

## What Does the Acheulean Consist of? The Example of Western Europe (MIS 16-9)

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**Abstract:** *This paper presents the results of a technical analysis of 36 “Acheulean” lithic assemblages from Western Europe. The Acheulean is the emblematic culture of the Lower Paleolithic and is characterized by the presence of bifaces: tools that are easy to recognize from their almond-shape morphology and large size. Lower Paleolithic industries in general, and the Acheulean in particular, however, also include many other tool types. Conventional technological studies do not offer a comprehensive enough approach for analyzing these ancient industries due to the absence of well-developed “chaînes opératoires”. In this paper, we focus on the tools: how were they manufactured and with what are they associated? We demonstrate how the biface as a typological entity actually consists of three different technical structures: the “biface used as a blank for tools”, the “biface as a tool” and “pebbles/blocks with bifacial removals”. Other tools are made on flakes – by-products of bifacial shaping or from core reduction sequences – but also on small pebbles and various natural fragments. The bifacial structure changes together with the rest of the production. The rhythms and occurrences of this change could reveal examples of technical invention and innovation accompanied by a diffusion of populations within Western Europe.*

**Keywords:** *Western Europe, Middle Pleistocene, Acheulean, biface, Out of Africa*

### Woraus besteht das Acheuléen? Das Beispiel Westeuropa (MIS 16-9)

**Zusammenfassung:** Es werden die Ergebnisse einer technologischen Analyse an 36 Steinartefaktinventaren des „Acheuléen“ aus dem westlichen Europa (Frankreich, England, Spanien, Italien) vorgelegt. Diese Inventare datieren in die mittelpleistozänen Marinen Isotopenstufen (MIS) 16-9, wobei der Schwerpunkt auf den interglazialen Phasen MIS 13, 11 und 9 liegt. Das Acheuléen gilt als die emblematische Kultur des Altpaläolithikums und ist in erster Linie durch das Vorkommen von Faustkeilen gekennzeichnet, jene mandelförmigen und leicht erkennbaren Werkzeuge von nennenswerter Größe. Die altpaläolithischen Inventare im Allgemeinen und diejenigen des Acheuléen im Besonderen umfassen jedoch auch viele andere Werkzeuge. Herkömmliche technologische Untersuchungen reichen nicht aus, um diese frühen Industrien zu verstehen, da keine langen, ausgeprägten Herstellungsketten (*“chaînes opératoires”*) vorkommen.

Der Schwerpunkt des vorliegenden Beitrages liegt auf den Werkzeugen: Wie wurden sie hergestellt und womit sind sie vergesellschaftet? Es wird aufgezeigt, dass der Faustkeil als scheinbare typologische Einheit in Wirklichkeit drei unterschiedliche technische “Baupläne” erkennen lässt: den “Faustkeil als Grundform für Werkzeuge” (*biface used as a blank for tools, pièce bifaciale supports d’outils*), den “Faustkeil als Werkzeug” (*biface as a tool, pièce bifaciale-outil*) und die “Gerölle/Blöcke mit bifaziellen Abhüben” (*pebbles/blocks with bifacial removals, galets ou blocs à enlèvements bifaciaux*). Andere Werkzeuge sind aus Abschlägen – Nebenprodukten der bifaziellen Bearbeitung oder der Kernabbausequenzen – gefertigt oder auch aus kleinen Geröllen sowie verschiedenen natürlichen Produkten. Der bifazielle “Bauplan” ändert sich gemeinsam mit der übrigen lithischen Produktion. Der Rhythmus dieser Änderungen und die Stellen, an denen sie sich ereigneten, können Phänomene technischer Erfindungen und Innovationen sichtbar machen, die mit einer Diffusion von Menschenpopulationen innerhalb Westeuropas einhergehen.

So tritt der “Faustkeil als Grundform für Werkzeuge” vor allem im Pariser Becken (England und Nordfrankreich) vor MIS 10 auf, wohingegen der “Faustkeil als Werkzeug” seit MIS 10 überall in Westeuropa erscheint und dann in MIS 9 geläufig wird. Auf Grund dieser Ergebnisse wird die Möglichkeit der Erfindung des “Faustkeils als Grundform für Werkzeuge” im nordwestlichen Europa während MIS 13 oder 11, gefolgt von einer lokalen Evolution zum “Faustkeil als Werkzeug”, propagiert und, darauf aufbauend, die Hypothese einer Ausbreitung des Faustkeils in das südliche Europa zeitnah zu der Phase MIS 9 aufgestellt. Dagegen wird das häufiger vorgeschlagene Modell einer “Einwanderung” des Acheuléen und damit

der Faustkeile aus Afrika, wo sie mit einem Alter von etwa 1,7 Millionen Jahren bisher am frühesten belegt sind, nach Europa hinein abgelehnt. Begründet wird diese Ablehnung in erster Linie damit, dass das europäische “Acheuléen” keine fest umrissene einheitliche Industrie, sondern eine Zusammenfassung verschiedener Industrien ist und weil die verschiedenen Manifestationen des “Acheuléen” zu unterschiedlichen Zeiten sowie an unterschiedlichen Stellen auftreten und nicht zu einer einzigen Einheit zusammengruppiert werden können. Letztlich machen die Untersuchungen deutlich, dass der scheinbar erratische Block “Acheuléen” eine hohe Variabilität aufweist und dass es weder den Standardfaustkeil des Acheuléen gibt, noch ein standardisiertes Werkzeugensemble, noch eine standardisierte Acheuléen-Technologie.

**Schlagwörter:** Westeuropa, Mittelpleistozän, Acheuléen, Faustkeil, Out of Africa

## Introduction

The Acheulean is the emblematic culture of the Lower Paleolithic. It is characterized by bifaces within the lithic industry. We usually ascribe the Acheulean to the first part of the Middle Pleistocene in western Europe (Marine Isotopic Stage [MIS] 16 to 9, c. 630-300 kyr), before more structured flaking (*débitage*) techniques such as the Levallois concept occur. Western Europe was surrounded by seas and ‘culturally’ separated from Central Europe by the absence of bifaces east of the Rhine at this time. “Acheulean” is a persistent notion even if vaguely used in technical terms. The word was coined by G. de Mortillet (1872) to describe the industries from the Middle Terrace of the Somme Valley in northern France. Even then its legitimacy as representing a new culture was not universally accepted (see for example the debate between de Mortillet and D’Acy: Mortillet 1875). Today the term denotes a large variety of tools, occurring over 1.7 million years on several continents. The link between the numerous occurrences of the Acheulean is the biface (or handaxe), which is a typological entity, with an almond-shaped morphology. Its diversity is well known, and a great deal has been written about its shape and size. There is, however, no precise technical definition for the term. Bifaces are often regarded separately, standing apart from any overall lithic production.

In this paper, we present a study of lithic assemblages following a new technical approach (“structural analysis”) for comprehending this ambiguous culture. When considering the Lower Paleolithic in Western Europe, classical techno-economic studies, usually carried out for Middle or Upper Palaeolithic sites in the attempt to understand human settlements in anthropological terms, are difficult to undertake due to the rarity of well-preserved deposits. The first step in comprehending human behavior during the Lower Paleolithic in Europe involves a case-by-case technical review of industries coming from sites within a clear stratigraphic context. The synthesis we present below will demonstrate the plurality and complexity of what we usually call “Acheulean” industries. We then attempt to attach some meaning to our findings by looking closer at certain time periods and places. We suggest ideas on technical invention and innovation (Nicoud 2011, 2013) and propose some historic explanation (dispersal) for the technical changes we have observed.

## Corpus of lithic assemblages and method of study

The paradox always inherent in the Acheulean has been the great diversity of tools included within its conceptual framework. This diversity remains an incommensurable variability generating confusion when we address the Acheulean phenomenon. “Acheulean culture” is based on the presence of bifaces in the lithic assemblages. Bifaces are mostly found on the top of alluvial terraces, uncovered during surface surveys. They are rarely recovered from excavated sites with a clear stratigraphy, representing less than 2% of the lithic remains from these sites (Tuffeau 1992). Thirty-six assemblages were selected here for fine technical analysis (Figs. 1 and 2). Our selection includes industries from Barnham (Ashton et al. 1998), Boxgrove (Roberts and Parfitt 1999), Elveden (Ashton et al. 2005), High Lodge (Ashton et al. 1992), Hoxne (Singer et al. 1993; Ashton et al. 2008), Cagny (Tuffreau 2001), La Celle (Limondin-Lozouet et al. 2010), Soucy (Lhomme et al. 2004), Castel di Guido (Radmilli and Boschian 1996), Notarchirico (Piperno 1999), Torre in Pietra (Malatesta 1978), Aridos (Santonja et al. 1980, 2001), and Ambrona (Freeman 1975; Santonja and Pérez-González 2005).



*Fig. 1: Map showing the sites mentioned in the text.*

Assemblage	Nb of artifacts	Nb & % of bifaces ( <i>pièces bifaciales</i> ) in the sense of this study	
Ambrona AS1	235	5	2,1
Ambrona AS3	72	2	2,8
Aridos 1	333	0	0
Aridos 2	34	1	2,9
Barnham Area I	504	0	0
Barnham Area IV(4)	379	2	0,5
Boxgrove : Q1/A/ 4b	1715	3	0,2
Boxgrove : Q2/GTP17/ 4b	1800	0	0
Boxgrove : Q1/A/ 4c	2200	5	0,2
Boxgrove : Q2/C/ 4c	1354	8	0,7
Boxgrove : Q2/GTP17/ 4c	502	2	0,4
Boxgrove : Q1/B/ 4b	706	8	1,1
Cagny Cimetière I	11	1	0,9
Cagny la Garenne II I4	1348	19	1,4
Cagny la Garenne II I2	1086	3	0,3
Cagny Ferme de l'Epinette MS	1116	31	2,7
Cagny l'Epinette I1	932	18	0,9
Cagny l'Epinette I2	196	14	7
Castel di Guido	1131	0	0
Elveden Area III bed 4	1465	0	0
High Lodge bed C-D-E	1867	14	0,7
Hoxne Lower ind.bed 1 layer 3	51	0	0
La Celle	67	0	0
Notarchirico I	10	0	0
Notarchirico H-G-G1	10	0	0
Notarchirico F	10	0	0
Notarchirico E1	286	0	0
Notarchirico E	155	0	0
Notarchirico D	300	0	0
Notarchirico C	78	0	0
Notarchirico B	351	0	0
Notarchirico A1-B	41	0	0
Notarchirico A	316	0	0
Notarchirico alpha	950	0	0
Soucy 3P	6066	276	4,5
Torre in Pietra m	536	46	8,5
<b>Total</b>	<b>28213</b>	<b>458</b>	<b>1,6</b>

Fig. 2: Assemblages analyzed in the present study.

A routine technological analysis was conducted, uncovering evidence of *façonnage* and *débitage chaînes opératoires*. Common lithic technology analysis remains insufficient in comprehending Lower Paleolithic industries due to the frequent absence of clearly developed *chaînes opératoires*. Typologically, tools include bifaces, sidescrapers, notches, and denticulates made on flakes, or on pebbles, or on blocks. The numerous tools have already been described with sufficient accuracy (“techno-morpho-functional analysis”; Boëda 1997, 2001, 2013; Soriano 2000). Their construction is discernable: the chronology of the removals and the morphology of the surfaces help identify the intention of the knapper. Various cutting edges and tool structures appear. Most importantly, we noticed different tool kits. In particular, we distinguished between different structures of bifaces and perceived changes in its systemic role within broader lithic production. This approach allows us to establish structural comprehension of the artifacts and the assemblages.

### The three structures of bifaces

All assemblages described in the literature contain bifaces. But the biface is regarded as a typological entity, i.e., an artifact in the shape of a big almond with two faces intentionally worked. Several technical realities appear in fact within the biface concept. According to our interpretation (Boëda 1997; the words are translated there for the first time), these include the “biface used as a blank for tools” (*pièce bifaciale supports d’outils*), the “biface as a tool” (*pièce bifaciale-outil*) and “pebbles/blocks with bifacial removals” (*galets ou blocs à enlèvements bifaciaux*) (Fig. 3). The differences between one and the other techno-type of biface can seem subtle. Undoubtedly, one needs an extensive and representative corpus of artifacts for noticing regular recurrences in tool construction. Indeed, typologically, two bifaces can be very similar even though they were produced by two different methods – and *vice versa*. Some major assemblages from Boxgrove, Soucy, Torre in Pietra and Castel di Guido, with a large number of bifaces, helped us in distinguishing these categories. As stated above, assemblages with a large number of bifaces are rare, and assemblages only made of bifacial shaping products are represented by two of those studied here (many loci from Boxgrove and Soucy 3P). We will demonstrate below how these new categories become meaningful when the biface is considered with the rest of the assemblages, and when reported in a geo-chronological framework.

#### Biface used as a blank for tools

The first techno-type of biface is called “biface used as a blank for tools” (*pièce bifaciale-support d’outil*: Boëda 1997; Soriano 2000) (Fig. 3A). This is a bifacial volume, roughly almond- or oval-shaped. The rim is retouched in order to create any desirable cutting edge (sharp and shaped as a point, thick and denticulate, etc.). Different cutting edges can coexist on the same piece. The bifacial blank can easily be reduced to reproduce similar cutting edges simply by modifying the edge. Therefore, the general shape of the piece depends on the type of tool produced on its rim, which explains why some of them do not even have a point but look like cleavers with what appears to be a transversal cutting edge. For the most part this transversal edge is not intentional but results from the making of cutting edges on two sides. According to the assemblages analyzed here,

“bifaces used as a blank for tools” disappear with MIS 9. They represent, for example, all the Boxgrove industries (southern England).

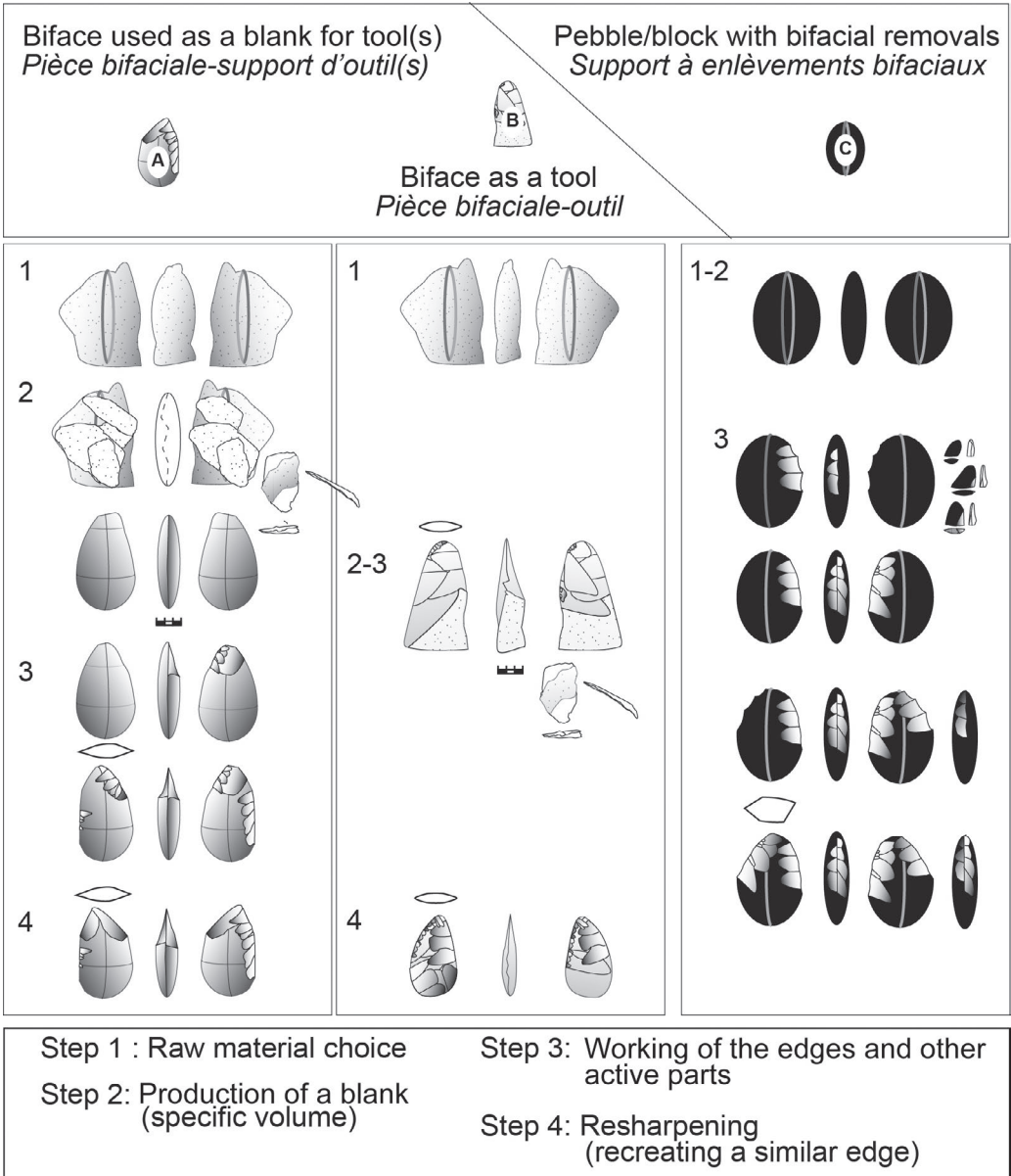
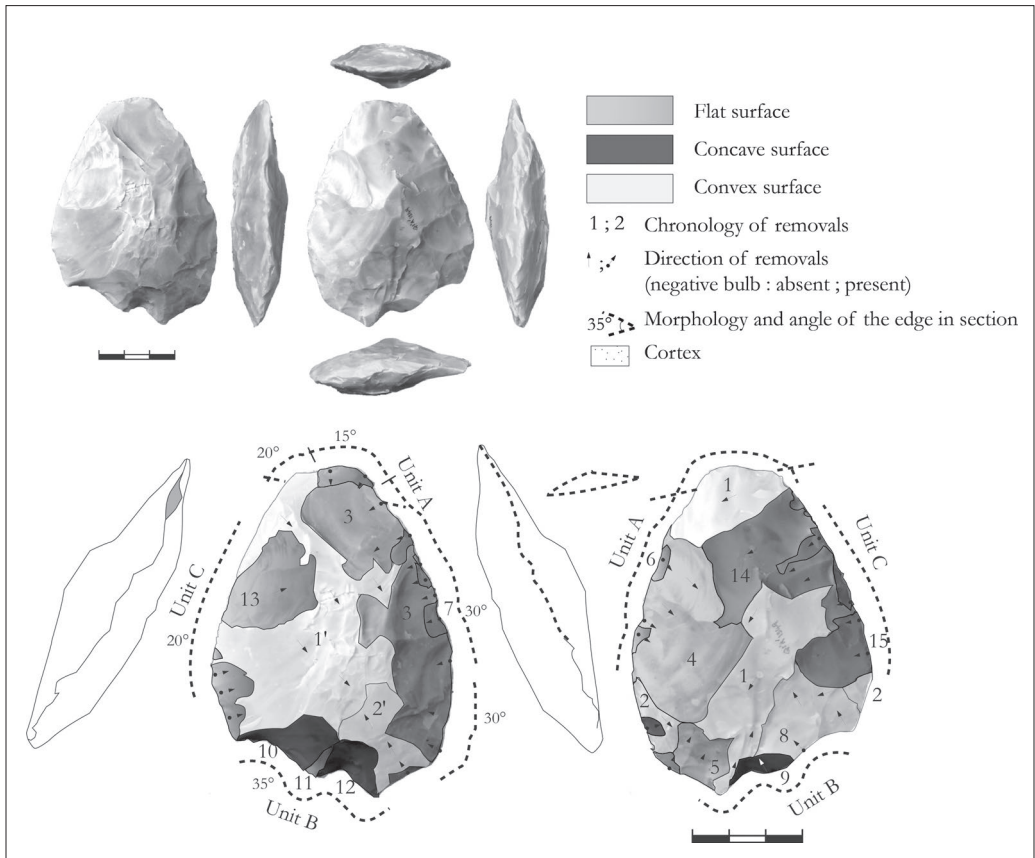


Fig. 3: Three structures of bifaces.



One example of a “biface used as a blank for tools” from Boxgrove, Sussex (Q1/A/4c 1349; 83 mm x 60 mm x 20 mm) is made of a flint nodule worked with a soft hammer in order to obtain initially a coarsely oval blank with two surfaces slightly convex, separated by an overall rectilinear plan of intersection with edge angles close to 40° (Fig. 4). The first removals are unipolar, large and invading (n° 1 to 2’). The second phase of manufacturing the biface consists in transforming certain portions of the blank to make the tool functional, for example, by shaping a cutting edge or a back for gripping. Several rows of bifacial and short removals create a homogenous edge (unit A; n° 3 to 7) including the point and 60 mm of a contiguous edge (bi-flat in section, angle: 15° at the point, then 30°). Ridges left by former negative scars are removed by shorter successive removals. A second unit (B) is created by two notches (n° 9 to 12) on the base of the blank. Short removals, with a negative bulb well marked, accentuate the concavity of the notches. A third unit (C) is produced on the left edge. One face already slightly convex is flattened by an invasive removal (n° 13) then used as a striking platform for two rows of removals (n° 14). The second row eliminates the ridges in order to produce a flat surface. Thus, a rectilinear edge (angle: 20°) is created.



**Fig. 4:** Example of a “biface used as a blank for tools” from Boxgrove, Sussex (Q1/A/4c 1349; 83 mm x 60 mm x 20 mm). Photo taken at the British Museum, London.

### Biface as a tool

The second techno-type of biface identified is the “biface as a tool” (*pièce bifaciale-outil*: Boëda 1997) (Fig. 3B). The entire volume of this type is not shaped to produce a cutting edge on its rim, but in order to create the tool. The different parts (cutting edge, back, etc.) together constitute the tool: they are formed in a continuous production process. The roughing out is often merged with the final trimming. This piece cannot easily be reduced because the whole volume would have to be reduced again to recreate the same tool. Every “biface as a tool” we observed was made as only one very specific tool. It includes a sharp cutting edge located on the apical part and an adjacent edge (“edge-point type”; Figs. 5 and 6). It appears 276 times at Soucy 3P (near Paris) but is also found at Torre in Pietra m (near Rome). Although this type of tool may look like the “bifacial

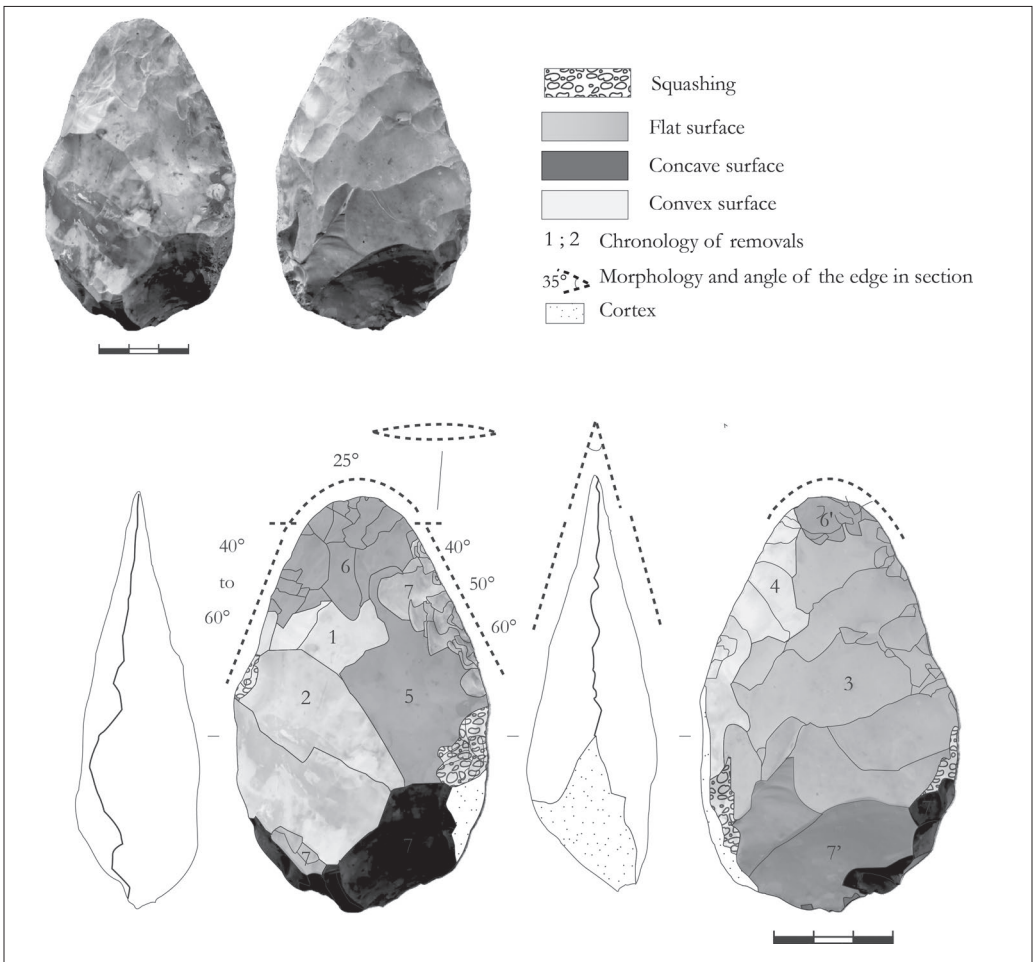
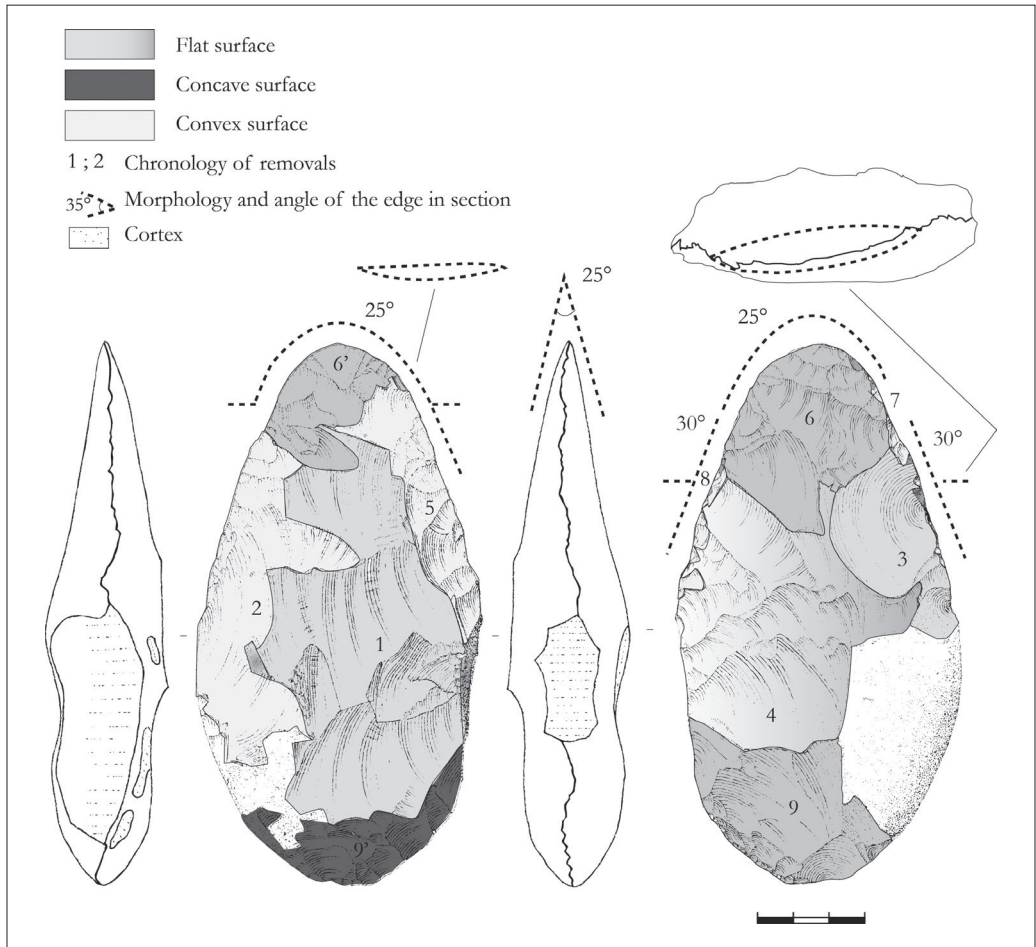


Fig. 5: Example of a “biface as a tool” from Soucy 3P, Yonne (K32/33; 101 mm x 63 mm x 29 mm).



piece as a blank for tool” from a typological point of view, the two of them differ in structure. In the assemblages we studied, the “biface as a tool” does not appear before MIS 9. We noted that, for the sake of efficiency, the apical part would have to be thin not only on the rim of the piece, but also over its entire width. Thus the convergence we find on these pieces arises from functional need. Often these bifaces still have cortex on the base that is kept when thinning the rest of the blank. This cortical part is totally coherent in a morphological way with regard to the volume of the biface and may have been used as the grip of the tool.



**Fig. 6:** Example of a “biface as a tool” from Soucy 3P, Yonne (K32/32; 155 mm x 81 mm x 30 mm). Drawing taken from Lhomme et al. 2004.

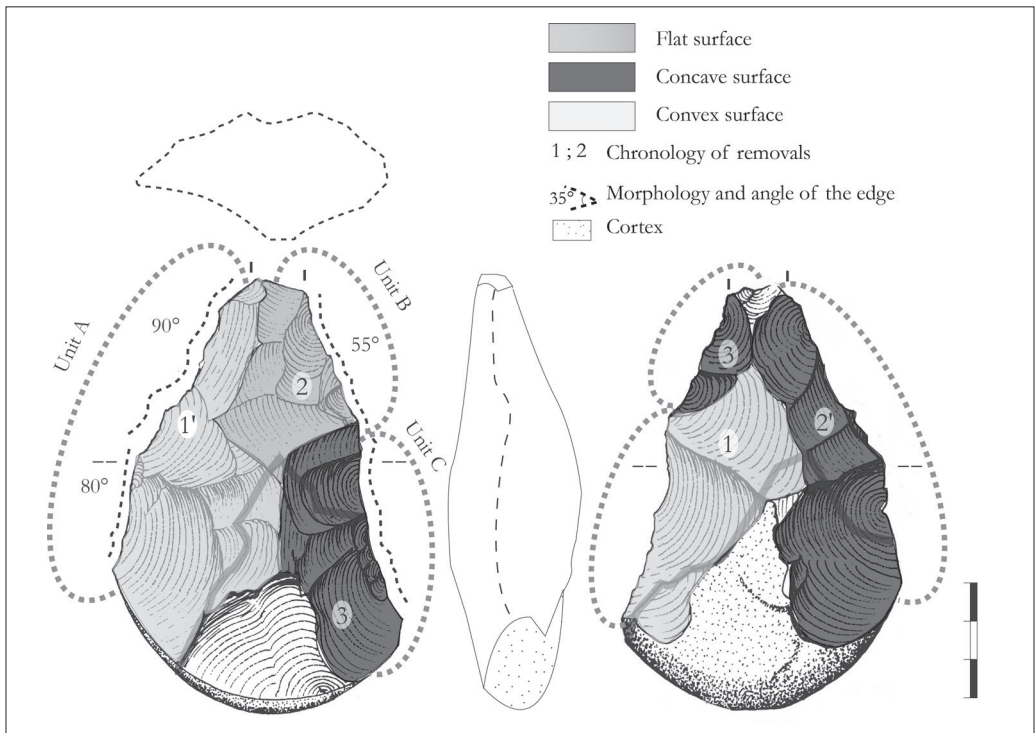
In the case of one “biface as a tool” from Soucy 3P, Yonne (K32/33; 101 mm x 63 mm x 29 mm) (Fig. 5), the cortex of a flint nodule was removed by invasive and convex flakes (n° 1, 2 and 4). The surfaces thus created were used as striking platforms for very invasive removals that shaped a flat surface (n° 3 and 5). During the continuous production

process, the distal part is thinned (n° 6 and 6'); it is very thin (angle: 25°) with the contiguous edges being rectilinear. From there, all the removals are included in the thinning of the apical part. The base is also thinned (n° 7 and 7') and the edges are crushed in the mesial part possibly due to the method of gripping.

In the case of another “biface as a tool” from Soucy 3P (K32/32; 155 mm x 81 mm x 30 mm; drawing in Lhomme et al. 2004) (Fig. 6), the cortex of a flint nodule was removed by invasive and convex flakes (n° 1). A second group of removals (n° 2) from the edge was removed to smooth the surface. The same process is applied on the other face (n° 3 and 4). During the continuous production process, the distal part is thinned as well as a contiguous edge (n° 5 to 8); the apical part is very thin (angle: 25°). Only the thinning of the base is not associated with the thinning of the whole artifact (n° 9 and 9').

### Pebble with bifacial removals

Similarly, some pebbles or other blanks (block, flake) with bifacial removals have the shape of a biface (Fig. 3C). We distinguish these handaxes from the bifaces described above due to the lack of a bifacial structure. The volume of the artifact is not important, as is the case for the other techno-types. Only a part of the blank is retouched; the shaping of the edge is independent of the volume of the blank. We often see a rupture in the



**Fig. 7:** Example of a “pebble with bifacial removals” from Castel di Guido, Latium (CDG 6816; 110 mm x 76 mm x 37 mm). Drawing taken from Radmilli and Boschian 1996.

morphology of the tool, between its general volume and its cutting edge(s), something observed at Notarchirico F (Southern Italy), at Torre in Pietra m or at Castel di Guido. If two edges have been worked, a convergence can be created, and the piece becomes a typological biface. However, such a piece is usually quadrangular in section and very thick. Some typological bifaces have initially been nuclei which were retouched afterwards, as seen at Aridos (near Madrid) or Torre in Pietra m.

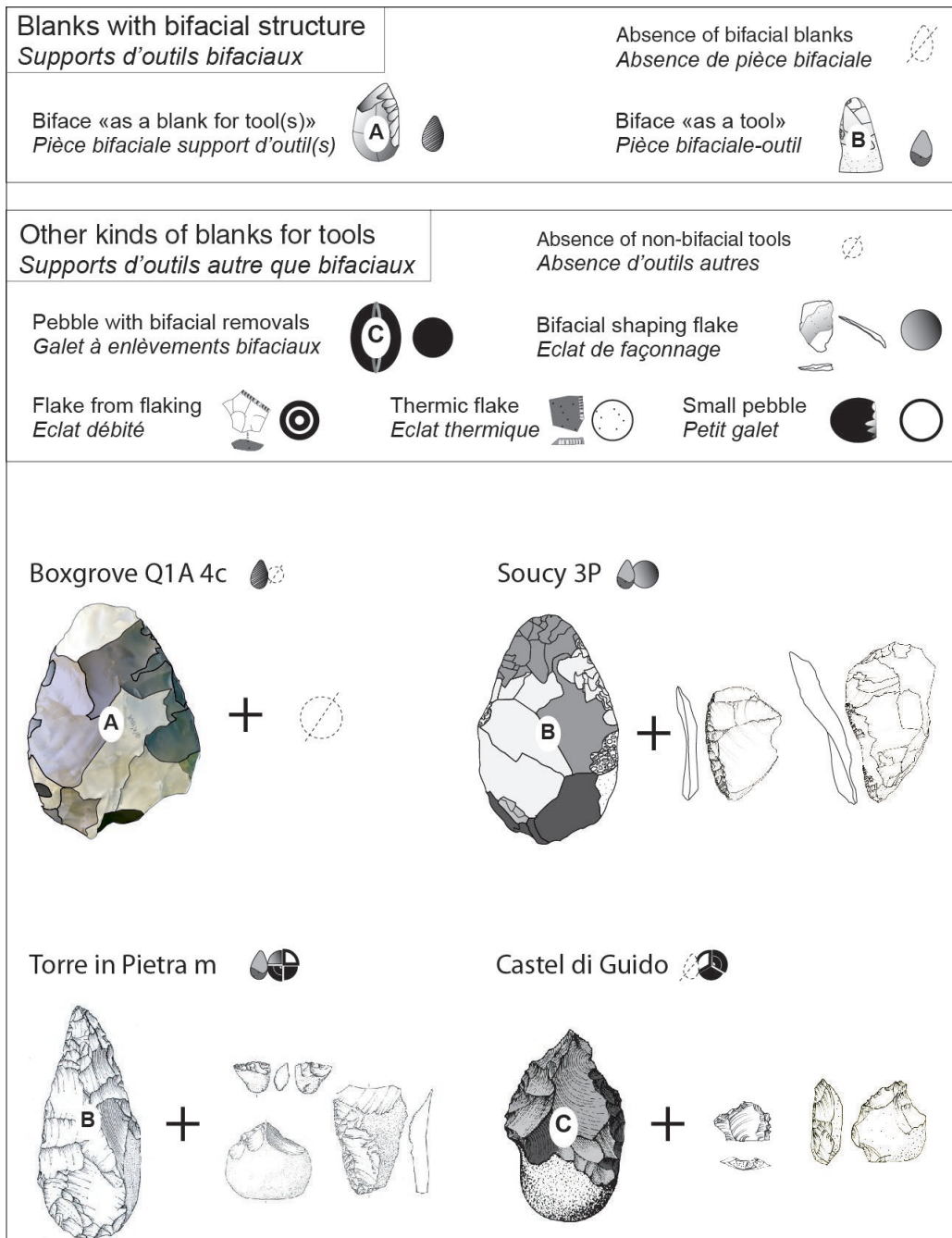
In the case of one “pebble with bifacial removals” from Castel di Guido, Latium (CDG 6816; 110 mm x 76 mm x 37 mm) (Fig. 7), flat surfaces are created on the opposite edges. The negative bulbs of previous removals disappear when an abrupt final retouch is applied. This creates the angle and the delineation of the edges. The edges present a plano-concave section, with an angle of 55 to 90°. The apical part is neither thinned nor resharpended.

### **Other tools (non-bifacial blanks)**

An Acheulean tool assemblage can also contain tools made on flakes and other blanks. These flakes come from bifacial shaping as observed at Soucy 3P or Torre in Pietra, but it is very rare. They are also produced through flaking (*débitage*). Tools on small pebbles are quite common, particularly in the Latium (Italy), at Torre in Pietra or Castel di Guido. In the latter site, bone fragments were modified. Indeterminate fragments or thermal flakes were used as blanks for different kinds of tools in the older levels from Ambrona (north-eastern Spain) or in the Soucy 2 and Soucy 6 sites, where no bifacial industries occur, unlike the other sites of the Soucy quarry (Lhomme 2007). The possible use of untransformed blanks should not be excluded. However, it would have been limited. A use-wear analysis conducted at Hoxne (East Anglia; Keeley 1980) revealed that flakes with use marks were rare. In some of the Boxgrove levels, well-preserved clusters built from thousands of flakes from the production of bifacials show that the bifacial piece had been taken away together with only one or two big flakes (Roberts and Parfitt 1999). If there are no retouched flakes (or only very few of them) in the many loci and levels of Boxgrove, we assume this must be related to the “biface used as a blank for tool” status, which can bear several types of cutting edges. Also, cleavers do not appear in the assemblages we considered.

### **Mode of existence of the different tool assemblages**

We know that the conservation of sites is linked to the conservation of quaternary deposits, and with the chance of finding them (often during quarry work). We can imagine that the presence of certain kinds of tools is due to the location of the settlement during the Paleolithic or to the activities done in the site. All the assemblages studied originated from open-air sites and from fluvial deposits. There is only scarce evidence of Acheulean sites in caves prior to MIS 9, which is one of the many reasons why we must be cautious with our results. We try to dissociate observable facts from interpretations still open for discussion (Fig. 8).



**Fig. 8:** Example of different tool kits from Acheulean assemblages and schematic representation. Drawings from Torre in Pietra: Malatesta 1978; from Castel di Guido: Radmilli and Boschian 1996.

With rare exceptions, each assemblage shows a spectrum of tools structured differently (Fig. 9). In certain series of the European Acheulean, the proportion of tools made on flakes or other non-bifacial blanks can be very important. Among the assemblages studied, the two techno-types of bifaces we distinguished (“used as a blank for tool” and “as a tool”) never appear together within the same assemblages. Thus they mutually exclude each other here. Also, we noticed that the use of the soft hammer does not appear to be necessary in creating bifaces.

In the assemblages where the “biface as a tool” is present, as at Torre in Pietra m or Soucy 3P, it represents a specific tool with an “edge-point” type cutting edge. It is associated with a broad spectrum of tools made on flakes or other blanks. Tools made on non-bifacial blanks present cutting edges different from the ones we see on the bifaces. Hence, bifaces and other tools seem functionally complementary; here the biface is “just” one kind of tool among others.

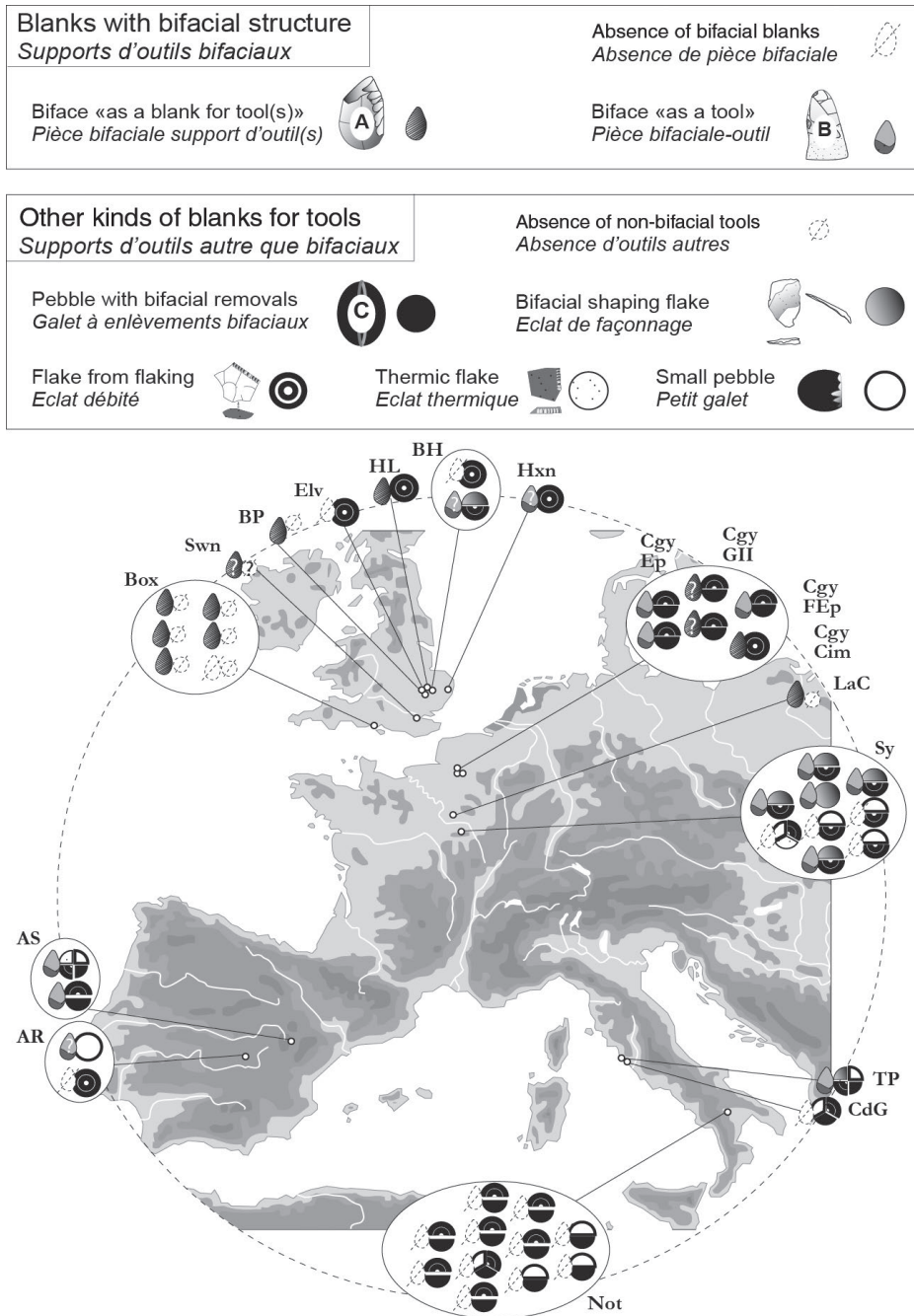
Bifacial shaping flakes are rarely used as blanks for tools, and it is even more a rarity that they are retouched in a systematic way. This is only observed at Soucy 3P.

Conversely, “bifaces used as a blank for tool” exclude almost any other tools (retouched blanks) as in the many assemblages of Boxgrove. Some denticulates or notches can be associated with this group of assemblages.

In the assemblages without “true” bifaces, no specific tools appear. The tools from these assemblages are made from hardly standardized blanks such as natural flakes or flakes from *débitage*, small pebbles, or bone fragments.

Flaking reduction sequences (*débitage*) are well represented in the Acheulean assemblages. They are rather short and simple (parallel flaking or alternate flaking; see for example Ashton et al. 1992). The cores are unprepared, and the methods used exploit only a small part of the core. Generally, the sequences of continuous removals are short (from 1 to 5 flakes). Sometimes bifaces are made of large flakes (High Lodge). There are rare examples of methods close to a lineal Levallois (as in Soucy 3P), and they do not reveal the use of the Levallois concept as a structuring element of the assemblages. It appears later with great intensity, during MIS 8.





**Fig. 9:** Synchronic view of lithic assemblages from the Acheulean. This “mosaic” shows the diversity of lithic industries within Acheulean series in western Europe. With regard to the Acheulean as a single entity, only its variability is obvious.



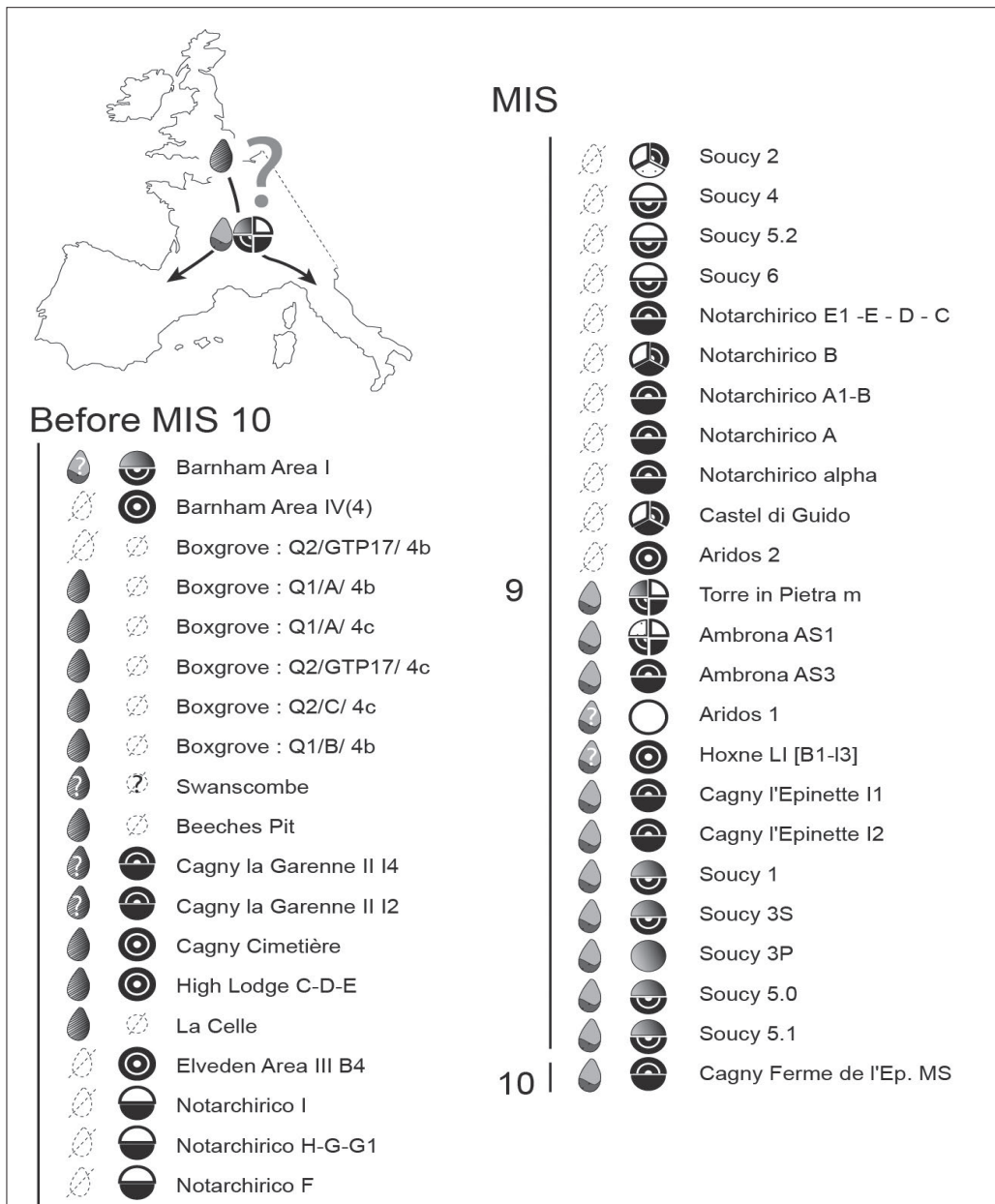
## The diversity of Acheulean Assemblages and Lower Paleolithic Societies

The wide diversity of the industries under study reveals remarkable diversity for the entire Lower Paleolithic. Clearly, the bifacial phenomenon must be seen as a part of this diversity, maybe the more emblematic of the period, but maybe not the more meaningful element, especially since MIS 9. Other industries have been documented in Europe: the small tools from Central Europe (recently described by Rocca 2013) and from the “Taya-cian” (Lumley Woodyear 1969), and the industries made on pebbles called Colombarian (Monnier 1996). Even within the industries called Acheulean we find many examples of artifacts produced without the focus of bifacial shaping.

And when we look closer at the six sites of Soucy and their nine archaeological levels discovered in the 1990s near Paris in the Yonne Valley (Lhomme et al. 2004), we find the indisputable proof for the subcontemporaneity of very different industries (all from MIS 9). Many assemblages are made up of bifacial shaping products, but others reveal no sign of such lithic technology. At Soucy, every Paleolithic settlement has a proper location, near the river channel. The data from Soucy show the potential complexity of subsistence strategies and technical behavior during the middle phase of the Middle Pleistocene (Lhomme 2007).

Indeed, our results show how this complexity appears initially, from a technical point of view. In Western Europe, between MIS 16 and 9, the biface declined, diverging into several technical entities (such as the “biface used as a blank for tools”, the “biface as a tool” and “pebbles/blocks with bifacial removals”). We know of other bifacial conceptions existing outside of Europe (for example, at El Meyrah, Syria; Boëda et al. 2004). The phenomenology of the biface has therefore lost its splendor. It should no longer be regarded as the vector of the Lower Paleolithic of Western Europe. Its symbolic or typological importance must also be reconsidered due to its techno-morpho-functional characteristics. In defining the Acheulean, G. de Mortillet pointed out a particular phenomenon known as the bifacial. Multiple discoveries have revealed that bifaces do not constitute the only industrial manifestation of the Acheulean, a period lasting 1.5 myr in the world. In Europe, in the sites within a clear stratigraphic context, bifaces are even in the minority. Their great visibility (through size and morphology) overshadowed less “aesthetic” industries.

The model often used to explain the origin of bifaces in Europe is the “Out of Africa” theory (see, for example, Freeman 1975; Carbonell and Rodríguez 2006; Rightmire 2011). As bifaces existed in Africa as of 1.7 million years ago (Lepre et al. 2011; Beyene et al. 2013), it seems logical to conclude that they were transported into Europe from Africa. But this model is made on a global scale, without considering important geochronological gaps or the technological component of bifacial industries. This model cannot be contradicted due to the breadth of its chronological and geographical scale and the use of the typological meaning of “biface”. But our results from the European data do not support it. Firstly, the “Acheulean” is not one but the sum of many different industries. Secondly, these manifestations appear in different times and places and cannot be bundled together in one group.



**Fig. 10:** Diachronic view of lithic assemblages from the Acheulean and the hypothesis on the origin and spread of the bifacial phenomenon in Western Europe. Regarding the Acheulean series through time, tendencies appear. The “biface as a blank for tools” mainly occurs in northwestern Europe until MIS 10 whereas the “biface as a tool” appears thereafter everywhere in Western Europe in association with many other tools that did not exist before. This confirms the hypothesis of a dispersal of the biface to the south of Europe near MIS 9. This diffusion is emphasized by a change of the biface structure and by the explosive arrival of new tools.

According to the new technical data provided by our study, we argue for the possibility of an invention of the “biface as a blank for tools” in northwestern Europe during MIS 13 or 11, an immense and perennial period of time (Fig. 10). Little evidence of older bifaces exists before MIS 13, such as at the Arago Cave in Tautavel (Lumley and Barsky 2004). We speak in terms of an invention because it is difficult to see any link with foreign industries. Before MIS 11, there is no biface in Central Europe or in the fluvial terraces of southern Europe (Santonja and Villa 2006). It is also hard to see direct technical links with bifaces from Africa or the Near East. There are also chronological and geographical gaps we cannot ignore. In another period, when the “biface as a tool” appears in Western Europe (MIS 9), there is still no evidence for bifaces in Central Europe. But during MIS 9, this biface is present nearly everywhere in Western Europe.

We clearly see two different conceptions of bifaces in Western Europe; the second one can even be considered as a technical evolution of the first. For that we must accept the idea of technical lineage (Simondon 1958) brought into the study of prehistory by E. Boëda (2013). If we do not accept this idea of a “filiation” between these two kinds of bifaces, we must accept the idea of a diffusion of bifaces outside of Western Europe around MIS 9 (though there is no evidence of such a diffusion); or, we have to consider the idea of a new reinvention of the biface at MIS 9.

We can confirm now that there is neither a standard Acheulean biface, nor a standard Acheulean tool kit, nor a standard Acheulean technology – all things researchers sensed already due to the numerous typological classifications of bifaces, or due to the now obsolete debates concerning the Clactonian vs. the Acheulean. The Acheulean can be defined by its diversity, this being the case since de Mortillet offered an imprecise definition of the term in 1872. If we abandon the cultural label for now, we might try to reinsert the industries inside a geochronological timeframe. The aim of this paper was not to discuss the age given to each site, but we can say that the lack of dating with a stratigraphical control is by far the biggest limitation in our understanding of the dynamics within the Lower Paleolithic. According to the literature, the different assemblages we studied date from MIS 16 to 9 and mainly occur during interglacial periods (MIS 13, 11, 9). “Bifaces used as a blank for tools” mainly appear in the, geologically speaking, Paris Basin (England and Northern France) before MIS 10, whereas the “bifaces as a tool” appear everywhere in Western Europe since MIS 10, becoming common at MIS 9. When changes occur in the bifacial structure, changes occur as well in the rest of the lithic production. We thus propose the hypothesis of a massive dispersal of the biface to the south of Europe near MIS 9.

Instead of diffusion from Africa or the Near East, we prefer to consider (for now) a European invention of the biface, together with a local evolution. However, to confirm one or another model, we need more technical comparisons between Africa and Europe as well as more sites within a clear stratigraphic context and with a reliable age. In Western Europe, there are more Upper Paleolithic caves with paintings than Lower Paleolithic sites with a coherent stratigraphy.

## Conclusion: Escaping the Acheulean paradox by abandoning the Acheulean

The substantial diversity associated with the Western European Acheulean has been described here from a phenomenological standpoint. All of the 36 lithic assemblages studied in France, England, Italy, and Spain provide original and independent samples. Also, the bifacial phenomenon can be separated from other expressions of the Acheulean. The hypothesis of its local invention and evolution is demonstrated through our analysis. From now on, when one creates models to express the diffusion of bifaces and the Acheulean from Africa, it is essential to consider the biface from a technical and structural point of view and the Acheulean with regard to technological meaning. Defining the Acheulean becomes impossible, leaving its fundamental paradox as something immutable: a diversity of technical manifestations has over time been gathered up under the same term, thus minimizing the significance of the term itself. New questions in research and new discoveries over the past 150 years have since made it unintelligible. How can we speak now about a phenomenon that is no longer perceptible?

Dividing the Acheulean period into Marine Isotopic Stages – the smallest universal temporal common denominator – makes it possible to comprehend partially the tangle of industries appearing over this range of time. We see more clearly now within the Acheulean from a technical viewpoint, thanks to a comparison over a long course of time (330,000 years) at a continental scale (Western Europe). Compared to other Paleolithic periods or techno-complexes, numerous questions remain open for the Lower Paleolithic: we know almost nothing about the territories crossed, exploited and inhabited by human groups. We hardly perceive the spatial organisation of the settlements. We still discuss which people occupied the sites in term of species and we are far from defining them with any kind of social meaning. We see the mobility of hominids through the biface, which is frequently depicted as a “travelling” artifact. It can be brought into a site and abandoned, as well as manufactured at the site or reworked there and then taken away. Even if certain actions become perceptible, human behaviors still remain indecipherable.

The differentiation we articulate among bifaces and tool kits should help us describe techno-economic behaviours. The use of the term “Acheulean” has limited our perception of the Lower Paleolithic as a whole. Labels are not essential in answering current questions as they offer little if any information on the origin and the evolution of the bifacial phenomenon in Europe. History has shown us that they are the source of coarse paradigms or models that end up masking the diversity of the phenomenon. We need to focus more precisely on Lower Paleolithic societies (Piperno 1982) whose plurality is already expressed by their technical manifestations.

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