)	Turq's groupe (1979)
limace		1		8	3
single straight scrapers	4	1	1	9	2
single convex scrapers	4	10	7	10	2
single concave scrapers	1	1		11	2
double scrapers	1	2		12_17	2
convergent scrapers		1	4	18_20	5
déjeté scrapers	1	1	1	21	5
straight transverse scrapers	2			22	3
convex transverse scrapers	8	1	4	23	3
thinned back scrapers	4	2	4	27	2
scraper with bifacial retouch	2			28	3
oblique convex scrapers	3	1			
natural scrapers	3				
perçoirs	2	1	1	31	8
truncation		1		40	8
notches	2	1		42	6
denticulate	3		3	43	6
bifaces	4	5	7	63	4
thinned back flakes	2	1	1		
Total	**46**	**30**	**33**		

Table 4.
Tally of the types of tools discovered on the three sites and correspondences with the typological list of F. Bordes (1961) and the groups of A. Turq (1979).

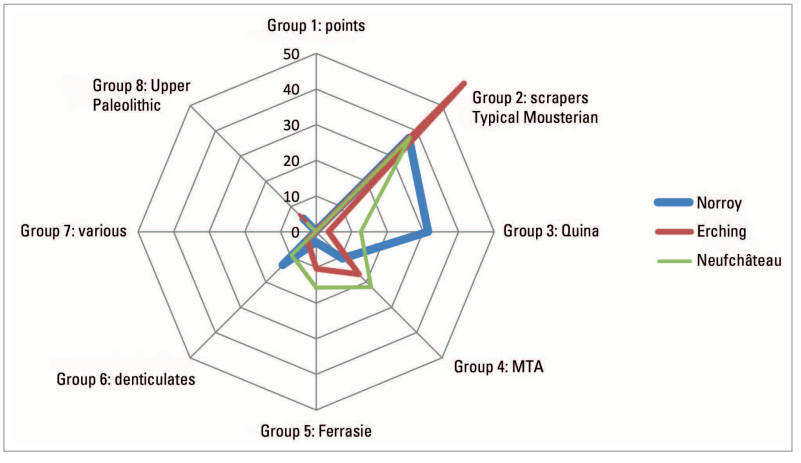


Fig. 8.
Star diagram of A. Turq's typological groups (1979) applied to the three sites (drawings: G. Asselin).

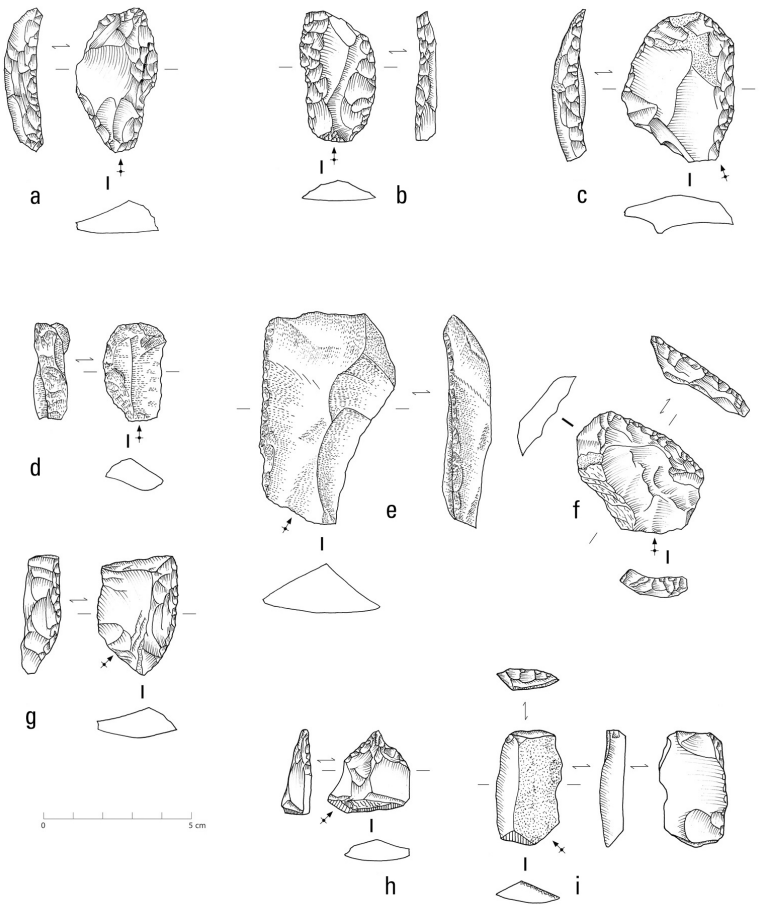


Fig. 9.
Tools from Erching in t4 Muschelkalk flint (a, b, c, f, g, h and i) and in quartzite (d and e) (drawings: J. Detrey).
a) Limace, b) double convex-concave scraper, c) double convex scraper, d) simple convex scraper, e) straight simple scraper, f) convex transverse scraper, g) oblique scraper, h) atypical perçoir, i) truncation.

Finally, in Neufchâteau, Groups 2 (Fig. 7h; Fig. 10a and b) and 4 predominate. Groups 3 (Fig. 10e), 5 (Fig. 10c, d and f) and 6 (Fig. 10g) are well represented, while Group 8 is represented by a single atypical *perçoir*.

e) Bifacial tools

The fourth typological group, while rare, is of importance in techno-cultural terms.

In Norroy, four bifacial tools were uncovered (Table 5). These are made up of two *Bocksteinmesser* (Bosinski 1967; Jöris 2006) in chert and quartzite (Fig. 11b), as well as two bifaces: one is a chert, partially-backed cordiform, the other is triangular with a massive cortical base and is made from quartzite. Two bifacial chert roughouts were also collected.

At Erching, five bifacial artifacts were collected, all of which were made of t4 Muschelkalk flint. They consist of an apical or basal fragment of a large leaf point (*Blattspitze*) (Fig. 12a), an apical fragment of a smaller leaf point, a *Bocksteinmesser* (Fig. 11c) and a *Klausennischemesser* (Bosin-

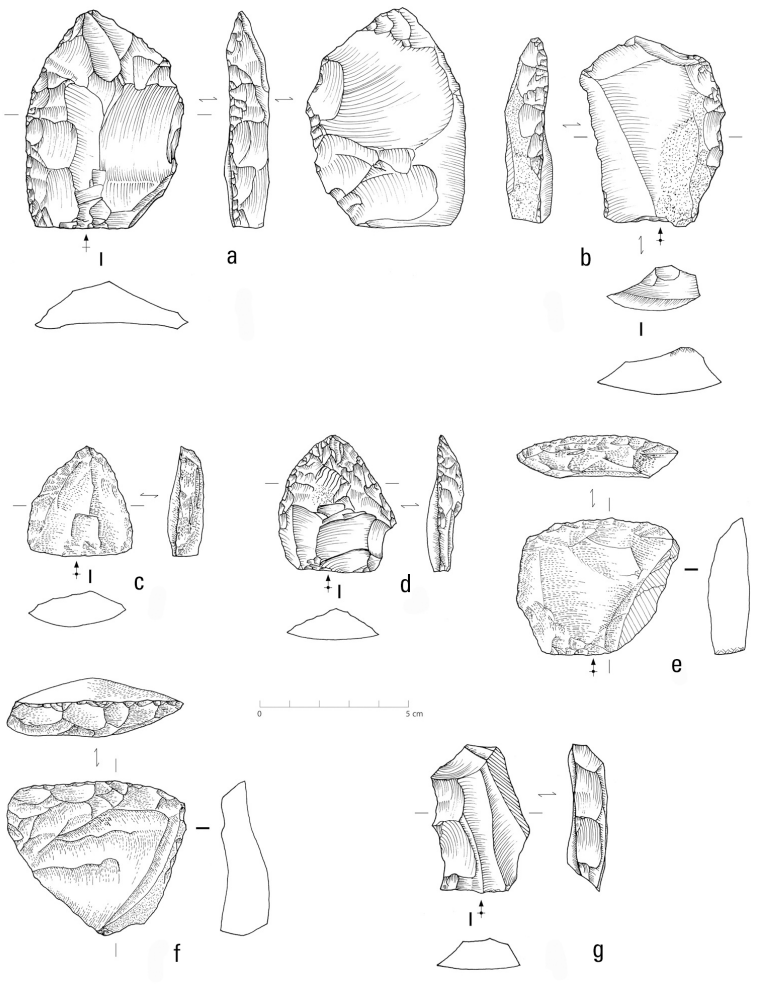


Fig. 10.
Tools from Neufchâteau in Oxfordian chert (a, b, d and g) and quartzite (c, e and f) (drawings: J. Detrey).
a) Convex simple thinned back scraper, b) convex simple scraper, c) and d) convex convergent scrapers, e) convex transverse scraper, f) déjeté convex scraper, g) denticulate.

ski 1967; Jöris 2006) (Fig. 11d) made from rolled slabs, as well as a *Bocksteinmesser* roughout.

Finally, at Neufchâteau, seven bifacial tools were collected, five of chert and two of quartzite. A *Königsaue Keilmesser* (Bosinski 1967; Jöris 2006), two *Bocksteinmesser* (Fig. 12b), three cordiform bifaces (Fig. 12c and 13b) and a triangular biface were discovered.

The original blanks used to manufacture these different bifacial tools were probably chert and flint slabs as well as quartzite pebbles. However, large flakes may have been used at Neufchâteau (Fig. 12c and Fig. 13b).

DISCUSSION

Before embarking on a more detailed discussion of these assemblages, it is important to remember that they were retrieved through surface col-

Sites	Description	raw material	dimensions	facial symmetry	basis	back
Erching	bifacial leaf point fragment	T4 flint	(89)X52x23	symmetric		
	Bocksteinmesser	T4 flint	57x33x14	asymmetric	linear	natural
	Bocksteinmesser roughout	T4 flint	(34)X39x15	symmetric	natural	prepared
	Klausennischemesser	T4 flint	53X36X13	asymmetric	natural	natural
	bifacial leaf point fragment	T4 flint	(27x21x8)	asymmetric		
Neufchâteau	*Bocksteinmesser*	chert	(78)x58x21	symmetric	convex	prepared
	Bocksteinmesser	chert	123X48X31	asymmetric	convex	prepared
	Königsaue Keilmesser	chert	98X65X29	asymmetric	natural	
	cordiform biface with little back	chert	106X78X30	symmetric	convex	prepared
	cordiform biface	chert	(66)X54X17	asymmetric	natural	
	cordiform biface	quartzite	119x78X48	asymmetric	convex	
	triangular biface	quartzite	(63)x60x17	symmetric	linear	
Norroy	*Bocksteinmesser*	chert	78x48x30	symmetric	convex	prepared
	triangular biface	quartzite	66x64x32	symmetric	natural	
	cordiform biface with little back	chert	94x63x25	symmetric	convex	prepared
	Bocksteinmesser	quartzite	39x31x11	symmetric	convex	mixed

Table 5.
Description of the bifacial tools from the three sites. The figures in brackets correspond to the measured values truncated by recent breaks.

lection. Therefore, despite their homogeneous appearance, the material may originate from several occupations spread out over time and belonging to different techno-complexes. Moreover, without any stratigraphic framework, dating can only be based on comparisons with dated series.

a) Results of the *chaîne opératoire*

The first phases of initiation and cortex removal of the blocks seem to have taken place on site at Norroy and Erching. In addition, tested and abandoned blocks from this phase were also uncovered at Norroy. This is probably due to the immediate proximity of the raw material. In Neufchâteau, the first phases of the *chaîne opératoire* are absent. Similarly, the lack of striking platform preparation flakes seems to suggest that pre-prepared nuclei were brought to the site.

Preparation fragments are also absent at Norroy, but this could be related to a taphonomic phenomenon. The loamy and, therefore, sticky nature of the soils favors the retrieval of larger finds. Thus, striking platform preparation flakes, as well as retouch flakes, are poorly represented on this site. In Erching, the discovery of striking platform preparation flakes points to on-site core debitage.

On the basis of the cores alone, most of which have been used to exhaustion, it is difficult to draw conclusions regarding the practice of any given mode of knapping. It is important to compare this data with the products discovered (Mourre 2003).

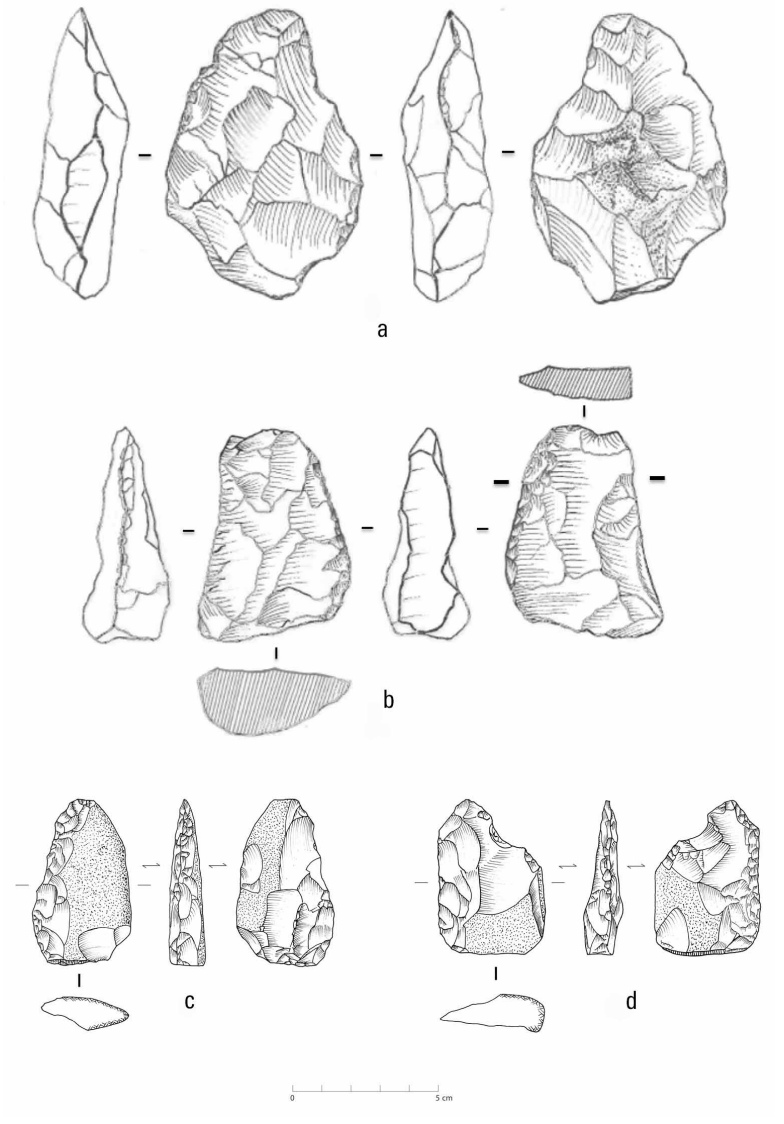


Fig. 11.
Bifacial tools in Bajocian chert from Norroy (a and b) and t4 Muschelkalk flint from Erching (c and d) (drawings: M. Griette and J. Detrey).
a) Irregular cordiform biface with partial back, b and c) *Bocksteinmesser*, d) *Klausennischemesser*.

In Norroy, based on the products most commonly found (centripetal flakes, pseudo-Levallois points, core-edge flakes, axial and transverse crests) it would seem that recurrent centripetal flat cores are linked to Discoid unifacial debitage. Levallois debitage is rarer and mainly of *linéal* modality. SSDA and chopper-type debitage were also employed, as well as Kombewa and bipolar on-anvil flaking (Fig.14). The flakes obtained by the SSDA method are similar to Discoid products but bear negatives of unipolar removals. "Chopper-type" knapping produces unipolar flakes with cortical butts and backs. The Bajocian chert, which is a minority raw material, is represented by only two cores—one *linéal* Levallois, the other

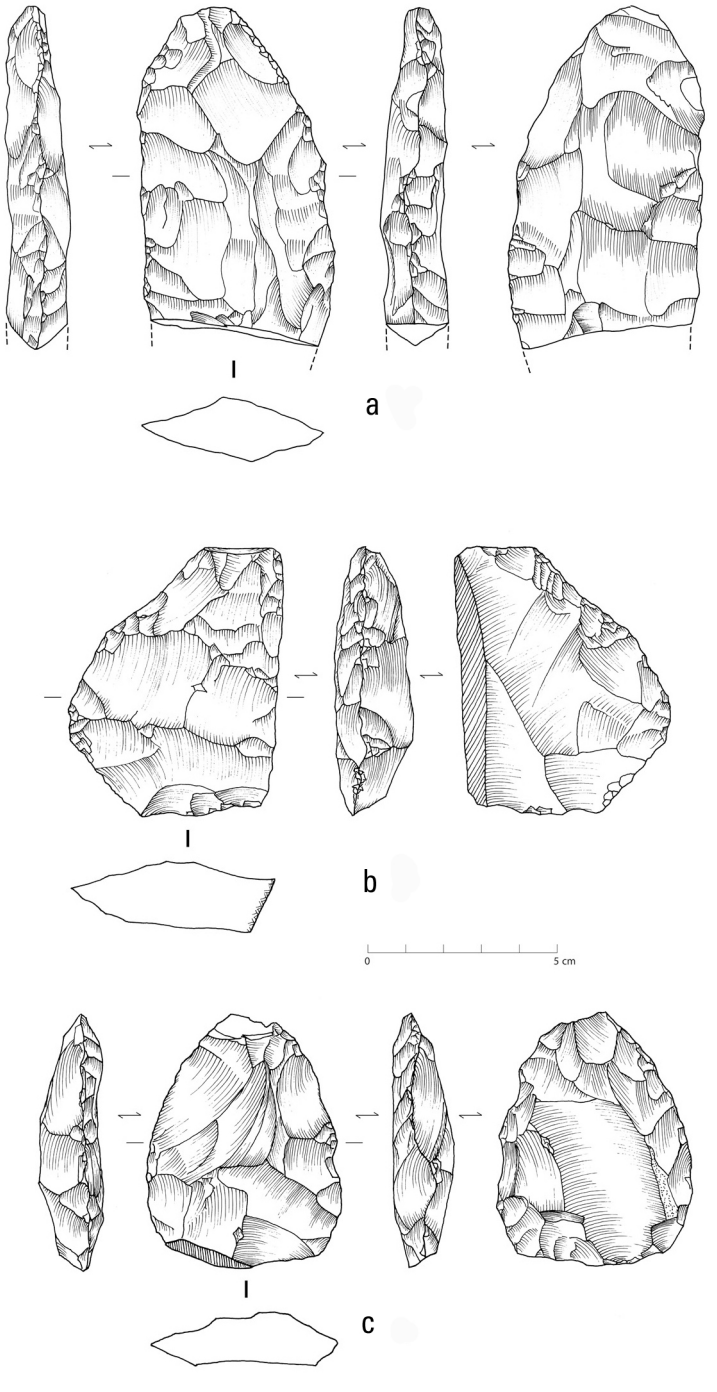


Fig. 12.
Bifacial tools in t4 Muschelkalk flint from Erching (a) and Oxfordian chert from Neufchâteau (b and c) (drawings: J. Detrey).
a) Bifacial leaf point fragment, b) *Bocksteinmesser*, c) cordiform biface.

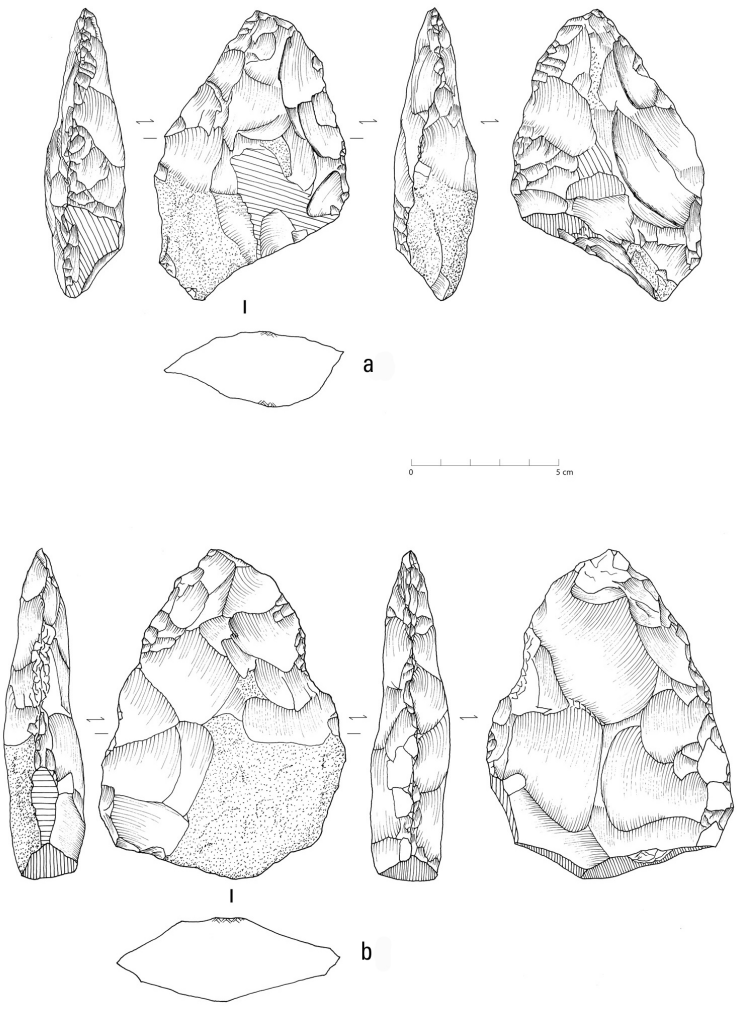


Fig. 13.
Bifacial tools in Oxfordian chert from Neufchâteau (drawings: J. Detrey). a) *Königsaue Keilmesser*, b) cordiform biface.

Discoid bifacial—as well as two pseudo-Levallois points and two cortical flakes.

At Erching, as is the case at Norroy, the products characteristic of Discoid debitage are present in larger quantities than Levallois flakes. Therefore, the centripetal recurrent unifacial cores would seem to be associated with unifacial Discoid knapping. The *linéal* and bipolar modalities of the Levallois debitage are also present. However, these data need to be put into perspective due to a very high incidence of simple flakes (Table 3) that cannot be related either to the Levallois or to the Discoid concept. No distinction was observed between the raw materials; the flaking behavior seems to be the same for quartz, quartzite and flint.

In Neufchâteau, unlike the other two sites, Levallois products (flakes and blades) dominate. The presence of a high percentage of blades (21%)

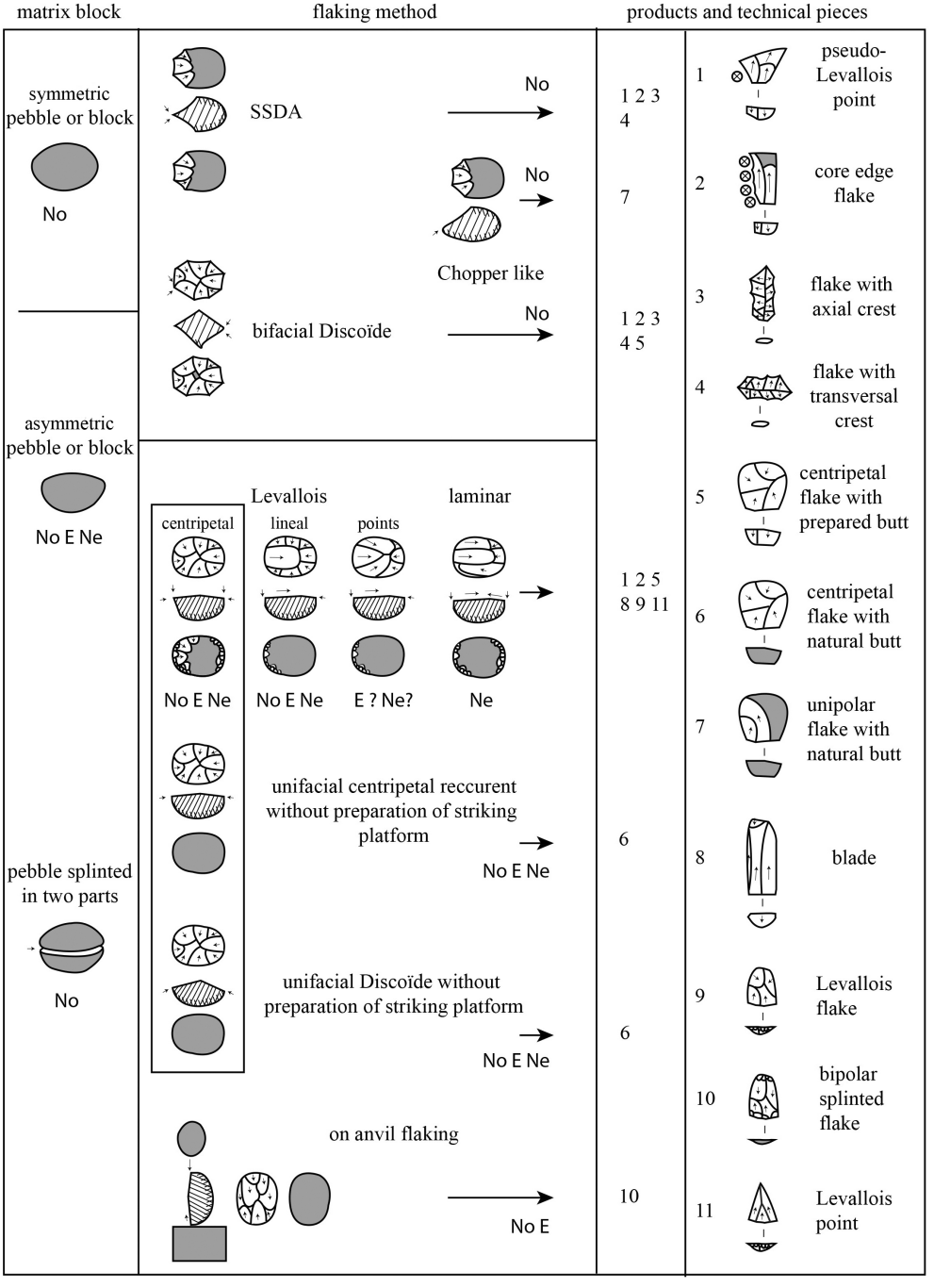


Fig. 14.
Simplified diagram of the *chaîne opératoire* used in Norroy (No), Erching (E) and Neufchâteau (Ne) (modified from Le Brun-Ricalens et al. 2012a; drawings: G. Asselin).

could be related to the larger dimensions of the Oxfordian chert blocks, which would have allowed the implementation of this kind of debitage. However, a quartzite blade fragment was also found. Cores associated with this mode of debitage are rare (n = 2), but recurrent centripetal Levallois flaking could have been continued, thus obliterating negatives created by the removal of blades. The knapping of the blades (n = 11) is carried out using bipolar Levallois (Boëda 1994; Revillon 1995) or bipolar facial laminar (Delagnes et al. 2007) techniques. Levallois flakes are well represented (n = 11) two of which are of quartzite and one may be of Sundgau flint. Moreover, some pseudo-Levallois points and centripetal flakes more characteristic of Discoid debitage, associated with secant recurrent centripetal unifacial cores, could well belong to the end of the Levallois sequence. Finally, an SSDA nucleus completes the range of modalities practiced by the prehistoric occupants of this site. No quartz and quartzite nuclei were found and the quartzite products are found in similar proportions to those of chert.

Modification of the debitage products seems to have taken place at all three sites.

Retouching and shaping flakes have been identified, but in very small quantities (n = 4) at Norroy, probably due to the taphonomic bias related to the nature of the terrain. Norroy's Discoid modality could produce flakes that were wider than they were long and which were used as blanks for transverse scrapers, whilst at Erching, the modification focused on the side edges of flakes, as was the case in Neufchateau. On all three sites, Quina and half-Quina modification (Bordes 1961) is noted mainly on quartzite elements. This is probably due to the raw material used which requires a large investment during the production phase (Belland and Guillaume 1989).

With regard to the shaping of bifacial tools, cherts and flint seem to have been preferred over quartzites. Indeed, the slab form of the chert and flint was probably selected in order to make thinner bifacial tools. In addition, the edges of the slabs lend themselves to the production of *Keilmesser*. In Norroy, for example, two of the four bifacial tools are of chert as are two roughouts. At Erching, all of the bifacial tools are of flint. However, in Neufchâteau, the pattern is different, with the rank of the shaped quartzite pebbles (n = 2) slightly higher than the bifaces produced from chert (n = 5).

b) Nature of the sites

Behavioral differences were observed at the three sites studied. Thus, at Norroy, all phases of the *chaîne opératoire* have been identified, from the testing of blocks to the modification of products, and even the recycling of tools. The fact that the test phase of blocks is present suggests that this is a raw material acquisition site. On the same site there is evidence for a workshop facies with production and consumption of blanks (Kegler-Graieweski, Zimmermann 2003).

At Erching, no tested blocks were found; however, the phase of cortex removal is attested on the site, as are the phases of tool production and consumption. The site thus also corresponds to a production and consumption site.

Finally, neither testing nor cortex removal seem to have taken place on site in Neufchateau. Instead, pre-prepared cores appear to have been imported in order to be knapped *in situ* so as to produce blanks. Similarly, the retouch phase took place *in situ*. Neufchâteau could correspond to a raw material consumption site. The possible Sundgau flint scraper is also noteworthy. It suggests population movement or exchanges of finished tools over long distances.

Moreover, the data from these three sites indicate that the closer the sites are to the raw material outcrops, the lower the percentage of tools present.

c) Convergences and divergences

The difference in the nature of the sites therefore influences the quantity of objects present but not their characteristics.

Thus, at all three sites recurrent centripetal flaking (Lenoir and Turq 1995; Di Modica 2010) is predominant. However, at Norroy there is a tendency towards the production of thicker products which are more characteristic of the Discoid concept, while in Neufchâteau, the products are thinner and tend to suggest that the Levallois technique was used. In Erching the distinction is more difficult to make.

Linéal Levallois debitage is systematically present at all three sites, laminar Levallois was only practiced at Neufchateau, while SSDA, "chopper-type" and Kombewa knapping are only represented at Norroy.

As regards typology, thinned back flakes and scrapers are observed on all three sites. This thinning may indicate the possible fitting of a handle to the edge opposite the cutting edge. Single side scrapers are the most common type at all three sites. At Norroy, transverse scrapers are also well represented. Upper Paleolithic type tools are represented by *perçoirs* (Fig. 9h) at all three sites and by the Erching truncation (Fig. 9i).

Finally, bifacial tools are rare in Norroy and more frequent in Erching and Neufchâteau.

d) Which techno-complex?

Because of the lack of stratigraphy and the risk of a palimpsest effect induced by surface gathering, the issue of attribution to a particular techno-complex has proven difficult and is fraught with uncertainty.

The presence of *Keilmesser* on each site is reminiscent of the *Keilmessergruppen* (KMG) (Mania 1990; Jöris 2004), the Micoquian of Central Europe (Günther 1964; Bosinski 1967), or the Mousterian with Micoquian Option (MMO) (Richter 1997).

The two *Bocksteinmesser*, the two leaf points fragments (*Blattspitzen*) and the *Klausennischemesser* from the Erching site evoke the Bockstein-type *Keilmessergruppe* (Bosinski 1967, 2004; Wetzel and Bosinski 1969), and even the *Blattspitzengruppen* of the recent Middle Paleolithic (Bosinski 2004). The straightness of the *Keilmesser* edges found on this site recall the KMG B or C (MIS 4 or 3; Jöris 2006), while the presence of *Blattspitzen* would coincide with MMO C (MIS 3; Richter 2010). Thus, part of the Erching occupation could possibly be connected to a recent phase of the *Keilmessergruppen* in the MIS 3.

The presence of KMG occupation remains hypothetical and evidence takes the form of just two *Bocksteinmesser* and a *Königsaue Keilmesser* in Neufchâteau. The convex edges of these backed bifaces would indicate a KMG A (MIS 5; Jöris 2006). However, the association of *Keilmesser* with Levallois laminar knapping at Neufchâteau could also correspond to the MMO C (MIS 3; Richter 2010). Moreover, a single triangular biface and three cordiform bifaces were unearthed on this site. The association of *Keilmesser* and MTA bifaces on this same site raises the question of the chronological homogeneity of the series. Indeed, in more precisely dated contexts, such as in the Vanne Valley (Yonne, France), the association of these types of tools is non-existent with the exception of the Lailly "Fond de laTournerie" site (Depaepe 2001). Not far from there, the surface assemblage from Pont-de-Planches (Lamotte et al. 2012), above the levels attributed to SIM 3, has yielded the same kind of assemblage.

At Norroy, two *Bocksteinmesser* were discovered; their convex edges also led them to be attributed to the KMG A (MIS 5, Jöris 2006). The two associated bifaces, one with a massive cortical base, the other cordiform with a partial back, do not evoke the MTA.

This last type of biface does not fall within the standards for either MTA bifaces or KMG *Keilmesser*. Similar types of objects, which are interpreted as being intermediate types, have already been identified at the "Hermitage" Cave in Moha, at "Doctor" Cave in Huccorgne in Belgium (Ulrix-Closset 1975; Ruebens and Di Modica 2011), and also at Vinneuf (Yonne, France; Gouedo 1993, 1999). The Belgian sites are attributed to the MIS 3 (Ruebens and Di Modica 2011) while the Burgundian site is estimated to belong to the MIS 5 and MIS 6. A similar un-dated object discovered in the Pays de Bitche, 6 km from Erching, was the subject of a recent publication (Asselin et al. 2016).

The presence of eastern-influenced tools in the Lorraine industries has already been highlighted by C. Guillaume, who described a final Acheulean or Micoquian with a Charentian character (Guillaume 1986: 53).

In neighboring regions in France, reference is made to a Charentian with Micoquian influences in the plains of the northern Paris Basin, Franche-Comté and Burgundy (see, among others, Ameloot-Van der Heijden and Tuffreau 1993; Farizy 1995; Lamotte et al. 2005, 2012; Depaepe 2007; Soriano 2015). Like the assemblages described here, the

industries of this technological complex are characterized by the presence of Micoquian bifacial tools associated with Levallois debitage. They are generally allocated to the MIS 7 and 3.

e) *Keilmessergruppen* in Lorraine and neighboring regions, an underestimation of the phenomenon?

In the Lorraine region, and in France more generally, *Keilmesser* are often classified as scrapers with bifacial retouch (Bordes 1961), thus limiting their identification.

At present in Lorraine, the Sarre watershed has provided the greatest numbers of *Keilmesser*, with a *Bocksteinmesser* in Neufechingen (Saarland, Germany; Fig. 15, 3) (Le Brun-Ricalens et al. 2012b) and a partially backed biface in Bettviller (Moselle, France; Fig. 15, 8) (Asselin et al. 2016). In addition to the Erching finds, investigations by S. Schmit have led to the discovery of five additional *Keilmesser* in the Pays de Bitche (Fig. 15, 4-7).

In the Neufchâteau region, in addition to the "Sur Conraux" assemblage, a fragment of *Blattspitze*, two *Klausennischemesser* and a *Faustkeilblatt* have been discovered by S. Béguinot (Fig. 15, 4-7).

The Moselle foothills have yielded further *Keilmesser* (Fig. 15, 1-2 and 13-14), particularly in Hellange in Luxembourg where two *Bocksteinmesser* and two *Königsaue Keilmesser* have been identified (Le Brun-Ricalens et al. 2012a; Griette et al. 2022).

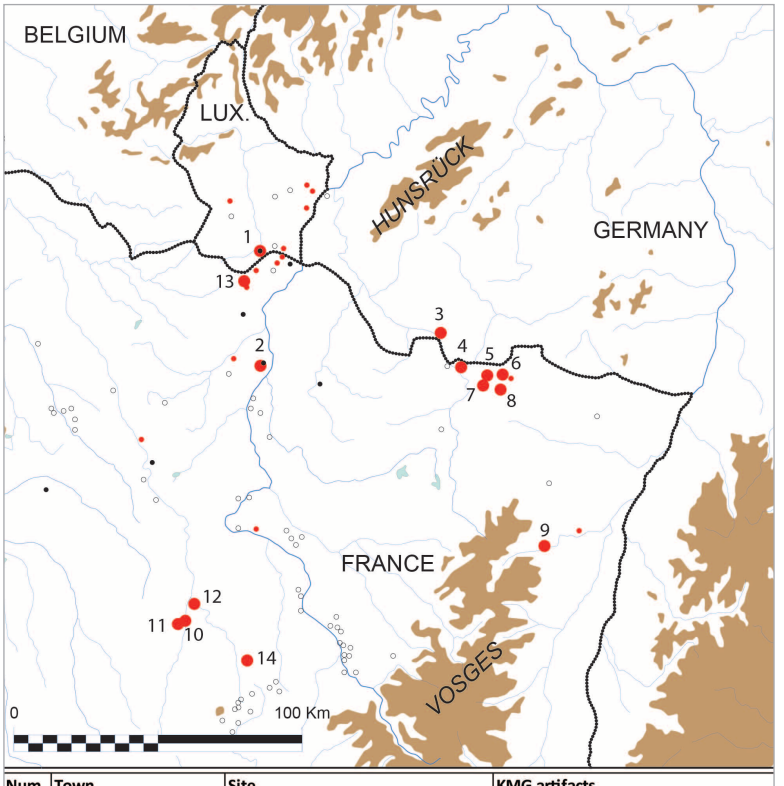
Recently, in Alsace, a *Bocksteinmesser* was uncovered in Flexbourg (Fig. 15, 9) (Koelher et al. 2020).

CONCLUSION AND PROSPECTS

The study of the three sites of Norroy, Erching and Neufchâteau clearly reveals that the *Keilmessergruppen* techno-complex, already foreseen with the Micoquien Charentian (Guillaume 1986; Belland and Guillaume 1989; Guillaume et al. 1992), did indeed spread to Lorraine and adjoining regions. These three sites are distinguished by the knapping modalities used and by the tool typology; they each maintain a well-defined Mousterian character with the practice of *linéal* Levallois debitage and with a predominance of simple scrapers among the tools.

As part of the research axis of UMR 7044 of the University of Strasbourg, which focuses on the Middle Paleolithic in the upper Rhine region and its margins, future work will extend to include hitherto unpublished finds made by the Lorraine survey teams and will also include a revision of previously published series.

A request was made (2018) to undertake further investigations in order to determine if archaeological levels were preserved beneath the silty layer at the site of "Bois Jacquemignon" in Norroy le Veneur. Unfortunately, no levels were found (Griette et al. 2022).



Num.	Town	Site	KMG artifacts
1	Hellange (L.)	Be' Nert'	Bockstein, Königsaue
2	Norroy le Veneur	Bois de Jacquemignon	Bockstein, partial backed biface
2	Norroy le Veneur	Grand Pré	Bockstein
3	Neufechingen (G.)	Auf Wappenhöh	Bockstein
4	Gros-Rederching	Feinbrunnen	Klausenniche
4	Obergailbach	Ormen	Bockstein
5	Erching-Rimling	Rehbrunenwald	Blattspitze, Bockstein, Klausennische
6	Epping	Sedlberg	Bockstein
7	Rimling	Verschingerwiese	Lichtenberger
7	Rimling	Buchenbusch	Königsaue
8	Bettviller – Hœlling	Hinterste Kiesehuebel Bauertchen	partial backed biface
9	Flexbourg		Bockstein
10	Neufchâteau	Champs la Noire	Klausenniche
10	Neufchâteau	Sur Conraux	Bockstein, Königsaue
11	Mont-lès-neufchâteau	Hudremont	Blattspitze
12	Moncel sur Vair	Herbus	Faustkeilblatt
13	Havange	Plat Cul	Blattspitze
14	Vittel	Col du Poirier	Blattspitze

Fig. 15.
Map of sites with bifacial tools (in black: Ancient Paleolithic sites, in red: Middle Paleolithic, white: undetermined dating). Sites that have delivered remains that may belong to the *Keilmessergruppen* are counted in the table (after Le Brun-Ricalens et al. 2012a, 2012b; Asselin et al. 2016; Ringenbach 2017; image: G. Asselin after CNRA Luxembourg background map).

At one time, there was a project to build a wind farm on the "Rebrunenwald" site in Erching-Rimling. However, it has been canceled for the time being. Maybe one day preventive archaeological investigations will be planned here in the future.

Finally, the site of "Sur Conraux" at Neufchâteau could be the subject of a manual survey in order to check the stratigraphy, but only if discoveries continue to be made and if refits are found.

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