Behavior and Technological Identity During the Middle Paleolithic: An Issue of the Scale of Analysis?
Examples from the Paris Basin (France) during the early Weichselian

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Abstract: *This article discusses the results obtained during doctoral research by the author defended at the end of 2009. This work focused on the Middle Paleolithic in France and on the possibility of identifying specific cultural dynamics. Its objective was to explain the impact of the choice of analytical tools used to study the Middle Paleolithic – and in particular the scales of analyses applied – on the grouping of industries and thus on the interpretations concerning human occupations that follow from this. To do so, ten lithic assemblages from the Paris Basin during the Early Weichselian were analyzed using an original model enabling comparison of the assemblages using four different scales of analysis. Several levels of interpretation could thus be demonstrated, revealing multiple results. While the assemblages are quite similar at a general scale of analysis, they are shown to be very different at a fine scale, at which five groups could be distinguished. Aided by cultural geography, we propose the hypothesis that these groups may reflect distinct technological traditions, included within similar cultural areas.*
Keywords: *France, Paris Basin, Middle Paleolithic, lithic assemblages, scale of analysis, cultural geography*

Verhalten und technologische Identität im Mittelpaläolithikum: eine Frage des Analysemaßstabs? Beispiele aus dem Pariser Becken (Frankreich) in der frühen Weichsel-Eiszeit

Zusammenfassung: Der Beitrag fasst die Ergebnisse der Dissertation der Verfasserin zusammen, die sie Ende des Jahres 2009 verteidigt hat. Im Mittelpunkt der Forschungen stehen das Mittelpaläolithikum in Frankreich und die Möglichkeiten der Sichtbarmachung einer besonderen Kulturdynamik. Ziel der methodisch ausgerichteten Arbeit ist es zu zeigen, welchen Einfluss die Wahl der Analysewerkzeuge und speziell die des zur Untersuchung paläolithischer Inventare angelegten Analysemaßstabs auf die Gruppierung von Steinindustrien und damit auch auf die darauf aufgebauten Interpretationen zu Siedlungs- und Verhaltensweisen der Menschen, im konkreten Fall der Neandertaler, haben. Zu diesem Zweck wurden zehn gut datierte und sorgfältig ausgegrabene frühweichselzeitliche Steininventare aus dem Pariser Becken aus dem Zeitraum zwischen 110.000 und 80.000 Jahren vor heute, das heißt aus dem Sauerstoffisotopenstadium 5, analysiert. In das Unterstadium 5a datieren die Schichten Wa1 und Wa2 von Mauquenchy (Seine-Maritime), die obere Fundschicht von Auteuil (Oise), die Fundstelle Angé (Loir-et-Cher) und die Schichten C, D und E von Soindres (Yvelines); in die Unterstadien 5d bzw. 5c gehören die Fundstelle Villiers-Adam (Val d'Oise), Schicht N1 von Vinneuf-Les Hauts Massous (Yonne) und schließlich die Fundstelle Verrières-le-Buisson (Essonne). In allen Fällen handelt es sich um Freilandfundplätze, die meist auf sehr großer Fläche ausgegraben wurden. Einige Plätze lassen sich als kurzzeitige Aufenthaltsorte interpretieren, andere sind das Ergebnis von Besiedlungen mit längerer Dauer. Bei den Analysen wird ein Modell zugrunde gelegt, das einen Vergleich der Inventare mit vier verschie-

denen Analysemaßstäben ermöglicht. Unter einem allgemeinen Maßstab werden nur die allgemeine Form der Steinartefakte (z.B. dreieckig, langrechteckig etc.) sowie die übergeordnete Herstellungsweise berücksichtigt. Unter einem mittleren Analysemaßstab werden weitere Merkmale der Artefakte, z.B. ihre Geometrie (symmetrisch, asymmetrisch etc.), und das jeweils angewandte Grundproduktionskonzept (Levallois, diskoid etc.) erfasst. Unter einem feinen Analysemaßstab werden noch weitere Kriterien hinzugefügt, z.B. Kantenverlauf, Größe und Form des Distalendes bei den Steinartefakten. Innerhalb der Grundproduktionskonzepte werden die verschiedenen Schritte der Herstellungskette *(chaîne opératoire)* untersucht. In einem letzten Schritt, unter einem sehr feinen Analysemaßstab, werden schließlich noch Beobachtungen zu Kantenwinkeln, Retuschen etc. hinzugefügt. Auf diese Weise können verschiedene Interpretationsstufen verdeutlicht werden, die jeweils verschiedenartige Aussagen zur Folge haben. Bei Anlegen eines allgemeinen Analysemaßstabs sind alle untersuchten Inventare ziemlich ähnlich und bilden Teil einer ‚technologischen Zivilisation des Moustérien' bzw. eines ‚sehr großen Moustérien-Technokomplexes'. Unter einem mittleren Analysemaßstab lassen sich die untersuchten Inventare zwei verschiedenen ‚technologischen Kulturen' zuordnen: dem ‚Nordwest-Technokomplex' oder aber dem ‚Französischen Micoquien'. Wird ein feiner Analysemaßstab angelegt, erweisen sich die Inventare als sehr unterschiedlich, und es können fünf Gruppen herausgearbeitet werden. Unter der Berücksichtigung von Modellen der Kulturgeographie wird die Hypothese vertreten, dass diese Gruppen eigenständige technologische Traditionen widerspiegeln, die innerhalb ähnlicher Kulturareale bestehen. Unter einem sehr feinen Maßstab schließlich ist jedes Inventar einzigartig.
Schlagwörter: Frankreich, Pariser Becken, Mittelpaläolithikum, Steininventare, Analysemaßstab, Kulturgeographie

Introduction

Difficulty in explaining the sociocultural behavior of Neandertals

This work concerns prehistoric archaeology and in particular Neandertals, one of the most enigmatic hominids in our story. They lived in Europe for more than 200,000 years to mysteriously disappear around 30,000 years ago. Although they have fascinated researchers for decades, they remain poorly understood. Long considered as brother, cousin and father to our species, the link they could have with us (*Homo sapiens sapiens*) remains unexplained. Recent research by the Max Planck Institute is proof of this. Virulent discussions concerning cognitive capacities have divided researchers into radically opposed epistemological positions; those who favor the 'fellow brother' hypothesis and those who stand by 'distant cousin' hypothesis. Polemics, especially about their capacity for social structure, have raged for decades.

These debates have meaning only because the excavated artifacts associated with Neandertals, reflecting 170,000 years of existence, are difficult to analyze. These artifacts are essentially lithic industries made of flint. They show an apparent similarity, leading researchers to group them as 'Mousterian', which refers to the Neandertal 'technological culture' which developed in France during the chronological period of the 'Middle Paleolithic' (roughly between 200,000 and 30,000 years BP). But this 'culture' is far from being shared by all. Strong distinctions can sometimes be observed between assemblages, indicating broad variability, but cannot be interpreted. Thus, in contrast to more recent periods for which sociocultural behavior has been clarified (such as during the Upper Paleolithic or the Mesolithic, both associated with modern humans), it is currently almost impossible to determine whether different groups or cultures could have existed within the Neandertal population. However, since the mid-twentieth century, research has continually attempted to identify Middle Paleolithic technological traditions, but without success. We should question why it is so difficult to interpret the industries associated with Neandertals.

Lithic assemblages: similar and different...

It was within this atmosphere that I began my doctoral research. I focused on the Paris Basin in France during the Early Weichselian, which is the chronological range roughly between 110,000 and 80,000 years BP (see Koehler 2009). My first investigations addressed the possibility – or not – of identifying culturally different 'groups' within the Neandertal population in this geographic region and time frame.

It rapidly appeared, however, during analysis of the lithic assemblages that they could appear to be identical or different depending on the scale of analysis and the number of criteria considered. Assemblages appear identical at a general scale of analysis because all the assemblages included, in varying proportions, the production of points, flakes and blades, as well as a small number of retouched tools, which most often were 'thinned' sidescrapers. In contrast, these assemblages appeared completely different if we examined the products and reduction sequences more attentively, that is, when we studied more criteria in greater detail. Two entirely opposed ideas could thus be developed: one of a broad uniformity in industries in the Paris Basin during this period, and one of a broad diversity. I therefore wanted to understand why such difference in results, depending on scales and criteria of analysis, was observable, affecting the interpretations that we make in sociocultural terms.

Questions

This led me to formulate four key types of questions:

- The first type of question is problematic: Do the results, with respect to groups of industries, vary by the scales of analysis and observation criteria retained?
- This leads to the second type of question, of historical order: Have such questions been taken into account for the Middle Paleolithic? And if so, how? In brief, are the criteria and scales of analysis the same for all research? What are they?
- The third type of question is methodological: what criteria and scales of analysis are the most pertinent for comparing between industries?
- Finally, the fourth type of question is interpretive: what explanations for the distinguished groups can be advanced? How can we interpret differences in results as a function of the criteria and scales of analysis retained?

I will start with questions of historical order.

Historical Background

For ages, comparing lithic industries has been a main focus for prehistoric research in France, and in the process researchers have developed a multitude of analytic methods.

Development of several analytic tools to attempt to explain Neandertal sociocultural behavior

From the middle of the 19th to the middle of the 20th century, researchers identified 'type fossils', which were artifacts used to situate an assemblage in a precise time and place. This is above all a diachronic approach. Similar to the classificatory approach for the evolution of living organisms, it focused uniquely on the establishment of cultural chronostratigraphies.

In the 1950s, however, a radical reversal took place in French prehistoric studies. Interest in chronology was progressively replaced by the cultural interpretation of the data. The introduction of the spatial dynamic enabled such a change in approach. This spatial dynamic brings to light behavioral variability in a given place at a given time. Thus, it excludes any 'universalist' kind of interpretation, that is, linear evolution of artifacts towards perfection. From then on, French research aimed to identify sociocultural behavior among the Neandertals, following the example of more recent periods.

François Bordes, inspired by his predecessors (Peyrony 1925), over more than fifteen years developed a new method of analysis based on all of the lithic material (Bordes and Bourgon 1951). He sought to create a classification of assemblages based on the relative frequency of certain technological traits and the different types of tools present, called 'indices'. He developed a typology based on the form of retouched tools, and distinguished more than ten facies of Neandertal assemblages in France. For Bordes, these facies were made by 'different cultural groups', evolving in the same territory. But many detractors, many of them Anglo-Saxon, contradicted this interpretation. They pointed out certain faults in the method, such as the chronological uncertainty of the assemblages and the lack use of paleoenvironmental data, in order to propose functional, chronological or ecological explanations for the differences between the Mousterian facies.

The next big analytic method, the analysis of lithic technology, was developed in the 1970s by Jacques Tixier and André Leroi-Gourhan. This method included the concept of *chaîne opératoire* (or operational sequence), which reconstructs the series of technological actions of the knappers. As a result of these new analytic techniques, French research took a deep breath and once again tried to describe human behavior. Particularly, they tried to identify 'technological traditions' through the technological production systems. Given the limits that are still present for the Middle Paleolithic, technology alone cannot lead to clear and unanimous interpretations about Neandertal sociocultural behavior. In effect, the infatuation with and the success of lithic technology analysis has sometimes led to violent rejection of the Bordes method, to such a point that the study of retouched artifacts has often been neglected. Only technological systems of production were considered to be vectors for technological tradition. However, like typological analysis, which studies tools alone, studying only production systems also puts limits on research.

Because of these limitations, new analytic methods have been developed in recent years. These include the technofunctional studies developed by Eric Boëda (1992, 1997), Michel Lepot (1993), and others, as well as the territorial analyses developed by Nicholas Conard (2001), Guillaume Porraz (2005) and Pascal Depaepe (2007). In addition, Eric Boëda (2009) has developed new methods for core classification.

Several facies for the Middle Paleolithic in France, but lacking clear and unanimous interpretation

Many analytic methods have been developed to try to explain Neandertal lithic industries and to identify unique sociocultural behaviors. Several 'facies' and 'technocomplexes' or 'groups' have been identified over the decades and are still recognized today, but they lack clear and widely accepted interpretation. While we have summarized the current state of understanding of the French Middle Paleolithic, we see from a general map (Fig. 1) that the territory is broken into 'groups' or 'facies', but the latter are not clearly interpreted as reflecting distinct technical traditions and have not been compared between them. This can be explained by the fact that these facies have not been differentiated using the same analytic tools.

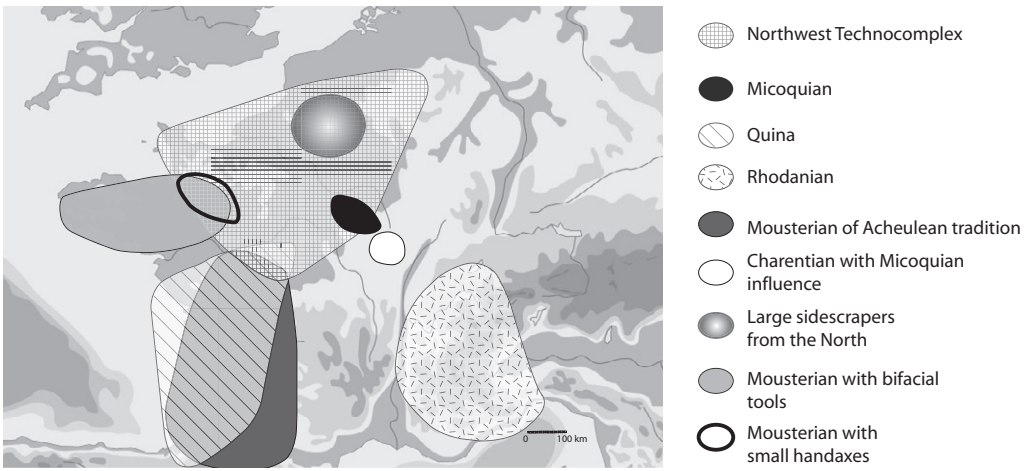


Fig. 1: *General map with the different 'facies' individualized for the early Middle Paleolithic in France.*

In a brief summary, then, if we compare the criteria used to identify the different facies, we see that:

- The data themselves are very disparate between facies, since cave and open-air sites are in opposition to each other by regions, dependent on the history of research and taphonomy. Some facies are thus grouped only by cave sites, as in the South of France, others by stratified open-air sites as in the North of France, and others only by unstratified open-air sites. Nevertheless, the sedimentary record seems to have an impact on the preservation of industries. In Southwest France, for example, open-air sites have begun to be excavated, yielding industries very different from those found in caves. In Belgium, too, industries found in caves are very different from those found at open-air sites.

- Moreover, the spatial limits of the facies are artificial since they correspond to modern administrative boundaries, dependent on the research poles interested in these questions. It follows that some geographic zones are poorly documented, even though many sites have been found in them, such as the Paris Basin. It also follows that if we specifically study these poorly documented zones, the limits of the facies fluctuate, as for example the Northwest Technocomplex, since sites in the central region and the Île-de-France have recently been attributed to this facies.

- Chronological data are also distorted since some facies are clearly positioned while others suffer from the lack of reliable dates.

- In addition, the most important point is the difference in criteria used to group or separate the lithic assemblages. Some facies have been grouped using typological, others technological criteria. For others, the functional traits of certain artifacts were used, for others still the preponderance of certain elements. So, it is unsurprising that researchers do not agree on the interpretation of the facies and particularly on the attribution of a given assemblage to a specific facies. A striking example are the 'small biface' facies in Normandy, identified on the basis of the size of bifacial pieces. Yet the MTA bifaces, identified as another facies using other criteria, have exactly the same dimensions.

- Finally, the scales of analysis must be taken into account. Very few studies do this and we note that assemblages have been primarily compared using a fairly general scale of analysis. Differences can sometimes be observed within a facies, when the industries are examined in detail, but no explanation is then advanced.

We now have a better understanding of why facies have not been compared at a national level, and why their interpretations are so poor and so problematic. I therefore wanted to determine if the choice of analytic tools could have an influence on our comparisons of industries.

Geographic, chronological, and methodological background

The Paris Basin and the Early Weichselian

To understand if the choice of analytic tool has an influence on our interpretation of industries, I selected an appropriate data set. The Paris Basin during the Early Weichselian (MIS 5) was seen as such, since it was possible to analyze ten coherent, uniform and well-dated series (Fig. 2). For MIS 5a, the following were chosen: layers Wa1 and Wa2 of Mauquenchy in Seine-Maritime (excavations by J.-L. Locht and N. Sellier-Segard: Locht et al. 2001; Sellier Segard 2003), the upper layer of Auteuil (Oise) (excavations by J.-L. Locht: Locht et al. 1995; Swinnen et al. 1996), Angé (Loir-et-Cher) (excavations by J.-L. Locht: Djemmali and Deloze 2004; Locht et al. 2009) and layers C, D and E of Soindres (Yvelines) (excavations by G. Dwrila: Dwrila and Duplessis in press). For MIS 5d and c, we analyzed the lithic assemblages from Villiers-Adam (Val d'Oise) (excavations by J.-L. Locht: Locht et al. 2003), layer N1 of Vinneuf-Les Hauts Massous (Yonne) (excavations by J.-L. Locht: Gouédo 1999) and Verrières-le-Buisson (Essonne) (excavations by R. Daniel: Gouédo 1999) They all come from open-air sites, for the most part excavated in the context of preventive archaeology, that is, across very large surface areas. Moreover, it is clear that they are quite variable. Some sites are interpreted as short-term halts,

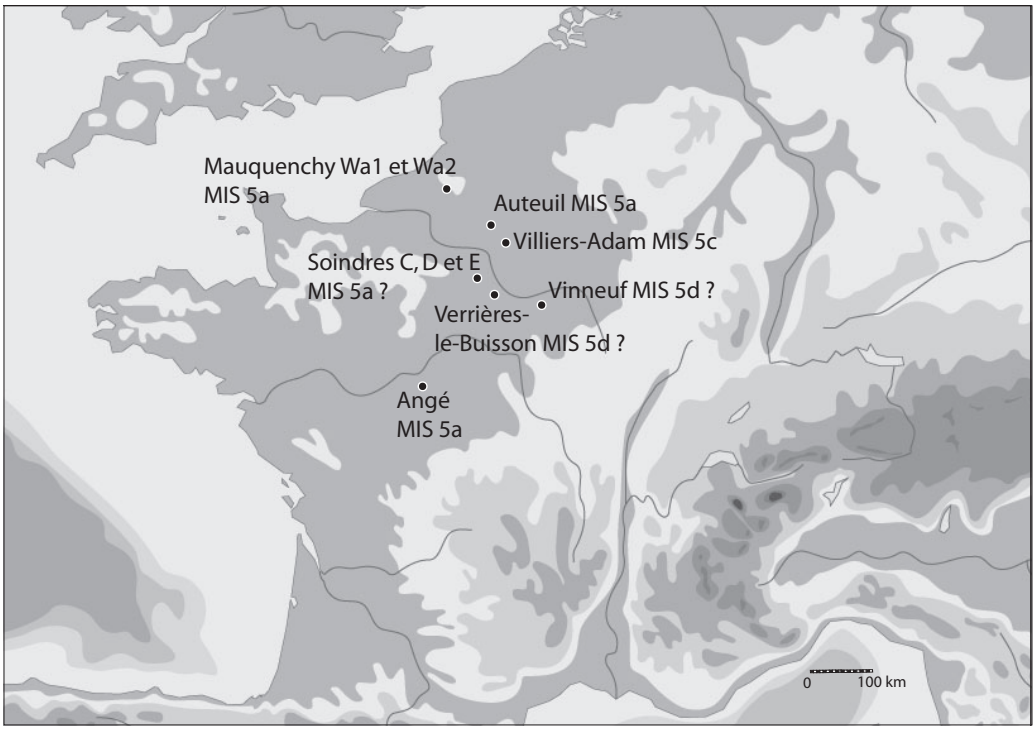


Fig. 2: *Location of the sites studied.*

others as occupations of longer duration. It is essential to compare sites with manifestly different functions.

An appropriate methodology

Next, I developed the methodology to address this research question, inspired by the technofunctional approaches developed by several researchers, the core classification methods of Eric Boëda (2009), and a more traditional technological approach.

This methodology attempts to combine the precise study of the intentions of production with that of the means used to attain them. Particular attention has been paid to 'objects': that is to say, the intended blanks, whether retouched or unretouched. I am interested not simply by their form, but have attempted to identify the intended functional properties: what kind of working edge, what size, what kind of point, etc. This has nothing to do with their specific function or use, but enables us to come closer to understanding the knappers' intentions. Next, I focus with great detail on the production modes used to make these artifacts. The aim is to identify the structures, concepts and *chaînes opératoires* involved.

This methodology has the additional advantage of being able to identify the criteria observed in order to compare the assemblages at several scales of analysis. I thus examined each series using four different scales of analysis, each time examining a different number of criteria (Fig. 3).

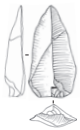
	criteria	
	objects	modes of production
example		
general scale of analysis	form → *triangular*	structure → *knapping*
medium scale of analysis	form + geometry → *symmetric triangular*	structure + concept → *Levallois reduction*
fine scale of analysis	technotype : form + geometry + form of the distal end + delineation of the edges + profile + size + non cutting-part → *technotype n° 1 : triangular, symmetric, narrow pointed distal end, convex edges, straight profil, robust, no non cutting-part*	structure + concept + methods of initialization and exploitation → *Levallois reduction* *Preferential exploitation* *Bipolar initialization*
very fine scale of analysis	technotype + dimensions + angles and sections of the working edges + angles and sections of the working edges → *technotype n° 1, big dimension (80 x 40 x 10 mm) , acute angles (35°), no retouch*	chaîne opératoire (from raw material acqusition to final object) → *Levallois reduction* *Preferential exploitation* *Bipolar initialization, over block, striking surfaces 'dièdres', extraction of two unidirectional removals, then two oppositely*

Fig. 3: *Analytic data form and example.*

- The series were first observed using a general scale of analysis, looking only at their general form: triangular, quadrangular, elongated quadrangular, etc., and examining only structure for production modes: shaping or knapping.

- Next, the series were examined using a medium scale of analysis, with the addition of certain criteria. This scale adds a geometric analysis for the artifacts which identifies, for example, whether triangular objects are symmetric. 'Conceptions' in production modes are also observed. This includes categories such as Levallois, discoidal, volumetric laminar, etc.

- Next, the artifacts were analyzed at a fine scale of analysis. In addition to form and geometry, aspects of the objects such as edge delineation, profiles, size and distal form were also examined. This led to identification of 'technotypes', meaning that a given triangular object, for example, belongs to a given technotype number one because it is symmetric, robust, has convex edges, a narrow pointed distal end and a straight profile. For production modes, core initialization and exploitation techniques of the *chaînes opératoires* were examined.

- Finally, at the finest scale of analysis, additional parameters such as precise size, edge angles, the number of rows of retouch, the number of predetermining removals, and others were observed.

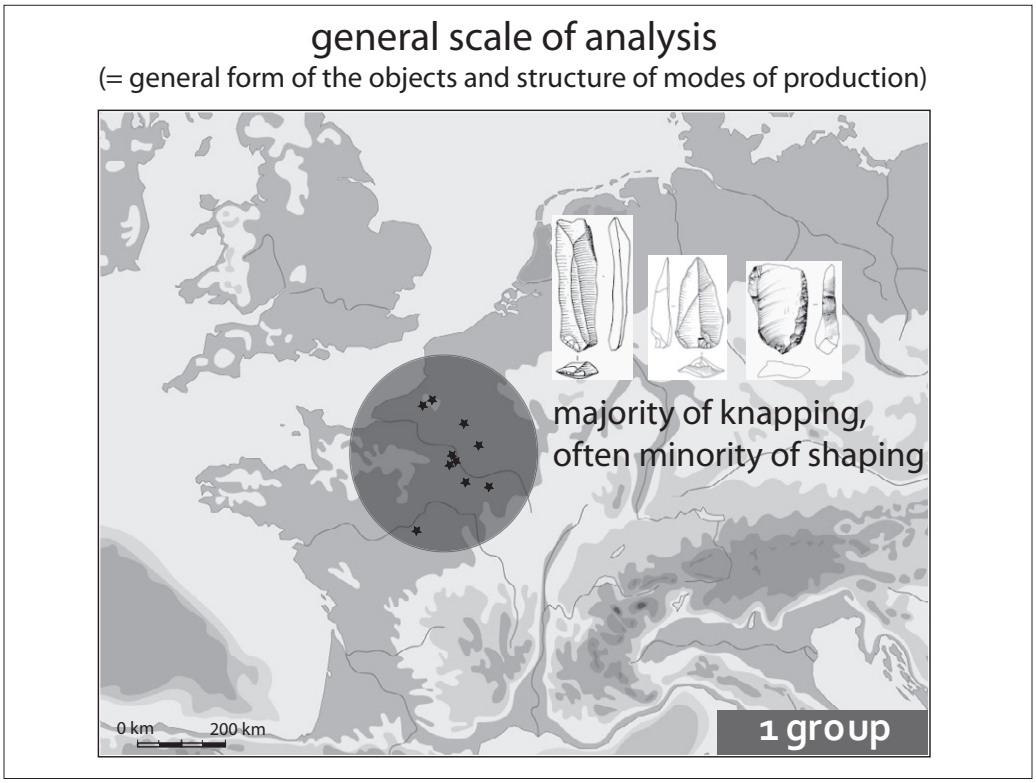


Fig. 4: *Comparison of lithic assemblages at a general scale of analysis.*

Comparison of lithic assemblages at the four scales of analysis

The ten series mentioned were thus compared at these four scales of analysis. At a general scale of analysis, when only object form and structures of production mode were examined, all of the series are identical because they all have triangular, quadrangular or elongated quadrangular objects, in brief flakes, points and blades, and predominantly reduction structures of knapping, often associated with shaping (Fig. 4).

At a medium scale of analysis, object geometry and conceptions of production modes were added. Two groups appear (Fig. 5). The first includes both symmetric and asymmetric objects, associated with Levallois, discoidal and volumetric laminar reduction as well as bifacial pieces considered to be bifacial tools based on Boëda's classifications. The second group contains mostly asymmetric objects resulting from non-volumetric reduction and shaping and belonging to the category of 'bifacial tool blanks'. It is of interest to note that sites from the first group are traditionally attributed to the 'Northwest Technocomplex' (Depaepe 2007), while the second group is attributed to the 'French Micoquian' (Gouédo 1999).

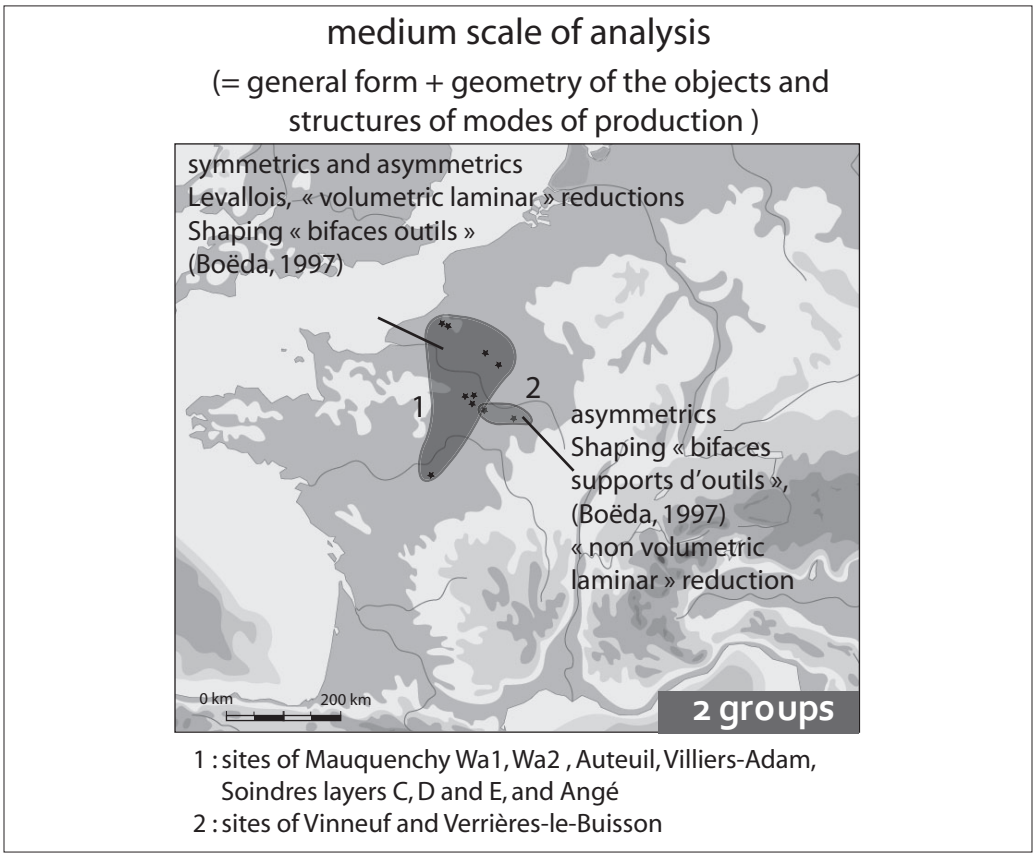


Fig. 5: *Comparison of lithic assemblages at a medium scale of analysis.*

At a fine scale of analysis, when technotypes and *chaînes opératoires* are examined, five groups appear very clearly (Fig. 6). Each group contains specific objects, associated with singular *chaînes opératoires* (Fig. 7).

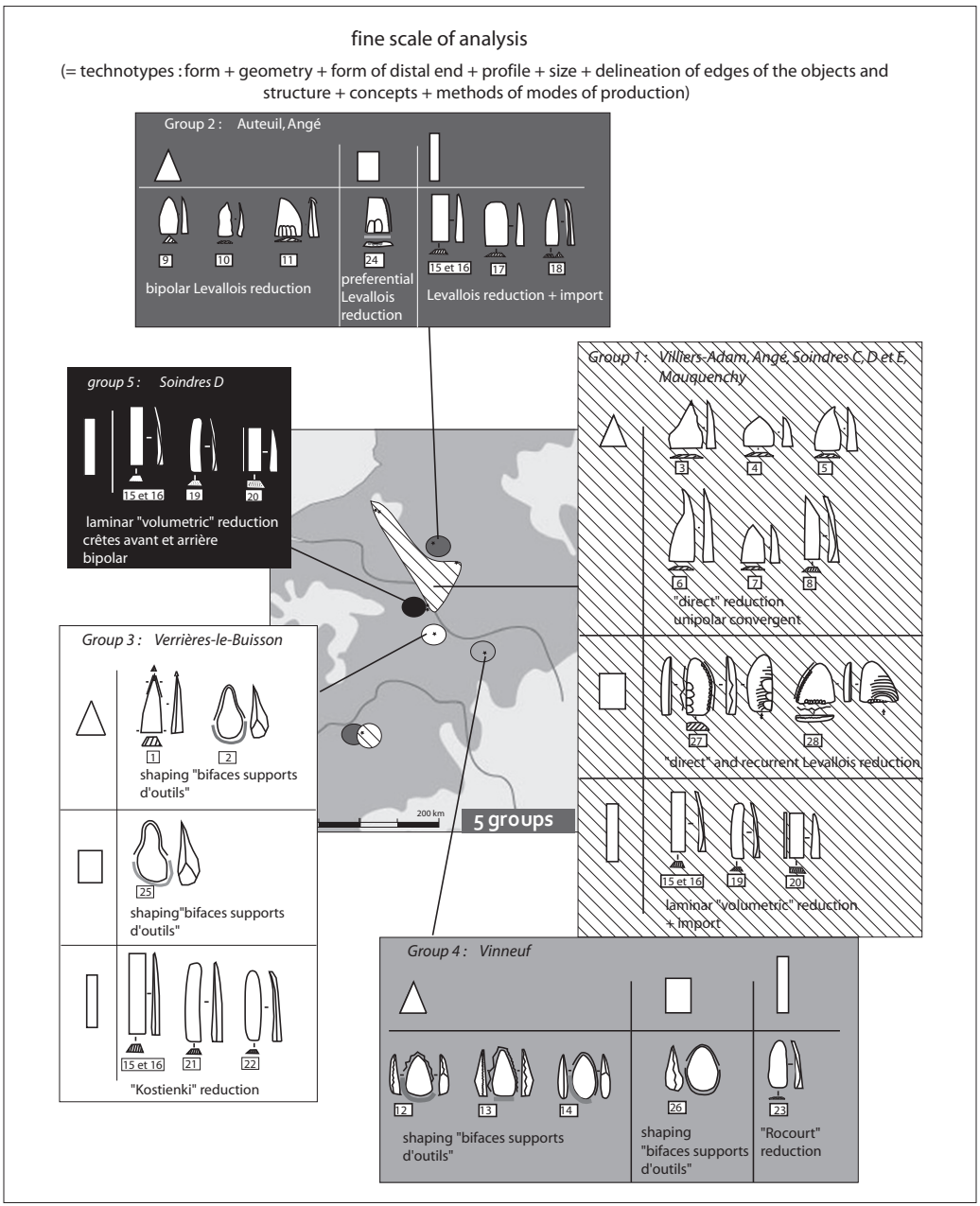


Fig. 6: *Comparison of lithic assemblages at a fine scale of analysis. Descriptions of the technotypes of objects are found in figure 7.*

For example, group 1 sites (see Fig. 6) contain all types of triangular objects, produced by non-Levallois reduction with unipolar convergent initialization, while group 2 (see Fig. 6), contains other types of triangular objects produced by Levallois reduction with bipolar initialization, etc.

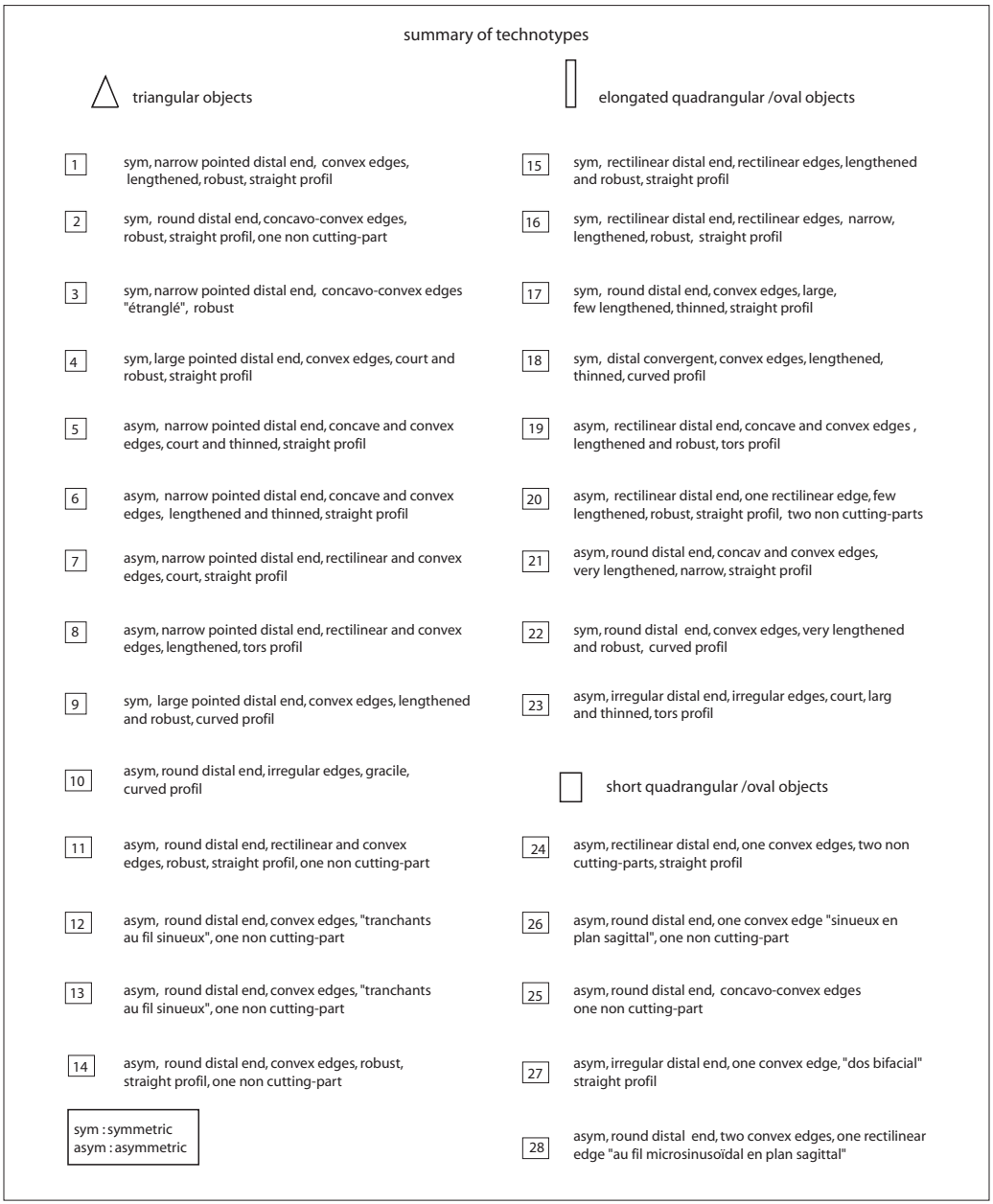


Fig. 7: *Description of the technotypes of objects at a fine scale of analysis.*

Finally, at the finest scale of analysis, when all aspects are observed in detail, all sites are different. The ten sites correspond to ten groups (Fig. 8). If we look at the previous map, for every given site there is a different pattern. One site might have objects with three rows of retouch while, in contrast, another site has objects with a single row of retouch and striking platforms prepared by a transversal removal. At yet another site, nodules of adequate form were given priority while at another site this was not the case. Each site displays its own pattern.

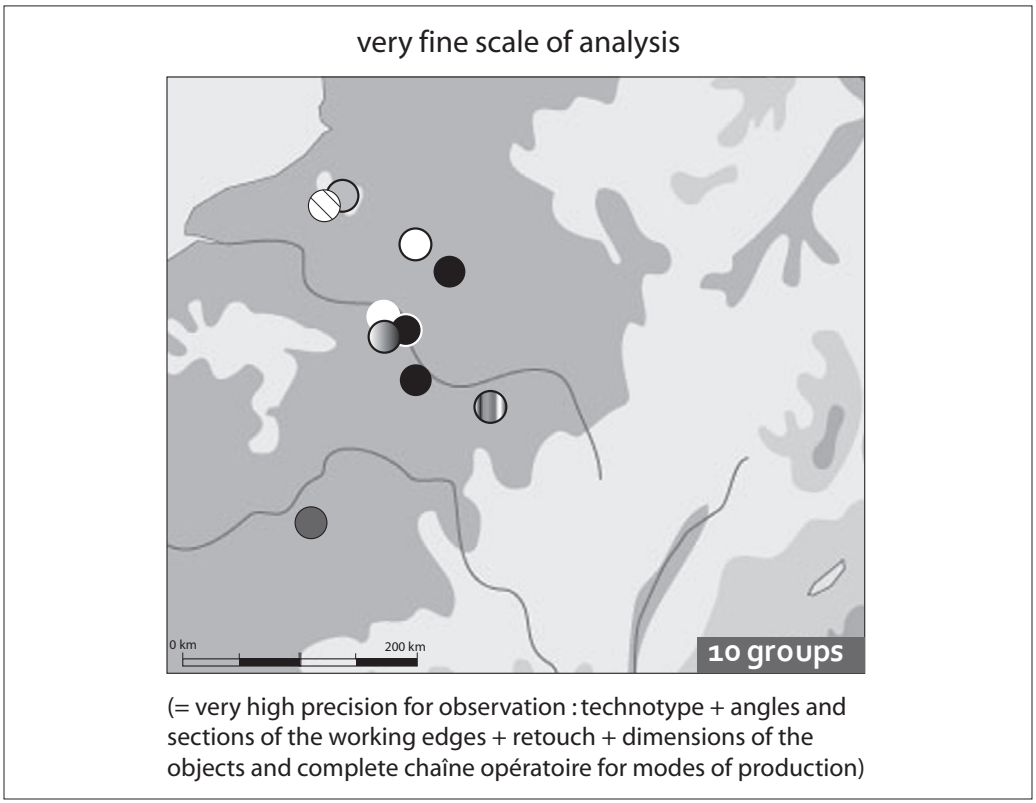


Fig. 8: *Comparison of lithic assemblages at a very fine scale of analysis.*

Summary and interpretations

After comparing the series, the results can be summarized. The differences observed between the groups and at the different scales of analysis must be interpreted.

Rather sociocultural differences and highly mobile groups

Raw material does not provide the only explanation concerning the differences between groups. On the contrary, all the sites are located close to raw materials of identical quality – secondary flint of average quality.

In addition, site function does not appear to be a complete explanation to explain the differences observed between lithic assemblages. In effect, some groups include three or four series. Yet, these series are highly varied, reflecting very disparate functions, as for example at a short-term halt and an occupation of long duration. Nevertheless, these sites with different corpus and function have enough elements in common to be found within the same group. Thus site function cannot alone explain the differences between assemblages.

Therefore, the data suggests that the groups identified reflect different technological traditions. These groups appear to have occupied a similar or identical geographic zone because we suspect the presence of at least two palimpsests for two sites. Moreover, with regard to reliable absolute dates, these groups do not appear to have been contemporaneous. This should be considered provisional, because the problem comes from the site of Soindres, for which recent absolute dates disagree with the relative dates suggested by the chronostratigraphy. If we exclude this site, the groups do not appear to be contemporaneous, but further confirmation should be obtained.

Finally, a significant split-up of the *chaînes opératoires* can be observed since, for most of the sites, frequent imports and exports of points, flakes and blades have been demonstrated. This, along with the highly varied corpus of the series as just mentioned, suggesting different functions, evokes a certain structuring of space and artifact mobility and thus probably of human groups during this period.

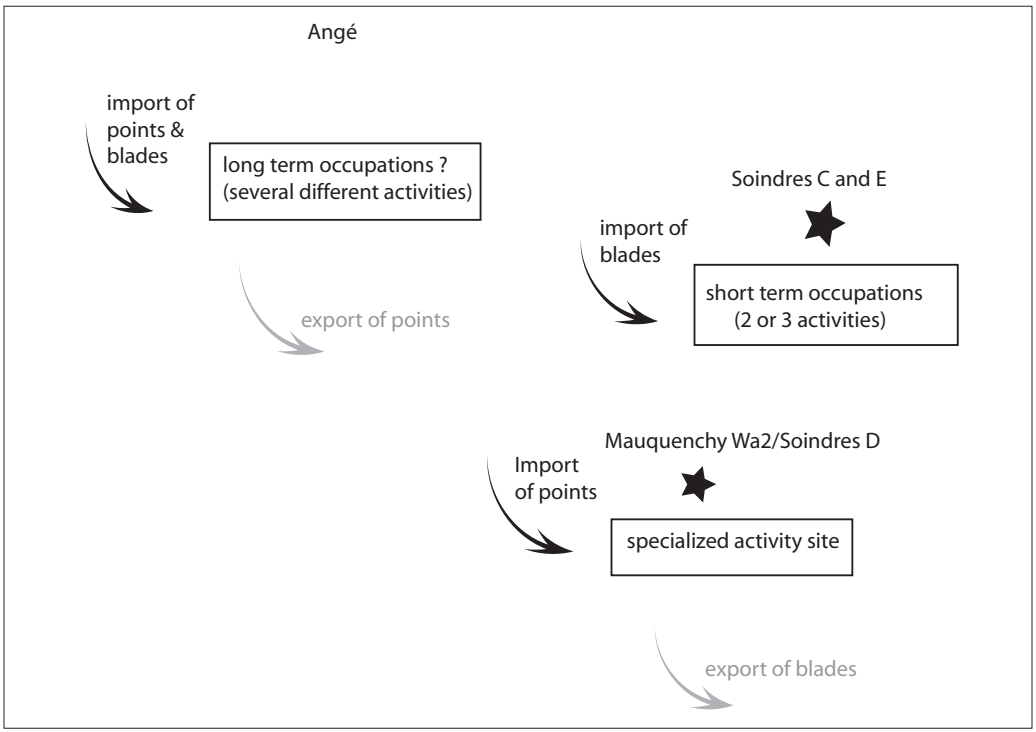


Fig. 9: *Mobility of artifacts.*

We thus have (Fig. 9):

- sites with very large assemblages, containing extremely varied retouched tools suggesting multiple activities, and with the import and export of artifacts,

- sites with large assemblages, but with very few retouched tools that vary little, indicating unvarying activities, with import of artifacts,

- and sites with less than 200 artifacts found in concentrations, suggesting short-term camps, with export of artifacts. These include layer Wa1 at Mauquenchy with only a single bifacial piece that was exported, and layer D at Soindres which produced only blades which were also exported.

All of this suggests that production strategies were far from being static and uniform during the Early Weichselian in the Paris Basin.

The contribution of cultural geography

Finally, while the differences observed between groups may reflect distinct technological traditions, we need to explain why these groups that are so different at a fine scale of analysis are so similar at a general scale. To go further in this respect, we exploited definitions from cultural geography. Cultural geography, as we know it today, is a sub-field of geography created in the 1960s. The best-known French specialists are J. Bonnemaison (2001) and P. Claval (2003). Cultural geography focuses on the analysis of modern cultural phenomena and how they are defined. Geographers have notably observed that cultural phenomena can be organized into a hierarchy by four distinct scales of analysis: cultural trait, cultural group, culture and civilization.

In this scheme, a civilization is situated within a very long time period, across a very broad area, and contains several cultures. Cultures, in their turn, contain several cultural groups in a more limited geographic area and within a short time period. Cultural groups are situated in even smaller regions, have shorter time periods, and contain several cultural traits, the latter representing a specific moment, activity, etc.

When such data is compared with the results and scales of analysis employed in this prehistoric study, it can be imagined that the groups identified at a fine scale of analysis would be technological assemblages. These would be included in a single 'technological culture' at a general scale of analysis (thus explaining their similarities), which is itself included in the 'Mousterian civilization'. All of this, obviously, is hypothetical, in order to provoke further consideration.

Interpretive hypotheses: impact of different scales of analysis

We will take the site of Mauquenchy as an example. At the finest scale of analysis, it is unique, since all of the sites are different at this scale (Fig. 10). This may be explained by the fact that at this scale, we would identify 'technological traits' as reflecting a moment in time, the individual, raw material constraints, site function, etc. The time period would be very short and the site would be spatially limited.

At a fine scale of analysis, this site joins three others, all of which have the same kinds of objects and the same *chaînes opératoires*. They form a group (group 1), different from the four other groups identified at this scale of analysis. The time and space separating these sites are larger, since they are dated between 80,000 and 100,000 BP. These may have been different technological assemblages within a relatively limited geographic area. This means that some specific aspects unique to individuals, site function, etc., will be obscured by more general criteria.

At a medium scale of analysis, the site of Mauquenchy is now joined by seven others on the basis of objects of identical form and similar operational concepts. They contrast with another group identified at this scale of analysis, since two groups were identified. These two groups may be considered 'technological cultures' and appear to be attributable to the 'Northwest Technocomplex' identified by P. Depaepe (2007) and J.-L. Locht, and the 'French Micoquian' identified by J. M. Gouédo (1999) and P. Depaepe (2007) for the Vanne Valley. The time period is longer, since all of these sites belong to the Early Weichselian period (between 70,000 and 110,000 years BP) and the geographic area is also broader. These 'provinces' or 'technological cultures' also contrast with those in Eastern Europe and the Micoquian, the Armorican Massif and the Mousterian with small bifaces, etc., and with the Lower and Middle Pleniglacial in the Paris Basin itself.

Finally, at a general scale of analysis, no differences can be seen between Mauquenchy and the other sites. More generally, no difference is perceptible at this scale of analysis for most of the European and Near-Eastern Mousterian sites, all of which are characterized by the production of flakes, points and blades, the use of Levallois and blade production methods, toolkits comprised mainly of sidescrapers, and sometimes the presence of shaping. This scale of analysis may reflect the Mousterian 'technological civilization' or 'very broad Mousterian technocomplex', existing over a very long time period (between 30,000 and 200,000 years BP) and across a vast geographic area, in contrast to the Lower and Upper Paleolithic.

Conclusions

Although it is obviously very difficult to strictly link geographic scales of analysis to those used here, an overview can nevertheless be constructed, leading to new directions of consideration for methodological and interpretive approaches.

First, looking at methodology, it has been clearly shown that scales of analysis have a direct impact on our explanations of cultural dynamics during the Middle Paleolithic. We need to know what phenomena we wish to analyze and adapt our methods of data recording. While the finest scale of analysis sheds light on specific behaviors, these cannot be generalized and are difficult to compare. Conversely, while medium and general scales of analysis demonstrate patterns over longer time periods and across broader areas, they are not precise enough to explain specific sociocultural behaviors. So, to explain in more detail the technological behaviors within a specific area, the fine scale of analysis appears to be the most appropriate. It enables identification of 'technological traditions'. But in general, it is clear that this scale of analysis has not often been employed.

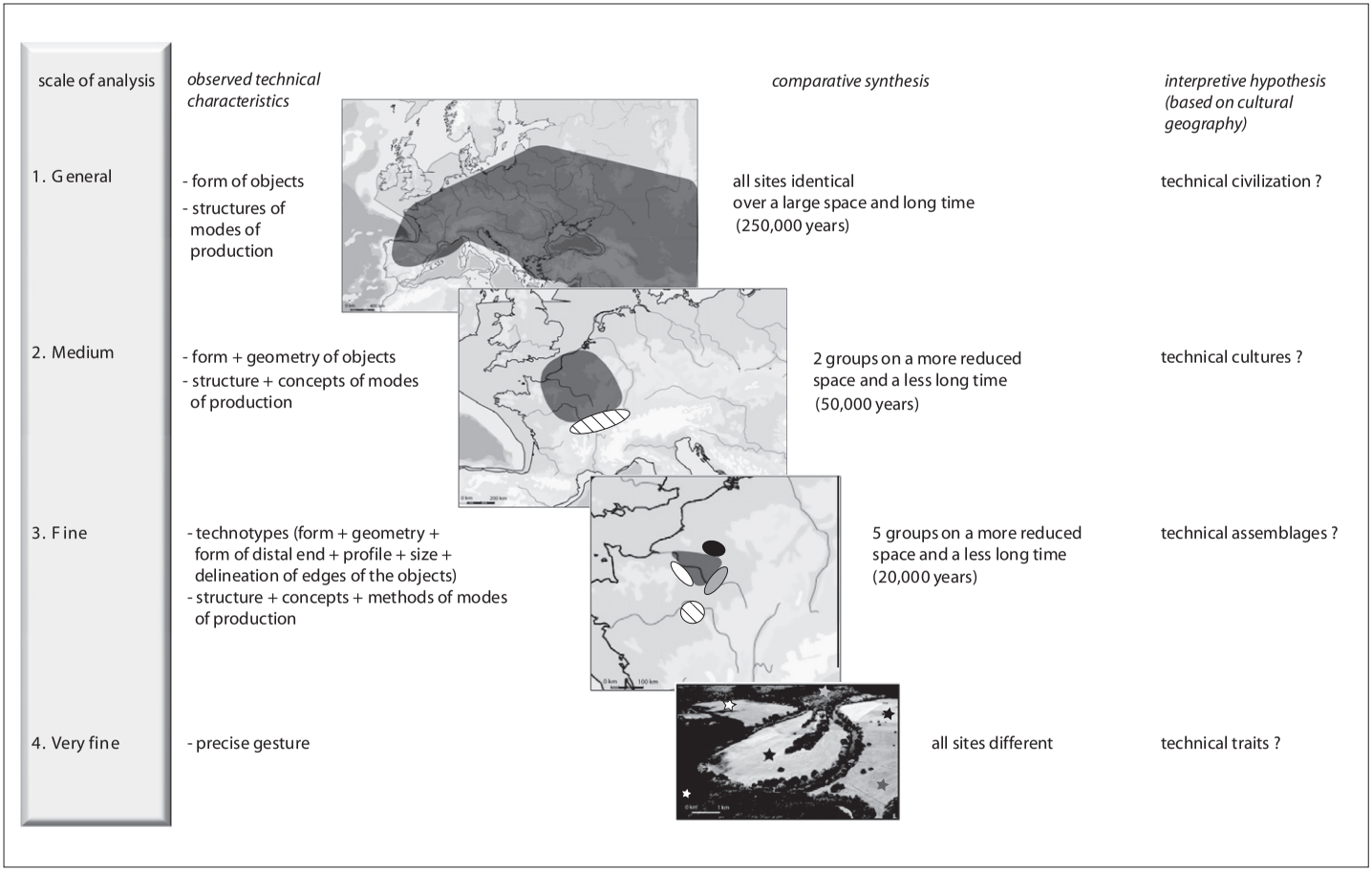


Fig. 10: *Synthesis of the different results depending on the four scales of analysis and interpretive hypotheses.*

Second, looking at interpretations, although these are hypotheses, I argue that the data demonstrates differences in sociocultural order between groups. In effect, the five groups identified in the Paris Basin during the Early Weichselian at a fine scale of analysis may reflect distinct technological traditions. In addition, these groups would have had a relatively unique spatial structure, based on the high split-up of the *chaînes opératoires* and perhaps a certain degree of mobility of human groups.

Acknowledgements

First of all, I would like to thank the committee members for awarding me the Tübingen Prize, and particularly Professor Nicholas Conard. I am also very grateful to Harald Floss, Sibylle Wolf and Michael Bolus and all members of the University of Tübingen for the warm welcome during my visit. This doctoral work was only possible thanks to the help of numerous persons. Without the financial support of the Conseil Régional de la Région Île-de-France, l'Université de Paris X et l'école doctorale *Milieux, Cultures et Sociétés du Passé et du Présent* this work could not have been realized. I warmly thank Eric Boëda for having managed it, as well as Sylvain Soriano, Jean-Luc Locht, and Vincent Lhomme – and all the members of the team AnTET of the UMR 7041 of the CNRS – to have supervised it. I am particularly grateful to Eric Boëda, Jean-Michel Geneste, Jean-Luc Locht, Liliane Meignen, Jürgen Richter and Alain Tuffreau for having agreed to be in the jury. Finally, Jean-Luc Locht, Gabriel Dwrila, Raymond and Jacqueline Tomasson, Olivier Guerlin, Nathalie Sellier-Segard, Jean-Marc Gouédo, Daniel Simonin (Museum of Nemours), Patricia Hervé (Museum of Guiry-en-Vexin), Pascal Depaepe, Monique de Cargouët (Museum of Sens), André Rigaud, Patrick Paillet (Museum of Argentomagus), and Thérèse Poulain (Museum of Avallon) were wonderfully generous for sharing their archaeological collections and their knowledge.

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