# Bifacial Elements in Continental Northwestern Europe during the Last Glacial Cycle (MIS5d-3): The Relationship between Mousterian, Micoquian and 'Mixed' Assemblages.

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Based on the different bifacial elements that occur in the last glacial cycle it is established that at least three technocomplexes can be distinguished in continental northwestern Europe: Mousterian of Acheulean Tradition (small, symmetric, cordiform and triangular handaxes), Micoquian or *Keilmessergruppe* (asymmetric bifacial elements, often with backing and non-covering retouched*)* and a leaf point industry. Moreover, the analyses show that some lithic assemblages in continental northwestern Europe do not fit into this current framework of Middle Palaeolithic industries. More specifically assemblages that contain a contemporary presence of Micoquian and Mousterian bifacial elements occur regularly, leaving a typological dilemma to assign them to one of these two technocomplexes. This leads to the question: do Micoquian and Mousterian industries represent behaviourally discrete entities and how do 'mixed' assemblages fit into this? After exploring the techno-typological characteristics of these 'mixed' assemblages, possible reasons for the variability in bifacial elements and the causes for the occurrence of mixed assemblages, including the relationship between the Micoquian and Mousterian, are presented. Interpreting this phenomenon is preliminary since the evidence is coarse-grained due to many old excavations and a lack of chronostratigraphic information. Most likely the mixed occurrences can be explained in relation to population migrations caused by climate change.

**Keywords:** Handaxes, Micoquian, MIS3, Mousterian

**Introduction**

While handaxes are the dominant feature of many Lower Palaeolithic assemblages during the main part of the Middle Palaeolithic, especially in western Europe, they occur no more than sporadically. It is only during the last glacial cycle, and more specifically in the period between Marine Isotope Stages (MIS) 5d and 3 (c.120-30 ka BP), that they again constitute an important part of many European sites. In western Europe these handaxe-rich assemblages have traditionally been classified as Mousterian of Acheulean Tradition (MTA) (Bordes 1961) and in central and eastern Europe as Micoquian (Bosinski 1967). These two Middle Palaeolithic technocomplexes do not only have separate geographical expansions (Soressi 2002: 257), they also differ in their characteristic bifacial tool types. This paper takes a closer look at this Mousterian-Micoquian dichotomy by mapping and interpreting the presence of bifacial elements during the last glacial cycle in continental northwestern Europe (Belgium, the Netherlands, northern and western France).

Firstly, this paper establishes which bifacial elements are distinctive for which taxonomic entities in western and central Europe. This leads to the conclusion that the MTA and Micoquian are both characterised by different bifacial tool types. Next, the pres-

ence of Micoquian elements on sites in continental northwestern Europe is analysed. Hereby it is recognised that Micoquian elements occur regularly in so-called 'mixed' assemblages which contain a contemporary mix of both Mousterian and Micoquian bifacial tool types. The subsequent discussion focuses on which factors can be responsible for the variability in stone tools in the Middle Palaeolithic and more specifically how this can be applied to the bifacial elements of the last glacial cycle. Finally, this paper suggests an interpretation of how the so-called 'mixed' occurrences fit into the debate about the relationship between the Mousterian and Micoquian technocomplexes. More specifically it questions the two current opposing views in which on the one hand the Mousterian and Micoquian are seen as two different technological traditions (Soressi 2002) and on the other hand the Micoquian is merely regarded as a further reduced version of the Mousterian (Richter 1997).

**The Relationship between Bifacial Tools and different Taxonomic Entities**

A large variety of Middle Palaeolithic bifacial tool types has been documented in the past (for a recent overview see Ruebens 2007). In the literature their classification has been obscured by the use of different typologies (e.g. Bordes (1961) vs. Bosinski (1967)), different languages and different synonyms (e.g. *Prondniks/Pradniks/Keilmesser*). Therefore an extensive study of Dutch, Belgian, French, German and English literature was necessary to unravel this cloud of different terminologies. The research for the present study suggests that at least 19 different categories of bifacial tools can be distinguished (Ruebens 2007: 59). Moreover it is possible to recognise certain patterns in the distribution of these bifacial elements. At least three taxonomic entities are present in western and central Europe during the last glacial cycle; each of them characterised by distinct types of bifacial elements.

***Mousterian***

Firstly there is the Mousterian technocomplex. Most classic Mousterian assemblages, both in western and central Europe, are characterised by a lack of bifacial tools. In some assemblages bifacial scrapers or handaxes may be present, but never in large numbers (Bordes 1961). Only from MIS5 onwards, in the Mousterian of Acheulean Tradition, are handaxes and other bifacial tools more common (Soressi 2002: 9). The MTA handaxes are thin, symmetric and (sub)cordiform or (sub)triangular in shape (Fig. 1). Several regional MTA variants can be recognised represented by cordiform handaxes in southwestern France, triangular handaxes in northern France (Soressi 2002: 7) and *bout-coupé* handaxes in England (White and Jacobi 2002: 110). Furthermore a Mousterian with small handaxes can be recognised in western Europe (Cliquet and Lautridou 1988). In general, all the typical Mousterian bifacial elements are thin, covering retouched handaxes that are (sub)cordiform or (sub)triangular in shape and are on average smaller than the Lower Palaeolithic examples.

***Micoquian***

The Micoquian was defined in 1916 by Otto Hauser and divided into four variants by Bosinski (1967). Over the years the Micoquian has become a controversial group of assemblages, which have been divided into an old and more recent phase (Richter 2002). Although this technocomplex was originally named after the French site of

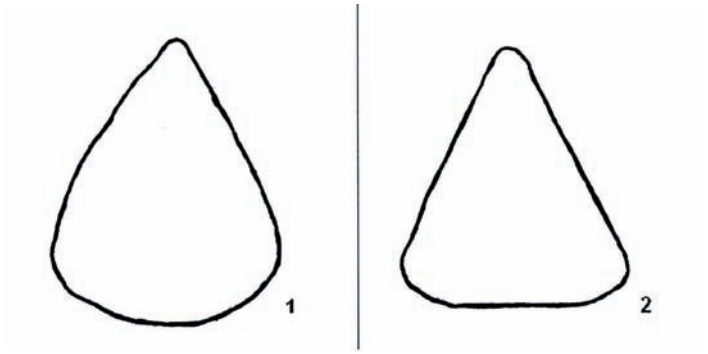



**Figure 1.** (1) Generic cordiform handaxe shape; (2) Generic triangular handaxe shape.

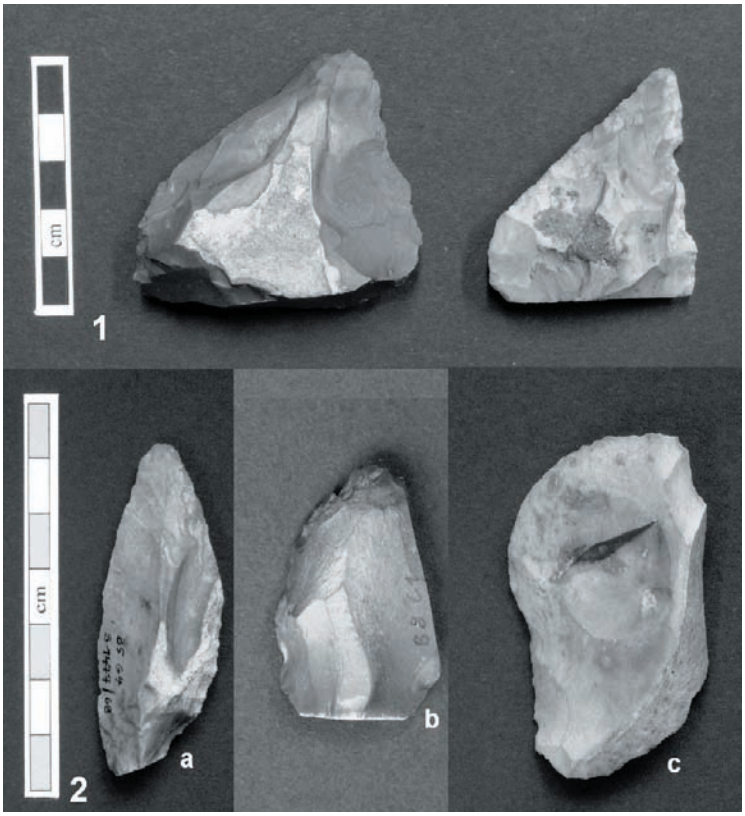



**Figure 2.** (1) *Faustkeilblätter* (2) *Keilmesser* (2.a: Ciemna type, 2.b: Klausennische type, 2.c: Bockstein type) all from the site of Sesselfelsgrotte.

La Micoque, the term Micoquian is now mainly used for specific late Middle Palaeolithic assemblages in central Europe. This more recent phase of the Micoquian, which is also the subject of the present study, is defined by the presence of the Levallois reduction technique and can be placed in MIS3 (Richter 2002: 7). In contrast to the Mousterian, which almost totally lacks bifacial elements, a high occurrence of bifacial tools is the defining character of the Micoquian. In general the Micoquian type fossils (Fig. 2) are *Keilmesser* (backed bifacial tools) together with *Faustkeilblätter* (artefacts with a finely retouched point, blunt base and one face which is flat and covering retouched), *Halbkeile* (elongated unifaces with a D-shaped cross-section) and *Fäustel* (small bifaces (<6cm) ) (Bosinski 1967). These bifacial elements are most often asymmetric. Besides handaxes, bifacial scrapers and leaf-shaped scrapers are also very common whilst leaf points only appear sporadically (Bosinski 1967). At many sites *Keilmesser* are far more numerous than *Micoquekeile* and *Faustkeilblätter* and therefore more recently the term *Keilmessergruppe* is preferred. Another advantage of this term is that it eliminates the necessity to correlate the central European material with the now problematic site of La Micoque (Conard and Fischer 2000: 11).

***Leaf Point Industries***

Besides the Micoquian and Mousterian, Bosinski (1967) also distinguished the *Althmühlgroup*, whose type fossil is the leaf point (Fig. 3): a thin, elongated, symmetric bifacial tool. Leaf points are one of the distinctive hallmarks of some late Mousterian industries. Hopkinson (2004: 229) made a twofold classification of Middle Palaeolithic leaf point assemblages: collections where leaf points are rare or absent and constitute part of a continuum of biface forms and secondly smaller assemblages with leaf points that represent a discrete form. Since true leaf point assemblages only appear at the very end of the Middle Palaeolithic and are rare in continental northwestern Europe, they fall out of the scope of this paper.

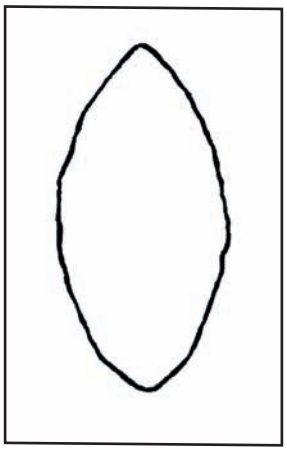


**Figure 3.** Generic leaf point shape.

***'Mixed' Entity***

Finally, a fourth technocomplex, containing a mix of typical Mousterian and Micoquian bifacial elements, can be recognised (Kind 1992). The validity of this mixed entity and its characteristics will be further analysed in this paper.

## Typological Dilemma: Micoquian Elements in Continental Northwestern Europe

***Introduction***

On top of the well-known Micoquian sites in central Europe, several researchers have mentioned the presence of assemblages with Micoquian influences in continental northwestern Europe during the last glacial cycle. These assemblages contain some typical Micoquian elements, such as *Keilmesser*, *Faustkeilblätter*, *Halbkeile* and *Fäustel.* A lot of confusion still surrounds these industries because a detailed analysis or clear summary is lacking and different regional names are in use:

• **Northern France:** "Charentian with Micoquian influences" (Farizy 1995).
• **Belgium:** "Mousterian with bifacial retouch" (Ulrix-Closset 1975) and more recently: "Charentian with Micoquian influences" (van Peer 2001).
• **Western France:** first seen as a variant of the "Mousterian of Acheulean Tradition" but more recently classified under the term "Micoquian" because of the presence of *prondniks* (*Keilmesser* with a rectangular cutting edge) (Molines et al. 2001).

This paper will take a new look at the presence of Micoquian elements outside central Europe, not just by mapping them but also by addressing the reasons for their occurrence.

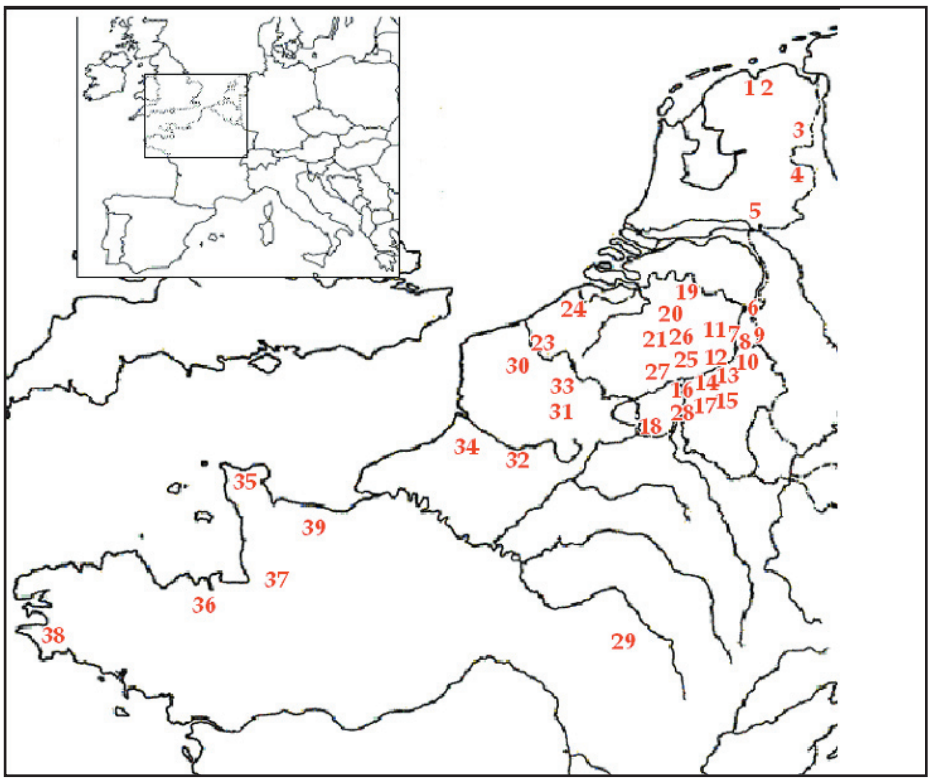
***Continental Northwestern Europe***
Based on a study of excavation reports from last glacial sites in continental northwestern Europe, it can be concluded that bifacial elements, including typical Micoquian tool types, occur regularly in the Netherlands (e.g. Sint-Geertruid (Wouters 1980)), Belgium (Ruebens 2006b; van Peer 2001), northern and western France (Cliquet 2001; Farizy 1995; Molines et al. 2001) (Fig. 4).

In general a distinction can be made in Europe between assemblages where only Mousterian handaxes occur, assemblages that contain only Micoquian elements and sites where both types of bifacial elements are present (Ruebens 2006b: 96). The most diagnostic Micoquian tool types, *Keilmesser* and *Faustkeilblätter*, appear only in very small numbers on western European sites. Therefore it can be stated that a real Micoquian, in which *Keilmesser* and *Faustkeilblätter* represent around 10% of the tool kit, is not present in continental northwestern Europe during MIS5d-3.

A Mousterian of Acheulean Tradition (MTA) on the other hand, occurs over the whole of northwestern Europe. Typical MTA handaxes have been found both in caves and open-air sites, as single finds and in larger stratified collections (e.g. the site of Sint-Geertruid). These assemblages are characterised by thin cordiform or triangular handaxes together with a high presence of scrapers and the use of the Levallois technique.

Additionally, the research done for this present study indicates that sites which contain both Micoquian and Mousterian elements are more common than previously thought. The Micoquian elements are *Keilmesser*, leaf-shaped artefacts, bifacial scrapers and bifaces with unworked bases. Characteristic is also the asymmetry and plano-convex section of many of these pieces. Especially in Belgium and western and northern France, these 'mixed' assemblages occur regularly, something that has not been demonstrated to this extent before in the published literature.

***'Mixed' assemblages as a separate entity?***
Methodology
Kind (1992) was one of the first to acknowledge the existence of assemblages with both Micoquian and Mousterian elements. By conducting a cluster analysis, which groups industries together according to statistical criteria, he proved the existence of mixed assemblages in Bavaria. The dendrogram of the cluster analysis indicated




| | | | |
|---|---|---|---|
| 1: Zeijen | 2: Anloo | 3: Exloo | 4: Mander |
| 5: Angerlo | 6: Colmont | 7: Maastricht-Belvédère | 8: Mescherheide |
| 9: Sint-Geertruid | 10: Snauwenberg | 11: Veldwezelt | 12: Kesselt |
| 13: Sainte-Walburge | 14: Sclayn | 15: Spy | 16:Grotte du Docteur |
| 17: Goyet | 18: Couvin | 19: Oosthoven | 20: Rotselaar |
| 21: Ottenburg | 22: Vollezele | 23: Kemmelberg | 24: Aalter |
| 25: Ramioulle | 26: Remicourt | 27: Franquenies | 28: Trou Magrite |
| 29: Champlost | 30: Mont de Beuvry | 31: Marcoing | 32: St. Just en Chausee |
| 33: Hamel | 34: St. Julien de la Liègue | 35: Querqueville | 36: Bois-du-Rocher |
| 37:Saint-Brice-sous-Rânes | 38: Kervouster | 39: Bons-Tassily | |

**Figure 4.** Sites in Northwestern Europe that contain bifaces.

that besides Mousterian, Micoquian and leaf point assemblages, a fourth unit, containing both Micoquian and Mousterian elements, is present. This group shows similarities in its composition of scraper forms with the Mousterian but contains a few clear Micoquian forms.

Following on from this work, cluster analyses have been conducted for this paper, comparing a selection of northwestern European MTA, Micoquian and 'mixed' sites. The advantage of a cluster analysis is that tool types, which in a typological-chronological order are regarded as very important, have the same value as tool types that can be interpreted as unimportant, making this method more objective.

The analyses are based on data collected from published site reports. Several problems occurred while selecting sites: uneven quality of publications largely in consequence of many of them having been excavated in the late 19$^{th}$ or early 20$^{th}$ centuries, site reports with not enough detail, assemblages from old excavations which are possible palimpsests and very small, unrepresentative assemblages.

Eventually 22 sites (Fig. 5) remained to be compared, including German Micoquian sites, sites classified as MTA, Mousterian with small bifaces, Mousterian with bifacial retouch and so-called mixed assemblages.

Next, a database was created of these assemblages comprising the frequencies of every tool type (the proportion of each tool type to the total number of tools). Since the analysed assemblages are of varying sizes and were collected according to different techniques, the percentages of the tool types are preferred over the exact numbers.

The conducted cluster analysis is hierarchical and based on the Euclidian distance between the assemblages. This type of cluster analysis was favoured over a binary cluster analysis, grouping assemblages together based on the presence or absence of tool categories, because not only the absence or presence of tool types is important but also the proportions in which the tool types occur. Moreover, this results in more details about the assemblages being included and therefore hopefully a better reflection of the reality is given (more information about using cluster analyses in archaeology can be found in Shennan 1997).

Results

The resulting dendrogram indicates that the assemblages group together in three clusters, which can be interpreted as: Micoquian, Mixed and MTA assemblages (Fig. 5). The MTA can further be divided into two groups: a classic MTA and a MTA with small bifaces. These latter MTA assemblages also contain unifaces and a few *Keilmesser* and therefore they appear close to the mixed assemblages. Furthermore, the cluster analysis shows that the mixed assemblages have more similarities with the Micoquian than with the MTA, indicating a clear Micoquian influence in these assemblages.

Caution is needed when interpreting cluster analyses since slight alterations occur when different grouping principles (e.g. Ward method) are used. This shows that some as-

semblages are on the borderline between two industries and therefore it is necessary to define these industries better. Regardless of which cluster principle is used, the same three basic groups, MTA, Micoquian and mixed reappear; that is where the value of the cluster analysis technique lies.

The created database further shows that typologically the assemblages, which cluster together as the mixed technocomplex, are characterised by:

| Site | Date | Classification | Cluster Analysis |
|---|---|---|---|
| **Sesselfelsgrotte G-A06** | MIS 3 | M.M.O. | Micoquian |
| **Sesselfelsgrotte G-A07** | MIS 3 | M.M.O. | Micoquian |
| **Sesselfelsgrotte G-A08** | MIS 3 | M.M.O. | Micoquian |
| **Balve III** | MIS 5 | Micoquian | Micoquian |
| **Ramioulle** | undated | Mousterian w. bifacial retouch | Micoquian |
| **Sesselfelsgrotte G-A10** | MIS 3 | M.M.O. | Micoquian |
| **Balve II** | MIS 5 | Micoquian | Micoquian |
| | | | |
| **Hamel** | MIS 5 | Mousterian with small bifaces | Mixed |
| **Vollezele-Congoberg** | MIS 5 | mixed assemblage | Mixed |
| **Franquenies** | MIS 5 or 4 | MTA | Mixed |
| **Kesselt** | MIS 5 | mixed assemblage | Mixed |
| **Aalter Hageland I** | estimate: MIS 3 | mixed assemblage | Mixed |
| **Aalter Nieuwendam II** | estimate: MIS 3 | mixed assemblage | Mixed |
| **Champlost** | MIS 5 | Charentian w. Micoquian influences | Mixed |
| **Grotte du Docteur** | undated | Mousterien w. bifacial retouch | Mixed |
| | | | |
| **Oosthoven** | estimate: MIS 5-3 | mixed/small bifaces | MTA with small bifaces |
| **St-J.dl Liegue(Bois L'abbé)** | MIS 5-3 | mixed/small bifaces | MTA with small bifaces |
| **St-J.dl Liegue(Gros Grès)** | MIS 5-3 | mixed/small bifaces | MTA with small bifaces |
| **Rotselaar** | undated | MTA | MTA |
| **St-Just en Chaussée** | MIS 5 | MTA | MTA |
| **Sainte-Walburge** | undated | MTA | MTA |
| **Saint-Brice-sous-Rânes** | MIS 5 | MTA | MTA |

**Figure 5.** Classification of relevant Northwestern European sites according to the cluster analysis.

▪ A regular occurrence of bifaces and bifacial scrapers.
▪ A sporadic presence of *Keilmesser* and/or leaf points.
▪ Typical Mousterian tools, such as points, scrapers, notches, denticulates and backed knives, which are present in all assemblages.

Technological data on the other hand are sparse in the excavation reports and therefore it can only be stated for the moment that in the mixed entity:

▪ Discoidal and irregular cores are common.
▪ The Levallois method is used very frequently.
▪ Blade technology occurs regularly.

Finally it is important to stress that typology and technology can and do vary independently of each other and there is a very large variability present during the last glacial cycle. Further research is required and more additional sites with well-preserved artefact concentrations and good chronostratigraphic evidence are needed before this mixed entity can be defined better.

**Interpretation and Discussion**
The recognition of the occurrence of typical Micoquian elements in continental northwestern Europe provokes two important questions:

▪ Which factors are responsible for the large variability in stone tools in the Middle Palaeolithic and more specifically how do they apply to the recognised regional variability in bifacial elements during the last glacial cycle?

▪ What is the relationship between Mousterian, Micoquian and mixed assemblages and how can these mixed occurrences be interpreted?

***Regional variation***
Explaining the variability in the Middle Palaeolithic is an issue scholars have been struggling with for decades (see Binford 1973; Bordes and de Sonneville-Bordes 1970; Mellars 1996). The basis of the debate is the recognition that the lithic assemblages of the Mousterian technocomplex comprise variable technological processes and typological compositions. An ever-increasing number of distinguishable spatio-temporal Mousterian variants are now commonly recognised (Howell 1999: 219-220) and new types of assemblages are still being discovered (Conard and Fischer 2000: 9).

This Mousterian debate resulted in several models being proposed to account for the variability attested in the Middle Palaeolithic (Binford 1973; Bordes 1970; Dibble and Rolland 1992; Kuhn 1995; Mellars 1996; Rolland 1981). In the author's opinion simplistic interpretations, in which only one factor accounts for all the variability, should now be rejected. The character of lithic assemblages is the result of a dynamic interplay of different factors (functional aspects; raw material; the extent to which tools are reduced; intensity of site occupation; climate and environmental factors; technological

and cultural preferences). Unfortunately it is problematic to reconstruct the determining factors with the current restricted archaeological data.

It is remarkable that in the whole Mousterian debate the presence or lack of bifacial elements is not an important issue. This is probably due to the focus of the debate being on southwestern France where bifaces only reoccur around MIS3. This is a first indication that the Late Pleistocene Middle Palaeolithic might differ from the older phases. As pointed out earlier, during the last glacial cycle different bifacial elements seem to dominate assemblages according to distinct spatio-temporal patterns (Fig. 6). In western Europe this is expressed by the different variants of the MTA and in central Europe Jöris (2003) has attempted to recognise patterning based on different bifacial elements in the *Keilmessergruppe*.


**Figure 6.** Simplified overview of the patterning of bifaces: *Bout-coupé* handaxes in **Britain**; *Prondniks* in **western France**; small and triangular bifaces in **northern France**; cordiform handaxes in **southwestern France**; *Keilmesser* and cordiform handaxes in **Benelux**; *Faustkeilblätter* and *Keilmesser* in **Germany**. (The presence of these types in these areas does not exclude their presence in other regions but reflects their dominance in these regions. The images reflect the classic outline shapes of the biface types and are not to scale).

In the author's view this patterning can for the moment only be explained by referring to a certain degree of cultural preference. Firstly, no appeal to raw material constraints can explain why the specific handaxe shapes of the MTA industries are so strikingly and consistently different from those encountered in the earlier Acheulean industries (Mellars 1996). Furthermore, Burdukiewicz and Ronen (2003: 237) pointed out that in practically every Palaeolithic region with human activity large chunks of flints were present. As a result of the mobile Neanderthal lifestyle, they probably even had different sources to choose from, so the decision to use a certain quality of raw material was deliberate. Also raw material constraints are not always a sufficient explanation for the small dimensions of some artefacts (e.g. Oosthoven (Ruebens 2006a: 189)). Therefore it can be concluded that raw material can explain some variability but not the distinct patterning in late Middle Palaeolithic bifacial elements.

The chronology for these assemblages is very coarse-grained and therefore no chrono-cultural patterns can be recognised for the moment, unlike those recognised by Mellars for some of the Mousterian variants (Mellars 1996). Many assemblages (especially in the Low Countries) have not been dated radiometrically and are only placed in MIS5-3 based on their stratigraphic position. Therefore it remains possible that chronological change accounts for a part of the variability but it gives no explanation for the specific geographical patterning. The same can be said about climatic factors. Only a few sites contain data that allow climatic or environmental reconstruction, and therefore Rolland's climate model (Rolland 1981), which links up climate and lithic parsimony, cannot be tested.

Furthermore, functional aspects, as suggested originally by Binford (1973), can in the author's view be excluded from accounting for this variability. As use-wear analyses have shown (Soressi 2005), both the Micoquian and Mousterian bifaces were used for a variety of tasks and therefore the different biface shapes cannot be task-specific. Functional elements cannot clarify the presence of bifaces on some sites and their absence on others. Site use, length of occupation and intensity and extent of tool reduction are also factors that might, and have, influenced the form of some tools (e.g. scraper reduction shown by Dibble and Rolland (1992) ) but cannot account for all the variability present at the sites (many handaxes do not show a large degree of secondary retouch (e.g. Oosthoven) so their form is not always the result of further reduction).

Kuhn (1995) states in his technological model that the different tool forms are the result of the choice to use a certain technology to form blanks. In the case of the last glacial bifacial elements this is only stating the problem differently. What factors then make a population decide to use a certain reduction technique? Finally, the different biface types cannot be explained as local adaptations. This is, for example, indicated by the presence of *bout-coupé* handaxes in England after a long period without human occupation (MIS6-4) (Ashton and Lewis 2002). First these handaxe types are present in northern France during MIS5 (Jöris 2003) and subsequently in England during MIS3, after which they seem to disappear in France, although this has to be interpreted with caution because of the low resolution of the data.

This makes me conclude that the variability in bifacial elements during the last glacial cycle is related to stylistic preferences and social aspects. I do not want to imply that the other factors did not play any role at all: on the contrary, the characteristics of an assemblage are still influenced by local circumstances but in the biface shapes a glimpse of cultural preference can also be recognised. More recently there appears a growing trend to interpret flint tools as a cultural choice. Studying the relations between raw materials and blank production Guislain (1998: 225) concluded that raw material does not determine flaking or retouch method. It has also been suggested that the retouch of a few edges of a blank and bifacial retouch, are culture-dependent (Marks et al. 1998: 281). White and Jacobi (2002: 126) similarly see the *bout-coupé* bifaces as an expression of deliberate sub-regional practices.

So to sum up, it is clear that the observed variability in the Middle Palaeolithic is still far from completely clarified. Many aspects of an assemblage can be interpreted as a response to the local circumstances but the spatio-temporal patterning in the last glacial cycle, and more specifically the different biface shapes, cannot be explained this way. In the author's opinion, the emergence of regional differentiation at the end of the Middle Palaeolithic reflects different cultural signatures. For the first time now, regionally and chronologically distinct tool types arise, which are not attested in the older part of the Middle Palaeolithic. Quina scrapers, for example, can be found in southwestern France just as well as in Hungary and their basic shape and retouch method can account for their final shape. *Bout-coupé* handaxes on the other hand only appear in northwestern Europe and their form is so specific and exhibits more effort than functionally necessary, and therefore has to be an intentional choice. This further indicates that the occurrence of Micoquian elements in Middle Palaeolithic assemblages in continental northwestern Europe is not the result of random variation: the making of these elements was deliberate.

***How Do Mixed Assemblages Fit into the Mousterian-Micoquian Relationship?***

Different scholars have explained the relationship between the Mousterian and Micoquian in different ways. Soressi (2002: 253) has analysed the different handaxe production techniques present in the Mousterian and Micoquian and concluded that they are two different technological traditions. Richter (1997) on the other hand, considers these two industries as interlinked phenomena with the Micoquian being a further reduced Mousterian. According to Richter the principal factor in assemblage variability at the site of Sesselfels is the different land use patterns. Occupation time and site function are considered as influencing the tool numbers (Richter 2000). In the author's opinion Richter's model might work in southern Germany but cannot be generalised and/or expanded to western Europe. In western Europe no clear Micoquian is present but this cannot mean that sites in this area were less intensely used because that would assume a distinct behavioural difference between Neanderthals in the east and west and there is currently no evidence to support this.

Therefore the author's hypothesis is that the Mousterian and Micoquian are two closely interlinked but different taxonomic entities. Despite the similar basic knapping and re-

touching techniques, some clear differences (especially in the character of the bifacial elements and their regional patterning) occur.

It is difficult to say how mixed assemblages fit into this viewpoint since the evidence is coarse-grained due to many old excavations and a lack of chronostratigraphical information. Several models to explain the emergence of a more complex cultural geography in the last glacial cycle hold clues to clarify the presence of these elements (e.g. Richter 2000 and Jöris 2003). A reoccurring factor in these models is the influence of population movements on material culture.

The idea of population retreat during MIS4 and expansion during MIS3 is well established since barely any sites in northwestern Europe have been securely dated to MIS4 (for Belgium this is indicated by Van Peer (2001), for France by Tuffreau (1990) and for Great Britain by Ashton and Lewis (2002) ). In general during MIS4 the number of sites in Europe is low and these sites are all south of 45°N latitude. This is followed by an increase in sites and spread to the north in MIS3 (van Andel et al. 2003). Additionally, analyses of fossil Neanderthal DNA have shown a high genetic homogeneity indicating rapid population growth that may have followed a demographic bottleneck during the first cold maximum (Jöris 2002). This Neanderthal population bottleneck is another indication that migration played an important role at this time.

The effect of migrating populations on material culture could have happened in several ways. When groups who used Micoquian tools migrated southwest during colder phases (e.g. MIS5d, MIS5b, MIS4) they would regularly pass through Belgium, the Netherlands, northern and western France. That way they could have left assemblages with Micoquian elements in this area or have influenced the local groups. These kinds of sporadic migration movements have also been mentioned by Otte (2001: 176) as an explanation for Micoquian elements in Belgium.

Furthermore, migrations as response to climate deteriorations led to the coming of people in certain *refugia* areas, leading to social contact (flow of ideas between Micoquian and Mousterian traditions) and stress (resulting in the need to express their group identity, that is regionalism), when the groups migrated back northwards during warm periods.

The contact between different Neanderthal groups could have happened in two ways. Firstly Neanderthal groups might have adopted new characteristics indirectly, through contact only with groups that had themselves adopted those characteristics from groups that had originated them. In other words, there could be many spatially-intervening groups between the originator group and the most distant acculturated group.

A second possibility is that the contact was direct and the assemblages were created by personal contact and exchange of techniques/elements by two groups of separate, original traditions. Thus, a distinction can be made between inter-group contact between groups that have both originated their characteristic elements (e.g. biface forms), and

those contacts that occurred indirectly, between groups where one (or even both) did not originate a particular tool form.

Moreover, regardless of the exact exchange mechanism, the continental northwestern region can be regarded as an overlap zone where Mousterian and Micoquian groups regularly met (as result of their mobile lifestyles). This is definitely possible since the area is situated between the core areas of the MTA (southwestern France) and Micoquian (Germany). This overlap zone can furthermore be seen as an area that manifested cultural features as territories of Neanderthal groups change due to climatic alterations or population movement. The character of a cultural interface between East and West is also manifested by the appearance of French Mousterian type fossils in the Micoquian (e.g. Sesselfelsgrotte, Uthmeier 2000: 137).

So it can be stated that the presence of Micoquian elements in Belgium, the Netherlands, northern and western France is a direct or indirect result of the dispersal of people from the east as a response to climatic and environmental changes. For the moment these models cannot be tested in a more comprehensive way because detailed chronostratigraphic and environmental information from the northwestern European sites is sparse.

**Conclusion**

This paper shows that the classic dichotomy Mousterian-Micoquian is a simplification of a much more complex reality. It establishes the distribution and extent of the mixed assemblages as a clear phenomenon – something which has not really been highlighted before.

Based on an analysis of the distribution of the different bifacial tool types, it is concluded that besides Mousterian, Micoquian and leaf point industries a fourth entity is also present. This fourth entity comprises assemblages with Micoquian elements outside the German core area and its existence in continental northwestern Europe during the last glacial cycle is confirmed by cluster analyses.

The regional patterning present in the bifacial elements indicates that during the last glacial cycle a more complex regional behavioural geography emerged and that the decision to make a certain bifacial tool type was intentional. This conforms to the idea that the Mousterian and Micoquian are two different traditions making different handaxe types.

Furthermore, the existence of ‘mixed’ assemblages can be fitted into this model by making a link with population expansion and retreat during the last glacial cycle as a response to changes in climatic and environmental conditions. Although population densities were low, the migration movements of these late Neanderthals, and the coming together of people in possible refuge areas, must have led to a certain flow of ideas or people between east (Micoquian) and west (MTA), continental northwestern Europe becoming a transit zone where foreign influences are easily adopted.

As a final conclusion a word of caution is required. It must be admitted that the data on which the general interpretation is based are far from perfect, particularly with respect to the dating of many sites. Good chronostratigraphic data are lacking for the large majority of the continental northwestern European sites. Therefore a key future priority is improved radiometric dating coverage. In addition it has to be realised that the current Middle Palaeolithic record is only a small reflection of what was probably a much more complicated and regionally varied pattern of cultural and technological change. Further research, and especially better-excavated sites are needed to come to a full understanding of the Micoquian elements in continental northwestern Europe during the last glacial cycle. Therefore this paper is just a first step in a wider research project whereby more factors (e.g. climatic data) and first hand data will be taken into account.

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