An Overview of the Middle Paleolithic of Northern Burgundy/Franche-Comté

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ABSTRACT

Since prehistoric times, the northern part of Bourgogne/Franche-Comté (east central France) has been an attractive transition area for populations and fauna, allowing movement from central to western Europe (and vice versa) via the Upper Danube Basin and the Belfort Gap. It also constitutes a North-South and South-North transition area via the main river valleys (Saône, Rhône, Rhine, Meuse, Moselle). In this region, the topography is varied and defined by hills that rise to between 300 and 600 m asl, including the Morvan and Côte-d'Or mountains, the Vosges hills and mountains and the foothill plateaux of the Jura. Prehistoric populations settled here at different times and for different durations. The late Middle Paleolithic and the Upper Paleolithic are the best represented prehistoric periods in the region. Since 2005, our research on the Middle Paleolithic has revealed that the lithic assemblages have many affinities with those of central Europe (Althmülian, Micoquien, Eastern Mousterian) including with facies dating to the transition with the Upper Paleolithic (Szélétien, Jankovichien, etc.). A spatio-temporal study shows that while topographical, geological (including raw material availability) and environmental factors facilitated the movement of and/or occupation by people and animals, this scenario cannot be applied in a blanket manner, varying locally and over time. Recent integrated scientific research, encompassing absolute dating, paleoenvironmental work, zooarchaeological studies and in-depth techno-typological analyses, sheds new light on the occupation of this part of France and Europe.

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RÉSUMÉ
Le Nord de la Bourgogne/Franche-Comté septentrionale est, depuis la Préhistoire, une entité géographique de passage d'Est en Ouest par les populations de l'Europe centrale vers l'Europe occidentale (ou inversement) via le bassin supérieur du Danube et la percée de Belfort. C'est aussi une terre de circulation du Nord au Sud via les axes principaux des cours d'eau de direction Nord/Sud (Saône et Rhône) ou Sud/Nord (Rhin, Meuse, Moselle). Dans cette région aux modelés topographiques assez variés situés autour de 200-600 m d'altitude définis par les contreforts du Morvan, de la Côte-d'Or, des sous-collines vosgiennes et des premiers plateaux du Jura, les populations s'y sont aussi établies pour une durée variable. Dans cette région, le Paléolithique moyen récent et le Paléolithique supérieur sont les deux périodes les plus fréquentes et les vestiges du Paléolithique moyen comptent de nombreuses affinités avec ceux de l'Europe centrale (Althmülien, Micoquien, Moustérien oriental). Grâce à nos recherches depuis 2005, certains gisements de plein-air ont bénéficié de datations absolues, de travaux archéozoologiques, de travaux sur les paléo-environnements et d'une re-lecture approfondie des marqueurs identitaires des populations paléolithiques. Toutes ces recherches sur les gisements de plein-air et grottes nous apportent un éclairage nouveau sur la fréquentation discontinue des territoires au sein de cette grande entité géographique.

ZUSAMMENFASSUNG
Der Norden der nördlichen Region Burgund/Franche-Comté ist seit der Vorgeschichte eine geografische Einheit mit wichtigen Verkehrswegen, durch die die Bevölkerungen von Mitteleuropa über das obere Donaubecken und den Belfort-Durchbruch von Ost- nach Westeuropa (oder umgekehrt) gewandert sind. Hier liegt auch eine wichtige Nord-Süd-Verkehrsachse über bedeutende Wasserläufe nach Süden (Saône und Rhône) oder Norden (Rhein, Maas, Mosel). In dieser Region mit ihren recht unterschiedlichen topografischen Mustern, in Höhenlagen um 200-600 m, die durch die Ausläufer des Morvan, der Côte d'Or, der Vogesen und der ersten Hochebenen des Jura geprägt werden, ließen sich die Menschen auch für unterschiedlich lange Zeiträume nieder. Das jüngere Mittelpaläolithikum und das Jungpaläolithikum sind am häufigsten im Fundmaterial der Freiland- und Höhlenstationen vertreten. Vor allem das Mittelpaläolithikum weist zahlreiche Affinitäten zu Technokomplexen aus Mitteleuropa auf (Althmühlien, Micoquien, östliches Moustérien). Durch unsere Forschungsarbeit seit 2005 konnten einige Freilandfundstätten absolut datiert werden, hinzu kommen archäozoologische Arbeiten, Studien zur Paläoumwelt und umfassende Neuinterpretationen zur Identität der paläolithischen Bevölkerungen. Dieser integrative interdisziplinäre Ansatz wirft ein neues Licht auf die Nutzung der Habitate in dieser bedeutenden Region über lange Zeiträume.

INTRODUCTION

The Burgundy/Franche-Comté region is located in east central France (Fig. 1). The region is a contact zone between the Parisian sedimentary basin and other neighboring regions such as the Vosges and the Massif Central that contain abundant metamorphic, sedimentary, glacial and fluvioglacial raw materials (Théobald 1973; Campy 1983). The plateau, situated at around 200-500 m (Cholley 1939; Journaux 1956), plus most of the stepped terraces (Théobald 1972; Campy and Contini 1973) and the Bresse

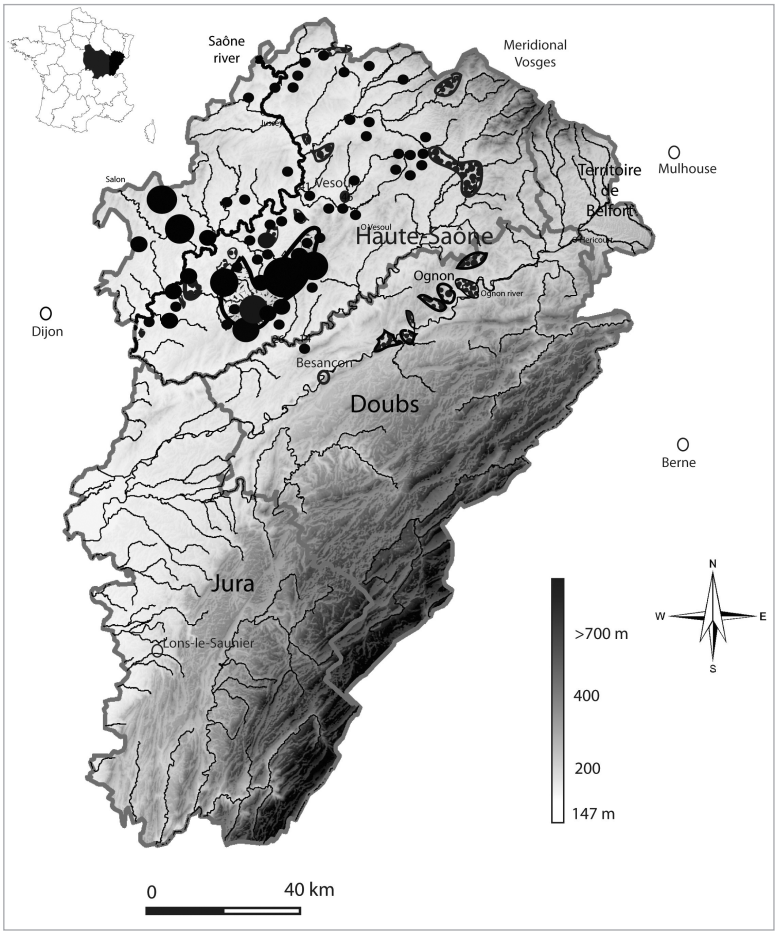


Fig. 1.
Location of main discoveries cited in the article (map source: DB Carthage: P.-G. Salvador, Lille University, modified).

tectonic depression which generated the Mont-les-Etrelles Basin (Contini 1991a, 1991b; Cupillard 1991) were occupied by numerous Paleolithic populations who were in a position to exploit 17 main types of available raw materials (Lamotte et al. 2011; Lamotte et al. 2017). Before the merger of French regions in 2016, it was well known that, in the Franche-Comté region, 90% of Paleolithic discoveries were concentrated in the Department of Haute-Saone (Thevenin and Huguenin 1966); the remaining 10% were located in Doubs, Jura and in the area of Belfort. In Haute-Saône, rockshelters represent around 10% of the occupation sites (Campy 1982) while the vast majority are open-air sites (Seara et al. 1990). Administratively, the region is now merged with Burgundy, which exhibits the same kinds of discoveries in rockshelters and open-air contexts (Joly 1950; Joffroy 1958; Verjux 1984, 1985; Pautrat 1988, 2002). The region lies in the periglacial area of the Vosges, located to the north, and the Jura Mountains, to the south. Quaternary deposits are rare and many sites lack clear stratig-

raphy (Théobald 1973; Campy, 1983). The regional stratigraphy is known in cave contexts (Campy and Piningre 1984; Campy and Vuillemey 1989) but not on open-air sites. In an attempt to redress this situation, the authors have undertaken 15 years of field work and research (Hallegouët et al. 2008; Lamotte et al. 2012) (Fig. 1).

OVERVIEW OF OPEN-AIR SITES WITH DATING EVIDENCE AND STRATIGRAPHY

In 2008 and 2010, two sites were subjected to OSL dating: Pont-de-Planches and Vantoux-Villers-Chemin. They both provided dates of around -48/-52 ka, i.e., MIS 3. Both sites lacked faunal remains but were rich in lithic material, probably belonging to the KMG (*Keilmessergruppen*) in the case of Pont-de-Planches and to the Eastern Mousterian in the case of Vantoux/Villers-Chemin.

The site of Pont-de-Planches

This site was investigated in 2008 and 2010 (Lamotte et al. 2012). Fourteen test excavations, carried out on the hill and toward the Romaine River, were significant with the discovery of a *Keilmesser* industry with very few *Blattspitzen*, leaf bifaces and many backed bifaces and others cordiforms. A new methodology, proposed by J.-A. Frick (Frick et al. 2017), for interpreting *Keilmesser* produced from slab flint or nodules may allow us to carry out better comparisons with biface assemblages in the future (Ruebens 2006; Frick 2016; Frick and Floss 2016). The site of Pont-de-Planches was occupied twice by Paleolithic hominids, first during the Middle Paleolithic, and then during the Gravettian (Le Mené and Lamotte 2018, n.d.). The existence of the site was first suggested by surface finds and was confirmed through field investigations and dating analysis carried out in 2008 and 2010. KMG occupation was identified at mid-slope level on the hill whereas Gravettian occupation was located near the small La Romaine River. The discovery of a young *Bison priscus* cranium, with most of its teeth still intact (see Magniez in Lamotte 2011), was of particular interest.

Stratigraphy and dating of the Middle Paleolithic occupation

As part of the survey operation carried out in 2011, two dates were obtained for the stratigraphic levels underlying and overlying the main Middle Paleolithic occupation. The upper level yielded a date of - 47,3 + 7.5/-6.2 ka BP; the lower of - 52,1 + 8.8/-7.1 ka BP (Lamotte et al. 2012) (Fig. 2). The industry is located in a red soil within a larger complex of soils assigned to the middle Pleniglacial and equivalent to the St-Acheul/Villiers-Adam Complex (Antoine 1990; Bahain et al. 1996). This paleosoil can also be tied into the Moerschofdt Interstadial (Van der Hammer 1995).

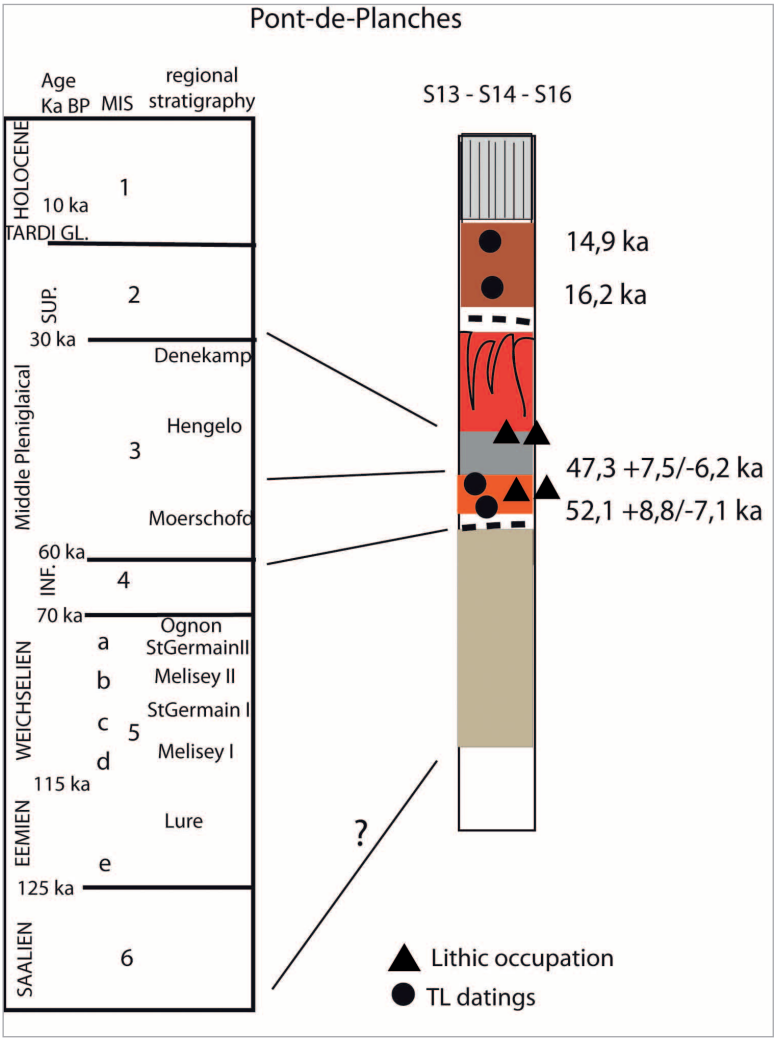


Fig. 2.
Pont-de-Planches: Description of finds and dating.

Lithic data and activities

The predominant raw material is of local origin (i.e., Oligocene flint in the form of slabs and flat nodules); the raw materials used for flake tools, however, were sourced from more than 20 km away (quartzite, Muschelkalk flint). There is ample evidence for shaping operations, with more than 200 bifaces, 40 cores and very rare retouched tools. The handaxe *chaîne opératoire* is incomplete with an absence of cortical elements. The Desmenard (Munier and Richard 2009) and Galtier assemblages tend to show that cordiform, sub-triangular and Micoquian types are dominant, but there are no clear concentrations of any particular type in the field. F. Galtier's collection numbers close to 500 artifacts, and everything was collected,

allowing us to consider all steps and to define several *chaînes opératoires*. Handaxes from Pont-de-Planches are the smallest ever encountered in the entire Mont-les-Etrelles Basin; they average 77 mm in length. A detailed breakdown indicates that 59% of handaxes are classic cordiforms, elongated and sub-cordiforms; 6% are triangular; 6% are oval; and 6% are broken. Handaxes with close parallels in southern Germany (Bosinski 1967) represent 13% of the total, the highest percentage in the region (Fig. 3). Some are less than 6 cm in length and fall into the category of *Faüstel,* others can be classed as *Bocksteinmesser* (backed handaxes) and one is clearly a *Faüstkeilblätter*. They are flat/flat, flat/convex, or convex/convex, in equal proportions.

The knapping activity clearly took place *in situ*, with more than 40 cores recorded. The Levallois method is most frequently observed (Fig. 4), and the lineal or preferential method is well represented (Boëda 1988, 1994). Distal and lateral convexities are very often created using the centripetal approach. Only two cores were knapped using the discoid method (Boëda 1993); these are also the biggest pieces in the series. Flake tools are not numerous on the site but they are all beautifully made. Raw materials are a bit more diversified (quartzite, Bajocian flint, Muschelkalk flint, chert) than the handaxes and cores. Double scrapers occur more frequently than single scrapers and endscrapers. Compared to other sites in the surrounding area, there is a broad spectrum of typologies present and

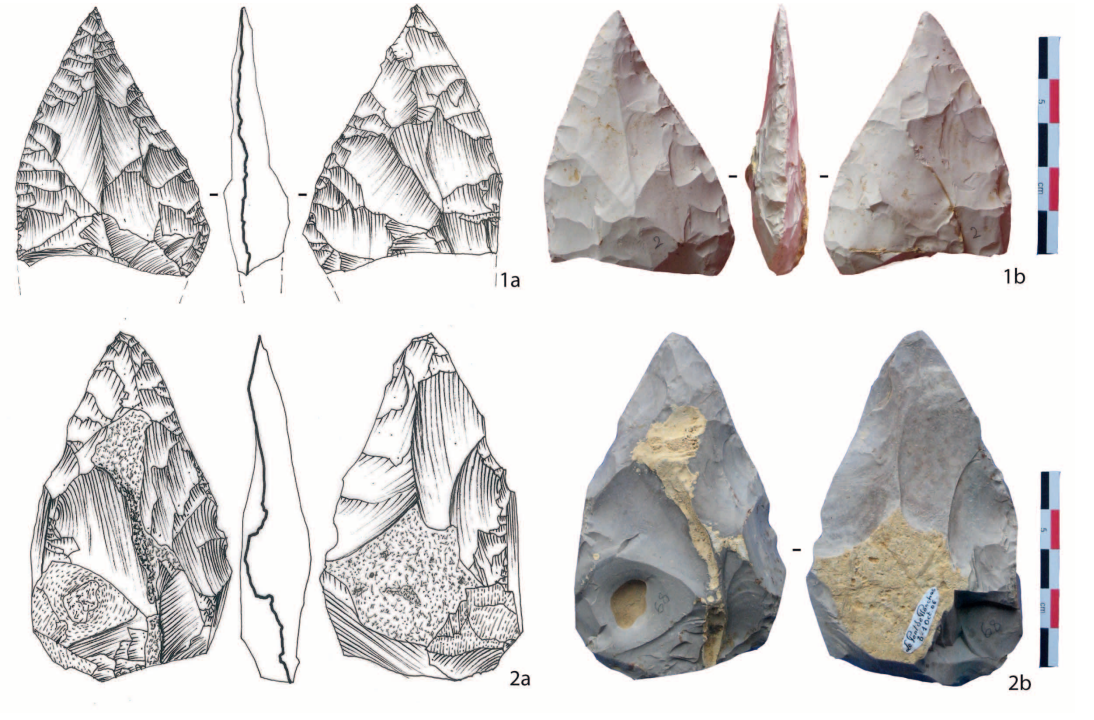


Fig. 3.
Pont-de-Planches: handaxes, 1a drawing of a leaf biface; 1b photo of same; 2a drawing of a keilmesser produced from a slab, 2b photo of same (drawings and photos: A. Lamotte).

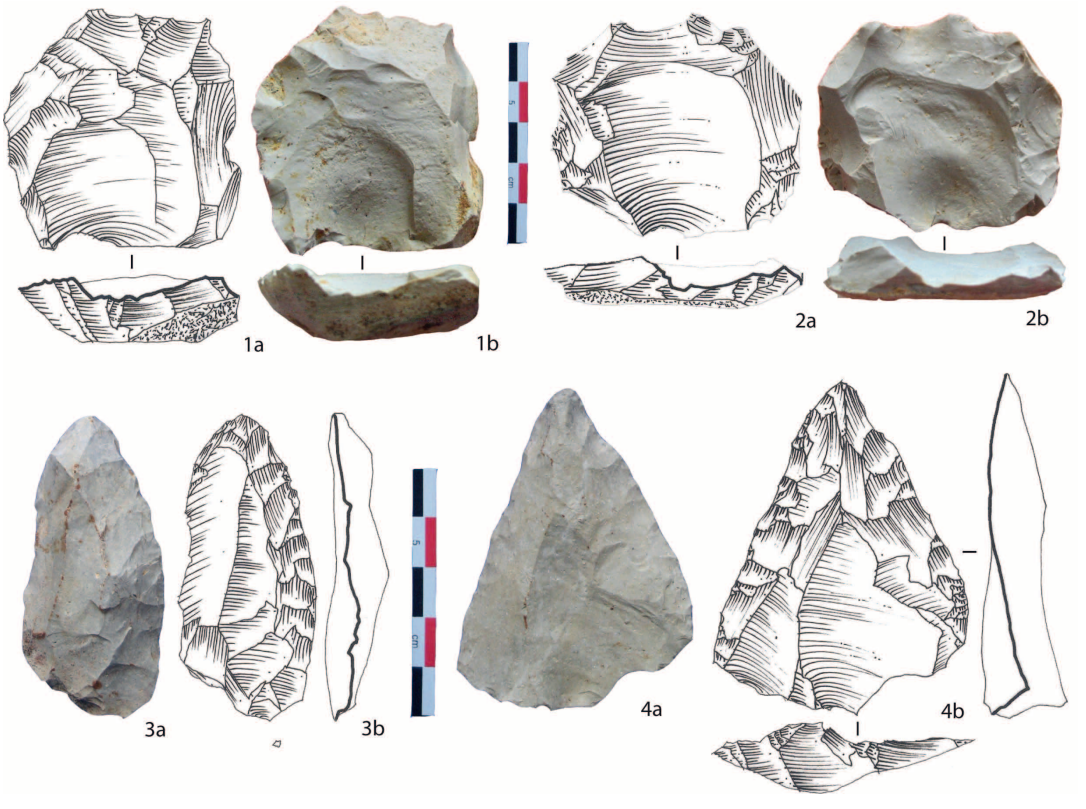


Fig. 4.
Pont-de-Planches: 1 and 2 Levallois cores and drawings of same; 3a, 3b single scraper; 4a, 4b double convergent scraper (drawings and photographs: A. Lamotte).

their blanks often feature cortex. Upper Paleolithic tools are only represented by an endscraper and very occasional notches and denticulates. Levallois flakes, handaxe roughouts made on flakes or slabs, and also numerous flakes linked to the manufacture of handaxes and scrapers (Fig. 4: 3 and 4) are clearly numerous. Finally, on the highest part of the slope, the Middle Paleolithic is well represented. Neanderthals undertook significant production of handaxes and were also engaged in flaking to reshape their flake tools. This occupation is very homogenous within the landscape and differs clearly from the Upper Paleolithic occupation. They used flat slab "soundy slab" as such flint is readily available in the local environment. Pont-de-Planches, therefore, clearly functioned as a handaxe workshop but also as a consumption site.

The site of Villers-Chemin

Located in an area called "Bois de la coupotte," some 20 km from Gray, the main town of the area, this site was first studied by B. Arnould in the early 1970s (Arnould 1971). Scrapers, Mousterian points and a small handaxe were discovered at the time. In 1998, drainage works in the field allowed us to identify a series of Middle Paleolithic artifacts in a primary

context. In 2008, test pits were excavated in the main concentration of lithic material and a further six pits were excavated in the immediate vicinity. Two of the pits yielded evidence for a lithic industry associated with a stratigraphic context (pits 3 and 4), while dates were obtained on sediments and a number of burnt flints. The preservation and ordering of the sediments show that they are not the result of a single phenomenon but are the result of several distinct processes and/or combinations of processes: eolian deposits, runoff, and erosion of soils during the MIS 3. Furthermore, no major hiatus is observed in the accumulation (see Saos in Lamotte 2009, 2011). As regards dating, the main level is situated between – 42.8 ka and – 65.1 ka. It is located in a yellowish orange sandy-clay horizon above a ferruginous horizon which could correspond to an intensely hot climatic episode (Moerschofd?) (Fig. 5).

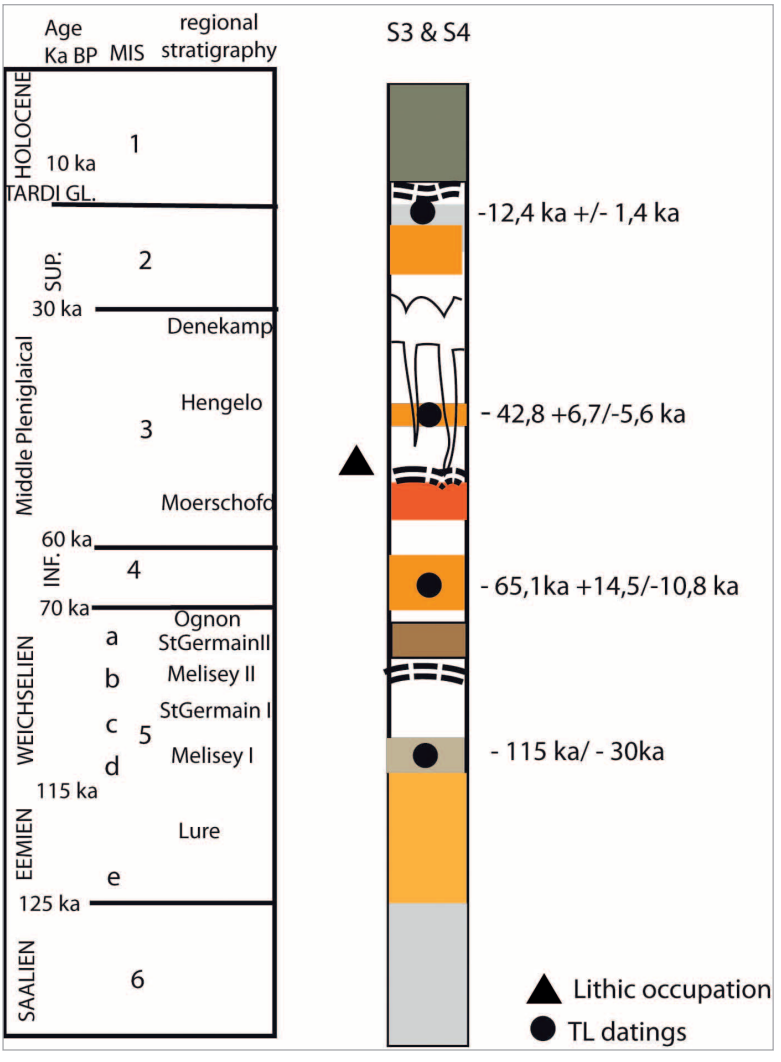


Fig. 5.
Villers-Chemin.
Description and dating
of the main occupation.

Lithic generalities: cores and flakes

A total of 666 artifacts were retrieved during the 1998 drainage works and, taken together with the material from the 2008-2009 excavations, the entire assemblage consists of 800 artifacts, allowing us to make the following observations regarding the composition of the material. Tested and untested nodules of raw material represent less than 1% of the total number of artifacts; cores account for over 6%; the remainder consists of material from various debitage steps (92.9%), including flake tools. The beginning of the *chaîne opératoire* is lacking on site. In the case of flakes, most are intact (87%) and in the majority of cases they lack cortex (65% of flakes). First flakes are very rare (less than 2%) and are very small; they may be associated with short test operations. In contrast, the longest flakes display partial cortex. Flake butts are generally plain (42%), punctiform (21%) and dihedral (14%); it is rarer to encounter examples that are cortical, facetted, absent or broken. Levallois flakes are numerous, as are backed knives, *kombewa* flakes and plunging flakes. There are no blades present.

All cores (n = 44) are made of the local flint. More than 50% are flake cores, with a large proportion of debitage blanks, perhaps reflecting the lack of raw materials described above. The length is about 100 mm for the longest and 33 mm for the smallest. Similar differences are observed for widths and thicknesses: width (90/38 mm), thickness (63/10 mm). The main types of cores are those with one main debitage surface (83%), followed by those with 2 (15%); examples with more than 2 surfaces, i.e., polyhedral cores, are very rare.

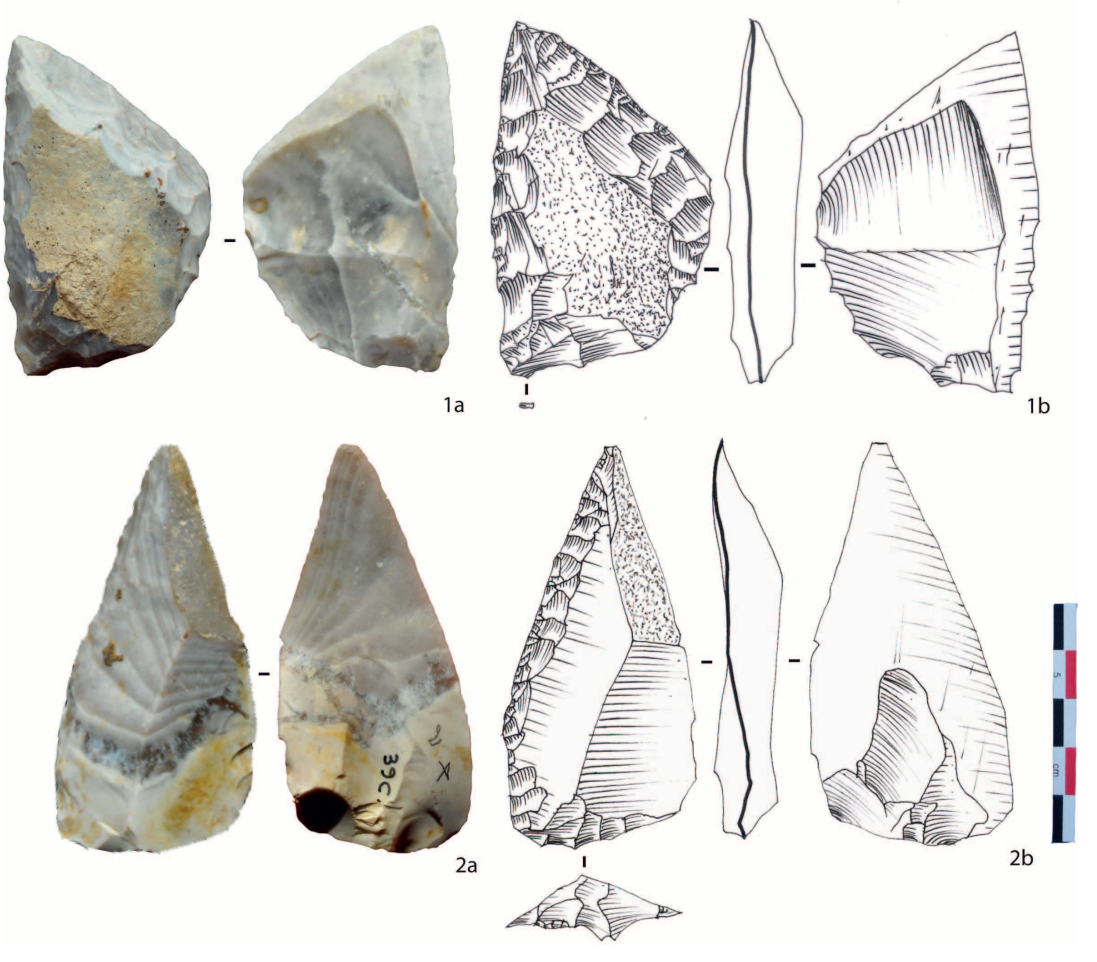
In the category of cores with a single debitage surface, non-Levallois cores are numerous. Flakes are produced using the centripetal method (n = 10). Some are exploited using unipolar (n = 8) and bi-directional (n = 6) methods. The bipolar method, with opposite knapping platforms, is rarely encountered. Levallois cores tend to be 10 mm longer and 6 mm thicker than non-Levallois cores. The preparation of Levallois convexity requires the removal of four to seven flakes, and more for the centripetal method, i.e., around 10 removals. Five cores are classed as preferential, two as recurrent. We also encounter cores with two debitage surfaces; these are the longest examples. Their production is well managed, with the removal of large flakes.

Flake tool typology

A total of 114 flake tools represent 14% of the assemblage. Flake tool blanks principally take the form of whole flakes (91% of cases). First flakes with large areas of cortex are never chosen, whereas other flakes resulting from several steps of the *chaîne opératoire* are selected. Of these blanks, 7% are backed knives, 2% are blades, 2% are *kombewa* flakes and 13% are Levallois flakes. Flake tools represent 15% of the assemblage, which is dominated by scrapers; a notable feature is the high percentage of thinned single and

double scrapers (Desmadry 2017). In descending order, flake tools are composed of single scrapers (47.1%), double scrapers (15%), and Mousterian points (3.8%). Notches represent 8%, denticulates less than 3%, and only one Levallois point and one pseudo-Levallois point have been identified. Metric analysis of these tools does not reveal any significant size difference between the flake tools, apart from notches which are produced from the smallest flakes (40 mm in length); in comparison, the rest of the flakes measure around 44-53 mm. Many double scrapers show traces of thinning (n = 7) (Fig. 6); of these 4 are base-thinned and 3 are back-thinned. The rest of the scrapers include 1 limace, 4 Mousterian points, 3 lopsided scrapers, 2 double convex scrapers and 2 double straight scrapers. Thinned scrapers have a very standardized blank length of around 55 mm; they are also flakes with a high degree of morphological variability, and very often possess residual cortex.

Fig. 6.
Villers-Chemin/Vantoux.
1 to 3: double scrapers with thinned base or thinned back (drawings and photographs: A. Lamotte).



The lithic study does not reveal any points in common with the Charentian: scalariform retouch of flake tools, open angles of flake butts, micro-Mousterian, link between small blank size and the use of different retouch. The main technical and typological characteristics of the Mousterian at Villers-Chemin/Vantoux lie mid-way (Huguenin 1987; Farizy 1995) between the Aquitanian Mousterian and the Eastern European complex. At Villers-Chemin/Vantoux, leaf points are very rare, but thinned scrapers with Kostienki retouch and Kostienki technology are numerous; these facts once again allow us to suggest connections with sites located further to the east.

The site may have functioned as a seasonal encampment, where an important activity obliged the occupants to produce large numbers of scrapers. It seems that there was one main phase of occupation, as indicated by the limited vertical dispersion of artifacts observed during the excavation (1 to 3 cm) and during the drainage works (1 to 7 cm).

OVERVIEW OF OPEN-AIR SITES WITH FEW OR NO ELEMENTS OF STRATIGRAPHY

Unfortunately, more than 91 sites with more than 200 artifacts lack clear stratigraphy (Dubois 1992, 1993); some are sub-surface sites revealed by surveys (Piningre and Vuillemey 1976) while others, such as Autet, Mercey-sur-Saône, Delain, Frettes and Pierrecourt (Hallégouët et al. 2008), were the subject of test excavations between 2005 and 2012 (Lamotte 2011). As is often the case in regions where sediments are poorly preserved, certain rare or short climatic signatures such as ice wedges, loess, or soils become very important.

Sites without handaxes

More than 30 sites have yielded between 200 and 3,500 artifacts each. In fact, the regional total is much greater if we take into consideration sites with less than 10 artifacts (Dubois 1993). As stated before, the absence of loess cover and colluvial deposits means that many Upper and late Middle Paleolithic industries are found on or just below the ground surface. However, it is worth noting that some successful refittings (see Frettes site and Pont-de-Planches) show that sites have sometimes escaped significant disturbance, but unfortunately the fact that the sediments display less than 80 cm of stratigraphy means that they are not sufficient to allow their attribution within a regional framework. Pierrecourt "les Cabrelles" and Frettes are excellent examples of sites with numerous artifacts (up to 3-4,000 artifacts). They are located near the Champlitte Plateau in the western part of the region and are only 700 meters apart. Both are open-air sites; one is a Levallois workshop (Pierrecourt; Huguenin 1987), the other lies within the Châtelperronian influence (Lamotte et al. 2012).

Pierrecourt

This open-air site has benefited from 30 years of prospecting by the same researcher (Huguenin 1987) and has yielded a homogeneous collection of more than 4,000 artifacts. A field investigation carried out in 2006 involved the excavation of 13 test pits located in and around a dolina. The aim was to improve our knowledge of the site by determining the stratigraphy and identifying corresponding lithics. The most significant discoveries were made around the outer edge of the dolina. As part of the rescue excavation, nine pits, each measuring 4m^2, were mechanically excavated.

Most of the cuttings yielded between 13 and 300 artifacts per m^2 (Pit 7). Each time, only one main level with limited vertical dispersion (less than 4 cm), was revealed. For the pits around the dolina, the stratigraphy was poor and bedrock is encountered 20-30 cm below the surface. In the outer edge of the dolina (Pits 11 and 12), a yellow sandy-loam unit with 20 cm vertical dispersion was revealed and was found to have shared characteristics with loess in bordering areas. Artifacts are numerous at the base of this stratigraphic unit, just 15-18 cm below the surface; this may be due to annual ploughing which tends to bring artifacts to the surface. Below this is a clayey, orange to brown unit with a thickness of 20-30 cm; the bedrock is encountered at a depth of 60 cm below the surface. Finally, in the center of the dolina (Pit 3), 3 meters of stratigraphy were discovered (Fig. 7). From the top to the bedrock, the stratigraphy is made up of an accumulation of gray-brown sandy-loams, then of chalky levels, a thin compact brown horizon (forest brown soil type reflecting the onset of glacial conditions?) 3 times (all 1 meter deep), a level of flint slabs or nodules interbedded, and finally bedrock. Pits 7 and 36 allow us to observe a completely preserved level. As regards interpretation, we believe that the upper units of this dolina record the Eemian, a part of the lower Weichselian and perhaps a small part of the Pleniglacial. Lower units are much more difficult to interpret.

It was undoubtedly the availability of raw materials (Bajocian and Callovian) that attracted recurrent occupation of the site by humans during the late Middle Paleolithic; a Levallois *chaîne opératoire* predominates (Pahaut 2007, 2008), and it is possible that we are looking at a Levallois workshop (Giros 2011) producing significant quantities of quality tools (Huguenin 1987). More than 1500 Levallois preferential cores (Fig. 8: 1) and the same quantity of Levallois flakes have been recorded (Fig. 8: 3 and 4). However, few Levallois points have been discovered; this is a common pattern in many other sites in the region (Santacroce 2015). The occupation took place after an erosion phase that stripped the upper slopes, and following the cessation of Weichselian silt deposition, at the end of the Middle Pleniglacial. Metrical analysis of the artifacts reveals a reduction in size until something close to the so-called "Asiniopodien" (Bordes 1981) emerges: similarities include types of scrapers, numerous notches, few denticulates, numerous back-knives, reduced cores, numerous non-transformed Levallois flakes, truncated flakes and resharpened

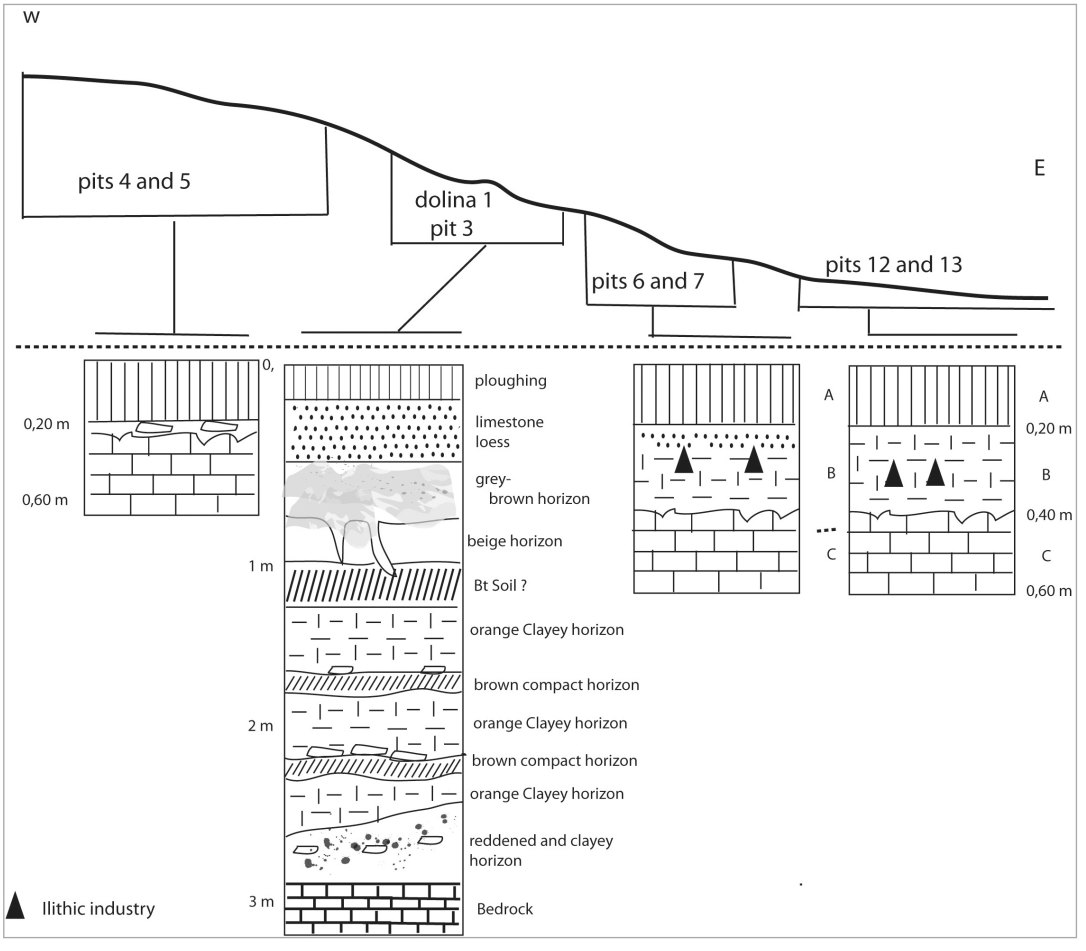


Fig. 7.
Pierrecourt. Stratigraphic observations along the slope and around the dolina (after Hallégouët et al. 2008; modified, drawings: A. Lamotte).

edges. Limaces (Bordes 1954, 1984) are also well represented among single and double scrapers (Fig. 8: 2, 5, and 6). Quina retouch is present but very rare, observed only on small scrapers and limaces; up to now Mousterian Quina (Bourguignon 1997) has not been defined in this region.

Frettes

Frettes is an open-air site which was discovered in the early1900s (Bouchet 1900). Since then, the site has been prospected by several other local researchers. The surface industry, which is concentrated in areas of 50 m^2, can be defined as Ferrassie Mousterian with eastern affinities. Following a campaign of testing carried out in 1988 and 1989, the site was more extensively excavated in 1990 and 1991 by Gilles Huguenin. This excavation, which extended over an area of 48 m^2, yielded 3,746 artifacts (c. 28 artifacts per m^2) constituting one main lithic series with links to the Châtelperron-

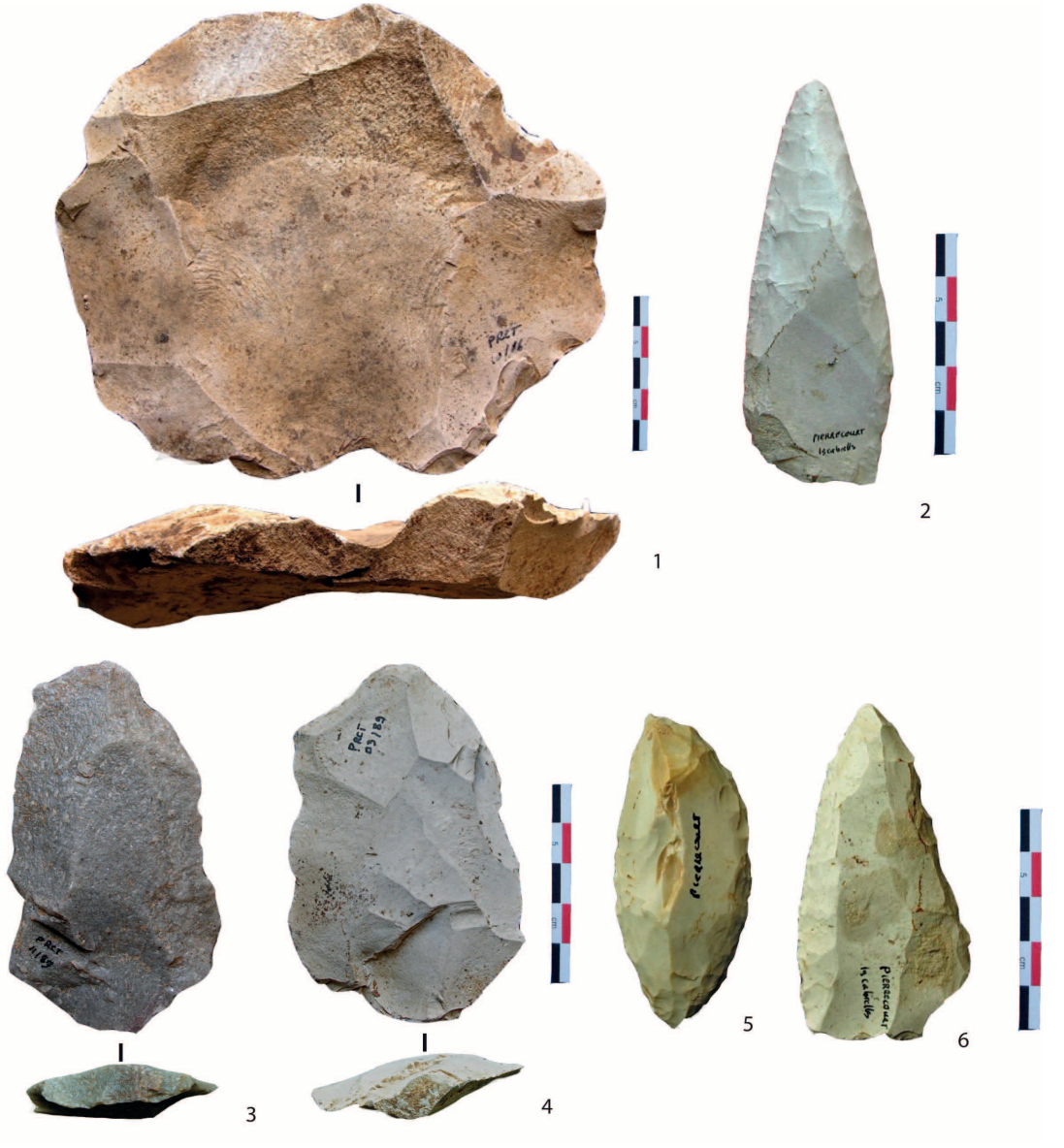


Fig. 8.
Pierrecourt. 1: Levallois preferential core (Bajocian chert); 2: double convergent scraper; 3 and 4: Levallois preferential flakes (3: quartzite; 4: flint); 5: limace; 6: single right-convex scraper (Huguenin collection, photographs and DAO: A. Lamotte).

ian industry. In 1989 and 1990, for the first time, a 220-meter long trench revealed a stratigraphic sequence of variable thickness over a large part of the slope and parallel to the slope (Fig. 9). The substratum, in this sector, forms a number of steps followed by sudden breaks. They can be likened to karstic structures due to the proximity of an existing fault not far from the site. The lowest horizon consists of red decalcification clays, the formation of which is considered to pre-date the last glaciation; it should be remembered that such clays could also be formed during an interstadial

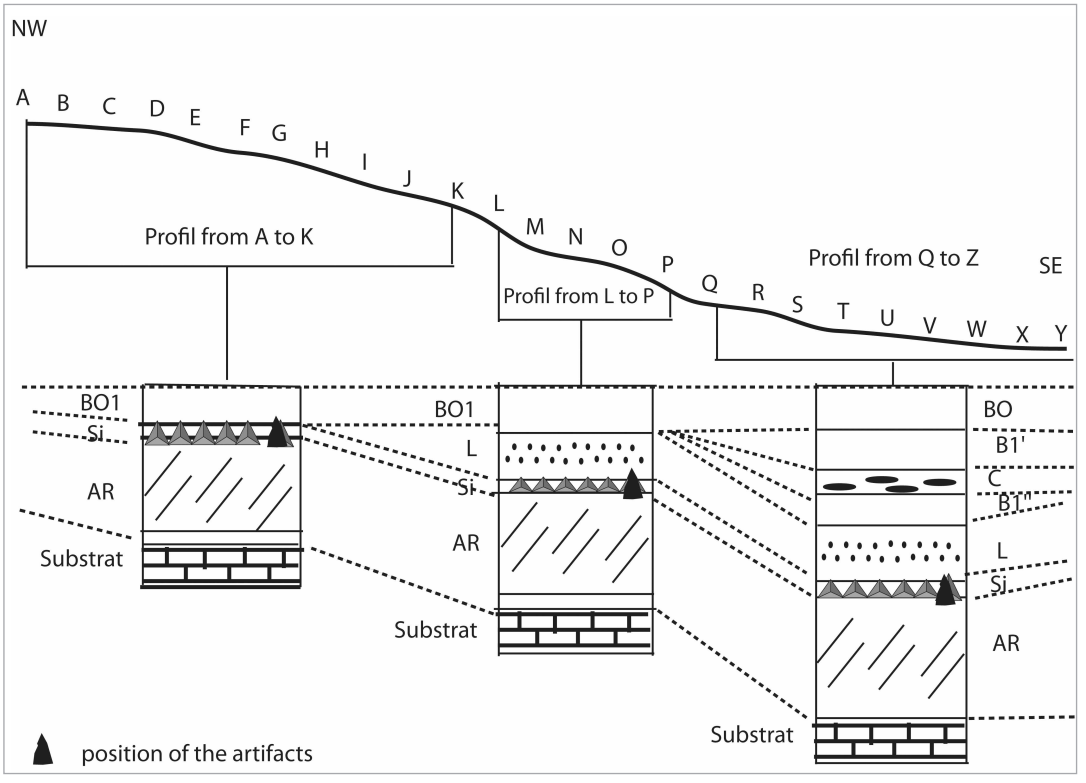


Fig. 9.
Frettes (Haute-Saône). Stratigraphy along the hillslope (after J.-L. Deherippont, modified).

in the last glaciation. The upper horizon is composed of fine yellowish silts, possibly of eolian origin (Champlitte-et-le Prélot 1985). The nature of the substratum confirms the relationship of flint with the limestones of the Middle Bajocian.

The local flint from Bajocian/Bathonian/Callovian formations constitutes more than 99% of the lithic series (Lamotte et al. 2014). The remaining percentage is made up of five other types of materials: quartz (11.5% of non-flint materials), quartzite (23%), tertiary flint (11.5%), Callovian silicified limestone (19.2%) and cherts (34.6%). Only quartz, quartzite and tertiary flint come from a more distant area, most likely from a source located about 25 km to the east or 30 km southeast of the site towards the Saône (Lamotte and Huguenin 2007; Lamotte et al. 2011). The lithic series consists of 3,746 objects with a significant proportion of nuclei (6.5% of the assemblage) and retouched tools (6.5%). The rest is made up of flakes (more than 93%). In the excavated area of 48 m^2, the density of the remains varies considerably from two artifacts/m^2 (H2) to 394 (B5) with an average of 78 artifacts per m^2 (Corbeaux 2011). Levallois cores (n = 53) represent 22% of the cores. Within this debitage concept, there are 34 cores with preferential modality (i.e., 64% of the Levallois cores) and 19 with a recurrent modality. Non-Levallois cores with multiple debitage

surfaces (usually two) were predominantly worked using the unipolar method (70.6%). Eleven of them were used for producing laminar blanks. The intentional production of blade and bladelets has not yet been demonstrated. Flake tools are well represented by scrapers of Middle Paleolithic type (single and double scrapers). End-scrapers and typical knives are also numerous and occur in the same proportions as scrapers; typical and atypical Châtelperronian points (Fig. 10: 1 to 3) are present but are rarer (Lamotte et al. 2012). Refittings are still in progress, but the initial results reveal about eleven groups of refittings and a basic connection between the distal and proximal parts of flakes. It should be noted that refittings include all of the categories of lithic artifacts: chips, low-cortical flakes, flakes and their cores. No retouched tools have been refitted.

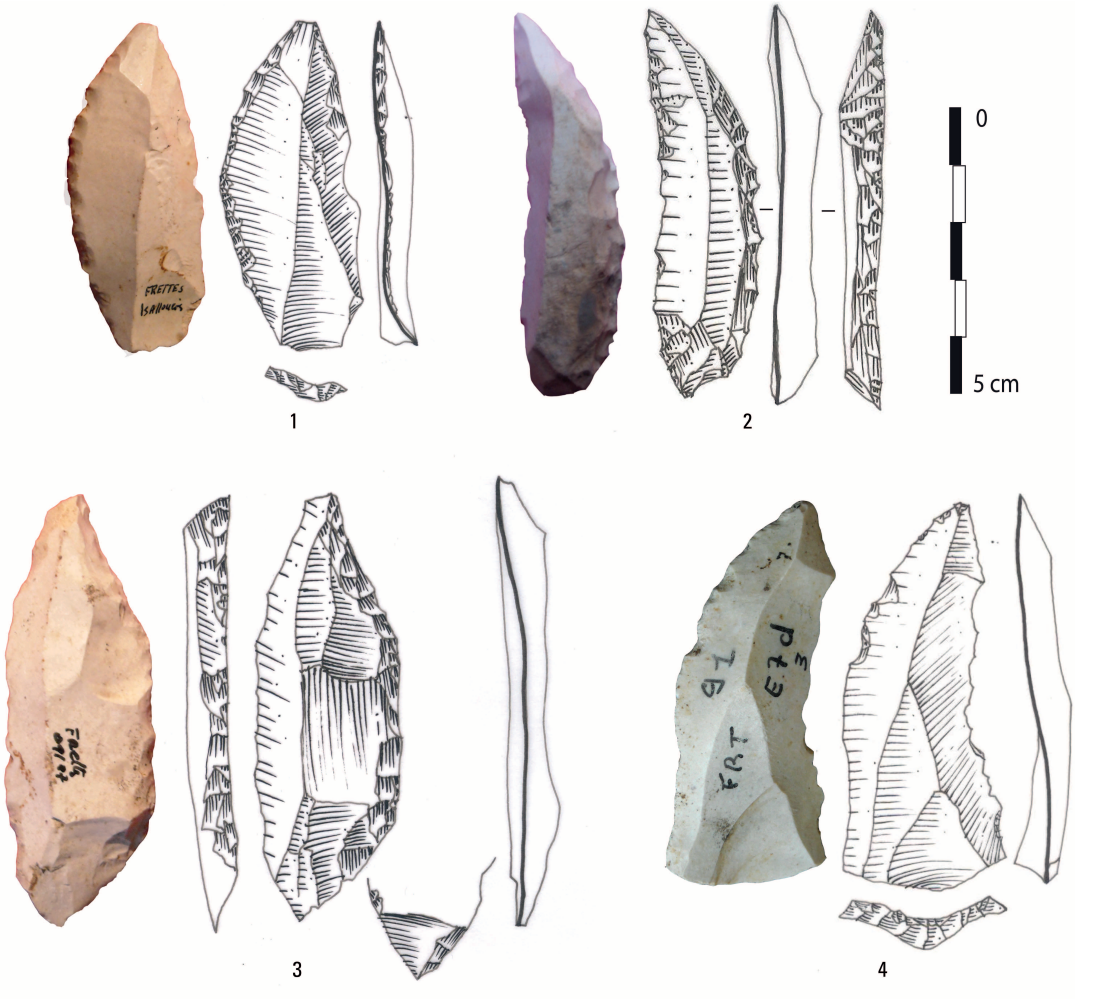


Fig. 10.
Frettes (Haute-Saône). 1 to 3: laminar blank and tools similar to Châtelperronian points; 4: Levallois blank (drawings: A. Lamotte).

The Frettes open-air site belongs to a wider spatio-temporal complex in which laminar technology (in plan, on the edge) exists alongside Levallois debitage and where the retouched tools agree with the chronology. Numerous lithic series belonging to this complex (Boëda 1988, 1990) feature retouched pieces with laminar debitage accompanied by tools that will subsequently be favored and developed at Châtelperron (Farizy and Schimder 1985; Farizy 1990; Floss 2003; Pélegrin and Soressi 2007; Floss et al. 2013).

Sites with handaxes

Handaxe find sites are the most common type of site in the region, and it is well known that a short walk in the field will often reveal further finds. In our last inventory, some 91 recorded sites had yielded around 478 handaxes (Lamotte and Huguenin 2008). In these sites, the main knapping method is Levallois. Flake tools principally take the form of simple scrapers; some feature bulbar resharpening, others display dorsal or lateral resharpening, while others exhibit the Kostienki technique. They can also be associated with bulbar or dorsal removals. Levallois points can be observed in the assemblages but double scrapers, Mousterian points and limaces are more numerous (Huguenin 1987). Most of the time, Upper Paleolithic tools, notches, denticulates, and typical knives are rare (Lamotte 2012).

In Haute-Saône, the number of bifaces from the various sites indicates that these tools are found, in rather similar proportions, in the three geographical and geological entities, with 18 sites on the plateaus, 23 sites in the Saône Valley, and 20 sites in the tertiary basin of Mont-les-Etrelles. The north of the Department, which corresponds to the southern hills of the Vosges range, has the lowest density of sites. Conversely, the triangular zone of the Oligocene Basin and along the Saone has revealed the highest density of discoveries. The open-air sites have yielded from 1 to 258 bifaces each, and three techno-complexes have been identified on the basis of our inventory: Acheulean (rare), Micoquian and KMG (present), Mousterian of Acheulean tradition (rare), Mousterian with bifacial tools (numerous).

The plateaux

On the plateau sites, the bifaces present a wide range of forms (Fig. 11) that can be linked to the raw material sources, which are also quite varied (Table 1). At Champlitte, there is a quasi-tripartite distribution between the amygdaloid, cordiform and Micoquian forms, whereas only chert and Bajocian flint are selected. Delain has yielded much more Micoquian bifaces made from chert (Lamotte et al. 2005). Frettes, which is located 15 km away from the Champlitte and Delain sites, is an exceptional surface site featuring cordiform and denatured flint bifaces; they are clumsily made from flakes or small nodules.

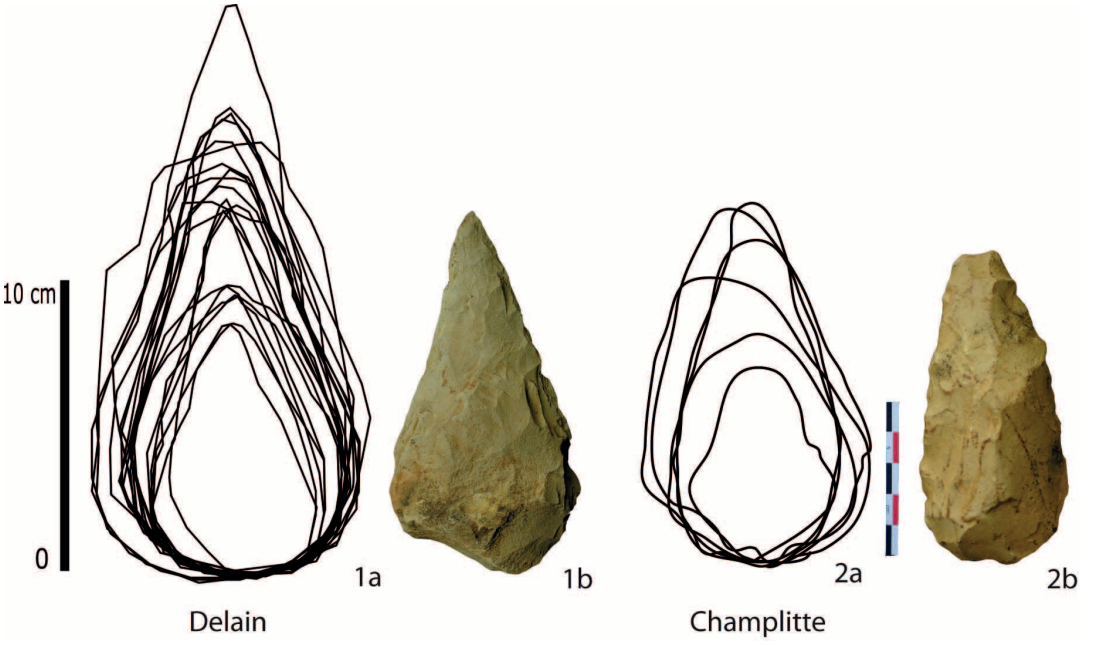


Fig. 11.
Handaxes from the plateaus, intra-site and inter-site comparison of morphology (DAO: A. Lamotte); Delain 1a: total of handaxes; 1b: chert handaxe; Champlitte 2a: total of handaxes; 2b: chert handaxe.

Parameter	Blank	Raw materials	Length (mm)	Width (mm)	Thickness (mm)	Weight (gr)	Main typology
Sites							
Champlitte Nb = 6	Nodule	Chert	99.3	66.8	36.3	168.3	Micoquian Amygdaloïd Cordiform
Delain Nb = 26	Nodule	Chert	121.03	72.42	37.8	274	Micoquian Amygdaloïd
Frettes Nb = 20	Flake	Bajocian flint	77.85	53.7	24.75	91	Cordiform Back biface

Table 1.
Plateau sites: main elements of comparison.

Along the Saône River

In the Saône Valley, 23 sites have yielded a total of 112 bifaces (Table 2). Studies of blanks, raw materials, biface morphologies, and methods of shaping have produced very diverse results, which suggest that we may be looking at the lithic signatures of various lithic tradition along this major river and its immediate tributaries. The blanks can take the form of nodules, as in Charentenay, Fedry, and Mercey-sur-Saône, or flakes as in Autet, Scye, and Vereux. In Vaite, flint slabs were preferentially selected. Whatever the raw material, cordiform bifaces are very common all along the

Parameter	Blank	Raw materials	Length (mm)	Width (mm)	Thickness (mm)	Weight (gr)	Main typology
Sites							
Autet Nb = 9	Flake	Oligocen flint	92.77	65.11	26.44	133.88	Cordiform
Charentenay Nb = 5	Nodule	Oligocen flint	76.85	57.42	27.71	104.28	Cordiform
Fedry Nb = 5	Nodule	Quartzit	88.6	69.2	28.6	155.6	Cordiform
Mercey/Saône Nb = 23	Nodule	Oligocen flint	114.27	74.94	35.72	278.4	Cordiform
Rigny Nb = 7	Slab Nodule	Oligocen flint	94.57	66.71	31	175	Cordiform
Scye Nb = 9	Flake	Quartzit Oligocen	119.33	73.7	35.33	290	Amygdaloïd
Soing Nb = 15	Nodule ?	Oligocen flint	117.3	74.8	33.2	247	Micoquian Amygdaloïd
Vaite Nb = 8	Slab	Oligocen flint	101.62	70.5	25.25	125.63	Cordiform
Vereux Nb = 11	Flake	Oligocen flint	98.45	66.6	36.16	178.18	Cordiform

Table 2.
Sites with bifaces in the Saône Valley: main elements of comparison.

Saône River, and sometimes a site yields tools with a specific morphology or tools made using special raw materials. In Fedry, quartzite bifaces predominate, while at Rigny, both quartzite and Oligocene flint bifaces predominate. In Scye, amygdaloids are prevalent, while in Soing Micoquian forms predominate (Fig. 12). In terms of size and weight, the artifacts from the sites of Mercey-sur-Saône, Scye, Soing, Vaite are significantly above the average.

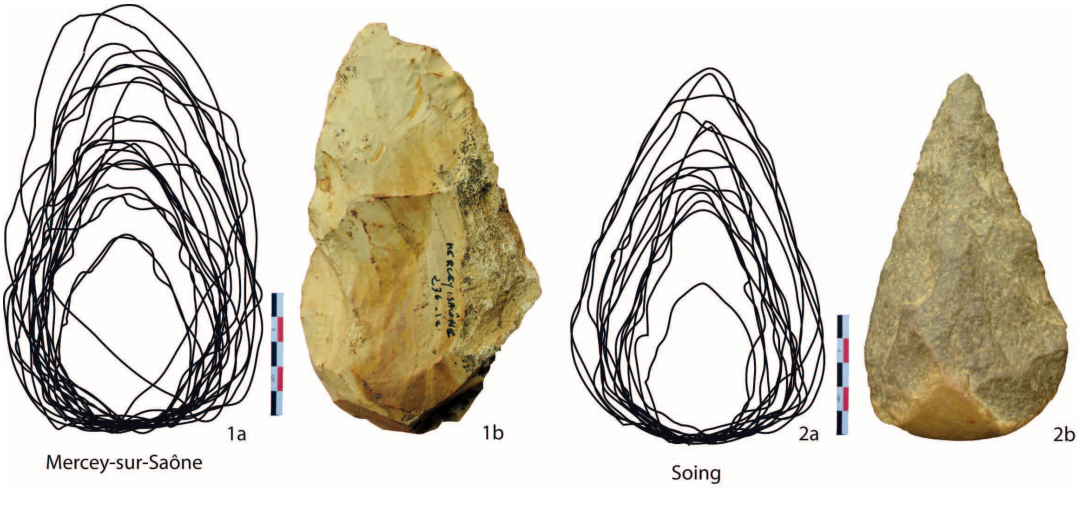


Fig. 12.
Handaxes from the Saône Valley, intra-site and inter-site morphological comparisons (CAD: A. Lamotte). Mercey-sur-Saône. 1a: total; 1b: flint handaxe; Soing 2a: total of handaxes; 2b: quartzite handaxe.

The tertiary Oligocene Basin of "Mont-les-Etrelles"

In this part of the region, 20 sites have been recorded, each yielding between 1 and 91 bifaces. Metric analysis reveals a wide range of dimensions, but there is considerable homogeneity in the selection of blanks (slabs of flat nodules), the type of raw materials used (local Oligocene flint; see Affolter 1991; Cupillard and Affolter 1991), and the morphology of the final tools. Among the 11 principal sites (Table 3), the site of Vantoux belongs to those sites with the exclusive use of flakes as blanks. As for the main morphology of handaxes for each site, there is much more variability than indicated in the table.

In the Mont-les-Etrelles Dasin, data differ greatly regarding raw material selection. We observe that the biface assemblages from Etrelles, Vezet and Fresne-St-Mamès are remarkable due to their typological variety (Fig. 13); in contrast, the biface assemblage from La Chapelle-Saint-Quillain is exclusively composed of cordiforms. Micoquian bifaces are quite numerous in Fresne-St-Mamès and they are also well represented in a wide variety of typologies in Pont-de-Planches (surface site), Vantoux and Etrelles. Amygdaloïds are present in Etrelles, Fresne-St-Mamès, Fretigney and Noidans-le-Ferroux. Biface roughouts are numerous in Vezet and Granvelle-et-le-Perennot where a high proportion of oval

Table 3.
Sites with bifaces from the Mont-les-Etrelles Basin: main elements of comparison.

Parameter	Blank	Raw materials	Length (mm)	Width (mm)	Thickness (mm)	Weight (gr)	Main typology
Sites							
Etrelles et la Montbl. Nb = 43	slab	Oligocen flint	98.55	72.66	31.51	163.14	Cordiform
Frasne-le-Château Nb = 8	slab	Oligocen flint	105.87	74	30.14	180	Cordiform
Fresne St-Mamès Nb = 39	slab	Oligocen flint	101.3	71.25	28.64	176.18	Cordiform
Fretigney-Velloreille Nb = 6	slab	Oligocen flint	97.83	68.33	32.5	143.33	Cordiform
Le Perrenot Nb = 5	slab	Oligocen flint	106.85	68.42	32.42	165.71	Cordiform
La Chapelle St-Quillain Nb = 5	slab	Oligocen flint	95.4	66.6	35.4	146	Cordiform
Noidans-le-Ferroux Nb = 6	slab	Oligocen flint	84.1	60	21.3	94	Cordiform
Le Pont-de-Planches Nb = 95	slab	Oligocen flint	77.89	56.55	25.23	69.21	Cordiform
Vaux-le Moncelot Nb = 5	slab	Oligocen flint	107.4	68.4	27.4	163	Cordiform
Vantoux Nb = 24	flake	Oligocen flint	95.12	65.66	29.2	129.58	Cordiform
Vezet Nb = 11	slab	Oligocen flint	104.54	73.9	30.63	216.81	Cordiform

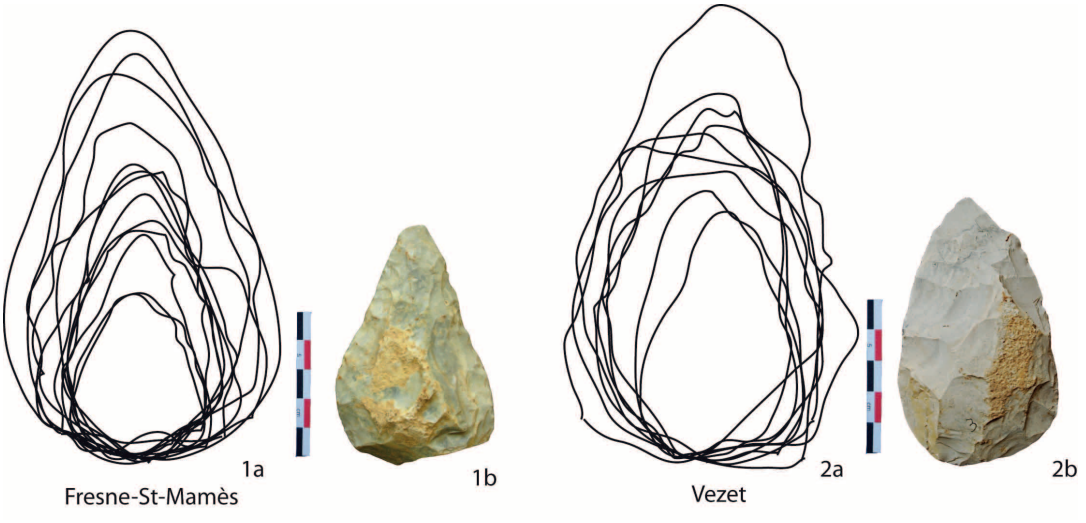


Fig. 13.
Handaxes from the Oligocene basin, intra-site and inter-site morphological comparisons (DAO: A. Lamotte). Fresne-St-Mamès 1a: total of handaxes; 1b: flint handaxe; Vezet 2a: total of handaxes; 2b: flint handaxe.

bifaces is recorded. On occasion, *prondniks* have been recorded in Fresne-St-Mamès, Vezet and Pont-de-Planches, while leaf bifaces are frequent in the area of Vantoux, Vaux-le-Moncelot and Frasne-le-Château.

In Vaux-le-Moncelot, only two blank types were used in the manufacture of bifaces: flint slabs of regular thickness and flat or bi-convex flint nodules. In Noidans-le-Ferroux, flakes were most often used for producing bifaces. In Granvelle-et-le-Perennot, Vantoux-et-Longevelle and Fresne-St-Mamès, slabs dominate for the production of bifaces, but they are immediately followed in importance by large flakes. This long Paleolithic occupation has produced interesting results but, from our point of view, has produced insufficient dating evidence to allow us to create an accurate map of the chronology of occupations linked to their territories. However, we can say that Lower Paleolithic bifaces are rare (perhaps late Acheulean for Mercey-sur-Saône; see Huguenin and Rigolot 1971), Middle Paleolithic bifaces (Ruebens 2006, 2014) are much more common, and there is a scarcity of triangular bifaces. The late Middle Paleolithic evidence seems to indicate that groups moved between southern Germany and the Mont-les-Etrelles Basin, observed, for example, at the site of Pont-de-Planches and the interest in *Keilmesser* with tranchet blow.

Sites with leaf points

This section presents the results of our most recent research. Ten sites yielded a total of 15 leaf points. Some leaf points are clearly attributable to the Middle Paleolithic and resemble material from southern Germany, others show characteristics that fit with the transition between the Middle and Upper Paleolithic. Without dating, it's difficult to assign them to a precise cultural tradition.

Geological and topographical considerations

Within the region, leaf point artifacts are located in the western part of the Haute-Saône Department (Fig. 14) where the principal recorded sites are Villers-Chemin (n = 4), La Montbleuse (n =1), Frasne-le-Château (n = 2), Montarlot (n = 4), Scye (n = 1), Mercey-sur-Saône (n = 1), Fedry (n = 1), and Vy-le-Ferroux (n = 1). As demonstrated in other regions, such pieces can be discovered as stray finds, with few other artifacts, or may occur together in larger numbers on workshop sites (Bolus 2004). Looking at the raw materials, we can see that the knappers were selecting very specific raw materials to fulfil their requirements (Lamotte et al. 2017). In fact, these tools were made using three main types of regionally available raw materials, even though 17 types of raw material are actually present in the landscape. Tool makers were using the best flint quality for knapping, specifically flint types that are present in the southern part of the Mont-les-Etrelles Basin. The latest surface discoveries allow us to map the leaf point phenomenon along the Saône River, and leaf point sites are also present in small numbers on the western Bajocian Plateau of Champlitte (Lamotte et al. 2006; Lamotte and Huguenin 2009). Following many years of survey in the field, it is clear that such tools are often discovered alone or in sparse concentrations along with other lithics like cores, flakes and flake tools (Lamotte et al. 2006). Until now none of these find spots has been subjected to archeological excavation, but hopefully this will be rectified in the future.

General typological and technological data relating to leaf points

The classification of bifacial tools that lack dating evidence and stratigraphy is, as always, a difficult task. We share the same problems with many central and eastern Europe researchers. Happily, researchers from both parts of Europe have authorized us to study and publish studies on knapping, morphology and techno-functional approaches of such tools (Bosinski 1972, 2004, 2006; Oliva 1988; Richter 2001, 2006, 2009; Joris 2006, 2012; Kot 2013, Ruebens 2014).

In the light of recent studies (Kot 2013; Kot and Richter 2013), three main groups of leaf knives, based on Bohmer's classification with adjustments (Bohmers 1951), have been suggested for Germany.

Group I leaf tools are characterized by slight asymmetry of the vertical axis, convex edges converging at a tip treated analogously to the base, the presence of notches and truncations, and surface formation by flat extensive removals on both tool faces (= flat/flat). Group II artifacts, according to the authors, do not differ greatly from those of Group I except that they feature significant edge asymmetry. The treatment of the surface is different (i.e., Flat/Convex), and they have retouched edges. Group III includes tools that have been broken, retouched or rejuvenated after breaking.

From our study and subsequent results, no correlation can be made with the Kot and Richter typology. In Haute-Saône, we have a mixture of

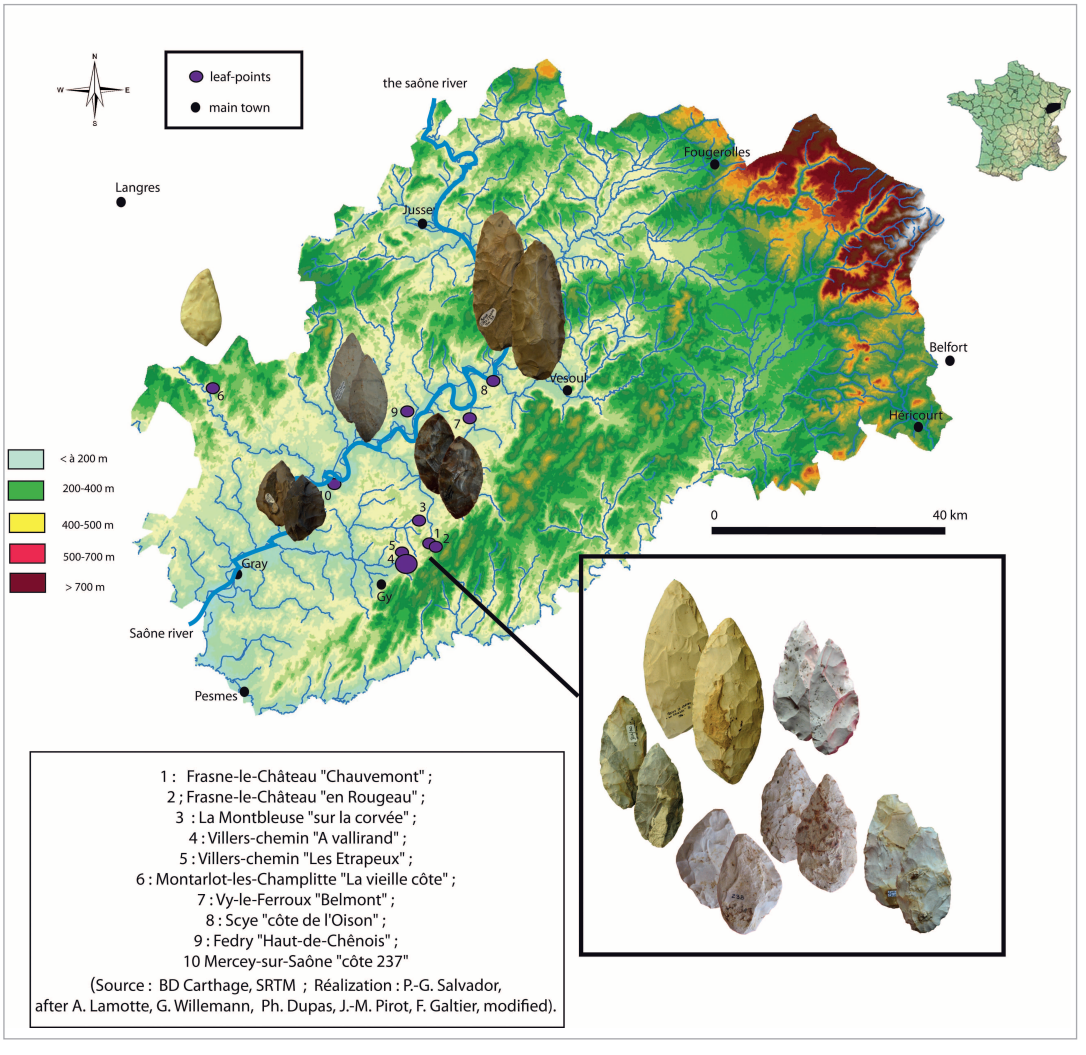


Fig. 14.
Locations of main leaf point find sites dating to the Middle Paleolithic and the Middle to Upper Paleolithic transition in Haute-Saône (Map source: BD Carthage, SRTM; illustration: P.-G. Salvador, after A. Lamotte, J.-M. Chanson, G. Willemann, F. Galtier, 2017, modified).

Group I and II. The typological study clearly shows the existence of (Freund 1952, 1954) plano-convex or flat/convex *Blattspitzen* (Frasne-le-Château "en Rougeau" and La Montbleuse). The rest are bi-convex leaf tools; in most cases there is non-continuous shaping between the body of the tool and the tip and base, whereas shaping is continuous for *Blattspitzen*. Finally, in a third group we encounter rough outs of the two preceding groups.

The technological study shows that most of the leaf points or bifacial leaf tools are plano-convex. The flat face is very often the first face shaped with extensive and reflective removals. Total decortication is carried out. The second face is much more convex, sometimes retaining cortical residue, and in most cases both edges are feature continuous with regular retouch. Up until now, no broken pieces have been discovered. There has

been no evidence of real notches, truncation or artifacts with flat extensive removals on both tool faces, apart from two of the four pieces from Montarlot-les-Champlitte, which are 45 mm in length. The detailed analysis of each leaf tool is currently being undertaken as part of a PhD thesis (Desmadryl 2022).

CONCLUDING REMARKS

In northern Burgundy/Franche-Comté, most of the surface finds indicate Neanderthals not only frequented the region often during the Middle Paleolithic but also during the transition to the Upper Paleolithic. Two sites, which have produced absolute dates, show homogeneous settlement around -50 ka (MIS 3). The composition of the lithic assemblages from these dated sites shows clear affinities with the KMG but also with the so-called "Eastern Mousterian." Other assemblages share features in common with the "traditional" Mousterian of F. Bordes, except for the Denticulate Mousterian and the Mousterian of Acheulean Tradition type B. A Burgundy-Charentian type industry has been described in the region, but our 15 years of research have not allowed us to observe these facies nor to add to their description. Leaf points belonging to the Middle Paleolithic and to the Middle Paleolithic /Upper Paleolithic transition have been described in our most recent research based on more than ten years of study. Initial results of our analyses show that most of the leaf bifaces can be related to *Blattzpitzen* and to Szeleta leaf points. The presence of leaf points or leaf bifaces in Burgundy/Franche-Comté indicates a direct link (an east-west link) between that region and central Europe and the Danube Region (Gabori 1988; Gabori-Csank 1990; Allworth-Jones 1990; Kozlowski 1990, 1995; Mester 1995; Ringer 2000; Hopkinson 2004). Perhaps the Rhine constituted a barrier at that time, and fauna and/or human populations were obliged to cross further to the south in the Upper Danube Region. The Northern Franche-Comté region to the east also has some connections with Southern Belgium through the Meuse and Moselle valleys (Ulrix-Closset 1975, 1990, 1995) In conclusion, we can say that coherent tool concepts are also present in the evidence of Altmühlian leaf points and to transitional cultures toward the Upper Paleolithic, with clear affinities of lithics from central or eastern Europe. Examinations of the assemblages and the dating of these new sites should allow us to acquire a deeper knowledge in the paleogeography of the study region, in typology, technology, and animal and human behavior as well. Finally, our limited data, dating evidence and stratigraphical records underline the absence of typical loess deposits which would allow us to define the position of the industries within the last glacial/interglacial cycle. Glaciation and erosion have largely destroyed most of the local stratigraphies, but more and more, we are coming to the conclusion that open-air sites are located within a palimpsest of interglacial and warmer interstadial soils. It is essential that we gain a detailed understanding of these within the regional context in order to be able to carry out comparisons with other regions.

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