ISSN 0871-2581

TRABALHOS DE ARQUEOLOGIA 45

Ofer Bar-Yosef, João Zilhão, eds.

Towards a definition of the Aurignacian

Proceedings of the Symposium held in Lisbon, Portugal, June 25-30, 2002

Ministério da Cultura
Instituto Português de Arqueologia
American School of Prehistoric Research
Peabody Museum
Harvard University

TRABALHOS DE ARQUEOLOGIA 45
Towards a definition of the Aurignacian

TRABALHOS DE ARQUEOLOGIA 45

Ofer Bar-Yosef, João Zilhão, eds.

Towards a definition of the Aurignacian

Proceedings of the Symposium held in Lisbon, Portugal, June 25-30, 2002

Ministério da Cultura

IPA
Instituto Português de Arqueologia

American School of Prehistoric Research
Peabody Museum
Harvard University

TRABALHOS DE ARQUEOLOGIA; 45

COORDENAÇÃO EDITORIAL
António Marques de Faria

DESIGN GRÁFICO
www.tvmdesigners.pt

FOTOGRAFIA DA CAPA
Copyright Universidade de Tübingen, foto Hilde Jensen

PRÉ-IMPRESSÃO E IMPRESSÃO
Textype, Artes Gráficas, Lda.

TIRAGEM
500 exemplares

Depósito Legal
245 720/06

ISSN 0871-2581

ISBN 972-8662-28-9

Instituto Português de Arqueologia
LISBOA
2006

CONTENTS

Preface

OFER BAR-YOSEF JOÃO ZILHÃO

The idea for having a workshop dedicated to the definition of the Aurignacian emerged when we felt that there were major disagreements among colleagues in recognizing what the "real" Aurignacian is. While not ignoring the disputes concerning the chronology of this "prehistoric culture", and the question of "who made these tools", we felt that the basic criteria for defining an assemblage as "Aurignacian" were not as clear as one would expect after a century of research. An unfortunate development is that the term "Aurignacian", originally suggested by Breuil in 1912, is today associated with the genetically supported hypothesis of the colonization of Europe by modern humans, or Cro-Magnons. The impact of this equation is that research became focused on origins issues, with some viewing the Aurignacian as originating in remote areas, far away from Europe, such as central or western Asia, while alternative interpretations suggest seeing it as the culmination of local, European cultural processes.

During the last decade, increasing numbers of scholars have accepted the notion that the earliest Upper Paleolithic assemblages in Eurasia were found in the Levant, where the ensuing sequence of later industries provides the evidence for continuous occupations of this region. The Initial Upper Paleolithic industries in the Levant are generally characterized by blade production bearing residual morphological attributes of the former Middle Paleolithic, such as facetted striking platforms. However, the main classes of retouched pieces are those that led early twentieth century archaeologists to define the onset of the Upper Paleolithic by stressing the presence of endscrapers and burins. Particular tool types of this region include "chamfered" (à chanfrein) blades and flakes in the northern Levant, and Emireh points mainly in the southern Levant. Early blade industries appear also in eastern Europe (e.g., Bachokirian, Bohunician), and are interpreted by some scholars as marking the expansion of modern humans through the "Danube Corridor". Others see them as autochthonous developments out of local, preceding Middle Paleolithic traditions, akin to the industries with backed pieces and backed points of southern and western Europe (e.g., Uluzzian and Châtelperronian). The latter stratigraphically precede the emergence of the classical Aurignacian, and at least one of them, the Châtelperronian, has been found in association with Neandertal remains.

Historically, "classical" Aurignacian assemblages were recognized as those consisting of bone and antler tools, pendants made from animal teeth and more, together with the proliferation of blades and bladelets, as well as nosed and carinated scrapers, prismatic and some carinated cores. While, in most cases, sites in western, central and even eastern Europe produced the full package of the Aurignacian, with a certain degree of variability mostly among the bone and antler objects, the situation in western Asia and central Asia is different. Scholars searching for the origins of the Aurignacian have picked a limited set of cultural characteristics such as blade and bladelet production, and carinated cores, as the common cultural markers. Classifying carinated cores as scrapers results in increasing confusion; such cores appear in different localities at different times and are just a technique for obtaining bladelets that is not unique to the Aurignacian. Unfortunately, by reducing the

"Aurignacian" package to only a few elements meant that numerous Upper Paleolithic industries across Eurasia could be seen as "Aurignacian". Hence, the term has tended to loose its culturally, territorially useful definition.

At this juncture, we felt that the gathering of colleagues who study the "Aurignacian" cultural phenomenon should be an essential step for clarification. We asked everyone who intended to come to bring some lithic collections so we could achieve a better understanding of the used terminology and learn how and why certain collections were defined as "Aurignacian". We did not expect a full agreement given the different traditions in classification between schools of archaeology, although most participants were either trained in France or knew well the French literature on this subject. The discussions with the artifacts in hand were useful, as was the substantial amount of time allocated to presentations and discussions.

The success of the meeting was to a large extent made possible by the comfortable and well-equipped facilities at the Centro Cultural de Belém, in Lisbon, where we all gathered in June 25-30, 2002; we thank staff and management for their courteous and efficient assistance. We would also like to thank all those who participated in the meeting, as well as those who submitted papers. Unfortunately, for various reasons, it took us longer than expected to complete this volume. The papers collected here are arranged according to conceptual and geographical criteria, first those that deal with general issues of definition, then those that deal with regional studies, from west to east; within each group, an alphabetical order was followed.

We are grateful to Wren Fournier (Peabody Museum, Harvard University), who efficiently and diligently assisted us in organizing the meeting and the collection of the different contributions. Last but not the least, we thank the Instituto Português de Arqueologia for logistical and other support to the organization of the meeting as well as for the publication of its proceedings in the "Trabalhos de Arqueologia" series, and the American School of Prehistoric Research (Peabody Museum, Harvard University), who sponsored the symposium and the publication of this volume.

Defining the Aurignacian

OFER BAR-YOSEF

ABSTRACT The paper discusses several issues pertaining to definitions of "Aurignacian" assemblages. It emphasizes the observation that by widening the definition to include assemblages that do not contain the most basic types of this entity, as originally described and defined (e.g., nosed and carinated scrapers on thick flakes, Dufour bladelets, as well as some bone and antler objects), we introduce confusion into our understanding of the archeological record. Straight and lateral carinated cores for the production of bladelets, which differ from relatively flat frontal carinated scrapers on flakes, appear in the archeological record all along the prehistoric Upper Paleolithic sequence, and thus are not necessarily a particular Aurignacian characteristic. The same applies to bi-point antler objects or pendants made of animal teeth. Two examples, one from the Upper Paleolithic of the Caucasus and the other relating to the Levantine Kebaran entity, illustrate this observation. Therefore, we need clearer and better definitions of the lithic industries which can be achieved through combining the study of operational sequences (*chaîne opératoire*) with the traditional type-lists. Adding to these data plenty of lithic illustrations, we may achieve a greater understanding of the choices and decisions made by the prehistoric artisans. Having this kind of information will facilitate to tackle the currently popular off hand equation of "Aurignacian" with the early dispersal of modern humans into Europe. Moreover, there is a host of Initial Upper Paleolithic industries across Europe which mark the advent of a new population. In spite of the ambiguities involved in the radiocarbon dates from 50-47 through 38-35 kyr BP and especially in their calibration to calendrical dates, it becomes clear that the Initial Upper Paleolithic industries in western Asia and eastern Europe were older than the western European Aurignacian.

The issue of "who made these tools?"

The demise of the Neandertals and the colonization of Europe by modern humans puzzled several generations of anthropologists and archeologists. What is understood today from archeological studies and supported by ancient DNA research as population replacement in Europe and western Asia, is marked by a major cultural change defined as the "transition" from the Middle to the Upper Paleolithic periods. Discoveries of fragmentary or complete human fossils of Neandertals and modern humans, sometimes in dubious geological contexts or through old, poorly controlled excavations brought about debates concerning the relationship between the archeological materials and the fossils, resulting in numerous disagreements (see Zilhão, this volume, for a comprehensive survey).

In order to solve this conundrum we need to have a fresh look at two of the fundamental issues in Early Upper Paleolithic archeology of Eurasia, namely, the stratigraphic evidence and the definition of the "Aurignacian". I propose to treat them separately: (a) summarizing the ambiguities concerning the relationship between the human fossils and their archeological contexts within the Châtelperronian, considered as the first Upper Paleolithic industry in western Europe and originally named the "Lower Aurignacian" (Breuil, 1913), and (b) briefly review the definitions of the "Aurignacian" entity mainly based on its stone tools.

The first point, namely, the Neandertal remains in Châtelperronian contexts, is not an easy issue to deal with because the original finds, the burial from St.-Césaire and the isolated teeth from Grotte du Renne, were not published in detail, although they were exposed some 25-50 years ago, though the latter will be soon published (Hublin, personal communication). Reservations concerning the St. Césaire burial were already raised in the literature (Lucas et al., 2003; Bordes, 1981)

The Neandertal teeth in the Grotte du Renne were recognized as representing these populations by A. Leroi-Gourhan, the excavator. Although the excavations were not conducted according to current field techniques, the information published by B. Schmider and associates (2002), and the summary description provided by H. Movius (1969), who visited the site, make it clear that there are good reasons to suspect admixture of Mousterian age elements within the Châtelperronian contexts (layers X-VIII, from the lower to the upper). The Châtelperronian habitation activities entailed digging into the earlier Mousterian deposits including postholes and hearths, which caused removal and redeposition of Mousterian components within the depositional processes of the later layers. In addition, the earlier layers near the cave walls are often higher then in the central area, thus one may expect a continuous, although reduced, Mousterian contribution from these layers to the later, Châtelperronian deposits in the central area (and see Schmider et al., 2002; Figs. 20-21). Hence, finding most of the ornaments in the early Châtelperronian layer together with the largest number of Neandertal teeth can be interpreted as the result of the newcomers' activities in the cave. They had settled down on top of the Mousterian deposits, produced their own lithic and bone artifacts including ornaments, and at the same time dug into the Mousterian layers below causing the redeposition of the Mousterian material including the Neandertal isolated teeth within the earliest Châtelperronian layer. Worth noting is that nowhere across Europe did late Mousterian contexts contain the same kind of ornaments as found in the Châtelperronian layers of the Grotte du Renne. In addition, these ornaments were made by the same technique as that employed in the production of the Aurignacian ornaments and thus testify for a local regional production tradition that continued through time (d'Errico, in press). In sum, it seems that the Châtelperronians were the ancestors of the Aurignacian and not the late Neandertals.

The second case of doubtful correlation between the human fossil and the supposedly Châtelperronian context is the secondary burial in St.-Césaire. Doubts were first cast because of the different nature of the deposits of the burial area and those of the other parts of the Châtelperronian layer, as described by Gilbaud (1994). An alternative interpretation would be that the secondary burial of this Neandertal was done by his/her group members, who under the pressure of the advancing Châtelperronians flagged the site as their own. We should keep in mind that the two groups were contemporaries and possibly encountered and confronted each other. Inter-group relationships of hunter-gatherers, especially if they belonged to different ethno-linguistic entities (Marlowe, 2005), could have been friendly (eventually leading to interbreeding); they could also ignore each other or they could confront each other resulting in physical conflicts. Hence, as long as we do not have an intact, articulated Neandertal burial in a clear Châtelperronian context, it is quite probable that this prehistoric culture was the product of modern humans.

Generalized Upper Paleolithic terminology

One cannot over-exaggerate the impact of poorly defined cultural markers for industries that are intuitively attributed to the Upper Paleolithic on the continuous misunderstandings concerning the beginning of this period. The worse example is that of the indiscriminate use of the term "Aurignacian" for assemblages far removed typologically from the original definition as coined in western Europe. However, before we delve into this problem, it would be worth considering several general terms often employed in reference to the Middle to Upper Paleolithic transition or the "Upper Paleolithic revolution". These are the terms used in the relative chronological attribution of sites and assemblages across Eurasia. For clarification, I suggest, in the footsteps of other authors, to employ the following three terms accordingly:

Early Upper Paleolithic (EUP) means the period of the first ten or twenty millennia of Upper Paleolithic industries-cum-entities since the end of the Middle Paleolithic. It is a temporal term that has no cultural connotations and may include any prehistoric culture or cultural complex that we believe are dated to this period. EUP entities can be of one age in one region (e.g., the Levant, ca. 45-37 000 BP) or much younger in another area (e.g., the Caucasus region, 35-23 000 BP).

Initial Upper Paleolithic (IUP) means those cultural entities that were formerly considered as "Transitional Industries" and marked the onset of the Upper Paleolithic period through a clear change of the operational sequences (e.g., Marks, 1990; Kuhn et al., 1999; Goring-Morris and Belfer-Cohen, 2003).

Transitional Industry means an industry or industries that we consider as marking the observable change from the Mousterian lithic technology to one or more of the Upper Paleolithic entities. In the Levant it was used to designate the industries of Boker Tachtit, Emireh cave, Ksar Akil layers XXV- XXI (e.g., Copeland, 1975; Marks, 1983; Garrod, 1951, 1957; Bourguignon, 1998; Belfer-Cohen and Goring-Morris, 2003; Fox, 2003; Kuhn, 2003; Goring-Morris and Belfer-Cohen, this volume). The question which remains open is whether there were several cases of "Transitional Industries" or only one or two that marked the change within a particular Middle Paleolithic population that became the forefathers of the Upper Paleolithic people. Perhaps, in view of the ambiguities that accumulated through the use of this term in the last three or four decades, it would be advisable to use the IUP term as that which implies the dated earliest cultural change.

The definition of the Aurignacian

The historical review of the original definition of the Aurignacian in western Europe is provided by several authors in the present volume (cf. also Bon, 2002; Conard and Bolus, 2003; Bordes, 2003) and, previously, in general volumes on prehistory (e.g., Bordes, 1968; Taborin, 1992; Djindjian et al., 1999). Whether we take the definition of the "Early Aurignacian" or of the "Recent Aurignacian", we find commonalities as described in the papers mentioned above. Similar operational sequences were responsible for the production of bladelets with different forms of what we normally classify as cores. Some are "carinated scrapers" on thick flakes where the bladelets were removed from the thickness of the flake creating "narrow carinated scrapers". When the bladelet removal from a flake is limited by a retouched notch it is known as a "busked burin". Bladelets detached from "cores" that are known as "carinated (keeled) scrapers" (*grattoir caréné surélevé*) were named already by Bourlon and Bouyssonie (1912) as *grattoirs nucléiformes* and *rabots*. Hence, it seems that the aim of the artisans was to obtain short, curved and twisted bladelets, which in part were later retouched to become the Dufour bladelets, or "inversely retouched bladelets". At the same time there were also regular (i.e., not exhausted cores) carinated and nosed scrapers, where the front is shaped through flaking of shorter mini-flakes and sometime bladelets; endscrapers on blades and flakes, Aurignacian blades, and in particular areas, mostly in central Europe through the Levant, also Font-Yves, or Krems, or el-Wad points on blades/bladelets of various sizes.

The Aurignacian features rich assemblages of teeth, bone, antler and ivory items modified to serve as body ornaments, tools, and imagery objects. The challenge, as mentioned by Marks (2003), is to identify the Aurignacian solely through its lithic component in sites where preservation of organic material is rather poor. In this case, certain loess contexts are not much different from the semi-arid areas of western Asia. Apparently, this is possible, as, for example, a classical "Aurignacian" assemblage was identified in Stránská skála (Svoboda and Bar-Yosef, 2003). Hence, one could have an almost full suite of lithic tools and debitage products in an open air site that would make its assemblage comparable to cave contexts. Not surprisingly, the cases of "Aurignacoid" assemblages described from the Negev and similar arid areas in Jordan on the basis of the proliferation of scrapers (mostly lateral ones, some of which are made on thick flakes) and were called Levantine Aurignacian, are not considered anymore as belonging to the Aurignacian culture (Belfer-Cohen and Goring-Morris, 2003). Yet, clearly classic Aurignacian assemblages were reported from Kebara, el-Wad, Hayonim and Yabrud III cave sites and perhaps should be called simply Aurignacian without the "Levantine" prefix (Belfer-Cohen and Bar-Yosef, 1981, 1999; Goring-Morris and Belfer-Cohen, this volume). If we retain the "Levantine", then we should be systematic and have similar geographic subdivisions in other parts of Eurasia where the Aurignacian is well recorded.

The most basic confusion of the Aurignacian with other industries does not only stem from the mere absence of bone or antler tools but primarily from the use of carinated cores by other groups of people in different times. As mentioned above, these carinated cores represent a particular reduction sequence for obtaining narrow bladelets, a technique employed by a host of late Upper Paleolithic entities in western Asia. One of the best illustrative cases is recorded in the caves of the southern slopes of the Caucasus. In the excavation of Dzudzuana cave (Meshveliani et al., 2004), the industry rich in carinated cores was dated by seven readings to 23-20 kyr BP (uncalibrated). Directly dated bone and antler tools from other Georgian sites, thought to be Aurignacian, provided similar readings (Nioradze and Otte, 2000). Needless to mention that most of the bladelets, shaped from the laminar blanks obtained from the carinated cores, cannot be classified as Dufour bladelets. In addition, none of the other Aurignacian tool-types, like nosed scrapers and Aurignacian blades, are present in these assemblages.

Another case where carinated cores were the basic source for bladelets is the Kebaran assemblages from sites such as Ein Gev I (Jordan Valley, Israel). We can note the absence of nosed scrapers, el-Wad points, and inversely retouched bladelets. Instead, the dominant microlithic types are finely retouched curved bladelets, obliquely truncated backed bladelets (known also as Kebara points), along with mostly flat endscrapers and various types of burins (apart from the "narrow carinated types" on the flake's thickness). The dates for this industry are 18-14.5 kyr BP (uncalibrated). It is not surprising that in the first report on this site (Stekelis and Bar-Yosef, 1965) we referred to the presence of the carinated cores as an "Aurignacoid" character. This, of course, was done because both Stekelis and I employed the French terminology. The use of this comparison with the French Aurignacian *rabot*, in the absence of radiometric dates in those days, had the implicit connotation of indicating a degree of relatedness between the industries.

In sum, a minimal number of lithic characteristics such as nosed scrapers, carinated scrapers on thick flakes from which often small twisted bladelets were removed (known as *lamelle Dufour*), regular carinated scrapers on flat flakes, as well as, where preservation is fine, the presence of bone and antler objects (e.g., split-based points), characterize the original Aurignacian culture which emerged around 36.5 kyr BP (Zilhão and d'Errico, 1999), and clearly developed, in my view, from local west European IUP industries (see also Bon and Bordes, this volume).

Discussion

There is a growing awareness among scholars that the IUP in southwestern Asia is earlier than in Europe, although additional radiocarbon and TL dates are needed. The makers of these assemblages focused on the production of blade blanks demonstrating that their technical attributes originated in particular Mousterian knapping techniques (Marks, 1983; Marks and Ferring, 1988; Fox, 2003; Tostevin, 2003; Monigal, 2003; Meignen and Bar-Yosef, 2000). The best recorded assemblages are found in the Levant (e.g., Boker Tachtit and Ksar 'Akil). The next cultural change is the entity called the Ahmarian. Although the exact time that passed since the IUP and the fully blade industry is unknown (but could have been just a couple of millennia), the classical Upper Paleolithic appearance of this industry is evident (e.g., Monigal, 2003; Belfer-Cohen and Goring-Morris, 2003). Not surprisingly, European scholars now suggest that the early blade industries of this continent emerged from the Ahmarian (e.g., Koz owski, 2004).

Similar blade industries in Bulgaria (Temnata and Bacho Kiro caves), and the Czech Republic (Stránská skála), indicate the route of the Cro-Magnon expansion through the Danube Corridor (Koz owski, 20004; Teyssandier, 2005; Teyssandier and Liolios, 2003; Conard and Bolus, 2003). As the first IUP, real "Transitional Industry" emerged from the Mousterian, and if the bearers of these tool-kits dispersed rapidly, their lithics may resemble on several instances the local late Mousterian leading to erroneous conclusions about "local cultural continuity". However, there are some good examples when the local Mousterian is very different from the industry of the newcomers. Such is the Bohunician, whose knapping technique differs entirely from local Mousterian tool production. I suspect that when further examinations will be conducted as regards other IUP European entities, they will produce similar results, in particular when natural mixing in stratified sites of Middle and Upper Paleolithic deposits will be clarified (e.g., Bordes, 2003). Another case of lack of relationship between the Late Mousterian and the Early Upper Paleolithic is observed on both the northern and southern slopes of the Caucasus, where the first Upper Paleolithic assemblages overlaying the Mousterian date to 34-33 kyr BP. These UP assemblages are dominated by tool forms comprising retouched bladelets, small endscrapers and bone tools (Meshveliani et al., 2004).

The overall cultural differences between the Middle and Upper Paleolithic contexts are visible in the observed rate of change in lithic assemblages. Archeologists have paid little attention to the reasons for the retention of stereotyped knapping techniques among Middle Paleolithic populations. The use of the same one or two methods for shaping blanks and the retention of the same or similar tool forms over a period of 100 000 to 40 000 years seems to reflect a high degree of technological and, by extension, social conservatism. The change during the Upper Paleolithic is clearly evident. All across Eurasia, modern human groups are characterized by faster shifts in shaping their stone tools, and a greater geographic range of typological variability. This may signify the appearance of individual ethno-linguistic cultures in well defined territories, in contrast to the large regions where Middle Paleolithic tool-kits characterized both the Neandertals and the archaic modern humans (i.e., the Skhul-Qafzeh group).

From a survey of the relevant literature, it seems that what we miss today in prehistoric research is not theoretical approaches but well-defined and justifiable terminology. No one doubts that the research of prehistoric periods began in western Europe. Therefore, most of the common terminologies were created by European scholars and carried over into other parts of the Old World, either by European-trained archeologists who worked in Asia and North Africa or through the available literature. Only in regions remote from western Europe did local archeologists create their own terminology. One example is South Africa, where the term Middle Stone Age (MSA) was originally an English translation of Middle Paleolithic (MP), the latter coined after the scholarly tradition of using Greek words, and now is widely used in the sub-Saharan African literature.

Justifiably, the Aurignacian assemblages of western Europe received considerable attention due to the wealth of mobiliary art, elaborate bone, antler and ivory industries, and the earliest cave art (e.g., Conard and Bolus, this volume). It was and still is erroneously considered, as mentioned above, to have been the first culture of modern humans, and scholars are searching its origin in the east parts of the ancient world (western Asia and beyond). It would be advisable to keep the two aspects separated, namely, the definition of the industry and its chronological range should be unrelated to the issue of which particular human population was its carrier. We first need to agree about what assemblages we can call "Aurignacian" and what are the names to be given to other entities. By keeping the definition of an entity or culture to a cluster of sites within a given geographic space and time, we get closer to identify an ethno-linguistic group of past hunter-gatherers. The current aim of Middle and Upper Paleolithic archeology is not only to uncover past behaviors of human populations and their particular adaptations to the environment, but also the tracing of their idiosyncratic, dynamic histories.

REFERENCES

BAR-YOSEF, O. (2000) - The Middle and early Upper Palaeolithic in southwest Asia and neighboring regions. In BAR-YOSEF, O.; PILBEAM, D., eds. - *The geography of Neandertals and modern humans in Europe and the Greater Mediterranean*. Cambridge, MA: Peabody Museum-Harvard University, p. 107-156.

BELFER-COHEN, A.; BAR-YOSEF, O. (1981) - The Aurignacian at Hayonim Cave. *Paléorient*. Paris. 7:2, p. 19-42.

BELFER-COHEN, A.; BAR-YOSEF, O. (1999) - The Levantine Aurignacian: 60 years of research. In DAVIES, W.; CHARLES, R., eds. - *Dorothy Garrod and the progress of the Palaeolithic: studies in the prehistoric archaeology of the Near East and Europe*. Oxford: Oxbow, p. 118-134.

BELFER-COHEN, A.; GORING-MORRIS, A. N. (2003) - Current issues in Levantine Upper Palaeolithic research. In GORING-MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow, p. 1-12.

BON, F. (2002) - *L'Aurignacien entre mer et océan: réflexion sur l'unité des phases anciennes de l'Aurignacien dans le Sud de la France*. Paris: Société Préhistorique Française (Mémoire de la Société Préhistorique Française; 29).

BORDES, F. (1968) - *The Old Stone Age*. New York, NY: McGraw Hill.

BORDES, F. (1981) - Un néandertalien encombrant. *La Recherche*. Paris. 122, p. 644-645.

BORDES, J.-G. (2003) - Châtelperronian/Aurignacian interstratifications at Roc-de-Combe and Le Piage (Lot, France): lithic taphonomy, stratigraphic re-evaluation and archaeological implications. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 223-244.

BOURGUIGNON, L. (1998) - Les industries du Paléolithique intermédiaire d'Umm el Tlel. Nouveaux éléments pour le passage entre Paléolithique moyen et supérieur dans le Bassin d'El Khowm. In OTTE, M., ed. - *Préhistoire d'Anatolie. Genèse de deux mondes. Actes du colloque international de Liège, 28 avril-3 mai 1997*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 85), p. 709-730.

BOURLON, M.; BOUYSSONIE, J.; BOUYSSONIE, A. (1912) - Grattoirs carénés, rabots et grattoirs nucléiformes: essai de classification des grattoirs. *Revue Anthropologique*. Paris. 22, p. 473-486.

BREUIL, H. (1913) - Les subdivisions du Paléolithique supérieur et leur signification. In *Congrès International d'Anthropologie et d'Archéologie préhistoriques. Compte-rendu de la 14ème session, Genève 1912*. 1, p. 165-238.

CONARD, N. J.; BOLUS, M. (2003) - Radiocarbon dating the appearance of modern humans and timing of cultural innovations in Europe: new results and new challenges. *Journal of Human Evolution*. London. 44, p. 331-371.

COPELAND, L. (1975) - The Middle and Upper Palaeolithic of Lebanon and Syria in the light of recent research. In WENDORF, F.; MARKS, A. E., eds. - *Problems in Prehistory: North Africa and the Levant*. Dallas: TX: Southern Methodist University Press, p. 317-350.

D'ERRICO, F.; VANHAEREN, M. (in press) - Evolution or revolution? New evidence for the origin of symbolic behavior in Africa and Europe. Paper presented at the symposium "*Rethinking the human revolution: New behavioural and biological perspectives on the origins and dispersals of Modern humans*". Cambridge, 7-11 September 2005.

DJINDJIAN, F.; KOZŁOWSKI, J. K.; OTTE, M. (1999) - *Le Paléolithique supérieur en Europe*. Paris: Armand Colin.

FOX, J. R. (2003) - The Tor Sadaf lithic assemblages: a technological study of the Early Upper Palaeolithic in the Wadi al-Hasa. In GORING-MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow, p. 80-94.

GARROD, D. A. E. (1951) - A transitional industry from the base of the Upper Palaeolithic in Palestine and Syria. *Journal of the Royal Anthropological Institute*. London. 81, p. 121-132.

GARROD, D. A. E. (1957) - Notes sur le Paléolithique supérieur du Moyen Orient. *Bulletin de la Société Préhistorique Française*. Paris. 55, p. 239-445.

GORING-MORRIS, A. N.; BELFER-COHEN, A., eds. (2003) - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow.

KOZŁOWSKI, J. K. (2004) - Early Upper Palaeolithic Levallois derived industries in the Balkans and the middle Danube basin. *Anthropologie*. Brno. 42, p. 263-280.

KUHN, S. L. (2003) - In what sense is the Levantine Initial Upper Paleolithic a "transitional industry". In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 61-70.

KUHN, S. L.; STINER, M. C.; GÜLEÇ, E. (1999) - Initial Upper Palaeolithic in south-central Turkey and its regional context: a preliminary report. *Antiquity*. Cambridge. 73, p. 505-517.

LUCAS, G.; RIGAUD, J.-Ph.; SIMEK, J.; SORESSI, M. (2003) - The Châtelperronian of Grotte XVI, Cénac-et-Saint-Julien (Dordogne, France). In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 289-298.

MARKS, A. E. (1983) - The sites of Boqer Tachtit and Boqer: a brief introduction. In MARKS, A. E., ed. - *Prehistory and paleoenvironments in the Central Negev, Israel, vol. III. The Avdat/Aqev Area, Part 3*. Dallas, TX: Southern Methodist University Press, p. 15-37.

MARKS, A. E. (1990) - The Upper and Middle Paleolithic of the Near East and the Nile valley: the problem of cultural transformations. In MELLARS, P. A., ed. - *The emergence of modern humans: an archaeological perspective*. Edinburgh: University of Edinburgh Press, p. 56-80.

MARKS, A. E. (2003) - Reflections on Levantine Upper Palaeolithic Studies: past and present. In GORING-MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow, p. 249-264.

MARKS, A. E.; FERRING, C. R. (1988) - The early Upper Paleolithic of the Levant. In HOFFECKER, J. F.; WOLF, C. A., eds. - *The Early Upper Paleolithic: evidence from Europe and the Near East*. Oxford: British Archaeological Reports (BAR International Series; 437), p. 43-72.

MARLOWE, F. (2005) - Hunter-gatherers and human evolution. *Evolutionary Anthropology*. New York, NY. 14, p. 54-67.

MEIGNEN, L.; BAR-YOSEF, O. (2002) - The lithic industries of the Middle and Upper Paleolithic of the Levant: continuity or break? *Archaeology, Ethnology & Anthropology of Eurasia*. Novosibirsk. 3, p. 12-21.

MESHVELIANI, T.; BAR-YOSEF, O.; BELFER-COHEN, A. (2004). - The Upper Paleolithic of Western Georgia. In BRANTIGHAM, P. J.; KUHN, S. L.; KERRY, K.W., eds.- *The Early Upper Paleolithic beyond Western Europe*. Berkeley, CA: University of California Press, p. 129-143.

MONIGAL, K. (2003) - Technology, economy, and mobility at the beginning of the Levantine Upper Palaeolithic. In GORING--MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow, p. 118-133.

MOVIUS, H. L. (1969) - The Chatelperronian in French archaeology: the evidence of Arcy-sur-Cure. *Antiquity*. Cambridge. 43, p. 111-123.

NIORADZE, M.; OTTE, M. (2000) - Paléolithique supérieur de Géorgie. *L'Anthropologie*. Paris. 104, p. 265-300.

SCHMIDER, B., ed. (2002) - *L'Aurignacien de la Grotte du Renne: les fouilles d'André Leroi-Gourhan à Arcy-sur-Cure (Yonne)*. Paris: Centre National de la Recherche Scientifique (*Gallia Préhistoire*. Supplément; 34).

STEKELIS, M.; BAR-YOSEF, O. (1965) - Un habitat du Paléolithique supérieur a Ein Gev (Israel). *L'Anthropologie*. Paris. 69, p. 176-184.

SVOBODA, J.; BAR-YOSEF, O., eds. (2003) - *Stránská skála. Origins of the Upper Paleolithic in the Brno Basin, Moravia, Czech Republic*. Cambridge, MA: Harvard University Press.

TEYSSANDIER, N. (2005) - Résumé de thèse: les débuts de l'Aurignacien en Europe. Discussion à partir des sites de Geißenklösterle, Willendorf II, Krems-Hundssteig et Bacho Kiro. Thèse de doctorat, Université de Paris X-Nanterre. *Bulletin de la Société Préhistorique Française*. Paris. 102, p. 211-220.

TEYSSANDIER, N.; LIOLIOS, D. (2003) - Defining the earliest Aurignacian in the Swabian Alp: the relevance of the technological study of the Geißenklösterle (Baden-Würtenberg, Germany) lithic and organic productions. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 179-196.

TOSTEVIN, G. B. (2003) - A quest for antecedents: a comparison of the Terminal Middle Palaeolithic and Early Upper Palaeolithic of the Levant. In GORING-MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow, p. 54-67.

ZILHÃO, J.; D'ERRICO, F. (1999) - The chronology and taphonomy of the earliest Aurignacian and its implications for the understanding of Neanderthal extinction. *Journal of World Prehistory*. New York, NY. 13:1, p. 1-68.

A dynamic view of Aurignacian technology

JANUSZ K. KOZŁOWSKI

ABSTRACT The technological analysis of blank production in Balkan EUP sites (Bacho Kiro and Temnata caves) points to the stability of blade technology from the Pre-Aurignacian (>40 kyr BP) until the Typical Aurignacian (35-28 kyr BP). At the same time the analysis of blank production techniques in different regions of Europe (Poland, France) indicates similarities with the Balkan Aurignacian.

Introduction

The subject of the recent discussion on the origin of the Aurignacian has been the question whether the Early Upper Paleolithic assemblages that occur in the Balkans — described as the Bachokirian (Kozłowski, 1979, 1982) — can be regarded as an early stage of the Aurignacian proper in the same sense as the notion of the Pre-Aurignacian (Kozłowski and Otte, 2000). Such a hypothesis has been recently opposed by J.-Ph. Rigaud (2001, p. 66) and G. Lucas (2000) who argue that in comparison with the western European Aurignacian the Balkan Early Upper Paleolithic industries do not exhibit any features that "define the European Aurignacian". In a paper published in the book commemorating Dorothy Garrod I attempted (Kozłowski, 1999), on the basis of the typology of assemblages from layers 9, 8, 7/6b, 7, 6a/7 from Bacho Kiro cave and from trench I and V from the Temnata cave, to show that 1) these assemblages have an almost complete set of tool forms typical for the classical Western European Aurignacian, and 2) that there is a continuity between the assemblages from layer 11 at Bacho Kiro cave and layer 4 in the Temnata cave and further evolution of the assemblages that are already Aurignacian from the same sites.

In the Balkan sequences the continuity from the hypothetical Pre-Aurignacian to the Typical Aurignacian could be compared to similar sequences at the Middle Danube sites (Willendorf II, Geißenklösterle — Hahn, 1988). The objective of this paper is to show the technological evolution in the Balkan sequences, and to compare the Early Upper Paleolithic (Pre-Aurignacian) technologies in the Balkans with the technologies of the classical Aurignacian in Europe.

We can agree with J.-Ph. Rigaud's suggestion that the industry from layer 11 of Bacho Kiro cave, although it remains very distinctly Upper Paleolithic "is not without affinities with the Initial Upper Paleolithic of the Near East" (Rigaud, 2001, p. 66). In the sphere of technology the industries of the Initial Upper Paleolithic in the Near East such as the Ahmarian and/or the Emiran are characterized by the occurrence of the specific opposed platform Levallois point strategy which is basically unknown in western Europe (Marks and Ferring, 1988) but appears at the beginning of the Initial Upper Palaeolithic sequence in the Temnata cave, trench II, layer VI. Even if in the latest phase of the Ahmarian this strategy becomes replaced by the blade strategy of a single platform core, yet the Levallois tradition can still be seen in the blank forms and technical features. In respect to the typology the Ahmarian is dominated by the Levallois-like points (40-50%), while denticulated and notched tools are

	BACHO KIRO			TEMNATA		
	Layer	Date	Industry	Sector/Layer	Date	Industry
30	Base 6a	C-14 (bone 29150±950 (Ly-1102)	Typical Aurignacian			A U R I G N A C I A N
	Base 7	AMS (charcoal) 32200±780 (OxA-3181)	Typical Aurignacian	TD-V – 3g	>31500 (Gd-4595)	
				TD-V – 3h	>32200 (Gd-4693)	
	Base 6b	AMS (bone) 32700±300	Typical Aurignacian	TD-V – 3i		
	6b/8	AMS (charcoal) 33300±820 (OxA-3182)	?	TD-I 4 (top)	C-14 (charcoal) 31900±1600 (Gd-2354)	
	8	-	Aurignacian with Mladeč point			
	6c	-	?	TD-V – 4	AMS (charcoal) 33000±900 (OxA-5174)	
35	9	-	Aurignacian with split-based point			
				TD-V – 4	AMS (charcoal) 36900±1300 (OxA-5173)	
	11/I	AMS (bone) 34800±1150				
			Final Bachokirian			
		AMS (charcoal) 37650±1450 (OxA-3183)				
				TD-V – 4	AMS (charcoal) 38300±1800 (OxA-5172)	
				TD-I 4 (middle)	AMS (charcoal) 38200±1500 (OxA-5171) 38800±1700 (OxA-5170) 39100±1800 (OxA-5160)	EUP Unit B
40	11/III	AMS (charcoal) 38500±1150 (OxA-3213)	Bachokirian			
45	11/IV	C-14 (charcoal) >43000 (GrN-7545)	Bachokirian			
				TD-I 4 (base)	45000±7000 (GdTL-256) 46000±8000 (GdTL-255)	EUP Unit C

FIG. 1 – Correlation of stratigraphic sequences from Bacho Kiro and Temnata caves.

next, followed by endscrapers, burins and tools with lateral retouch. The presence of a large number of micro-retouched pointed bladelets at some Ahmarian sites causes that the Ahmarian is closer to the Mediterranean Proto-Aurignacian than to the Balkan Bachokirian (Pre-Aurignacian).

To present the development of blank production technology, we have selected several sites situated in different parts of Europe. For SE Europe the sequence of three levels in the Temnata cave (within lithostratigraphical unit 4, trench TD-I) was chosen (Drobniewicz et al., 2000). The sequence shows the formation of the basic morphology of Aurignacian lithic tools. Another example, from a more northern sphere of the diffusion of the Typical Aurignacian, is the site of Kraków-Zwierzyniec I, sector 3–4, layer 12 (Sachse-Kozłowska, 1982). Western Europe is exemplified by the site of Barbas in Dordogne (Teyssandier, 2000), and Mediterranean Europe by the Proto-Aurignacian site from the Fumane cave in northern Italy (Bartolomei et al., 1992).

The chronological position of these assemblages is determined by the following dates:

1. In Temnata cave, the lowest culture level C in layer 4 has been dated only by TL to 45 000±7000 BP (GdTl-256), level B has given AMS dates from 39 100±1800 BP (OxA--5169) to 38 200±1500 BP (OxA-5172), and level A is delimited by the dates of 36 900±1300 (OxA-5173) to 31 900±1600 (Gd-2354) (Fig. 1).
2. The dating of the site of Kraków-Zwierzyniec, layer 12 has been based on the similar chronostratigraphic position of layer 4 at Kraków-Spadzista A (unfortunately a very poor site, but Aurignacian too) which provided a ^{14}C date of 31 000±2000 BP (Kozłowski and Kozłowski, 1996).
3. The Aurignacian level at the site of Barbas is later than the date of 38 300±500 BP for the Mousterian level stratified below, and later than the site's Châtelperronian level, for which there is no absolute dating. We have chosen this site because its publication offers a thorough reconstruction of blade technology based on large quantities of cores and debitage products on the site.
4. The site of Fumane has been dated by a large number of AMS determinations ranging between 37 and 30 kyr BP. However, the most likely seems the interval between 33 and 31 kyr BP.

The evolution of chaînes opératoires in Temnata cave

Level C in layer 4 yielded only seven cores: these are residual cores, strongly exhausted, single-platform blade and blade-flake specimens, without traces of preparation (Fig. 2, nos. 1-2). One core is on a thick flake. The small number of cores does not allow us to reconstruct the *chaîne opératoire*, but taking into account the structure of these cores we can say that they are the outcome of a single *chaîne opératoire* whose objective, initially, had been blade production, and in the final phase of exploitation the production of blades and flakes. In the early phase of reduction the platform was shaped by a single-blow, subsequently blades were detached from the broad face of a flint nodule, gradually extending the flaking surface onto the narrower sides. When we take into account the occurrence of a variety of blade types (including large specimens with straight profiles, up to even 12 cm long) we can see that they may have come from other *chaînes opératoires* that had been realized off site (Fig. 2, nos. 3-6). Such blades could have been brought as finished products, a possibility that is confirmed by the comparison of the raw-material structure of blades and cores.

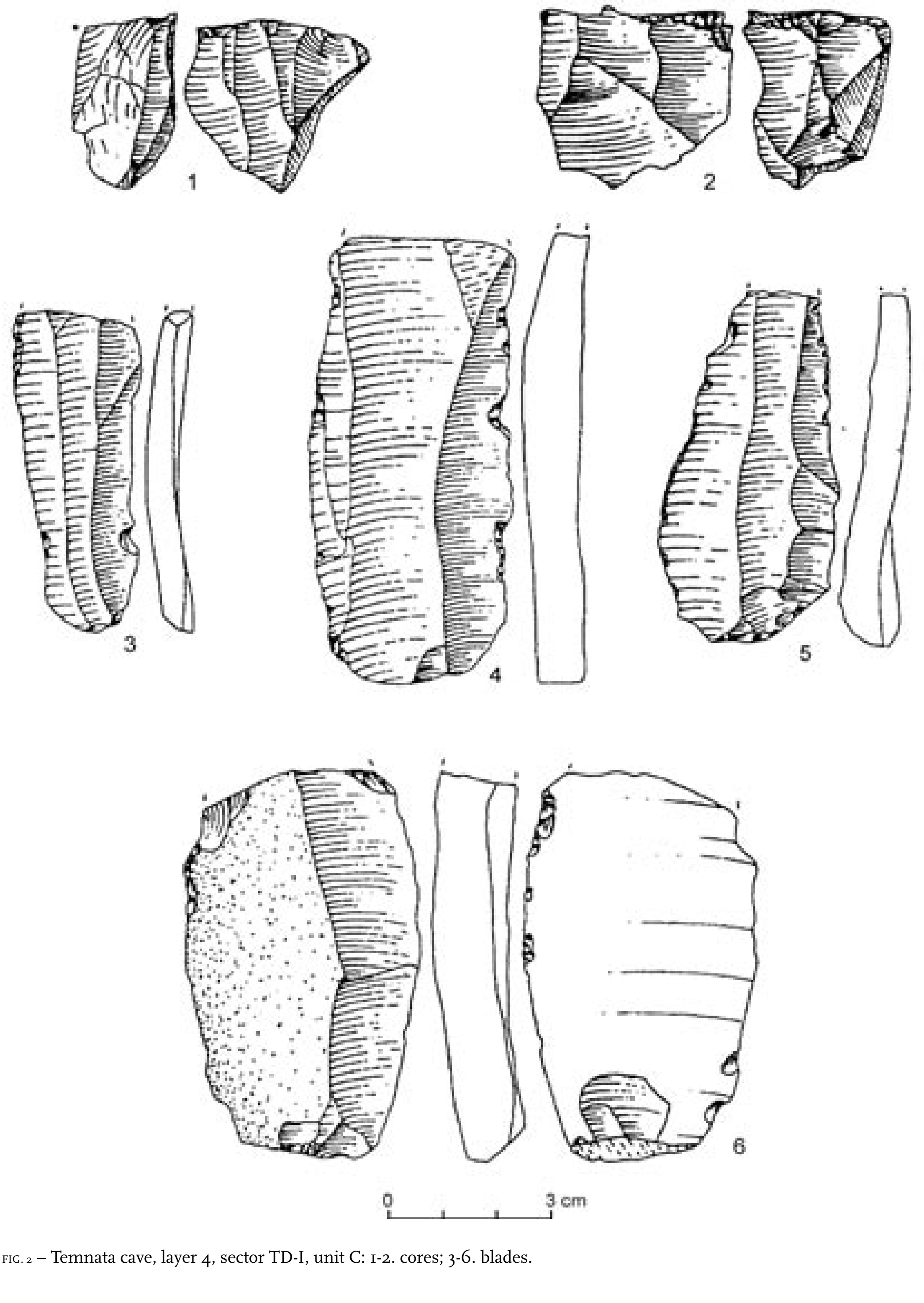

FIG. 2 – Temnata cave, layer 4, sector TD-I, unit C: 1-2. cores; 3-6. blades.

In level B, where the Aurignacian tool typology is restricted to only nosed endscrapers and retouched blades with multiseriate retouch, cores are more numerous (20 specimens). These cores document divergent reduction sequences, especially in the advanced phase (Fig. 3). In the preliminary stage most cores exhibit platform shaping and postero-lateral crests. At first, the preparation was limited to broad surfaces from which flaking faces were extended onto a side (one or two sides), and, consequently, one or two lateral crests were detached (Fig. 4, nos. 2-3). As reduction was continued neo-crests were sometimes formed. Another reduction method was the shaping of postero-mesial and antero-mesial crests in the preliminary stage. The result of this procedure was that already in the early phase of reduction narrow and convex flaking surfaces were formed which gave narrower blades (Fig. 4, nos. 4-5). The flaking surfaces were corrected by shaping opposed platforms from which blades were successively detached. In the case of double platform cores the flaking surface, formed by blades detached from the opposed platform, twisted onto the core side. The cores side could have been first prepared by a postero-lateral crest (Fig. 4, no. 8).

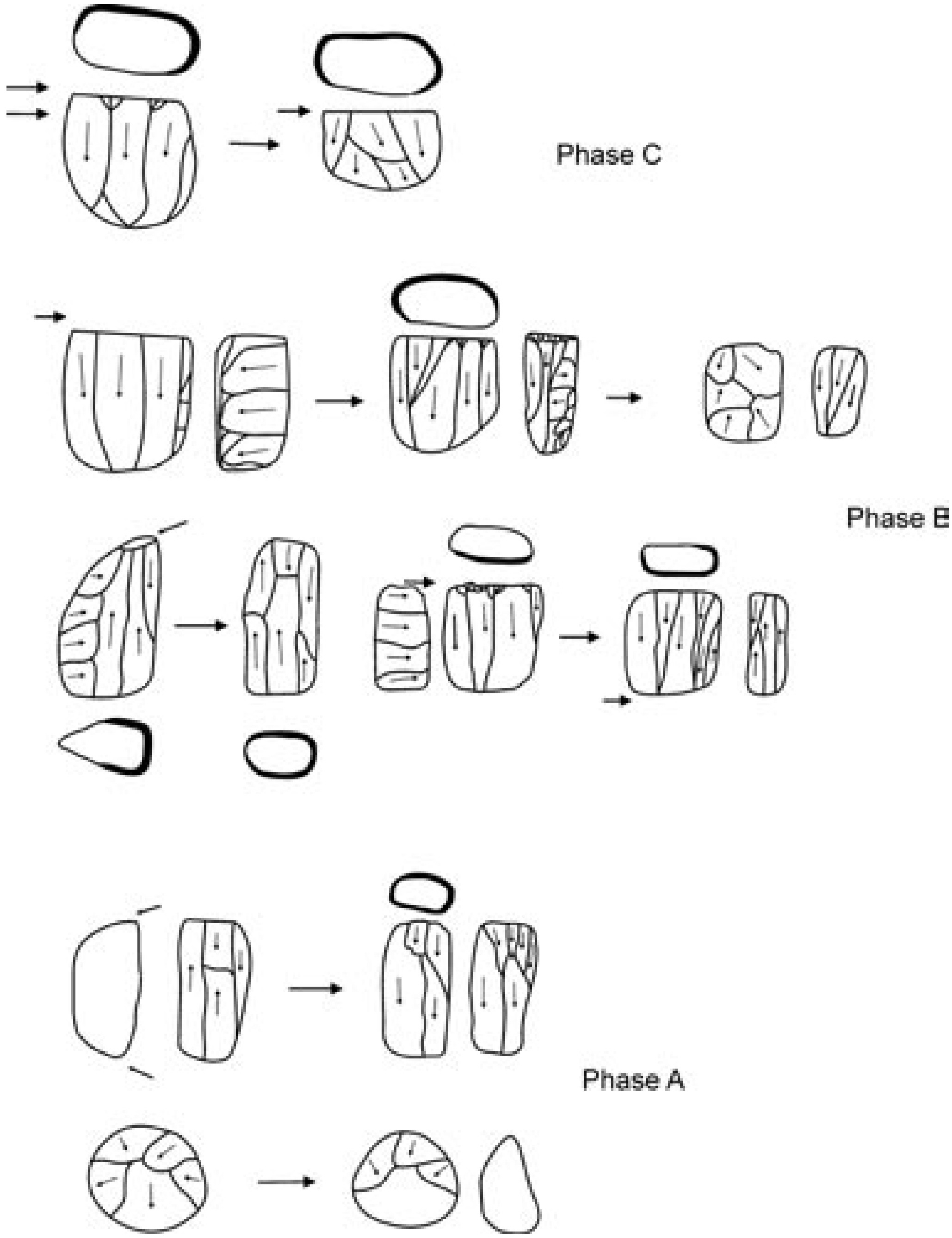

FIG. 3 – Temnata cave, layer 4, sector TD-I. Core reduction sequences in particular units.

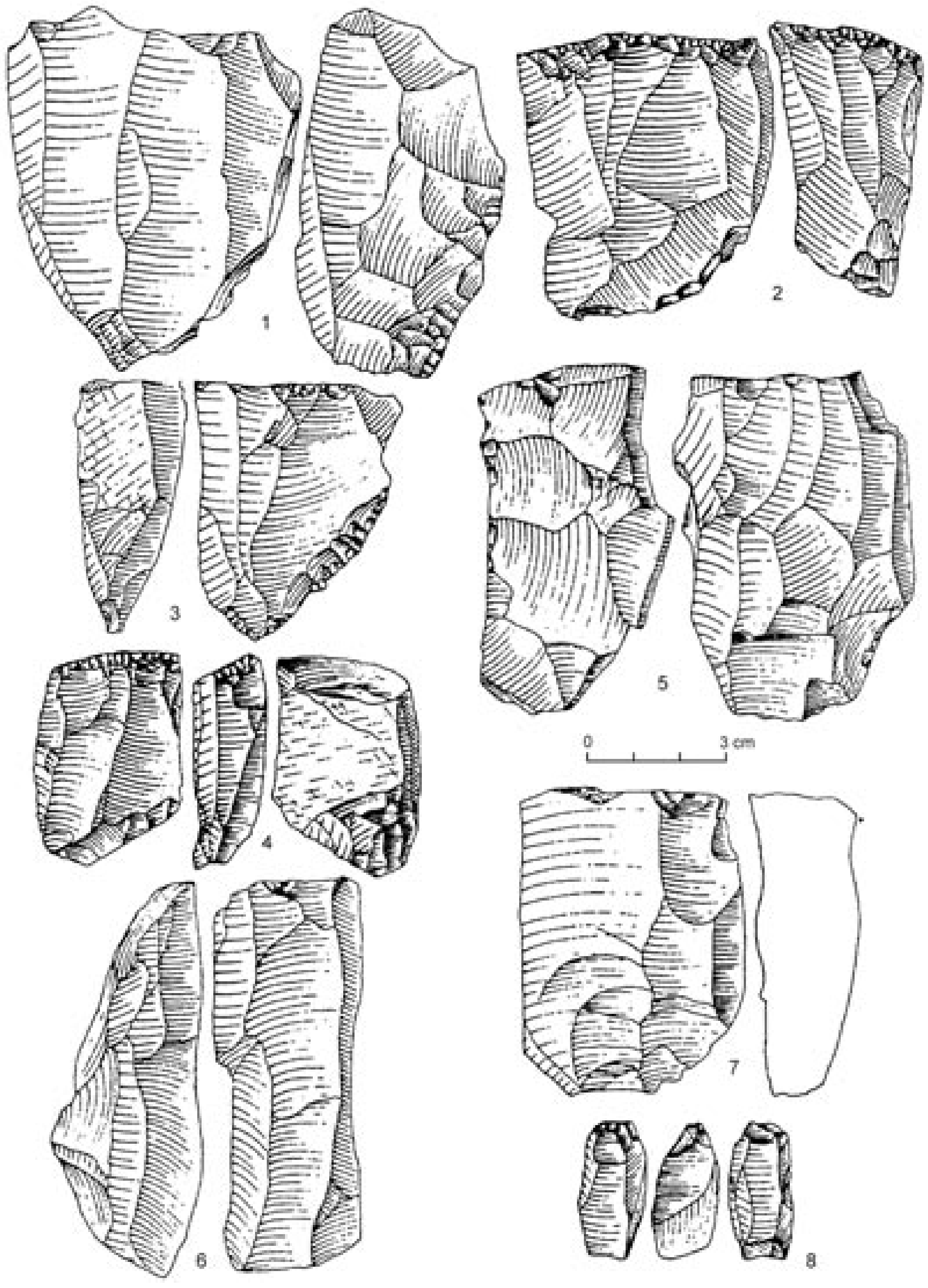

FIG. 4 – Temnata cave, layer 4, sector TD-I, unit B: 1-8. cores.

Level A yielded a complete tool-kit characterized by Aurignacian morphology, comprising carenoidal and nosed scrapers, retouched blades of *appointé* type with stepped retouch. Aurignacian scrapers account for 20% of all endscrapers, which are more numerous than burins (the IG:IB ratio varies between 28.4 and 54.8) and nearly equal in number to tools with lateral retouch. In level A, two *chaînes opératoires*, similar to those in Phase B, can be seen, with a tendency towards a much strongly rounded flaking face on the side until, in the advanced phase of reduction, subconical and subcylindrical cores were shaped (Fig. 5, nos. 1-2). However, we did not record the shaping of neo-crests. Double-platform cores are known in the two sequences as an advanced phase in which, sequentially, first one and then the other platform were used (Fig. 5, nos. 3-4). Alternate detachment of blades from both platforms does not occur. In level A, a third *chaîne opératoire* appears which produced flakes from discoidal cores, possibly multiplatform flake cores (Fig. 5, nos. 5-6). The latter cores could be the final stage of double-platform cores reduction.

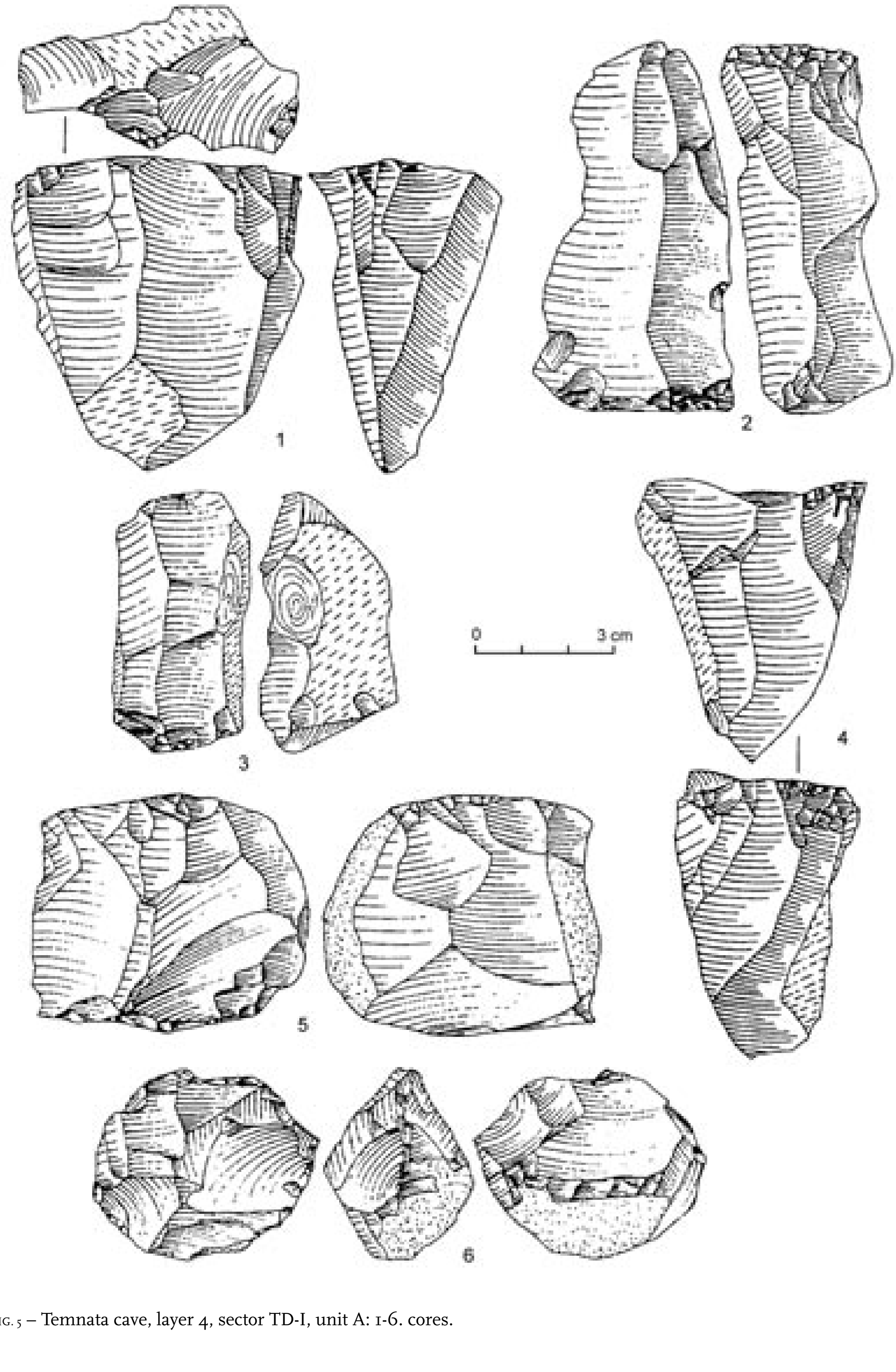

FIG. 5 – Temnata cave, layer 4, sector TD-I, unit A: 1-6. cores.

The whole sequence of C-B-A levels in layer 4 of Temnata cave is characterized by the stability of technological attributes of both flakes and blades. Blades in all the levels exhibit a similar proportion of butt types (there is a small increase in single-blow butts and a minimal drop in the facetted butts) (Fig. 6). Blade profiles (Fig. 7), just like the shape of blades, are similar in the three levels (a small increase is seen in the blades with convergent sides and a minimal drop in the irregular blades — Fig. 8). It is interesting that the ratio of blades from single platform cores to those from double-platform cores is similar in all levels (i.e. blades with the parallel dorsal pattern are five times as many as blades with opposed direction pattern of dorsal scars).

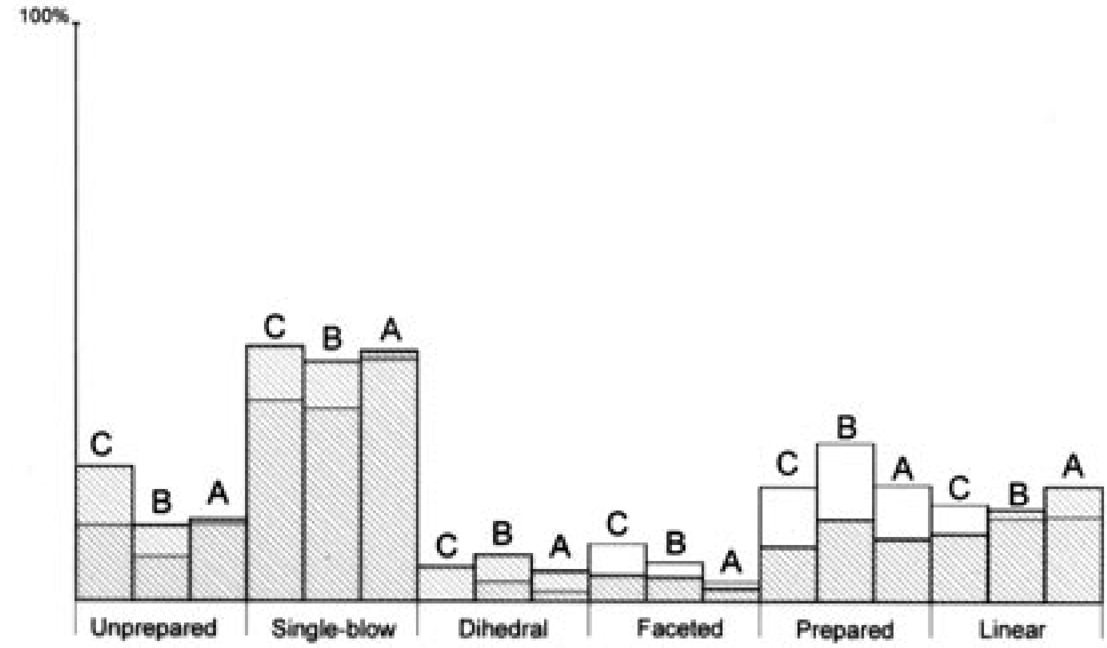

FIG. 6 – Temnata cave, layer 4, sector TD-I. Butt types in particular units C-A.

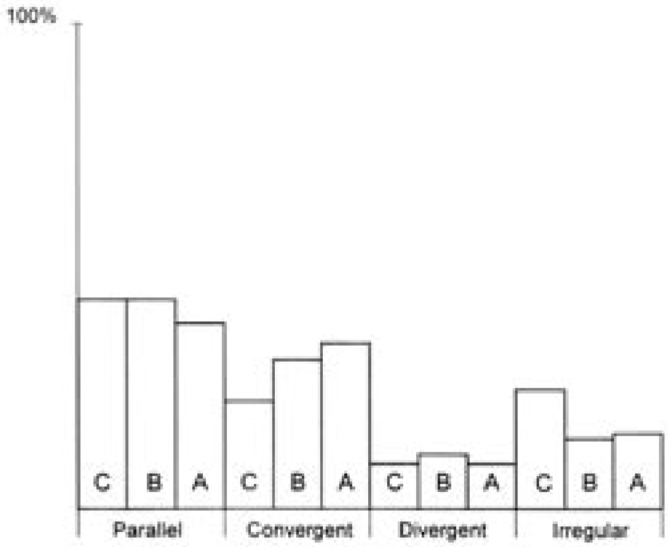

FIG. 7 – Temnata cave, layer 4, sector TD-I. Blade profiles in particular units C-A.

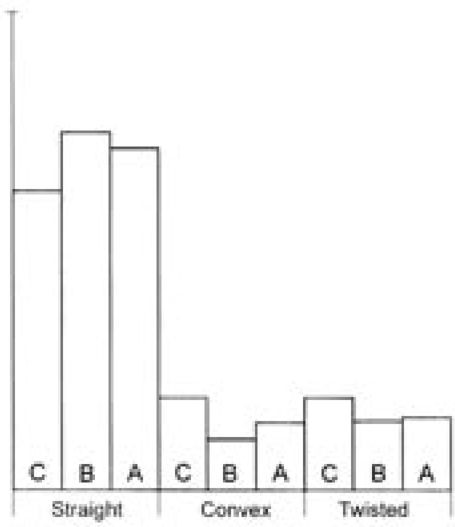

FIG. 8 – Temnata cave, layer 4, sector TD-I. Blade shapes in particular units C-A.

Measurable blade attributes show multimodal length curves (Fig. 9a) with modes at about 3,5 cm (only in phase A), 4-5 cm, 6-7 cm and 9-10 cm (except phase C). These modes are the expression of core reduction stages and the passing from single- to double-platform exploitation rather than the result of two distinct *chaînes opératoires* in levels A and B. The width (Fig. 9b) and thickness (Fig. 9c) curves are unimodal with the same modes for the three levels: for thickness, between 0,3 and 0,8 cm, and for width, between 1,4 and 2,6 cm.

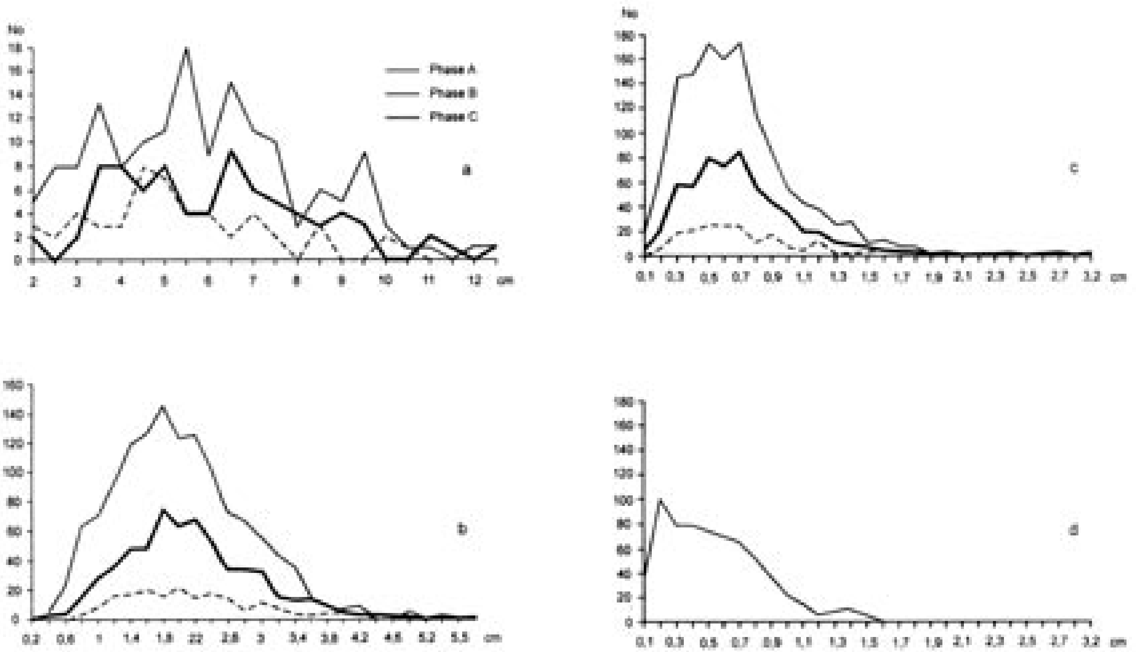

FIG. 9 – Temnata cave, layer 4, sector TD-I: a. blade lengths; b. blade widths; c. blade thickness. Kraków-Zwierzyniec: d. Aurignacian blade thickness.

The blade technique in the Temnata cave sequence and the blade technique at Kraków Zwierzyniec

The assemblage in layer 12 of Kraków-Zwierzyniec is an industry where tool morphology has distinctly Aurignacian features. The index of carenoidal and nosed endscrapers is 45.2. However, the assemblage is not dominated by endscrapers but by burins (38,8 and 54,8%, respectively). Among burins, carenoidal and busked specimens are dominant. The proportion of tools with lateral retouch is smaller (12,5%).

Blade production was carried out by means of two *chaînes opératoires* (Figs. 10-11):

a) Without preparation, on flat flint nodules or thermal fragments. The edge at the intersection of the broader face and the narrow lateral side was used as a guiding ridge (*nervure-guide*) for the first blades detached from a core. Reduction was continued either on the broader or on the narrow face. The platforms of cores were prepared by one or, at most, two or three flake scars. Exploitation was usually carried out from one platform, less often from two opposed platforms. The blades were detached in succession: first from one and next from the other platform. The instances of alternate detachment of blades from one and the other platform are very rare.

b) Starting from a pre-core, on which postero-lateral crests were shaped, the platform was carefully prepared, usually by detaching a number of small flakes. Exploitation began on the broad side of a nodule and was continued onto the sides (naturally, after crested blades had been detached). The formation of neo-crests at the site has also been recorded.

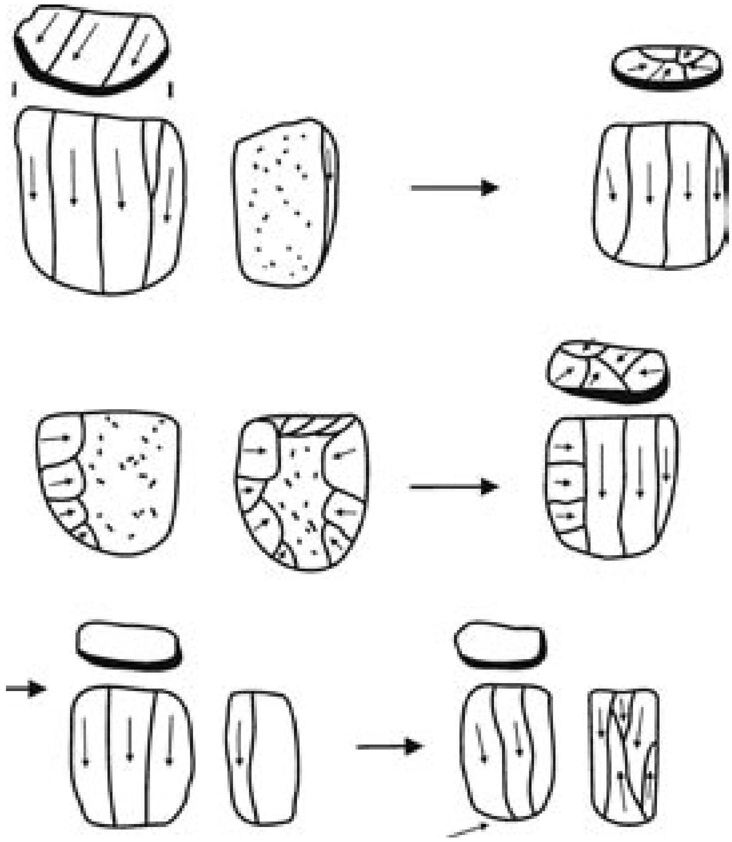

FIG. 10 – Kraków-Zwierzyniec. Core reduction sequences.

The products of the two *chaînes opératoires* were blades whose measurable and technological parameters are close to the blades from levels B and A of Temnata cave. This similarity is seen in the structure of butts and of shapes and profiles of blades. As regards morphometric parameters the length curves are, just like in Temnata cave, multimodal, with three modes of less than 10 cm and a mode of about 12 cm (higher than in Temnata, but within the maximum length interval of its phases B and A). The difference between Kraków-Zwierzyniec and Temnata cave is first of all in width, namely: at Kraków-Zwierzyniec, width is a multimodal curve with the modes of 0,7-0,8, 1,3-1,7 and 1,92,0 cm, whereas in Temnata cave there is only one mode of 1,4 to 2,6 cm; blade thickness at Kraków-Zwierzyniec gave a unimodal curve with one mode between 0,2-0,7 cm which, basically, corresponds to the Temnata cave, although at this site very thin blades, of less than 0,3 cm, do not occur, whereas they are present at Kraków-Zwierzyniec (Fig. 9d).

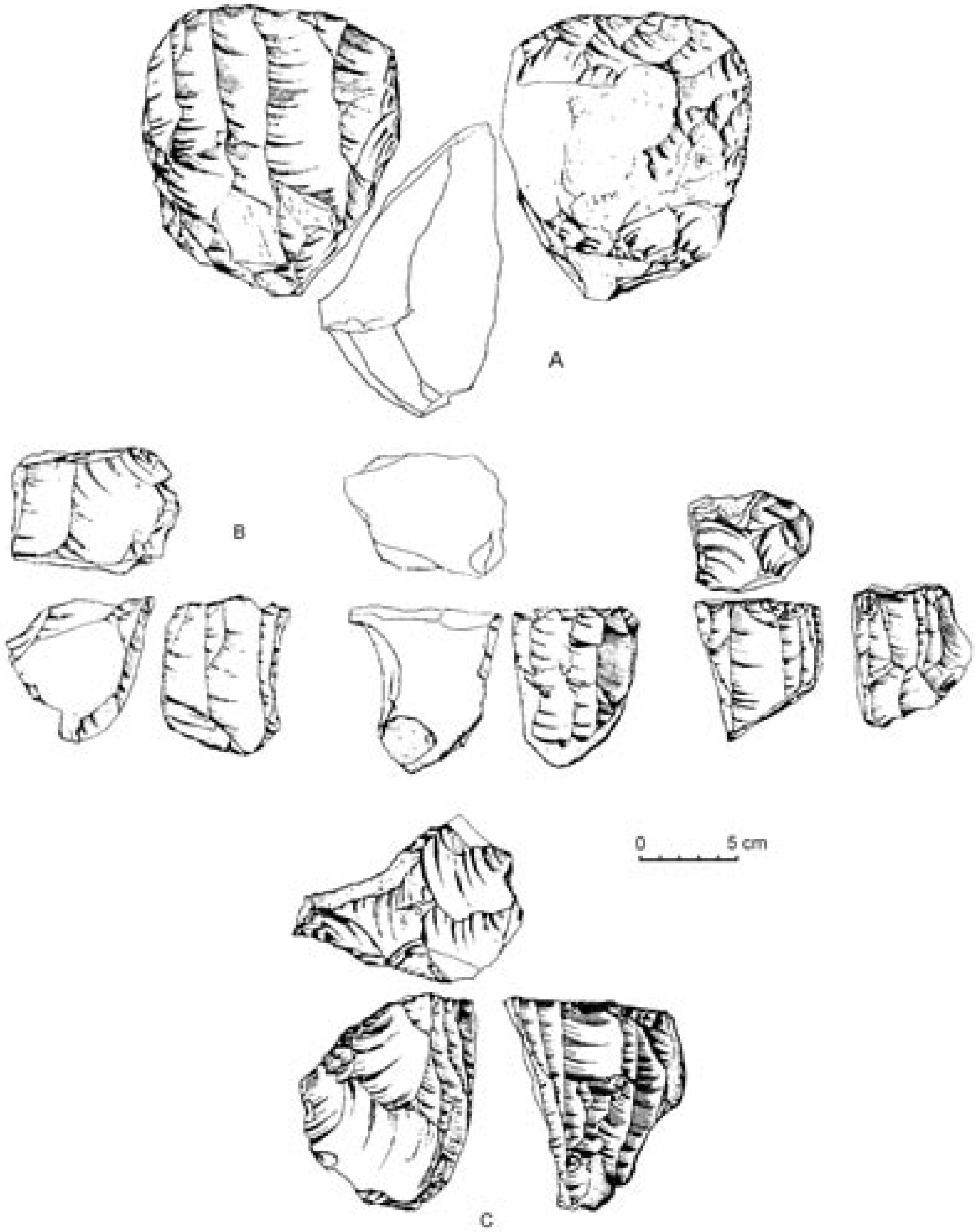

FIG. 11 – Kraków-Zwierzyniec. Examples of single platform cores (after Sachse-Kozłowska, 1982).

Comparison with the blade technology in western Europe

As an example of an Aurignacian assemblage from western Europe we have chosen the site of Barbas II not only because the technology on this site has been described in an excellent work by N. Teyssandier (2000), but also because of the features of raw-material on this site. The dimensions of flint nodules from Bergerac and its technological properties are close to both flint C from the vicinity of Karlukovo in Bulgaria as well as to type C Jurassic flint from the region of Kraków in the hill range of Góra Bronislawy and Sowiniec.

At Barbas the technological features are distinctive for the whole Aurignacian of south-western France. According to Teyssandier these are:

a) Detachment of blades from one platform, on the broader face of a nodule and, consequently, the receding of the front face of a nodule as its volume diminishes.
b) Frequent preparation of *en éperon* type which correlates with the rejuvenation of the platform by tablet detaching.
c) Location of the flaking face on the broader face of a flint nodule or block.
d) Rejuvenation of flaking faces by the formation of neo-crests or detachment of *lames débordantes* at the ridge between the flaking face and the core sides.
e) The use of a hard hammer stone in the preliminary phase and a punch during the reduction itself.

All these features are conspicuous both in the Temnata cave sequence and at the site of Kraków-Zwierzyniec. We should draw attention to the fact that at Barbas there are also cores for large blades with preparation from antero- or postero-lateral crests (one or two). In such cases reduction began from detaching cortical blades and blade-flakes. The contiguous scars formed guiding ridges (*nervures-guides*). Rejuvenation is relatively weakly exhibited on these cores. This means that they were discarded in a stage that still made reduction possible as the volume of cores was considerable. A similar situation can be observed for some cores at Kraków-Zwierzyniec, whereas it has not been recorded in any of the levels at the Temnata cave where the core volumes were much more exhausted.

At Barbas the length curve of blades is, too, multimodal within the interval of 7-15 cm. Thus, only the first two modes from Barbas correspond to the last two modes from the Temnata cave. When we compare Kraków-Zwierzyniec and Barbas we can see that all the upper modes overlap. It is important to add that at Barbas there occur exceptionally long blades (more than 18 cm), but they are represented mainly by mesial fragments which, according to N. Teyssandier, come from reduction phases that were carried out away from the site. Just as at Kraków-Zwierzyniec and in the Temnata sequence also at Barbas separate *chaînes opératoires* have been identified whose end-product were flakes produced from discoidal cores.

The difference between Temnata cave, Kraków-Zwierzyniec and Barbas rests, in all likelihood, in the occurrence at Barbas of cores for the production of bladelets. At the other two sites bladelet production is, in my opinion, an epiphenomenon of *chaînes opératoires* for blade production. Bladelets come either from final stages of exploitation of blade cores, or from the retouching of high scrapers and carenoidal burins.

The specificity of bladelet production in the Mediterranean zone

The feature that distinguishes the sites of the Mediterranean Aurignacian (also referred to as Proto-Aurignacian) from central and western European sites is the presence of well-defined *chaînes opératoires* whose purpose was the production of bladelets with straight and not twisted profiles. Twisted profiles are frequent at some Aurignacian sites, but they come from the "retouching" of high-scrapers.

When we analyze cores from the site in the Fumane cave we can attempt to reconstruct two different *chaînes opératoires* aiming at bladelet production. Both chains resemble the core reduction leading to the production of macroblades, typical for the whole Aurignacian:
a) In the first reduction sequence, during the preliminary phase platforms were prepared on flat, oval nodules and postero-lateral crests were made, then blades and blade-flakes were detached from a broad, slightly convex flaking surface. The flaking surface was extended onto core sides and, sometimes, neo-crests were shaped.

b) In the second reduction sequence, more cuboid, blocky nodules were used which restricted preparation to the platform (shaped by centripetal flake scars), then blades were detached on the broader face of a nodule with the purpose of making a rounded flaking face. This was sometimes combined with scars from the core tip in order to make the core narrower by side reduction. As a result, conical or subconical cores for bladelets were made which enabled the exploitation of nearly the whole volume of a nodule.

The bladelets obtained from both core types were narrow (the width was limited to one mode only from 0,5 to 1,0 cm), but they were occasionally fairly long, between 3,5 to 4,0 cm.

Conclusions

The technological analysis of assemblages from the Temnata cave sequence points to the stability of blade technology from the Initial Upper Palaeolithic until the Aurignacian in the Balkans, in the period from >40 to 32 kyr BP.

At the same time, the analysis of production techniques in regions remote from one another (Poland, France) indicates similarity of technology within the Typical Aurignacian. This technology derived from the Initial Upper Palaeolithic, known as the Bachokirian in southeastern Europe.

Also, in the Mediterranean zone, specialized bladelet production shows principles of manufacture similar to the macroblade techniques known in other areas of the European Aurignacian.

REFERENCES

BARTOLOMEI, G.; BROGLIO, A.; CASSOLI, P. F.; CASTELLETTI, L.; CATTANI, L.; CREMASCHI, M.; GIACOBINI, G.; MALERBA, G.; MASPERO, A.; PERESANI, M.; SARTORELLI, A.; TAGLIACOZZO, A. (1994) - La Grotte de Fumane: un site aurignacien au pied des Alpes. *Preistoria Alpina*. Trento. 28:1, p. 131-179.

DROBNIEWICZ, B.; GINTER, B.; KAZIOR, B.; KOZŁOWSKI, J. K. (2000) - Early Upper Palaeolithic assemblages from layer 4, trench TD-I. In GINTER, B.; KOZŁOWSKI, J. K.; GUADELLI, J.-L.; LAVILLE, H. - *Temnata Cave. Excavations in Karlukovo Karst Area, Bulgaria*, vol. 2, part 1. Kraków: Uniwersytet Jagielloński, p. 333-418.

HAHN, J. (1988) - *Die Geißenklösterle-Höhle im Achtal bei Blaubeuren I. Fundhorizontbildung und Besiedlung im Mittelpaläolithikum und im Aurignacien*. Stuttgart: Theiss.

KOZŁOWSKI, J. K. (1979) - Le Bachokirien - la plus ancienne industrie du Paleolithique superieur en Europe, Quelques remarques à propos de la position stratigraphique et taxonomique des outillages de la couche 11 de la grotte Bacho Kiro. In KOZŁOWSKI, J. K., ed. - *Middle and early Upper Palaeolithic in Balkans*. Kraków: Uniwersytet Jagielloński, p. 77-99.

KOZŁOWSKI, J. K., ed. (1982) - *Excavation in the Bacho Kiro Cave (Bulgaria): final report*. Warszawa: Państwowe Wydawnictwo Naukowe.

KOZŁOWSKI, J. K. (1999) - The evolution of the Balkan Aurignacian. In DAVIES, W.; CHARLES, R., eds. - *Dorothy Garrod and the progress of the Palaeolithic: studies in the Prehistoric Archaeology of the Near East and Europe*. Oxford: Oxbow, p. 97-117.

KOZŁOWSKI, J. K.; KOZŁOWSKI, S. K. (1996) - *Le Paléolithique en Pologne*. Grenoble: Millon.

KOZŁOWSKI, J. K.; OTTE, M. (2000) - The formation of the Aurignacian in Europe. *Journal of Anthropological Research*. Albuquerque, NM. 56, p. 513-534.

LUCAS, G. (2000) - *Les industries lithiques du Flageolet I (Dordogne), approche économique, technologique, fonctionnelle et analyse spatiale*. Thèse de Doctorat. Université Bordeaux I. 2 vols.

MARKS, A. E.; FERRING, C. R. (1988) - The early Upper Paleolithic of the Levant. In HOFFECKER, J. F.; WOLF, C. A., eds. - *The Early Upper Paleolithic: evidence from Europe and the Near East*. Oxford: British Archaeological Reports (BAR International Series; 437), p. 43-72.

RIGAUD, J.-Ph. (2001) - A propos de la contemporanéité du Châtelperronien et de l'Aurignacien ancien: une révision des données et ses implications. In ZILHÃO, J.; AUBRY, T.; CARVALHO, A. F., eds. - *Les premiers hommes modernes de la Péninsule Ibérique. Actes du Colloque de la Commission VIII de l'UISPP. Vila Nova de Foz Côa, 22-24 octobre 1998*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 17), p. 61-68.

SACHSE-KOZŁOWSKA, E. (1982) - Core exploitation process at the Aurignacian site Zwierzyniec I. In *Aurignacien et Gravettien en Europe*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 13), p. 325-338.

TEYSSANDIER, N. (2000) - L'industrie lithique aurignacienne du secteur II de Barbas (Creysse, Dordogne): analyse technique et implications archéologiques. *Ateliers*. Paris. 20, p. 29-59.

Reflections on the role of bone tools in the definition of the Early Aurignacian

DESPINA LIOLIOS

ABSTRACT Certain particularities of the known corpus of split-based points, hitherto often considered as an index fossil of the classical Aurignacian and as forming a relatively homogeneous ensemble, are discussed. Differences were found in relation to the design of the intended point at La Quina, Castanet, Geißenklösterle, Tuto de Camalhot, and Isturitz. These differences may coexist, however, with a similar product economy, as when Isturitz is compared with Tuto de Camalhot, suggesting that some form of technical differentiation existed among Early Aurignacian groups. A fundamental type of divergence may also have to do simply with the existence of Early Aurignacian groups with no production of bone tools (or with very little of it), as seems to be the case in Spain.

The composition of Aurignacian bone tool assemblages has often determined the cultural attribution of archeological levels (Sonneville-Bordes, 1960; Hahn, 1977), the Early Aurignacian becoming typical simply as a result of the presence of split-based points, even when these were in very limited numbers and one could not assess whether they were produced on-site because of the lack of evidence concerning the technological processes involved

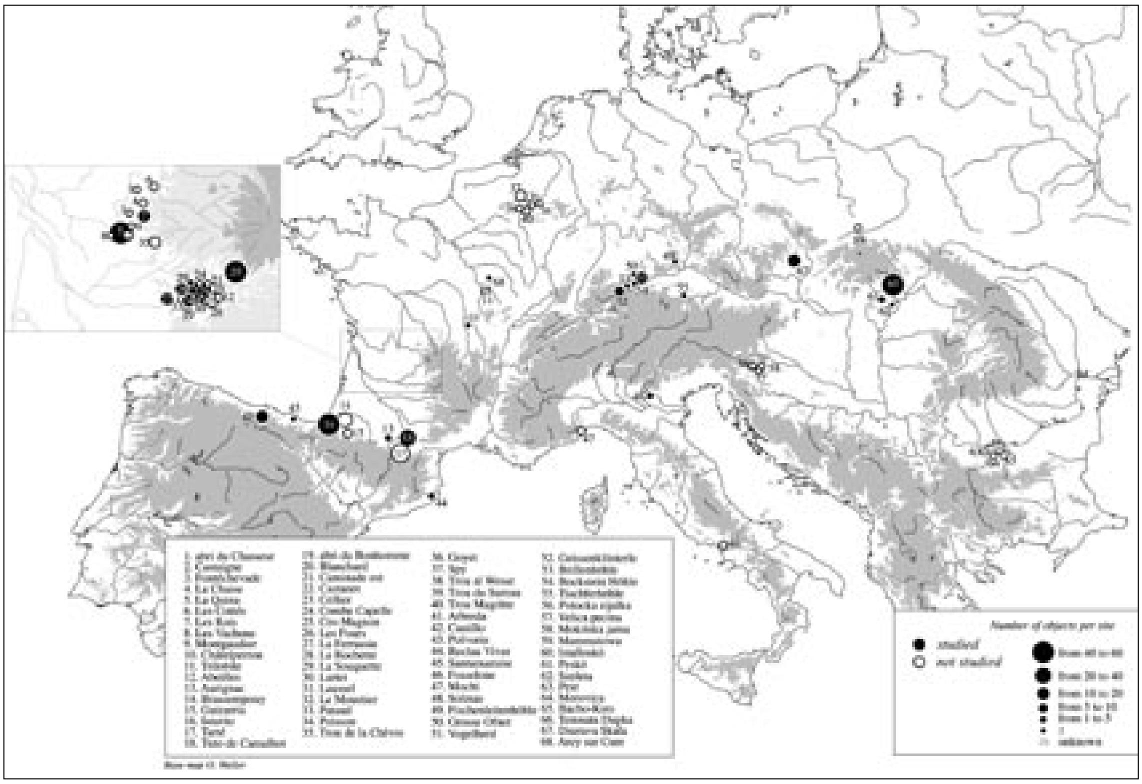

FIG. 1 – Sites of the Early Aurignacian with split-based points.

(Fig. 1). Moreover, the use of bone tool data has often been partial at best (only the points are dealt with), and typological. The identification of these analytical biases led us to an investigation of the intrinsic characteristics of the corpus, and of the potential meanings of such characteristics in assemblages from the Aurignacian.

Several aspects are successively dealt with: 1) the quantitative representativity of split-based points in assemblages at a wider European scale; 2) the actual diversity of technical designs that may exist among split-based points in spite of them being considered as a single type; 3) one instance (the Spanish Aurignacian) of a marginal development of bone tools that, in combination with the low numbers of points, suggests that some Early Aurignacian groups may have been altogether lacking in bone tool production; 4) questions raised by the pattern of observed diversity, which does not strictly coincide with that observed in the realm of lithics (actually, it would be striking if things were otherwise, as any ethnologist would point out).

The geographical and quantitative distribution of split-based points

Even if their antiquity is not under question, outside certain geographical zones (i.e., southwest France), the role of split-based points as index fossils must come under scrutiny. It suffices in fact to consider the density distribution of the Early Aurignacian corpus of split-based points to verify an extreme concentration in southwest France and in the upper Danube valley, as well as a sporadic presence in certain zones such as northern Spain or the Balkans (Fig. 1) (Albrecht et al., 1972; Hahn, 1977; Bernaldo de Quirós, 1981, 1982; Soler and Maroto, 1993). For a grand total of no more than some 500 items, three quarters of the finds, in fact, come from the Aquitaine basin (Liolios, 1999). A priori, two not contradictory hypotheses come to mind as possible explanations for this spatial and quantitative pattern.

The first hypothesis is that of differential preservation, which would allow continued consideration of the existence outside of southwest France and the Swabian Jura of a typical Early Aurignacian to which would belong also the Hungarian, Belgian or Croatian assemblages with split-based points, regardless of whether they are made up of one, two or ten specimens. Differential preservation alone, however, does not seem capable of explaining the absence of points and bone tools from certain areas, such as Italy (Broglio, 1993, 1996; Gambassini, 1993), or southeast France, or the low figures characterizing the Spanish assemblages (Bernaldo de Quirós, 1982), especially since, in all cases, these areas are close to the groups producing most intensively.

Some of these assemblages poor in bone tools are now interpreted as Proto-Aurignacian (Bon, 2002); and the hypothesis has also been put forward that a penecontemporaneous material culture existed which would have differed from the Early Aurignacian in its lack of investment in bone working techniques (Teyssandier, 2003); the affinities of such a material culture with the Aurignacian are in any case currently under scrutiny (Teyssandier, 2003). Unfortunately, however, the evidence is not easily amenable to quantitative treatment, because the excavations are old, and the corpuses truncated. As a result, quantitative assessment of the correlative frequencies of stone tools, faunal remains, waste from bone debitage, and points, is not possible (Liolios, 1999). Whatever the cultural identity of these assemblages poor in bone tools, their interpretation poses problems, and nothing is there to suggest that those tools were indeed manufactured by the occupants of the sites.

It is also possible to advance a diffusionist hypothesis according to which bone working emerges and spreads from east to west, following the Danubian axis, and then comes down to the Aquitainian and Pyrenean zones, as in classical migrationist models (Djindjian, 1993;

Kozłowski, 2000). Such a progression would have accompanied the equivalent east-west development of the Early Aurignacian (sensu stricto). However, no gradual quantitative increase of bone tools exists in east and central European corpuses. In simple terms, a clear quantitative imbalance exists between east and west, and in fact prevails throughout the entire duration of the Aurignacian (Bernaldo de Quirós, 1982; Hahn, 1977; Knecht, 1991). Moreover, most eastern European corpuses contain only isolated specimens, some of which recovered in rather problematic archeological contexts (cf., for instance, Zotz, 1964-1965; Hahn, 1977; Otte, 1979). It is often on the basis of a single specimen that certain sites were attributed to the Early Aurignacian, and when the corpuses are larger, they either come from disturbed contexts (Dzeráva skala — Prosek, 1953), or are so isolated that interpretation becomes almost impossible (Istallóskö, Peskö — Vertès, 1955, 1956).

If not associated to a lithic assemblage context, such isolated point finds are of little demonstration value at the cultural level, especially when one duly considers how such relatively valuable objects circulate in contemporary hunter-gatherer societies. At best, the index fossils may provide an indication of the age of the deposits, or of contemporaneity with more diagnostic assemblages, but their presence in small numbers at a given site or level otherwise bears little cultural meaning. This is all the more so if one adds three other observations that give witness to the specificity of these tools: the diversity of split-based point designs; the diversity in design in spite of a similar organization of production; the local resistance to the adoption of bone working techniques.

The diversity in the technical design of split-based points

Where the debitage of point blanks is concerned, similar methods are always used (Knecht, 1991; Liolios, 1999). All split-based points are on antler (with perhaps a single exception at El Castillo, in Spain, cf. *infra*). Blanks are extracted by cleaving or fracturation and then split again, through indirect percussion, into three or four baguettes (Figs. 2h-2i). The standardization of blanks is generally much reduced. In such a context of little predetermination, shaping becomes of paramount importance in giving the objects their morphological and functional characteristics. It is at the level of this shaping stage that differences exist in the *chaînes opératoires* of the assemblages discussed here: Geißenklösterle (Hahn, 1988), La Quina (Henri-Martin, 1931), Castanet (Peyrony, 1935), Isturitz (Passemard, 1944), and Tuto de Camalhot (Vézian and Vézian, 1966).

To compare these corpuses, we have reconstituted the reduction and resharpening sequences of these objects, in order to arrive at the "initial (intended) point", upon which all comparisons are made (Liolios, 1999). Without such a reconstitution, the corpuses can only be described on the basis of typology; in fact, the successive resharpening and reshaping episodes underwent by these points explain the marked heterogeneity of the corpuses, further compounded by the "noise" introduced from the beginning by the initial morphology of the reindeer antler, exploited by Aurignacian groups in very flexible ways. Shaping sequences do not vary, and feature three phases: roughing-out, fabrication of the split-base, object finishing. What varies are the techniques used, the procedures to obtain the slit and the intended traits of the point.

The corpus from Geißenklösterle (Fig. 3) includes 26 points or point elements; only five are complete pieces. The intended product has a sub-rectangular cross section and is obtained by scraping and partially shaped; only the internal surface and the edges are scraped, the spongiosa being systematically removed. The preparation of the basal slit is effected through lateral incisions (one on each side of the piece, parallel to the axis), which serve as guides for

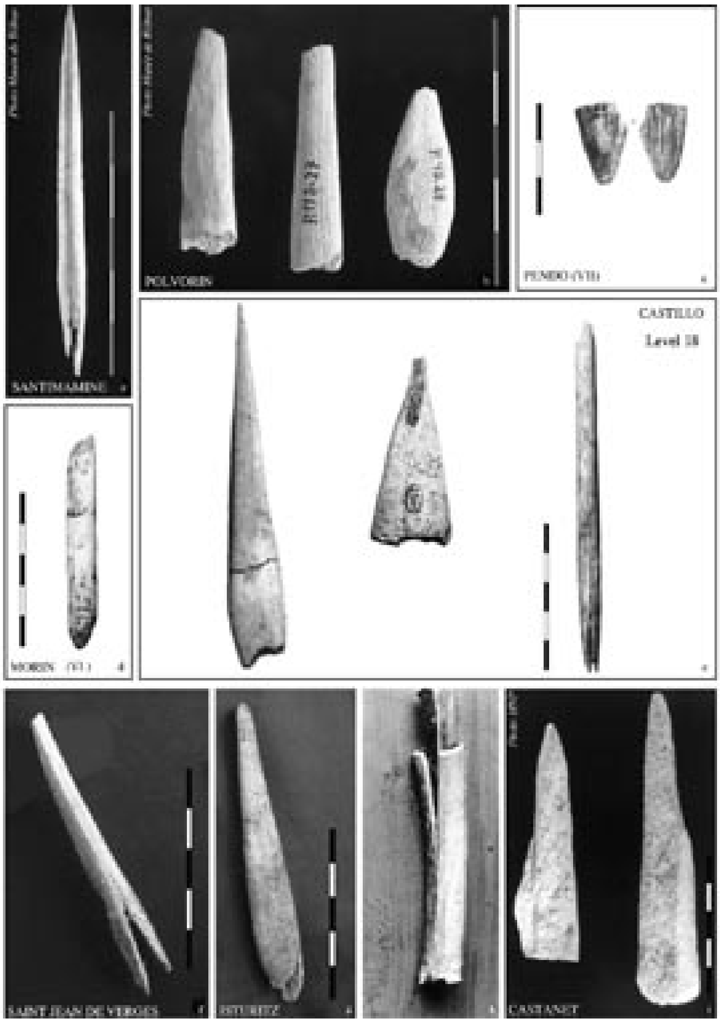

FIG. 2 – a. split-based point from Santimamiñe; b. mesio-distal fragments and complete split-based point from Polvorín; c. lip of a split-based point from Pendo (level VII); d. ivory point fragment from Morin (level VI); e. split-based points in deer antler and ivory from Castillo; f. sub-rectangular split-based point from Tuto de Camalhot; g. elliptic split-based point from Isturitz; h. cleaved section of reindeer antler (experimental); i. unmodified reindeer antler baguettes from Castanet.

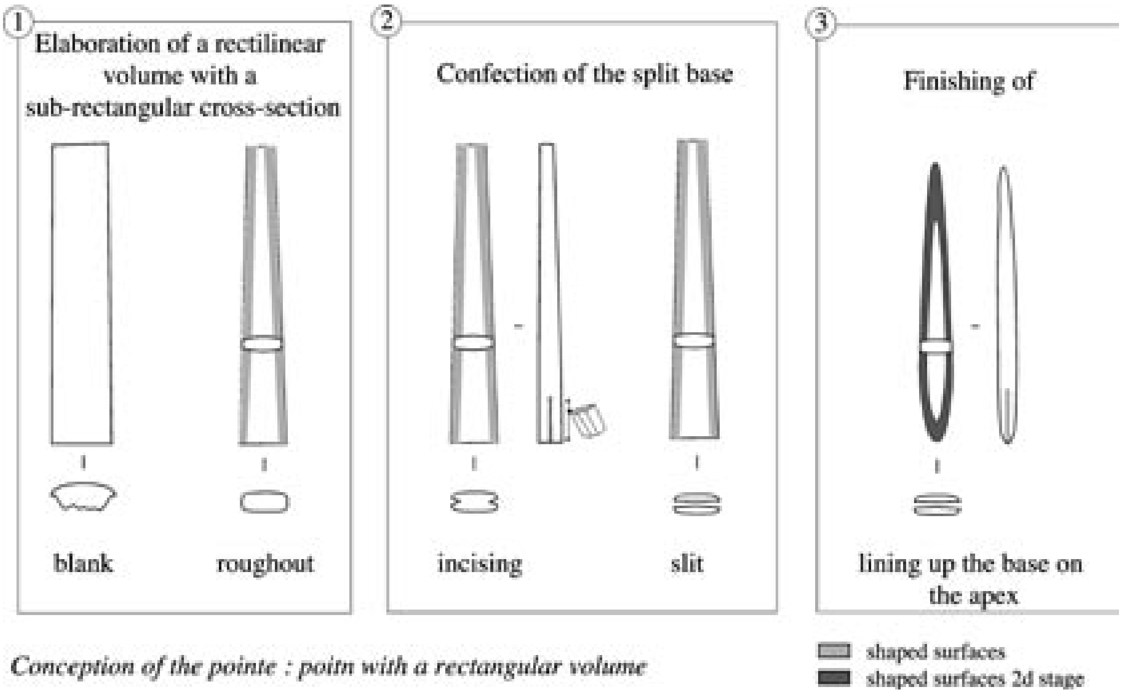

FIG. 3 – Shaping of a split-based point at Geißenklösterle.

the slit (for technical reasons relating to the size of the blank); no particular attention is given to the surface of the latter. The point, and especially the tip, is then finished.

The corpus from La Quina (Fig. 4) at the Musée des Antiquités Nationales at St. Germain-en-Laye contains nine complete points, nine points abandoned while undergoing reshaping, and 22 point fragments. The intended point has a biconvex cross section and is preformed by abrasion, beginning with the internal surface of the blank, in order to remove most of spongiosa and regularize the lateral breaks; work then continues towards the external sides and, finally, extends into the proximal zone. The external medial surface remains unmodified. The base of the preform is then split, after preparation by transversal sawing, which eliminates bone material from the sides, in order to obtain a kind of rectangular, flat "striking platform". The piece can then be finished, through abrasion.

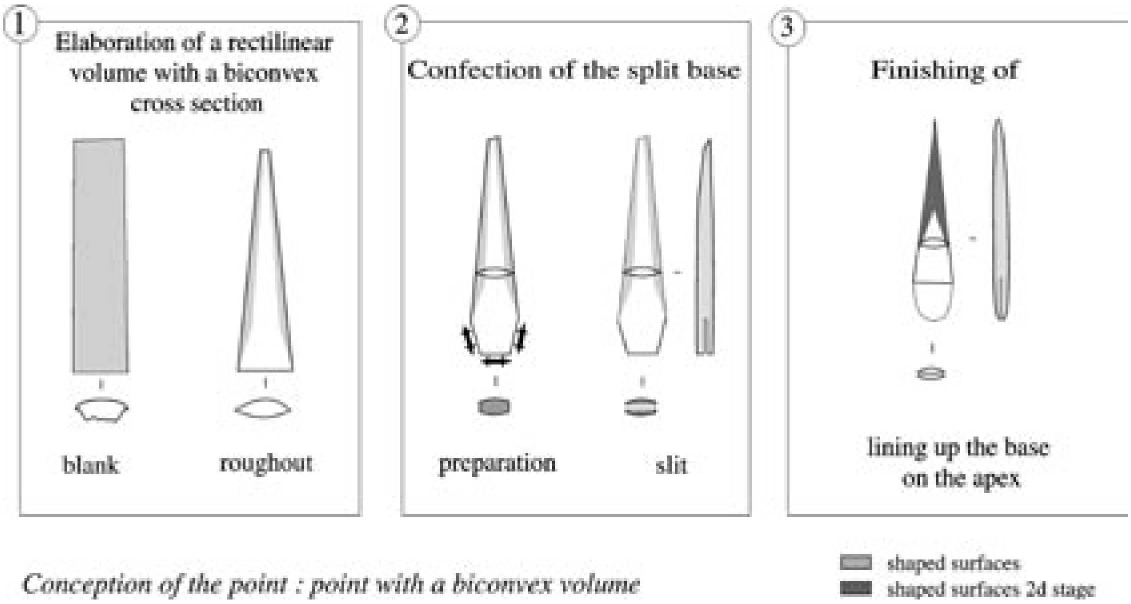

FIG. 4 – Shaping of a split-based point at La Quina.

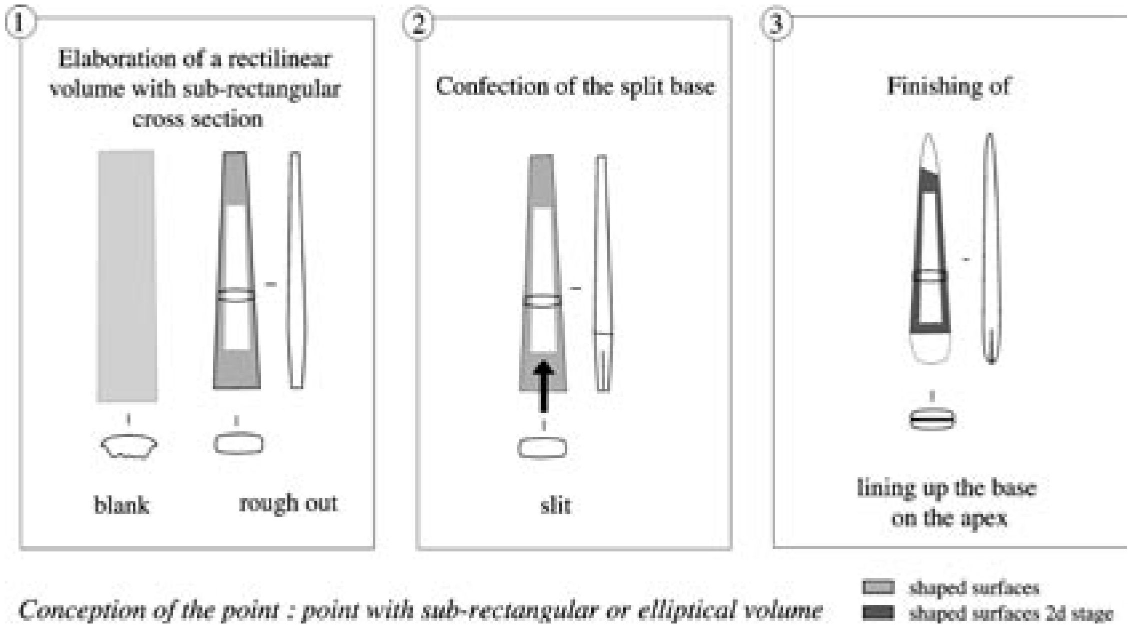

FIG. 5 – Shaping of a split-based point at Castanet.

At Castanet (Fig. 5), the corpus comprises 24 complete points and 40 fragments. The degree of standardization of the Castanet points is very low. The initial section varies between elliptic and sub-rectangular. It is only partially shaped (by scraping), the external medial part remaining unmodified. The basal slit is executed with no specific preparation. This assemblage is the most heterogeneous and least standardized of all that were analyzed.

At Isturitz (Fig. 6), the corpus comprises 43 objects, of which 14 are complete. The Isturitz point is elliptic in cross section (Fig. 2g). It is worked by scraping and, in contrast with those from the preceding collections, shaped in its entirety. In the single preform, the preparation of the slit involves the removal of two small lateral *languettes*; on each side, a double incision followed by splitting effectively removes a small languette, triangular in cross section, thus creating two grooves which guide the production of the slit. The piece is then finished by scraping.

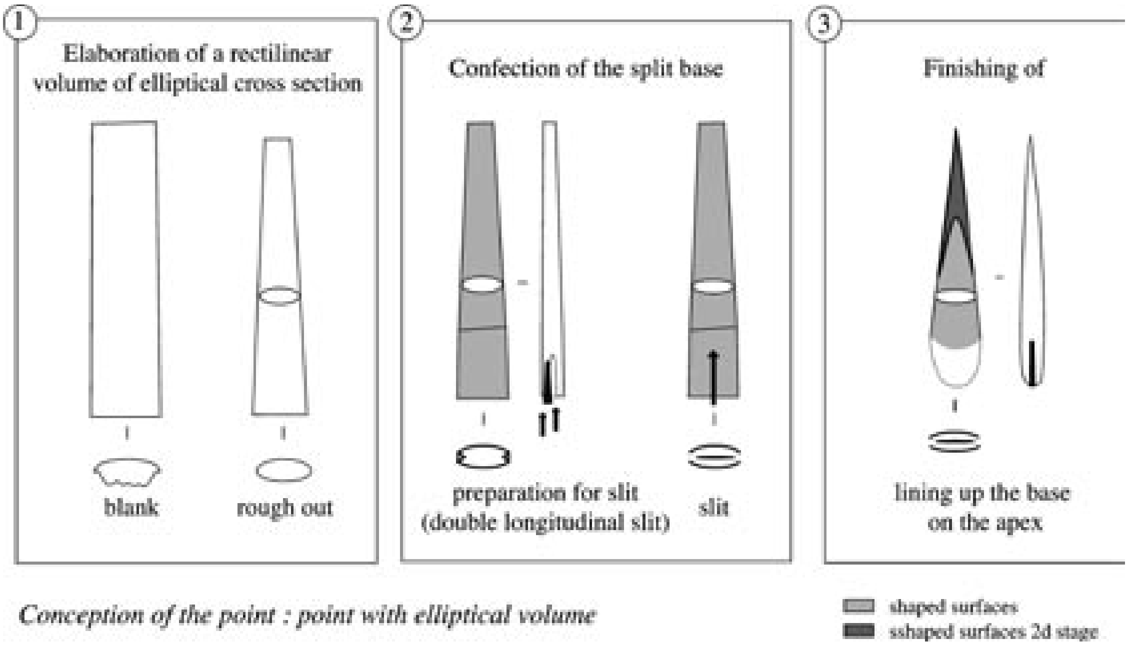

FIG. 6 – Shaping of a split-based point at Isturitz.

At Tuto de Camalhot (Fig. 7), the corpus comprises 39 points and fragments. The blank is scraped on both sides and on the two edges, so that a rectangular cross section is obtained. If need be, the proximal end is then regularized by sawing or reduced by notching, upon which the slit is made with no further preparation. The piece is finished by scraping but, even when retargeted, always preserves a rectangular cross section from base to tip (Fig. 2f).

These objects, typologically similar, are technologically different. They share function, raw-material, *chaîne opératoire* of blank production, and hafting system; but they differ in the underlying concept of what an "efficient point" should look like. It is not so much the techniques (abrasion and scraping), or the diverse methods to split the base, that are most telling. In fact, the scraping of the La Quina pieces can be explained by their exceptional size and the incision of the base in the objects from Geißenklösterle by the narrow blanks. The real difference lies in the volumetric design of the intended point, which varies in the different corpuses between having four (sub-rectangular cross section), two (biconvex cross section) or one surface (elliptic cross section) only.

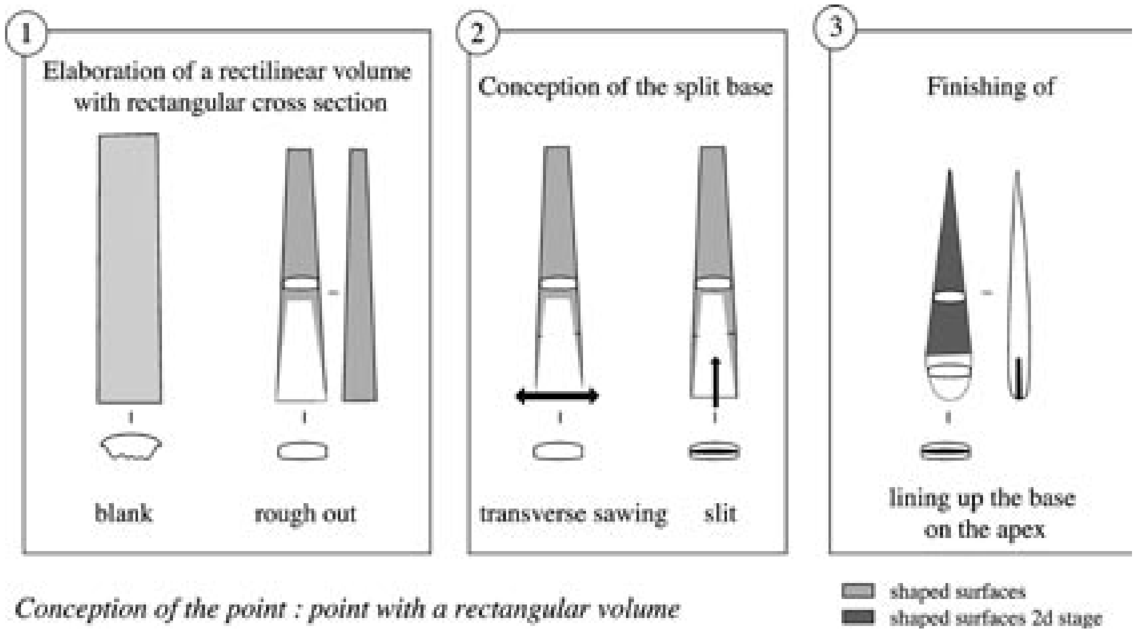

FIG. 7 – Shaping of a split-based point at Tuto de Camalhot.

The technical differentiation of points

Some of these corpuses also exhibit a further specificity. Two given assemblages may be characterized by different point designs and still yield bone tool productions whose economic organization is similar. This is the case with Isturitz (Atlantic Pyrenees) and Tuto de Camalhot (eastern Pyrenees).

The bone tool assemblage from Tuto de Camalhot (Fig. 8) comprises 82 finished objects and is characterized by an important exploitation of antler mainly aimed at the manufacture of split-based points. Raw-material economy is well apparent in that ivory, rare, is exclusively used for ornaments, whereas bone is used for smoothing tools and awls.

Where bone is concerned, the *chaînes opératoires* are relatively simple: blanks are mostly extracted through fracturation and then scraped and, some times, incised. Ivory working is represented only by the last stages of the production system and involves similar techniques of scraping and incision. The antlers of are exploited in their entirety mostly for the production of the split-based points whose manufacturing technique was discussed in the preceding section.

Although caution is in order when considering the collection from Isturitz, because of the history of excavation at the site, it would seem that it features an economy of bone tool production very similar to Tuto de Camalhot (Fig. 9). In level SIII there are 93 finished objects, for the most part split-based points. As at Tuto de Camalhot, ivory is used for ornaments, but also for a few awls, and bone for the manufacture of smoothing tools and awls. Antlers are again exploited in their entirety for the manufacture of points, chisels, and compressors. In spite of the necessary reservations regarding this enumeration, which is clearly not exhaustive, the similarity between the two corpuses remains nonetheless striking.

Where the *chaînes opératoires* are concerned, the methods and techniques used at Isturitz are the same as at Tuto de Camalhot, except for certain awls which, at Isturitz, are not incised. However, the points from Isturitz derive from a different design, and there is also a difference in the intended size of the initial point, those from Isturitz being smaller (Fig. 10). This phenomenon is not due to raw-material, because at both sites the cortical thickness of

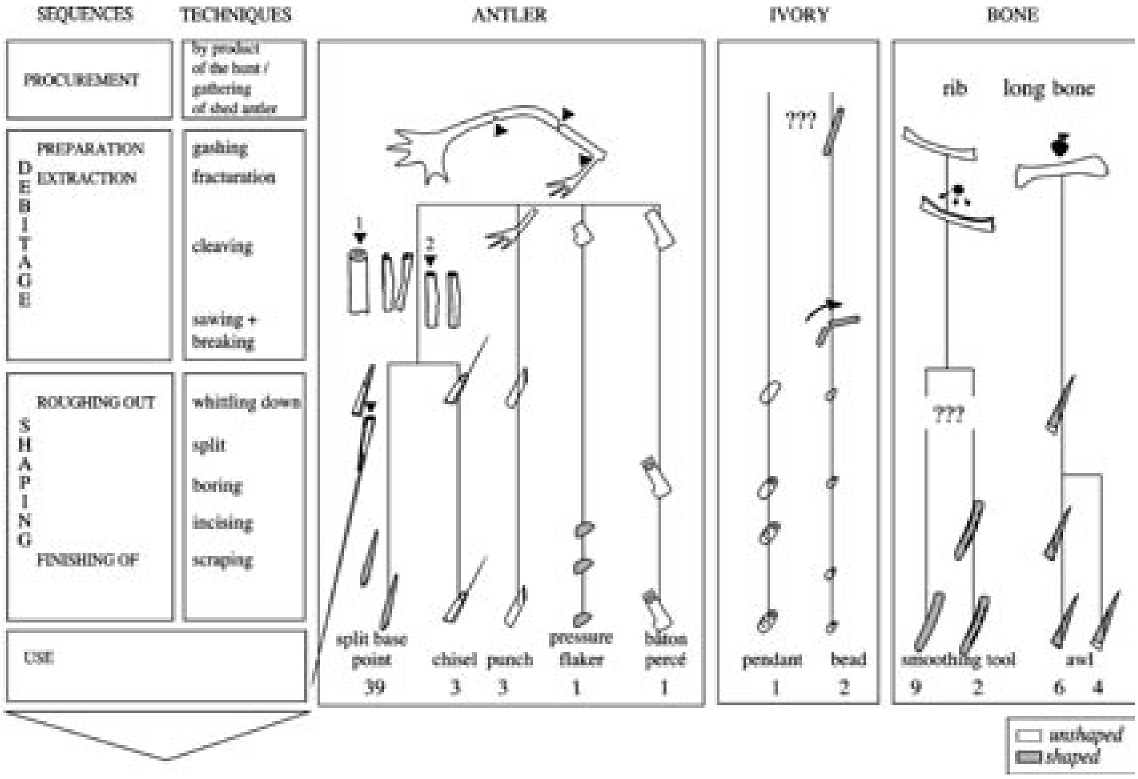

FIG. 8 – *Chaînes opératoires* of osseous raw-materials at Tuto de Camalhot.

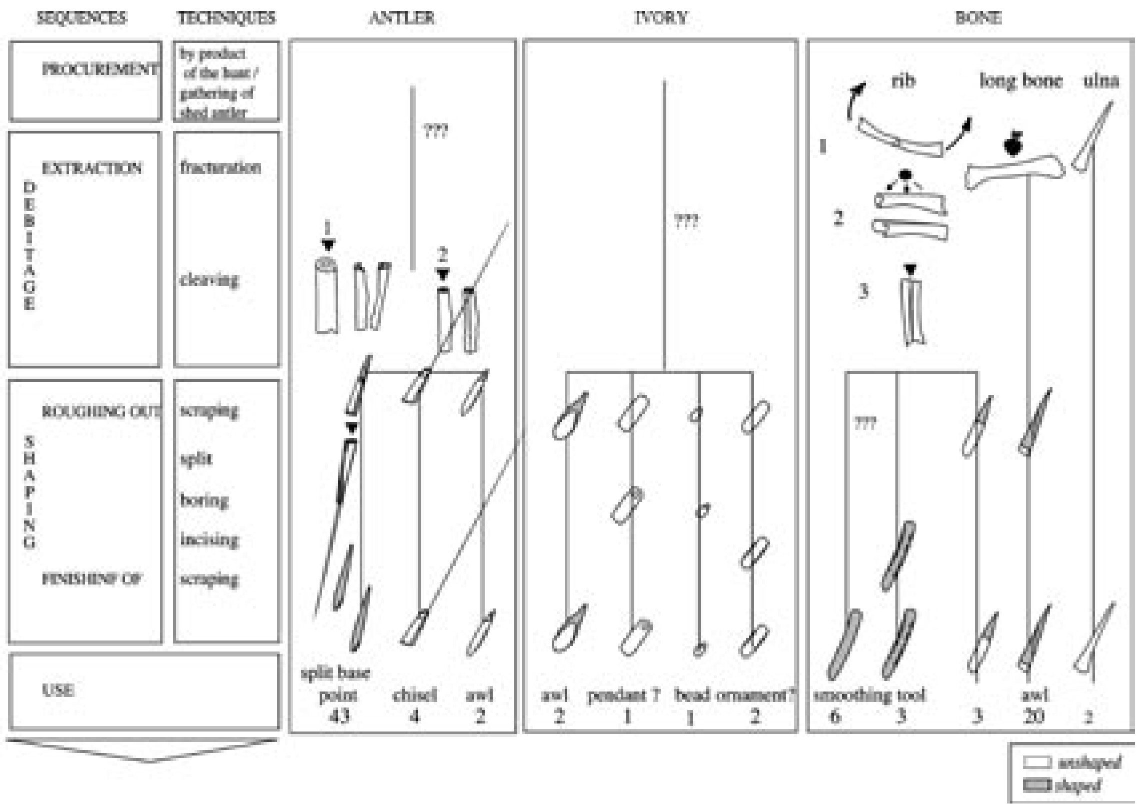

FIG. 9 – *Chaînes opératoires* of osseous raw-materials Isturitz (level SIII).

the blanks used to manufacture the points is identical (Fig. 10). Moreover, the elliptic cross section of the Isturitz points cannot result from the practice of successive reasharpenings, because even the smallest points from Tuto de Camalhot conserve a subrectangular cross section, whereas even the largest from Isturitz are elliptic. These Early Aurignacian productions therefore use the same operational concepts and technical traditions, but differ in the design of the main target of production, the points.

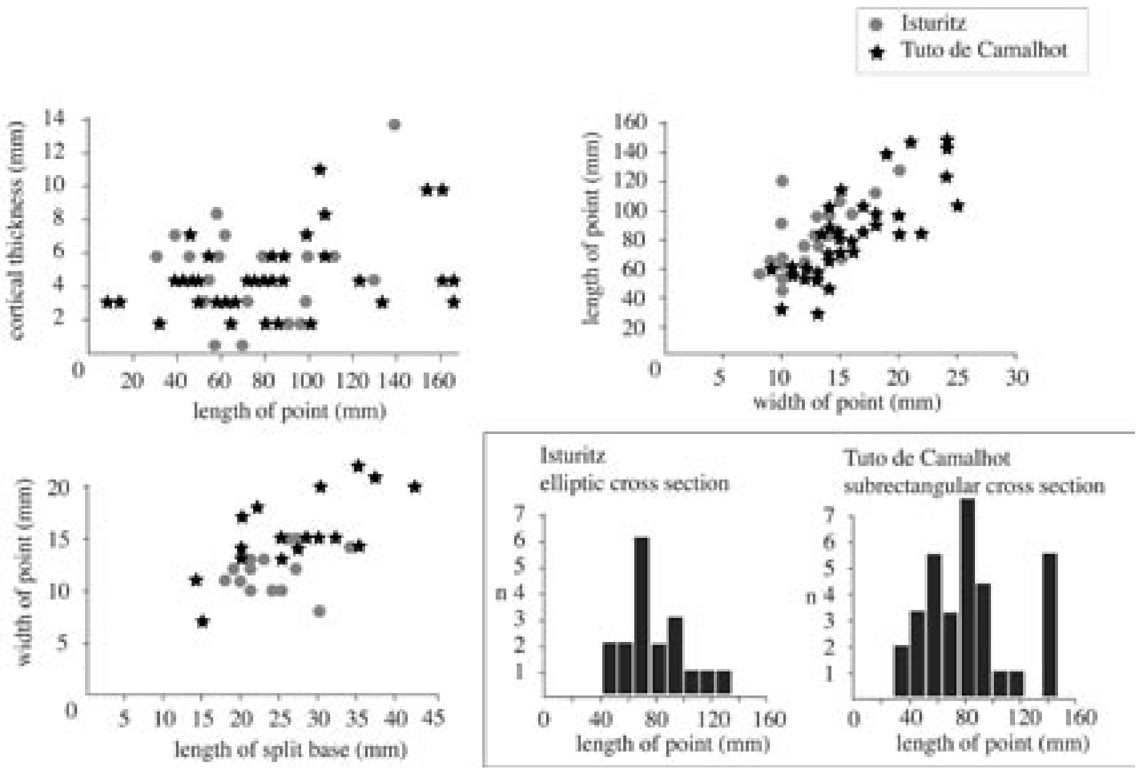

FIG. 10 – Morphometric comparison of the points from Isturitz and Tuto de Camalhot.

The points from the site of Aurignac are too few for comparison, but the two pieces known evoke the corpus from Isturitz. Their comparison with assemblages from the Périgord is currently under way, but the analysis is complicated by the nature of the data; in fact, the corpus of points from the Périgord comes from large sites associated with a plethora of satellite sites where one would not expect to find homogeneous assemblages in the first place (cf., where Castanet is concerned, Liolios, 1999). We have nonetheless compared them with the points from the nearby Spanish sites, in the hope of defining similarities and differences and to better interpret the latter, whose low numbers are so striking.

Bone working in the Early Aurignacian of Spain

The analysis of the Spanish corpuses is complicated by the fact that they are poor and often from old excavations. The sites with Aurignacian bone tools are all in the Cantabrian region (*sensu lato*) (Obermaier, 1925; González Echegaray and Freeman, 1971, 1973; González Echegaray, 1980; Bernaldo de Quirós, 1981, 1982; Cabrera, 1984, 1993; Fortea, 1995) or in Catalonia (Corominas, 1949; Soler, 1986; Soler and Maroto, 1987; Rueda i Torres, 1987) (Fig. 11).

The Catalonian sites of Reclau Viver and l'Abreda are by far the richest (Figs. 11-12), but significantly less so than the French sites. Both yielded points; according to Narcis Soler (paper presented to the Liège 2001 UISPP conference), Reclau Viver yielded eight, and about ten come from l'Arbreda. The latter site also yielded a chisel made on deer antler as well as ivory smoothing tools, a category of finds that, in French sites, is made on animal ribs. Bone has not been worked, and ivory is not exclusively used for ornaments. At Reclau Viver, however, the points are clearly associated with smoothing tools made on ribs.

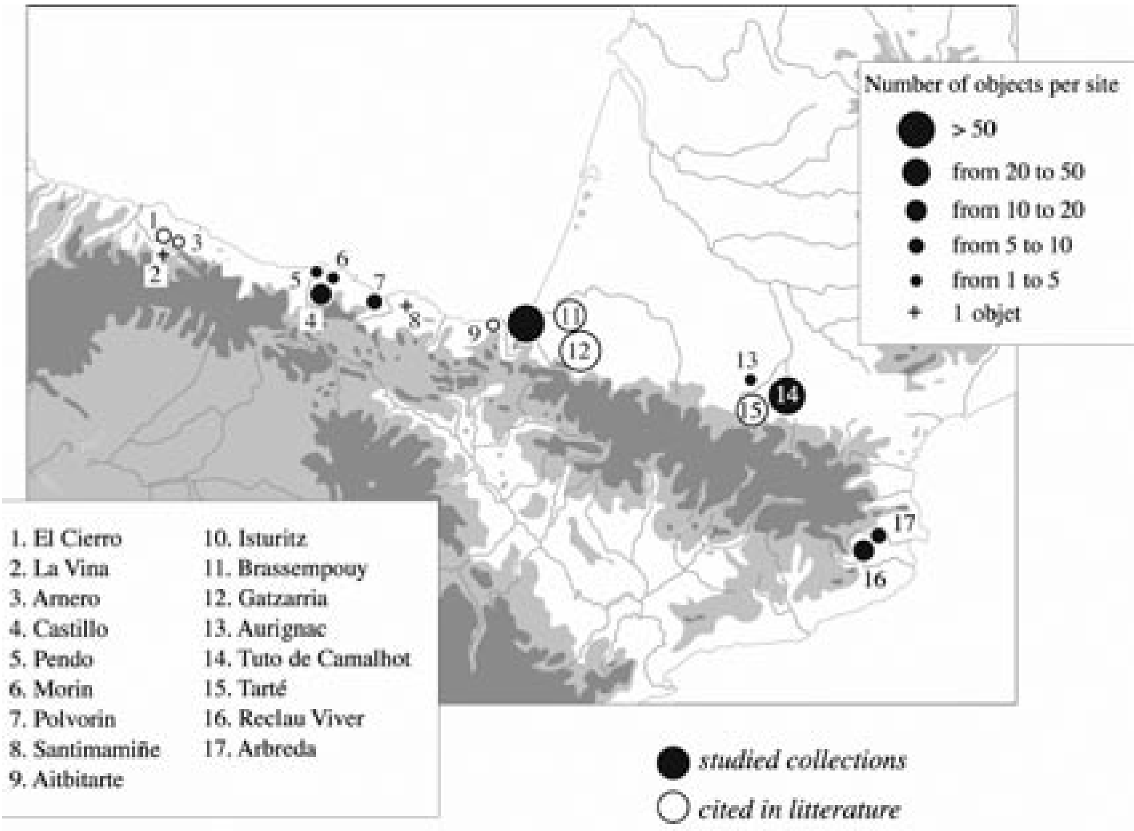

FIG. 11 – Early Aurignacian sites with bone tools in the Pyrenees and northern Iberia.

In the Cantabrian region (Fig. 12), sites are even less rich (Barandiarán, J. M., 1976; Barandiarán, I., 1980; Bernaldo de Quirós, 1982). Split-based points are present in very small numbers, and other features are equally striking: the lack of debitage byproducts, the absence of ornaments and, at El Castillo (level D), the fact that an ivory point is apparently split-based (the single such instance known; a more detailed study of this piece is ongoing). There is also an ivory point fragment in level 6 of Morín (Bernaldo de Quirós, 1982). As in France, there are some smoothing tools made on ribs and chisels made of antler.

All Catalonian points feature an elliptic design; the Cantabrian points, however, are very diverse (Fig. 13). At El Castillo, three different point designs exist: elliptic, biconvex, and cylindrical, but the association of these different points is perhaps simply stratigraphical, not cultural. The single split-based points from Santimamiñe and Polvorín are, respectively, cylindrical and elliptic (cf. also Figs. 2a-2b). The sizes of these pieces vary as much as their design (Fig. 14).

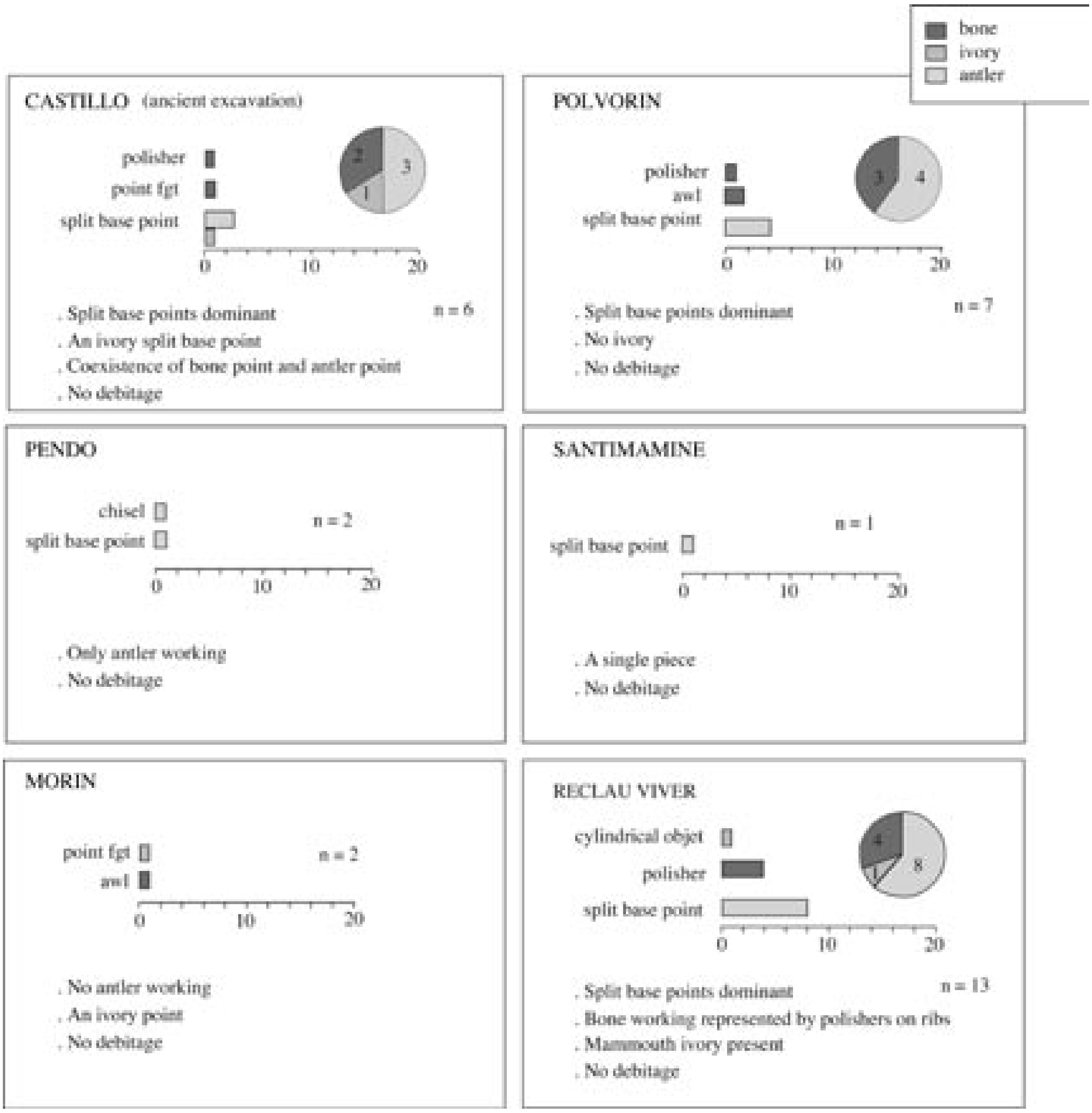

FIG. 12 – Composition of bone tool assemblages from Cantabrian Early Aurignacian sites.

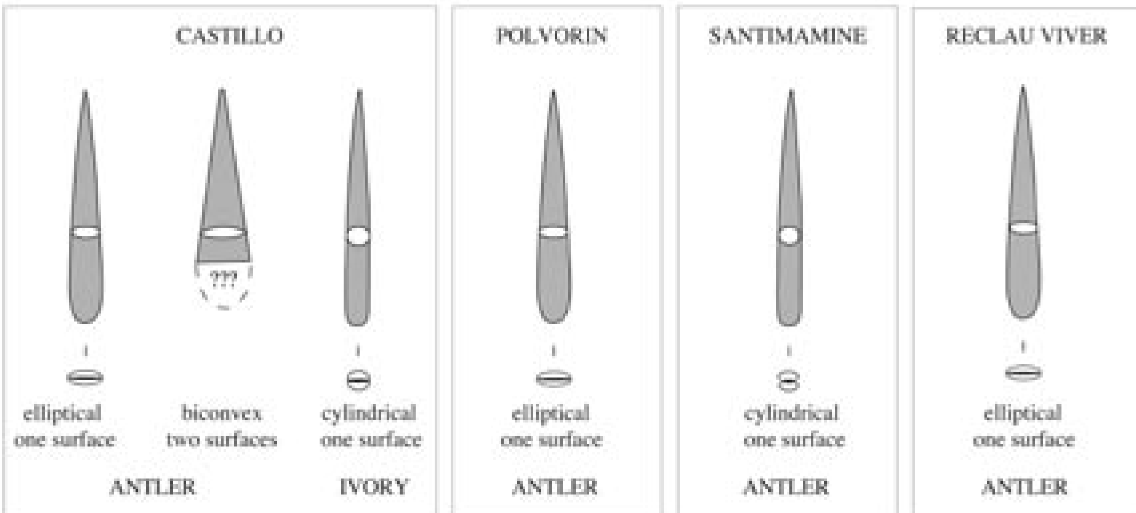

FIG. 13 – Different split-based point designs from northern Spain.

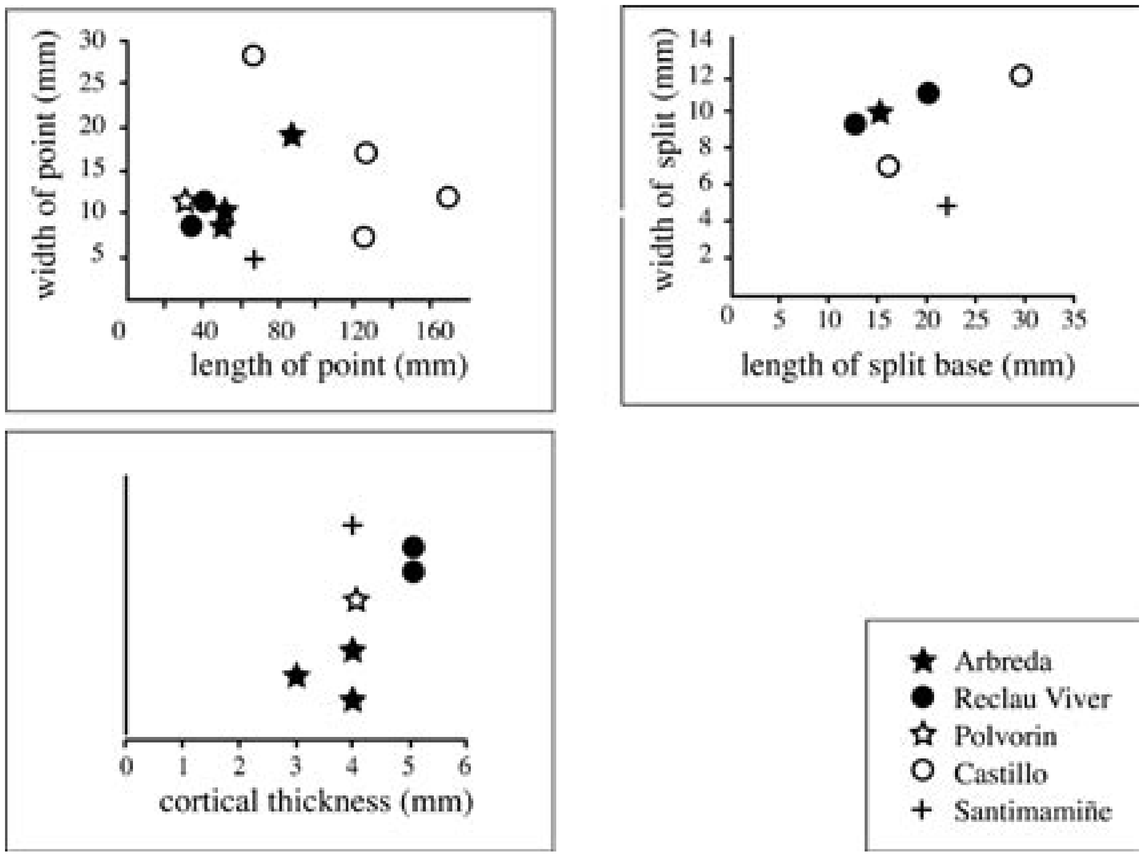

FIG. 14 – Main metric features of split-based points from northern Spain.

How do we explain the Spanish pattern? Given the early dates for El Castillo and l'Arbreda (Bischoff et al., 1989; Cabrera and Bischoff, 1989; but see Zilhão and d'Errico, 1999), is it possible that we are dealing with the earliest stages of the emergence of a bone working tradition, and that the differences between sites north and south of the Pyrenees are of a chronological nature? The fact that bone tools are as rare at sites with dates not as early as those obtained for l'Arbreda and El Castillo suggests that this is unlikely. Bone tools are really not a major feature of the Spanish Aurignacian, Early or Evolved (Bernaldo de Quirós, 1982; Soler and Maroto, 1993).

Another possibility relates to issues of raw-material availability. The reduced cortical thickness of the antler used for the Spanish points (Fig. 14) in any case would not have prevented production. Such problems would also not suffice to explain the absence of bone products, or the special status of ivory, not used for ornaments, contrary to the situation at Tuto de Camalhot and Isturitz, where, although rare, this raw-material is reserved to bead manufacture, as in the Périgord. Availability issues cannot explain either the exceptional case (if confirmed by ongoing research) of a cylindrical split-based point made out of ivory from El Castillo (Fig. 2e), so far the single such point on this raw-material known in Europe. The base of this point was scraped, not split, because the latter technique does not work well with ivory. This difference is telling both of the importance of the implied hafting system, and of the technical distance separating at least El Castillo from the French sites.

If we add to all of this the absence of debitage byproducts (even if the meaning of such absence is rendered ambiguous by the selective conservation of finds practiced in old excavations, which prevents exclusion of the possibility that such byproducts were simply discarded), the Spanish material is clearly quite different: of reduced numerical importance, bearing witness to a rather diverse array of designs, with no working of bone, and with a particular mode of economic exploitation of ivory. It is conceivable that this pattern relates to the fact that the Spanish pieces are finished objects abandoned away from the place of manufacture; finished objects, in fact, may indeed have circulated among Aurignacian groups as much as raw-materials, ideas, or concepts, with Spanish groups lacking any systematic, routine exploitation of osseous raw-materials for tool manufacture.

This diversity is to be added to that observed in the realm of lithics, and undoubtedly is the expected and logical consequence of the expansion of Aurignacian cultures across Europe. It illustrates the complexity of what is at stake, and may well be related to geographical or chronological distance. Limiting us to these two choices, however, would lead to a view of the Aurignacian as a simple and linear process; one must also consider the fact that such distances precisely indicate that the constitution of the Early Aurignacian resulted from the confluence of population movements operating at diverse rhythms and speeds, in connection with the history of Aurignacian groups in Europe as much as in connection with their initial expansion and processes of diffusion of both objects and know-how as a result of contact between the different groups.

Finally, it must be borne in mind that in systems of a generalized economy such as those of contemporary hunter-gatherers, technical and economic activities are conditioned by the main goal of securing the reproduction of the group's means of subsistence. That is why several scales of social organization exist: nuclear (familiar, ensuring the group's biological reproduction), band (grouping several families in the procurement of daily subsistence), clan (relating several families linked by marriage alliances), and tribe (several families linked by political or economic alliances). Forms of differentiation may operate in multiple fashions at these distinct scales. At the level of the tribe, hunters may well utilize the same range of gear, even wear the same kinds of ornaments, and still differentiate in a fundamental way on the basis of what they eat or do not eat. The Aurignacian must be seen as related to phenomena of this kind, so familiar to ethnologists.

Acknowledgments

I wish to acknowledge Narcis Soler for permission to examine the as yet unpublished collection from l'Arbreda.

I am also grateful to J. Zilhão for his translation of the manuscript.

REFERENCES

ALBRECHT, G.; HAHN, J.; TORKE, W. G. (1972) - *Merkmalanalyse von Geschoßspitzen des mittleren Jungpleistozäns in Mittel- und Osteuropa*. Stuttgart: W. Kohlhammer (Archaeologica Venatoria; 2).

BARANDIARÁN, I. (1980) - Industria ósea. In GONZÁLEZ ECHEGARAY, J., ed. - *El yacimiento de la Cueva "El Pendo"*. Madrid: CSIC (Bibliotheca Praehistorica Hispana; 17), p. 151-191.

BARANDIARÁN, J. M. de (1976) - Vasconia antigua: la cueva de Santimamine. In *Obras completas. Tomo 9*. Bilbao: Gran Enciclopedia Vasca.

BERNALDO DE QUIRÓS, F. (1981) - Las industrias del Paleolítico Superior inicial en la región cantábrica española. *Trabajos de Prehistoria*. Madrid. 38, p. 69-92.

BERNALDO DE QUIRÓS, F. (1982) - *Los inicios del Paleolítico Superior cantábrico*. Santander: Centro de Investigación y Museo de Altamira.

BISCHOFF, J. L.; SOLER, N.; MAROTO, J.; JULIÀ, R. (1989) - Abrupt Mousterian/Aurignacian boundary at ca. 40 ka B.P.: accelerator radiocarbon dates from l'Arbreda Cave (Catalunya, Spain). *Journal of Archaeological Science*. London. 16, p. 563-576.

BON, F. (2002) - *L'Aurignacien entre mer et océan: réflexion sur l'unité des phases anciennes de l'Aurignacien dans le Sud de la France*. Paris: Société Préhistorique Française (Mémoire de la Société Préhistorique Française; 29).

BRODAR, M. (1968) - Knochenspitzenfundstellen des älteren Jungpaläolithikums in Deutschland und Österreich. *Quartär*. Bonn. 19, p. 219-237.

BROGLIO, A. (1993) - L'Aurignacien au sud des Alpes. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche Orient. Actes du XII^e Congrès International des Sciences Préhistoriques et Protohistoriques. Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 193-202.

BROGLIO, A. (1996) - Le Paléolithique supérieur en Italie du Nord. In OTTE, M.; KOZŁOWSKI, J. K., eds. - *Le Paléolithique supérieur européen: Bilan quinquennal 1991-1996. U.I.S.P.P. – Commission VIII (réunion de Forli, septembre 1996)*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège; 76), p. 289-304.

CABRERA VALDÉS, V. (1984) - *El yacimiento de la Cueva del Castillo (Puente Viesgo, Santander)*. Madrid: CSIC (Bibliotheca Praehistorica Hispana; 22).

CABRERA VALDÉS, V.; BERNALDO DE QUIRÓS, F. (1993) - L'Aurignacien de la région cantabrique espagnole. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche Orient. Actes du XII^e Congrès International des Sciences Préhistoriques et Protohistoriques. Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 181-186.

CABRERA VALDÉS, V.; BISCHOFF, J. L. (1989) - Accelerator ^{14}C dates for early upper Paleolithic (basal Aurignacian) at El Castillo Cave (Spain). *Journal of Archaeological Science*. London. 16, p. 577-584.

COROMINAS, J. M. (1949) - El Paleolítico Superior en la cueva Reclau Viver de Seriñá (España). *Rivista de Scienze Preistoriche*. Firenze. 4:1-2, p. 43-54.

DJINDJIAN, F. (1993) - Les origines du peuplement aurignacien en Europe. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche Orient. Actes du XII^e Congrès International des Sciences Préhistoriques et Protohistoriques. Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 136-154.

FORTEA PÉREZ, J. (1995) - Abrigo de la Viña. Informe y primera valoración de las campañas 1991 a 1994. *Excavaciones Arqueológicas en Asturias 1991-1994*. Oviedo, p. 19-32.

GAMBASSINI, P. (1993) - L'Aurignacien de l'Italie du sud. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche Orient. Actes du XII^e Congrès International des Sciences Préhistoriques et Protohistoriques. Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 203-206.

GONZÁLEZ ECHEGARAY, J. (1980) - *El yacimiento de la cueva de «El Pendo»*. Madrid: CSIC (Biblioteca Praehistorica Hispana; 17).

GONZÁLEZ ECHEGARAY, J.; FREEMAN, L. G. (1971) - *Cueva Morín. Vol. 1: excavaciones, 1966-1968*. Santander: Patronato de las Cuevas Prehistóricas de la Provincia de Santander (Publicaciones; 6).

GONZÁLEZ ECHEGARAY, J.; FREEMAN, L. G. (1973) - *Cueva Morín. Vol. 2: excavaciones, 1969*. Santander: Patronato de las Cuevas Prehistóricas de la Provincia de Santander (Publicaciones; 10).

HAHN, J. (1977) - *Aurignacien, das ältere Jungpaläolithikum im Mittel- und Osteuropa*. Köln-Wien: Böhlau (Fundamenta; A 9).

HAHN, J. (1988) - *Die Geißenklösterle -Höhle im Achtal bei Blaubeuren I. Fundhorizontbildung und Besiedlung im Mittelpaläolithikum und im Aurignacien*. Stuttgart: Theiss.

HENRI-MARTIN, L. (1931) - La station aurignacienne de la Quina. *Bulletins et Mémoires de la Société Archéologique et Historique de Charente pour l'année 1930*. Angoulême. 20, p. 1-77.

KNECHT, H. (1991) - *Technological Innovation and design during the Early Upper Paleolithic: a study of organic projectile technologies*. Ph. D. Department of Anthropology, New York University.

KOZŁOWSKI, J. K., ed. (1982) - *Excavation in the Bacho Kiro Cave (Bulgaria): final report*. Warszawa: Państwowe Wydawnictwo Naukowe.

KOZŁOWSKI, J. K. (2000) - The formation of the Aurignacian in Europe. *Journal of Archaeological Research*. New York, NY. 56, p. 513-534.

LIOLIOS, D. (1999) - *Variabilité et caractéristiques du travail des matières osseuses au début de l'Aurignacien: approche technologique et économique*. Thèse de doctorat de l'Université Paris X-Nanterre.

OBERMAIER, H. (1925) - *El hombre fósil*. Madrid: Comisión de Investigaciones Paleontológicas y Prehistóricas.

OTTE, M. (1979) - *Le Paléolithique supérieur ancien de Belgique*. Bruxelles: Musées Royaux d'Art et d'Histoire (Monographies d'Archéologie Nationale).

PASSEMARD, E. (1944) - La caverne d'Isturitz en Pays Basque. *Préhistoire*. Paris. 9, p. 1-84.

PERPÈRE, M. (1975) - Grands gisements aurignaciens de Charente. *L'Anthropologie*. Paris. 75:2, p. 243-260.

PEYRONY, D. (1933) - Les industries aurignaciennes dans le bassin de la Vezère. Aurignacien et Périgordien. *Bulletin de la Société Préhistorique Française*. Paris. 30, p. 543-559.

PEYRONY, D. (1935) - Le gisement Castanet, vallon de Castelmerle, commune de Sergeac (Dordogne). *Bulletin de la Société Préhistorique Française*. Paris. 32, p. 418-443.

PROSEK, F. (1953) - Szeletien na Slovensku. *Slovenská Archeológia*. Nitra. 1, p. 133-194.

RUEDA I TORRES, J. M. (1987) - La indústria òssia del Paleolític Superior de Serinyà: Reclau Viver i Bora Gran d'En Carreras. *Cypsela*. Girona. 6, p. 229-236.

SOLER MASFERRER, N. (1986) - *El Paleolític superior al Nord Este de Catalunya*. Thèse de doctorat de l'Université de Barcelone.

SOLER, N.; MAROTO, J. (1987) - Els nivells d'ocupació del Paleolític Superior a la cova de l'Arbreda (Serinyà, Girona). *Cypsela*. Girona. 6, p. 221-228.

SOLER, N.; MAROTO, J. (1993) - Les nouvelles datations de l'Aurignacien dans la péninsule ibérique. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche Orient. Actes du XII[e] Congrès International des Sciences Préhistoriques et Protohistoriques. Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 162-173.

SONNEVILLE-BORDES, D. de (1960) - *Le Paléolithique supérieur en Périgord*. Bordeaux: Delmas.

TEYSSANDIER, N. (2003) - *Les débuts d l'Aurignacien en Europe, Discussion à partir des sites de Geißenklösterle, Willendorf II, Krems-Hundssteig, Bacho-Kiro*. Thèse de doctorat de l'Université de Paris-X-Nanterre, Nanterre.

VÉRTÈS, L. (1955) - Neue Ausgrabungen und paläolithische Funde in der Höhle von Istállóskö. *Acta Archaeologica Academiae Scientiarium Hungaricae*. Budapest. 5, p. 111-131.

VERTÈS, L. (1956) - Ausgrabungen in der Petenyi und Peskö Höhle (Bükk Gebirge). *Folia Archaeologica*. Budapest. 10, p. 4-15.

VÉZIAN, J.; VÉZIAN, J. (1966) - Les gisements de la grotte Saint-Jean-de-Verges (Ariège). *Gallia Préhistoire*. Paris. 9, p. 93--129.

ZILHÃO, J.; D'ERRICO, F. (1999) - The chronology and taphonomy of the earliest Aurignacian and its implications for the understanding of Neandertal extinction. *Journal of World Prehistory*. New York, NY. 13:1, p. 1-68.

ZOTZ, L. (1964-1965) - Die Aurignac-Knochenspitzen aus der Tischoferhöhle in Tirol. *Quartär*. Bonn. 15-16. p. 143-153.

Aurignacian, behavior, modern: issues of definition in the emergence of the European Upper Paleolithic

JOÃO ZILHÃO

"Most of the propositions and questions of philosophers arise from our failure to understand the logic of our language. (They belong to the same class as the question whether the good is more or less identical than the beautiful.) And it is not surprising that the deepest problems are in fact not problems at all."

Ludwig Wittgenstein, *Tractatus Logico-Philosophicus*, proposition 4.003

ABSTRACT Because of their meaning in other realms (common language, biological sciences), the use of words such as "modern" or "behavior" to conceptualize aspects of human evolution has a strong impact in our current understanding of the emergence of the Upper Paleolithic in Europe; it implicitly conveys, and favors, teleological views of the process where the explanation of culture change is fully reduced to changes in the biological hardware of the protagonists of the cultural process. The problems of definition involving the Aurignacian relate to a large extent to the fact that, in this framework, the word has become equated with "behavior of the early modern Europeans". Such a practice should be abandoned, and the Aurignacian defined as a technocomplex, regardless of issues of authorship, so that we can work with a shared operational definition that holds in spite of adherence to paradigmatic views of what happened to Neandertals and early modern humans in the Europe of ca.40-30 kyr BP.

Introduction

In the mid-nineteenth century, when the term Aurignacian was coined, prehistoric research was carried out to a large extent under the paradigm that, given its time-depth, the archeological record represented a test-case of choice for the illustration of the validity of the Law of Universal Progress (Mortillet, 1867). The specific task of Science in this field was that of finding out the concrete stages, conceived and defined in the manner of geological eras and periods, through which human History had unfolded. In this framework, research questions were for the most part chronological (what stages are there and which cultural "fossils" differentiate between them) and stratigraphical (where exactly in the overall sequence does each stage fall).

Where the Aurignacian is concerned, these issues were largely settled by Breuil's (1907, 1913) demonstration that it pre-dated the Solutrean. At that time, however, prehistorians were beginning to recognize that the stages named by preceding generations of researchers were not of universal validity. This led to a gradual redefinition of those categories as cultures in the ethnographic sense of the concept, and inspired research along new lines: relations between cultures and "races"; construction of valid regional sequences and establishment of the chronological correlations between them; origins of the different cultures and regionally variable roles played in their observed emergence by local invention, diffusion and migration.

The processual archeology of the 1960s added new dimensions of investigation, anchored on the concept of "archeology as human ecology" (cf. Butzer, 1982). It was recognized that artifact morphology was constrained by function as much as (if not more than) by norm, and that changes through time could be explained through interaction with the environment as well as (if not better than) by the movement of peoples. Coupled with the explosive development of radiometric dating techniques, which often allowed issues of culture-stratigraphic assignment to be effectively side-stepped, this paradigmatic change contributed to bring issues of long-term change, transformation, or evolution to the center stage of prehistoric research. In a way, this represented a resurrection of the nineteenth-century perspective; even if the investigation was now driven by the search for cause, not illustrative example, "progress" (toward a modern anatomy, a fully human intellect, a sophisticated behavior, a complex social organization, etc.) was equally assumed to underlie the historical process.

Necessarily building on previous work, the last thirty years of research on the Aurignacian combined investigative trends rooted in the different paradigms that successively dominated the discipline in the past. We continue to argue about the temporal and geographical boundaries, the internal organization, the associations and the definition of the phenomenon; in spite of the fact that something we argue about must indeed exist at some level, some have even gone as far as questioning whether "the" Aurignacian existed at all. To a large extent, however, these arguments tend to be seen as concerning mere "particulars"; over the last couple of decades, the "big picture", the question that "implications" sections of research papers have almost never failed to address, the issue subsuming all those different research topics, has been that of how the Aurignacian relates to modern human origins.

This holds irrespective of paradigmatic affiliation. In the 1960s and the 1970s, the Aurignacian featured in the controversy between processual and culture-historical archeology in relation to the issue of functional variability versus cultural norm. Peyrony and Bordes' notion of two parallel phyla (Perigordian and Aurignacian) played a supporting role in the latter's view that the six Mousterian assemblage variants diagnosed in the Périgord represented true ethnic cultures, contra Binford's interpretation of them as functional variants of a single adaptive system (Binford, 1973; Bordes, 1973). Today, whether arguing about such classic cultural-historical questions as origins or artifact typology, or about such novel processual questions as adaptation or behavior, the unifying thread is the search for answers relating to the two sides of the "big picture": the Aurignacian as the archeological proxy for moderns in Europe; and the Aurignacian as the archeological evidence of fully modern human behavior. The extent to which this happens is made clear by carrying out a simple Internet search for "Aurignacian" with the Google search engine. At the top of the list come links to different encyclopedias and teaching resources posting near identical definitions, of which the following represents a fairly typical wording: "The story of the Aurignacian is that of the spread of anatomically modern humans across Europe. It is the first true Upper Paleolithic industry in Europe and the Near East, where it is thought to originate around 40 000 years ago" (http://scarab.newport.ac.uk/pavi/page2.html).

This is in spite of the fact that, beginning in the later part of the 1990s, a series of research papers (cf., for instance, d'Errico et al., 1998; Zilhão and d'Errico, 1999; Churchill and Smith, 2000; McBrearty and Brooks, 2000; Kuhn et al., 2001; Valladas et al., 2001; Conard, 2003) presented a considerable array of evidence showing that this view of the Aurignacian was in clear conflict with the empirical data. Those papers showed that modern behavior as traditionally defined had emerged, both in Africa and in Europe, before the Aurignacian; that the makers of the first Aurignacian remained unknown; that it could not be excluded that Neandertals had been involved in the phenomenon at its earliest stages; that, in central and southeastern Europe, the absence of diagnostic fossils meant that such pre-Aurignacian early Upper Paleolithic industries as the Bachokirian or the Bohunician, although more likely associated with Neandertals, could conceivably be related instead (as suggested by Bar-Yosef, this volume) to the continent's first modern human populations; and that figurative art, heralded by some as the true criterion of behavioral modernity, only existed in the later part of the Aurignacian, none being known from sites dated to the first five millennia of its duration.

The implication of this recent work should have been that research on the Aurignacian needed to be decoupled from the issue of modern human emergence and re-formulated again as a subject in its own terms, regardless of the potential implications for "big picture" issues. This has not been easy to achieve, to a certain extent because of inevitable inertia; the enduring influence exerted on practitioners of archeology and paleoanthropology by philosophical and paradigmatic bias and the misuse of language, however, has also played a very important role in the last twenty years of Aurignacian "troubles".

Human culture as modern behavior

Part of the problem is that, as the discipline changed and evolved, and as our perceptions of the external reality under investigation changed accordingly, the words created in the nineteenth century were retained to name scientific categories of a totally different nature. Because, as new paradigms emerge, the old ones inevitably survive alongside for some time, this creates a problem of communication — use of the same words to convey completely different meanings. On the other hand, the original choice of words, particularly if they were picked from common language instead of being created ex-novo as purely scientific jargon, inevitably reflects the paradigmatic view prevailing at the time. Thus, through the use of the same word, old meanings may become unconsciously incorporated in new concepts and may condition their understanding, interpretation and use by the profession; and, through the use of words borrowed from common language, the meanings associated with them in that realm come to influence the understanding of the scientific concept itself, whether that was originally intended or not, and even if that was originally explicitly rejected. Nowhere is this problem more apparent than in the current use in scientific language of the word "modern" to refer to the body morphology and the behavior of people that, in actual fact, lived more than 30 000 years ago.

Until the 1970s, European Upper Pleistocene hominids were referred to in the literature as "Neandertal" and "Cro-Magnon". Subsequently, the latter designation largely disappeared from technical papers, although one can still find it in works written for a wider audience, and was replaced by that of "anatomically modern humans". An explicit rationale for this change may exist somewhere in the literature of the late 1970s, but it is clear that the rapid acceptance of the new manner of speaking was related to the paradigmatic change in human evolution studies that occurred at about that time. In post-war years, the process was viewed by most practitioners as unilineal and stadial. It was the evolution of a single species with geographically differentiated, co-evolving populations going through similar stages of development, where biology and culture changed hand in hand. An influential European researcher, A. Leroi-Gourhan, designated those stages as Australanthropian, Archanthropian, Paleanthropian and Neanthropian. Where the origin of the latter was concerned, the answer was clear and unambiguous: they derived from their local Paleanthropian predecessors.

This view was to be replaced by one where evolution is bushy, and extinctions, bottlenecks, expansions and replacements are part of the process through which present-day human populations came into being. In particular, it became clear, first on a paleontological basis and then also on a genetic basis, that Africa had played a key role in human origins at least twice: in the Lower Pleistocene emergence of Leroi-Gourhan's Archanthropians, first; and then in the Late Pleistocene dispersal from Africa into Eurasia of the Neanthropians. Put another way, Neandertal Paleanthropians had not evolved to become Cro-Magnon Neanthropians; in spite of potential admixture at certain times or places, in a long-term evolutionary framework it was appropriate to conclude that the latter had replaced the former (Stringer, 2002; Trinkaus and Zilhão, 2002).

In this context, using Cro-Magnon to designate the ancestral African populations from which descended the European humans associated with the designation would have been odd, even Eurocentric, and one can understand the need to find an alternative. In retrospect, however, the choice of the designation "modern" instead of, for instance, "Qafzeh-Skhul", or "Omo-Kibish", was a rather unfortunate one. Granted, this choice was appropriate within a certain explanatory framework, one that postulated the short-term extinction of all morphologically "archaic" penecontemporaneous human groups and their complete replacement, with no admixture, by populations exclusively descended from a very small group of people living somewhere in eastern Africa around 150 000 BP — the "mitochondrial Eve hypothesis" (Cann et al., 1987). In such a scenario, the Qafzeh-Skhul or Omo-Kibish group could be conceived as "us as we were then", i.e., as people as "modern" as our relatives of only two or three generations ago (in the sense that they were the direct ancestors of "us", the one species of humans living on planet Earth in modern times).

"Modern"

If, however, the strict replacement-with-no-admixture scenario is rejected, as it is becoming increasingly clear that it should be, the simple fact that the word modern is used to describe those in fact chronologically archaic Qafzeh-Skhul or Omo-Kibish people makes it especially and unnecessarily cumbersome to explain (and to obtain a correct understanding of) alternative views. This is related, to a great extent, to the meanings that both the word modern and the opposition modern versus archaic have in common language, where modern often means more evolved or superior. The Merriam-Webster on-line Dictionary (http://www.m-w.com/cgi-bin/dictionary), for instance, gives the following meanings for modern: "of, relating to, or characteristic of the present or the immediate past"; "of, relating to, or characteristic of a period extending from a relevant remote past to the present time"; "involving recent techniques, methods, or ideas". Archaic, in turn, often means less evolved or inferior; according to the same dictionary, it may mean "of, relating to, or characteristic of an earlier or more primitive time", "surviving from an earlier period" and "typical of a previously dominant evolutionary stage". As a result, referring to a group of people who lived more than 100 000 years ago as modern (i.e., both more evolved and present) and as completely different and separate from their archaic (i.e., both less evolved and typical of the past) contemporaries implicitly conveys the teleological concept that those modern people were somehow predestined to prevail and become what they (in fact "we") are today. By the same token, such a practice also sets the intellectual background for the search of a prime mover residing in the immanent properties of being modern that would explain such an ultimate prevalence.

An analogy drawn from the automobile industry helps to make this point more clearly. Automatic cars became common in the American market in the 1950s. Today, they are almost exclusive in that market. However, nobody refers to American automatic cars of the 1950s as modern, and to their contemporary gear-shift cars as archaic, simply because the former ultimately prevailed and the latter went extinct or near-extinct. And nobody refers to twenty-first century European cars as archaic simply because they are gear-shift, not automatic. More importantly, no one these days refers to any car manufactured in the 1950s, either gear-shift or automatic, as modern; and people in search of explanations for why automatic cars ultimately prevailed in the American market do not propose to base such explanations in the mechanical properties of automatic transmissions. We look for explanations in how the different transmissions relate to the environment (user-friendliness, safety, fuel economy, corporate interests of the manufacturers, lobbying, market competition, etc.), and understand that their performance depends on both the inner mechanism and its interaction with the exterior world (the car as a whole, and its use in daily life). Yet, for the better part of the last two decades, when talking about late Middle and early Upper Pleistocene human populations, the wiring of the brain, genes coding for language, or the position of the larynx, have often played the same role in prevailing models as they would in imaginary theories of the "immanent-superiority-of-automatic-transmissions" that would be rejected up front as valid explanations when discussing cars instead of modern human origins.

And this is in spite of the fact that, where the latter are concerned, and contrary to twentieth-century car transmissions, we have no access to the observation of the inner mechanism, only to the byproducts of its performance. Thus, if performance is found to be equivalent across the spectrum of biological variation of later Pleistocene human populations, there should be no point in speculating on the specifics of the two putatively different inner mechanisms, given that the latter are completely beyond reach and that, at the end of the day, both got the job done. That such speculations nonetheless abound betrays the widespread acceptance of the notion that ultimate prevalence implies immanent superiority, but another simple analogy suffices to demonstrate the invalidity of such a notion. As a PC-user, I can understand that my computer-world conspecifics might find some comfort in the notion that PCs ultimately prevailed in the world of personal computing because of a superior hardware, and that Macs, at present already confined to niches, are doomed to extinction sooner rather than later. Naturally, Mac-users would strongly object to such a notion, and excellent cases for the technical superiority of Macs can actually be found in the computer literature. Thus, if indeed PC-users are to become the single species of personal-computer users on planet Earth, that may well be not because their hardware was superior, but in spite of the fact that it was inferior!

The use of the words archaic and modern in this context also carries another major implication. When we talked about Cro-Magnons, it was clear that we were talking about fossil people. When we talk about moderns, however, it is easy to conceive of our object simply as people like us and to forget that natural selection did not stop affecting humans once the set of anatomical features that we call modern morphology emerged. It is precisely in such an error, however, that, modern human origins research often tends to fall. A case in point is the practice of comparing the mtDNA of Neandertals with that of present-day modern humans as if the latter were representative of their Pleistocene predecessors, i.e., as if mutation and lineage extinction over the last 150 000 years had been non-existent or irrelevant.

"Species"

This problem is compounded by the notion that Neandertals and moderns were different species. The argument was originally based on morphological contrasts between fossils, but has recently been made mostly on the basis of the genetic evidence. However, even if one were to accept that the amount of morphological difference is sufficient to warrant the classification of Neandertals as a separate paleontological species, no one-to-one correlation can be established between distances in morphology, genes, behavior and overall biology. And, even if one were to accept as legitimate the logically flawed mtDNA comparisons, the amount of genetic difference recognized is much smaller than that found at the inter-individual level in, for instance, separate populations of chimpanzees (Gagneux et al., 1999). By primate standards, therefore, the genetic evidence would in fact suggest that Neandertals and moderns were different populations or subspecies of the same biological species, not different biological species.

More importantly, the practice of referring to these populations as different species carries a series of implications related to the common scientific usage of the species concept, according to which a particular species is also characterized by a particular behavior. This sets the intellectual background for a research agenda where the aim of paleoanthropologists is supposed to be that of defining "Neandertal behavior" versus "modern behavior". The basis for the agenda is the genetic evidence but, even if we were to accept that such evidence does substantiate a significant amount of biological difference between Neandertals and their modern contemporaries, this needs not have had any behavioral implications. The convenience of mtDNA for phylogenetic purposes resides in its fast mutation rate and in the fact that it is transmitted only along one line, with no recombination. But the DNA in our mitochondria is in fact a vanishingly small percentage of the total genome, and what it measures is drift, not change brought about by adaptation. Consequently, finding that there is a significant mtDNA difference between Neandertals and early modern humans carries, by definition, no meaning in terms of assessing their putative genetically-based behaviors (Zilhão and Trinkaus, 2001).

In any case, the expectation that adaptations must have been species-specific implies that there must be some biologically-based behavioral constants in what Neandertals and moderns did that (1) differentiate between the two, and (2) underlay the many apparently different concrete manifestations of such behaviors and, indeed, countless papers and tens of thousands of pages have been written where the empirical evidence from a particular site or region is used to make inferences on the behavior of the Neandertals or of the moderns. The underlying assumption is that whatever Neandertals, for instance, did with hearths, or raw-material procurement, or herbivore hunting, in, say, France, or Holland, is what Neandertals-as-a-species did at any place in their geographical distribution and at any time in their chronological range. The facts, however, show that the assumption is wrong: residential mobility, exploitation of marine resources, settlement features, manufacture of bone tools and ornaments, burial, etc., show a considerable degree of variation in Neandertal societies across time and space, much as it happens with coeval early modern societies.

"Behavior"

The extraordinary influence that this environment continues to exert on current research is clearly apparent in the most recent review of the evidence relating to the origins of modern behavior (Henshilwood and Marean, 2003, p. 643-644); at the end of an exhaustive discussion of these issues, the authors present what is the most clear and fully explicit formulation of the otherwise often simply assumed, implicit rationale that human behavior is species-specific:

"... wildlife ecologists regularly describe the scope and variety of the anatomy and behavior of a species [...], and these descriptions form the definition of that species relative to others. No two species are exactly alike in their behavioral and anatomical repertoires, and these taxonomically based descriptions form the empirical starting points for the recognition of patterns in behavior and anatomy and eventually for the development of a general theory about the relations between such things as environment and social behavior. Could we seek similarly succinct definitions of *Homo sapiens* and *H. neanderthalensis*? If they are different species (and we believe that they are), then a singular description must exist for each; otherwise their divergent evolution followed an evolutionary pattern unknown among other animals. The description of *H. sapiens*, then, would be our definition of 'modern human behavior,' and we believe that symbolically organized behavior would be at its foundation. [...] We would extend this foundation by suggesting [...] that we need a new term for 'modern human behavior.' [...] We suggest 'fully symbolic *sapiens* behavior.' We see fully symbolic *sapiens* behavior as the culmination of a long line of developments toward modernity."

Henshilwood and Marean then provide their solution for the key question of how can "fully symbolic *sapiens* behavior" be recognized in the archeological record: "The point at which we recognize it archaeologically must be when artifacts or features carry a clear symbolic message that is exosomatic — for example, personal ornaments, depictions, or even a tool clearly made to identify its maker." Both personal ornamentation and body painting, however, are documented among Neandertals; personal ornaments are a well-known feature of the Châtelperronian, and the use of manganese crayons for body painting is documented in the MTA of Pech de l'Azé I (d'Errico et al., 1998; Soressi et al., 2002; d'Errico, 2003). Conversely, figurative art is not documented, at present, among anatomically non-modern humans, but the same is true of many human societies of the historical and ethnographic present. By Henshilwood and Marean's own definition, therefore, Neandertals and moderns are not behaviorally distinct and, under the behavior-as-species-specific paradigm, there should be no escape to the conclusion that, therefore, they were not different species! Instead, these authors 1) suggest the existence of a problem of (poor) definition, particularly the use of inadequate trait lists and 2) disqualify the Neandertal evidence as "rare" and "relatively unspectacular", i.e., unrepresentative.

It is easy to see, however, that the problem is not a definitional one. For instance, it is not difficult to compile a trait list effectively discriminating 100% of the time between industrial and hunter-gatherer societies of the historical and ethnographic present. Ever since the nineteenth century, however, most anthropologists have refused to frame the differences between such societies in terms of the emergence of the biological capabilities required for the development of "industrial behavior". Instead, these differences are explained in terms of uneven development along separate, largely isolated historical trajectories. By the same token, the fundamental "behavioral" differences between industrial societies and those which preceded them in the corresponding trajectories are not framed in terms of the emergence of the biological capabilities for industrial behavior because different moments of a single developmental trajectory cannot be compared without adequate consideration of the time factor.

In fact, since human behavior, or "culture", is cumulative, the passage of time, or "history", is in itself a powerful explanator, through the build-up of social knowledge and population numbers, of differences between human societies separated by tens of thousands of years. The implication of the behavior-as-species-specific paradigm is that, organically and behaviorally, the Cro-Magnon people of 30 000 years ago had more in common with, say, the paleoanthropologists of today, than with penecontemporaneous archaics (namely, the Neandertals). Simple common sense, however, suffices to understand that, even if that assertion may hold where anatomy is concerned, it certainly does not hold when it comes to culture. For instance, whereas paleoanthropologists are capable of elaborating at length on their own behavioral modernity, Cro-Magnon people of 30 000 years ago most certainly could not!

The "representativity" argument, on the other hand, is logically inappropriate and internally inconsistent. Henshilwood and Marean (2003, p.646) state that

> "in contrast to the situation in Africa, the sample of Neandertal sites is huge, but the sample of symbolic material culture is tiny. Once modern humans enter Europe in the early Upper Paleolithic, there is a dramatic expansion in the record of this symbolic expression. Furthermore, we know that modern hunter-gatherers inhabiting these northern environments have elaborate material culture with regular external symbolic storage. While there are a few isolated finds that suggest some symbolic activity among Neandertals, there is a difference in kind here that is impossible to deny."

By the same token, however, it can also be said that modern southern African hunter-gatherers have elaborate material culture with regular external symbolic storage, and that, while there are a few isolated finds that suggest some symbolic activity among early and mid-Upper Pleistocene south-Africans, "there is here a difference in kind that is impossible to deny". That such differences in kind exist, however, does not mean that one can legitimately conclude that "fully symbolic *sapiens* behavior" only emerged in South Africa after ca.20 000 BP because, if ornaments and decorated bone tools are archeological criteria for "fully symbolic *sapiens* behavior", then the issue is one of presence or absence, not of frequency. If "fully symbolic *sapiens* behavior" is a pre-requisite for the production of decorated bone tools and objects of personal ornamentation, that such items exist, whether their number is small or large, must be sufficient evidence that the behavior also exists.

In the case of the Neandertals, moreover, the frequency is not even that low. In fact, the total number of Châtelperronian sites with some preservation of organics currently known is 65, of which nine (14%) contain ornaments and bone tools. The number of Aurignacian sites with some preservation of organics currently known may be estimated at some 230; Geißenklösterle, Vogelherd, Höhlenstein-Stadel, Hohle Fels and Stratzing are the only Aurignacian sites (2% of the total) with sculptured depictions of animals and humans (Conard, 2003). Thus, if the Austrian and German finds are representative of early modern human behavior, then the much less exceptional (in fact, seven times more frequent) occurrence of ornaments and bone tools in the Châtelperronian must be considered as no less representative of Neandertal behavior (Zilhão and d'Errico, 2003).

The Aurignacian as modern human emergence

Henshilwood and Marean (2003, p. 646) acknowledge that "the criteria used to define modern human behavior, derived from modern people, are present among non-modern people such as Neandertals". However, instead of accepting that evidence for what it is worth in the framework of the body of theory they themselves embrace or put forward, they remain unshaken in their twin "belief" that Neandertals and moderns must have been different species and, hence, must have had different behaviors. After decades of trying, all attempts to put together an empirical case in favor of such a view have failed. Notwithstanding, the paradigm survives, and with it the use of words and concepts that entrap the discussion in frameworks so fixed that the debates tend to revolve in circles, and progress in a common understanding of the issues becomes difficult, if not impossible.

The current situation of Aurignacian research is perhaps one of the most extreme examples of this. Because of the practice of equating the Aurignacian with "modern human behavior" and with "evidence for moderns in Europe and the Near East", interpretations and positions tend to be excessively conditioned by conscious adherence to explicit paradigms or unconscious adherence to implicit meanings; as a result, the scientific discourse is all-too-often disconnected from the empirical record to an extent that consensus through hypothesis-testing cannot be reached and special pleading replaces Occam's Razor and the principle of parsimony as the logical basis for the evaluation of the likelihood of the different hypotheses. Given how value- and meaning-laden the word has become, even a simple discussion on whether a certain assemblage is or is not Aurignacian inevitably goes way beyond a straightforward evaluation of its technological and typological features, and often gains such emotional overtones as one might otherwise find hard to believe the simplest of stone artifacts, related to the most mundane of daily activities, had the power to rouse.

The Aurignacian in relation to the Châtelperronian

That paradigmatic bias tends to carry more weight than fact in the modern human origins debate is not new, and can be seen very clearly in the change of meaning the categories Aurignacian (and Châtelperronian) went through in the last two decades of the twentieth century. In the late 1960s and 1970s, it was suggested that the units of European Upper Paleolithic systematics should be understood as technocomplexes (cf., for instance, Clarke, 1979), not chronological subdivisions (as originally formulated, in the nineteenth century), or ethnic cultures (as in the earlier part of the twentieth century). But, in the context of the paradigmatic changes reviewed above, the establishment of associations between the Châtelperronian and Neandertals, on one hand, and between the Aurignacian and anatomically modern humans, on the other hand, eventually led to their treatment as actualized manifestations of the species-specific behaviors of the two species.

Thirty years ago, for instance, Paul Mellars (1973) was of the opinion that "the arguments in favor of ethnic and cultural continuity between the Châtelperronian and latest Mousterian populations in southwest France are virtually conclusive" and that "there seems to be little doubt that the first exponents of upper paleolithic technology in southwestern France were of essentially local, as opposed to exotic, origin". Throughout the 1990s, however, he eventually came to argue the exact opposite, i.e., that the Châtelperronian was a product of mimicking behavior (Mellars, 1999); impacted by the arrival of Aurignacian moderns, the last Neandertals of France would have copied their culture without really understanding its full meaning. Hence, from being the earliest Upper Paleolithic, the Châtelperronian was downgraded to the status of an epigonical Middle Paleolithic. Since the empirical basis of these opposite views remained the same, this complete reversal of position can only be explained by the fact that, meanwhile, the Châtelperronian had been shown to be made by Neandertals, not moderns (Lévêque and Vandermeersch, 1980; Hublin et al., 1996). Because, in the framework of the paradigm that behavior is species-specific, Neandertals were not allowed to have modern behavior, the empirical evidence had to be re-evaluated accordingly, and the Châtelperronian, once an essentially local development, became acculturation under the influence of an intrusive culture (the Aurignacian) brought by exotic people (moderns).

Definitional implications

Where the Aurignacian is concerned, the impact of this paradigm went beyond re-evaluation and in fact amounted, in practice, to a definitional implosion, both at the level of the characterizing cultural traits and at the level of the time limits bounding the phenomenon. For instance, because it was equated with moderns, and because the re-evaluation of the Châtelperronian as acculturation required an early arrival of moderns in Europe, an Aurignacian earlier than or contemporary with the Châtelperronian had to exist, leading to an "earliest Aurignacian rush" that to this day still runs quite unabated. As a result, 1) assemblages were some times too quickly dubbed Aurignacian even when no sound evidence for the diagnosis existed, 2) any radiocarbon results that might provide some support for the notion that the Aurignacian, not the Châtelperronian, represented the earliest true Upper Paleolithic of Europe were all too uncritically accepted, and 3) direct ancestor-descendent links between the Aurignacian and previous industries (that is, under the behavior-as-species-specific paradigm, in the explicit or implicit understanding that those industries also stood for an early presence of early moderns) were proposed without due consideration of the actual technological evidence and of the differences that exist between the transmission of cultural traits and that of biological ones.

This environment may explain, for instance, why the age of ca.39 000 BP suggested for the Aurignacian at El Castillo on the basis of samples from the excavations of the 1980s (Cabrera and Bischoff, 1989) went virtually unchallenged for a whole decade. As it eventually became clear (Zilhão and d'Errico, 1999, 2003), in the excavated area there were virtually no diagnostic Aurignacian items, and certainly no ornaments, bone tools or art objects; the dates were presented as "Aurignacian" because of stratigraphic correlation with level 18 from early twentieth-century excavations, which did indeed contain some Aurignacian items. The "level" from that earlier work, however, was a one meter thick palimpsest containing also a major Mousterian component (such a multi-component nature having since been confirmed beyond any reasonable doubt by the dates of ca.43 000 and >47 300 BP obtained on two samples of deciduous elephant molars likely to have belonged to the same individual — Stuart, 2005). The correlation was therefore extremely weak, but the results were nonetheless widely accepted.

A similar age has recently been proposed for the Aurignacian of the Geißenklösterle, in spite of the fact that, again, that level is a palimpsest of occupations by carnivores (particularly cave bears) and humans, and that none of the 12 dates that were obtained on samples from bones with anthropic marks came out earlier than ca.36 500 BP (and, out of a total of 33, only one, in fact, has a mid-point of ca.40 000 BP) (for an extensive discussion, cf. Conard and Bolus, 2003; Conard et al., 2003; Zilhão and d'Errico, 2003; Teyssandier et al., this volume). Moreover, it was suggested that such an age represented evidence for early modern humans in the region, even if 1) no modern human skeletal remains dated to before ca.35 000 exist anywhere in Europe (Trinkaus et al., 2003), and 2) the results available for the two individuals from the Neandertal type-site in neighboring Rhineland place them precisely at ca.40 000 BP (Schmitz et al., 2002). In this context, even if one were to accept that the single bone from the Geißenklösterle dated to ca.40 000 BP related to Aurignacian human behavior, application of Occam's Razor should have led to the inference that such an early Aurignacian had been made by Neandertals, not that moderns had already settled the Swabian Alb at that time. Notwithstanding, the Geißenklösterle results now tend to replace those from El Castillo as evidence for the very early presence of moderns in Europe, with all the correlates (art, etc.) that such a presence has in the framework of the behavior-as-species-specific paradigm (Sinclair, 2003). The archeological basis of such interpretations, however, is no stronger in southern Germany than it was in northern Spain.

It is also understandable and almost inescapable that, in an intellectual background generating the expectation that a very early Aurignacian should exist, the criteria to identify the presence of the entity are relaxed; given the right date, even a glimpse of evidence goes very quickly from being suggestive to become conclusive. The result, often, is that, at the operative level, carinated scrapers are taken as Aurignacian index fossils, and, at the conceptual level, the Aurignacian is implicitly redefined as an ethnic entity — the complete, integrated package of a genetic configuration with a physical type and a set of cultural traits. Paradoxically, given the oversimplified nature of the archeological criteria underlying them, such uses of "the Aurignacian" in fact enable a school of opponents of the paradigm to counter that "the Aurignacian" as a past cultural or behavioral entity has no real existence, and that the word should be treated as no more than a convenient short-hand for the transitional time period during which Neandertals and the Middle Paleolithic were replaced by or transformed themselves into modern humans and the Upper Paleolithic (cf. Straus, 2003). The consequence is that, in the early twenty-first century, whereas other aspects, issues and periods of Prehistory fully benefit from the incorporation into mainstream practice of the processual and post-processual critiques of traditional archeology, namely the understanding of the taxonomic units of the Paleolithic as technocomplexes, research on the Aurignacian has remained to a large extent entrapped in the more than fifty-year old "culture" versus "period" dichotomy.

Authorship implications

This becomes especially apparent when "origins" issues are at stake (and those kinds of issues do carry a lot of weight in current research as a result of the binding relation that came to be established between the Aurignacian and the emergence of modern humans). Because moderns are supposed to have originated somewhere else, so must the Aurignacian too have a point of origin outside of Europe. Establishing it somewhere in the east substantiates models of Out-of-Africa dispersal, but, by the same token, for Out-of-Africa opponents, identifying that point of origin somewhere in western Europe scores a significant number of points towards refutation of that model. Throughout the 1990s, at least two attempts were made to root the Aurignacian in previous traditions that are good examples of these intellectual mechanisms; even if their solutions and ultimate objectives were different, if not antagonistic, the logic of the argument was basically the same.

In the framework of the Aurignacian-as-moderns paradigm, a phyletic connection with the later Aurignacian was argued for the Bachokirian of Bulgaria, not yet quite Aurignacian but on the evolutionary track to Aurignacian-ness (Kozłowski and Otte, 2000): in the beginning, there were thick blade blanks shaped by lamellar retouch, which, over the millennia, gradually evolved into true carinated scrapers-cores for the production of bladelets. Thus, cultural change was represented as proceeding through the mechanisms of biological evolution, as if stone tools were organic entities that could generate their own selection-shaped descent, while at the same time, completing the full circle, such an evolution of the Bachokirian into the Aurignacian substantiated the notion that the latter had indeed been made by modern humans, as was putatively the case with the Bachokirian. At the other end of Europe, it was proposed, on the contrary, that the early "Aurignacian" of El Castillo had evolved out of the local Mousterian, and that the assemblage from level 18 in fact represented a "Transitional Aurignacian" conceptually akin to the Bachokirian, the implication being that of a Neandertal, or at least part-Neandertal authorship for the Aurignacian (Cabrera et al., 2001). The conclusion and the implication were different, but the mechanism proposed for northern Spain was also based on an organic view of the development of lithic assemblages whereby such things as the simple scrapers made on the distal end of thick blades of the Bachokirian could be conceived as the evolutionary ancestors of carinated pieces.

It is clear that a given stone tool technique has to be invented and ameliorated by some person or persons belonging to some group or groups. The problem, however, is that the amount of time involved in the process is in the order of magnitude of the days or weeks that an experienced knapper would need to perfect the technology; a longer period of time is then necessary for an individual's invention to become socially adopted and, therefore, archeologically-visible, but the duration of time required for testing, improving and spreading across the wide and open exchange networks of hunter-gatherer societies is in the order of magnitude of a few generations. Because of the poor chronometric resolution of archeostratigraphic sequences and dating methods in such remote time periods as that of the "Transition", it is to be expected in the first place that such kinds of spreads will be so rapid that the emergence of the innovation in the archeological record will appear as instantaneous to the observer across vast expanses of geography. As a result, establishing a specific "origin" becomes difficult, if not altogether impossible, as it seems to be indeed the case with the Aurignacian. However, the fact that such a pattern of instantaneity exists is in itself highly informative of the demographic and social properties of the human occupation network in place during the specific time interval and in the specific geographical range concerned. Thus, even if the kind of Aurignacian origins-research guided by simplistic correlations between biology and culture that of late has featured so prominently and with such far-reaching implications is in fact a rather unproductive enterprise, that should not be taken as meaning that, if appropriately conducted, research on the Aurignacian and its distribution across time and space is devoid of implications for the modern human origins debate.

For instance, if, in spite of poor chronological resolution, different kinds of innovations, especially if in different realms, are observed to appear simultaneously and covering a similar geographical range, the hypothesis that a link exists between them is legitimate and warrants pursuit of explanations for the nature and causes of the hypothesized link. The skeletal evidence for modern human morphology indicates that it appears in Europe no earlier than ca.35 000 BP (Trinkaus et al., 2003), that is, in the same time interval and in the same geographical range occupied by early Aurignacian industries of the Proto-Aurignacian variety (cf. the papers by Bon and Bordes, this volume). Their fairly uniform stone tool technology, as well as the widespread distribution of the distinctive split-based bone points of the subsequent Typical Aurignacian stage (cf. Liolios, this volume), contrast markedly with the preceding panorama of regionally differentiated pre-Aurignacian, initial Upper Paleolithic technocomplexes, which, as documented for the Châtelperronian, are likely to have been the work of Neandertals. This discontinuity is, thus, a powerful argument in favor of the establishment, in Europe, of a connection between the emergence of the Aurignacian and that of modern humans.

The difference between biological and cultural dispersals

However, there is no reason to think that the establishment of such a connection is the equivalent of an effective demonstration that the Aurignacian was indeed a fully integrated and inseparable biocultural package. Because their mechanism of transmission is Lamarckian, not Darwinian, ideas and techniques can spread much faster than genes, and in different directions; as a result, contemporaneity within an "instant" of time that may in fact have lasted up to two or three millennia may be accounted for in many different ways, some of which, in the light of the ethnographic evidence, are equally if not more viable than the complete package model. For instance:

a) The Aurignacian may have been a technology developed by modern human groups once they start to spread into Europe. Ensuing interaction with local Neandertals would have originated the formation of hybrid zones, resulting from biological admixture (cf. Eswaran, 2002) and where technology introduced through exchange with the moderns ultimately prevailed. As continued gene influx from the east forced a gradual westward displacement of the hybrid zone, the Aurignacian spread with it. The appearance of the early Aurignacian in the archeological record of a given region could thus represent a proxy for the passing-through of the hybrid zone, i.e., a proxy for admixture, not for complete replacement.

b) The Aurignacian may have been invented somewhere in western Asia and in a biologically modern milieu, prior to the expansion of modern human groups into Europe. The innovations would have been somehow acquired by groups of Neandertals in nearby regions who, in turn, diffused them across the rest of the Neandertal world. When Aurignacian modern human groups finally entered Europe, they would have encountered, mixed with, or altogether replaced, Neandertal populations that, at the time, had already become Aurignacian as well.

c) The Aurignacian may have been invented in Europe by Neandertals just before modern human groups started to disperse into the continent. Because this technology was judged to perform better in the new environments that they were settling, incoming moderns could have adopted it, either in the framework of biological admixture processes or through the occasional situations of contact and exchange that must have occurred even in a migrationist scenario of complete replacement with no admixture. Then, through alliance and exchange networks, the acquired technology would also have spread eastward to Asia, way beyond the westward moving Neandertal/modern frontier and in the opposite direction.

Testing these different alternatives (and there are of course others) is not easy. For instance, even in the extreme example of Neandertal bones being found in an early Aurignacian context in, say, France, or southern Germany, that would not necessarily refute the notion that the technocomplex originally emerged among modern human populations, and that the contrast between a fragmented pre-Aurignacian and a technologically fairly homogeneous Aurignacian Europe is related to the spread of modern humans across the continent. Under alternative b) above, the notion and the find are fully compatible.

The point made by these examples is that letting models of human evolution influence the definition of the archeological categories of the Middle to Upper Paleolithic transition so that they can be accommodated to favored views of how biological modernity emerged and spread is counterproductive and can only lead to an ever-growing confusion of the issues. A good example of the potential (and, in fact, actual) problems is the recent paradoxical suggestion that the origin of the Aurignacian is to be sought in regions where the known assemblages are the least Aurignacian-like (central Asia, Afghanistan), and that the "Aurignacian-ness" of assemblages is best recognized in regions (France) where it arrived latest and, hence, should be considered least typical, even if that is where it was originally defined and is currently better known: "as it diffuses westward, the Aurignacian constitutes itself as such, while at the same time undergoing such a transformation that it can hardly be identified at its Atlantic extremity, where it is very specialized and relatively late" (Kozłowski and Otte, 2000, p. 13; my translation from the French original).

Towards a definition of the Aurignacian as a technocomplex

Faced with the unsurpassable contradictions and paradoxes of the "Aurignacian-as-modern-behavior" model, some authors have been led to argue for degrees of biological and cultural continuity across the Middle-to-Upper Paleolithic transition that would make such categories as Aurignacian or Châtelperronian essentially useless and misleading (cf. Clark and Lindly, 1991; Riel-Salvatore and Clark, 2001; Straus, 2003). This trend, however, is not very helpful either. Human intelligence requires the use of categories to organize and reduce the infinite diversity of the outside world, and science requires standard definitions of the categories operative in the different fields of research. It should be possible to achieve a widely shared definition of the Aurignacian that holds irrespective of paradigmatic adherence to models of modern human emergence, much as such definitions exist for other taxonomic units of the Paleolithic, like, for instance, the Solutrean, the Creswellian or the Acheulian. Granted, all such definitions also have their problems, but in no other case are they of the level of magnitude of those currently afflicting the Aurignacian. There is no reason for this state of things. If Levallois cores and Upper Paleolithic-type blade technologies have a temporal and spatial distribution that cuts across biological boundaries, and if nowadays it is widely accepted that they are per se not indicative of anything in terms of modern human origins (cf. Bar-Yosef and Khun, 1999), why must carinated technologies be so special as to make the Aurignacian different in that regard?

The only productive way to move forward in the understanding of the Middle to Upper Paleolithic transition in Europe is to achieve refined and widely shared definitions of the relevant basic archaeological categories that do not convey implicit or unconscious assumptions about the nature of the processes involved. For instance, we need paleontological definitions of Neandertals and "moderns" that allow discrimination between them, and appropriate classification of osteological remains that hold irrespective of the different evaluations of the paleobiological status of the two paleontological taxa; accordingly, fossil "moderns" should be more adequately renamed. By the same token, we need an operative definition of the Aurignacian that holds irrespective of any interpretation of the historical significance of the category. Such a definition should be based exclusively on lithic technology, which is the basis of Paleolithic taxonomy; other items of material culture, which frequently do not preserve archaeologically (bone tools, ornaments, art), should not be included in the basic definition, although they may play an important complementary role, particularly in attempts at defining more circumscribed time-space units with the potential to approach ethnographic categories (culture area, ethnic entity, language group, etc.; cf., for Aurignacian ornaments, Vanhaeren, 2002).

The basis of this definitional work was laid down in post-war years by F. Bordes, J. Combier, H. Delporte and D. de Sonneville-Bordes, and significantly improved by the introduction of the *chaîne opératoire* concept and the technological perspectives developed by

A. Leroi-Gourhan and J. Tixier. If the proof of the pudding is in the eating, then the simple fact that, most of the time, predictions derived from the type-list diagnosis of an assemblage as Aurignacian are independently verified by radiocarbon dating must mean that the basic elements of that definition are valid. Numerous lithic analysis studies carried out since (cf., recently, Chiotti, 1999; Lucas, 2000; Bon, 2002; Bordes, 2002; Teyssandier, 2003) have shown that such a success is due to a real, broad technological regularity, with many procedures being shared throughout space and time: 1) the production of large blades from single platform prismatic cores; 2) the careful preparation of blade cores (through abrasion of the edge or faceting of the platform) in the optimal stage of reduction sequences, when soft hammers were systematically used, resulting in parallel-sided blades with lipped platforms that serve as blanks for endscrapers and knives; and 3) the re-use of the debris from prismatic-core preparation and renewal (thick, often cortical flakes and blades), and of broken or exhausted tools, set up as thick "scrapers" (carinated or nosed) and thick "burins" (carinated or busked), to be used as cores for the extraction of blanks for different subtypes of Dufour bladelets.

Recent work has also shown that attention needs to be paid to workshop sites, because there are indications that, in the Aurignacian, extraction and consumption tend to be more spatially dissociated than is generally the norm in the Upper Paleolithic, with implications for the logistics of raw-material procurement and for stone tool economics (Zilhão, 1997). It is also increasingly clear that many different things are subsumed in the umbrella designation of Dufour bladelet; a refinement of the category on the basis of the technology of blank production and the mode of retouch might provide clues on temporal and regional variability and help organize the current database of sites and assemblages in more informative ways. Also, our view of the Aurignacian is essentially based on the assemblages from the earliest parts of its time range, between ca.36 000 BP and ca.30 000 BP. More attention needs to be paid to the later Aurignacian, if nothing else because, in such peripheral regions of Europe as southern and western Iberia or the Crimea, the Mousterian lasts longer and such a late Aurignacian in fact marks the beginning of the Upper Paleolithic. Finally, because carinated reduction is a feature of the Aurignacian but is not exclusive of it, archeological entities that have entered the literature with the "Aurignacian" tag attached to them (the "Pre-Aurignacian" of Bacho Kiro, the "Levantine Aurignacian" of the Levant, the "Aurignacian V" of southwestern Europe, etc.) should be appropriately redefined and accordingly renamed.

If the profession pays adequate tribute to the old motto "Render therefore unto Caesar the things that are Caesar's, and unto God the things that are God's", and work on the Aurignacian as a technocomplex is effectively decoupled from the issue of "modern" human origins, these tasks should not be too difficult. The papers assembled in the present volume, at least, show that there is good reason to hope.

Acknowledgments

I wish to acknowledge support from the Humboldt Foundation in 2003-2004, through a one year Research Award at the University of Cologne, where drafting of this paper was concluded.

REFERENCES

BAR-YOSEF, O.; KUHN, S. (1999) - The big deal about blades: laminar technologies and human evolution. *American Anthropologist*. Chicago, IL. 101:2, p. 322-338.

BINFORD, L. (1973) - Intersassemblage variability: The Mousterian and the «functional» argument. In RENFREW, C., ed. - *The explanation of culture change. Models in Prehistory*. London: Duckworth, p. 227-254.

BON, F. (2002) - L'Aurignacien entre Mer et Océan. Réflexion sur l'unité des phases anciennes de l'Aurignacien dans le sud de la France. Paris: Société Préhistorique Française (Mémoire de la Société Préhistorique Française; 29).

BORDES, F. (1973) - On the chronology and contemporaneity of different paleolithic cultures in France. In RENFREW, C., ed. - *The explanation of culture change. Models in Prehistory*. London: Duckworth, p. 217-226.

BORDES, J.-G. (2002) - Les interstratifications Châtelperronien/Aurignacien du Roc-de-Combe et du Piage (Lot, France). Analyse taphonomique des industries lithiques, implications archéologiques. Thèse de doctorat de Préhistoire et Géologie du Quaternaire de l'Université de Bordeaux I.

BREUIL, H. (1907) - La question aurignacienne. Étude critique de stratigraphie comparée. *Revue Préhistorique*. Paris. 2, p. 172-319.

BREUIL, H. (1913) - Les subdivisions du Paléolithique supérieur et leur signification. In *Congrès International d'Anthropologie et d'Archéologie préhistoriques. Compte-rendu de la 14ème session, Genève 1912*. 1, p. 165-238.

BUTZER, K. (1982) - *Archaeology as human ecology: method and theory for a contextual approach*. Cambridge: Cambridge University Press.

CABRERA VALDÉS, V.; BISCHOFF, J. L. (1989) - Accelerator ^{14}C dates for early upper Paleolithic (basal Aurignacian) at el Castillo Cave (Spain). *Journal of Archaeological Science*. London. 16, p. 577-584.

CABRERA, V.; MAÍLLO, J. M.; LLORET, M.; BERNALDO DE QUIRÓS, F. (2001) - La transition vers le Paléolithique supérieur dans la grotte du Castillo (Cantabrie, Espagne): la couche 18. *L'Anthropologie*. Paris. 105, p. 505-532.

CANN, R. L.; STONEKING, M.; WILSON, A. C. (1987) - Mitochondrial DNA and human evolution. *Nature*. London. 325, p. 31-36.

CHIOTTI, L. (1999) - Les industries lithiques des niveaux aurignaciens de l'Abri Pataud, les Eyzies-de-Tayac (Dordogne): étude technologique et typologique. Paris: Thèse de Doctorat du Muséum d'Histoire Naturelle, Institut de Paléontologie Humaine.

CHURCHILL, S.; SMITH, F. (2000) - Makers of the Early Aurignacian of Europe. *Yearbook of Physical Anthropology*. New York, NY. 43, p. 61-115.

CLARK, G.; LINDLY, J. (1991) - On paradigmatic biases and Paleolithic research. *Current Anthropology*. Chicago, IL. 32, p. 577-587.

CLARKE, D. (1979) - Towards analytical archeology. In *Analytical archeologist*. London: Academic Press, p. 181-191.

CONARD, N. J. (2003) - Palaeolithic ivory sculptures from southwestern Germany and the origins of figurative art. *Nature*. London. 426, p. 830-832.

CONARD, N. J.; BOLUS, M. (2003) - Radiocarbon dating the appearance of modern humans and timing of cultural innovations in Europe: new results and new challenges. *Journal of Human Evolution*. London. 44, p. 331-371.

CONARD, N. J.; DIPPON, G.; GOLDBERG, P. (2003) - Chronostratigraphy and archeological context of the aurignacian deposits at Geißenklösterle. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 165-176.

D'ERRICO, F. (2003) - The invisible frontier. A multiple species model for the origin of behavioral modernity. *Evolutionary Anthropology*. New York, NY. 12, p. 188-202.

D'ERRICO, F.; ZILHÃO, J.; BAFFIER, D.; JULIEN, M.; PELEGRIN, J. (1998) - Neanderthal acculturation in Western Europe? A critical review of the evidence and its interpretation. *Current Anthropology*. Chicago, IL. 39, Supplement, p. S1-S44.

ESWARAN, V. (2002) - A diffusion wave out of Africa. The mechanism of the modern human revolution? *Current Anthropology*. Chicago, IL. 43:5, p. 749-774.

GAGNEUX, P.; WILLS, C.; GERLOFF, U.; TAUTZ, D.; MORIN, P. A.; BOESCH, C.; FRUTH, B.; HOHMANN, G.; RYDER, O. A.; WOODRUFF, D. S. (1999) - Mitochondrial sequences show diverse evolutionary histories of African hominoids. *Proceedings of the National Academy of Sciences USA*. Washington, DC. 96, p. 5077-5082.

HENSHILWOOD, C.; MAREAN, C. (2003) - The origin of modern human behavior. Critique of the models and their test implications. *Current Anthropology*. Chicago, IL. 44:5, p. 627-651.

HUBLIN J.-J.; SPOOR, F.; BRAUN, M.; ZONNEVELD, F.; CONDEMI, S. (1996) - A late Neanderthal associated with Upper Palaeolithic artefacts. *Nature*. London. 381, p. 224-226.

KOZŁOWSKI, J. K.; OTTE, M. (2000) - La formation de l'Aurignacien en Europe. *L'Anthropologie*. Paris. 104, p. 3-15.

KUHN, S. L.; STINER, M. C.; REESE, D. S.; GÜLEÇ, E. (2001) - Ornaments of the earliest Upper Paleolithic: new insights from the Levant. *Proceedings of the National Academy of Sciences USA*. Washington, DC. 98:13, p. 7641-7646.

LÉVÊQUE, F.; VANDERMEERSCH, B. (1980) - Découverte de restes humains dans un niveau castelperronien à Saint-Césaire (Charente-Maritime). *Comptes rendus de l'Académie des Sciences de Paris*. Paris. 291D, p. 187-189.

LUCAS, G. (2000) - Les industries lithiques du Flageolet I (Dordogne), approche économique, technologique, fonctionnelle et analyse spatiale. Thèse de Doctorat. Université Bordeaux I. 2 vols.

MCBREARTY, S.; BROOKS, A. (2000) - The revolution that wasn't: a new interpretation of the origin of modern human behavior. *Journal of Human Evolution*. London. 39, p. 453-563.

MELLARS, P. A. (1973) - The character of the middle-upper paleolithic transition in south-west France. In RENFREW, C., ed. - *The explanation of cultural change. Models in Prehistory*. London: Duckworth, p. 255-276.

MELLARS, P. A. (1999) - The Neanderthal problem continued. *Current Anthropology*. Chicago, IL. 40:3, p. 341-350.

MORTILLET, G. (1867) - Promenades préhistoriques à l'Exposition Universelle. *Matériaux pour l'Histoire positive et philosophique de l'Homme*, 3ème année, 5-6/7-8, p. 181-368.

RIEL-SALVATORE, J.; CLARK, G. A. (2001) - Grave markers. Middle and Early Upper Paleolithic burials and the use of chronotypology in contemporary Paleolithic research. *Current Anthropology*. Chicago, IL. 42:4, p. 449-479.

SCHMITZ, R. W.; SERRE, D.; BONANI, G.; FEINE, S.; HILLGRUBER, F.; KRAINITZKI, H.; PÄÄBO, S.; SMITH, F. H. (2002) - The Neandertal type site revisited: interdisciplinary investigations of skeletal remains from the Neander Valley, Germany. *Proceedings of the National Academy of Sciences of the USA*. Washington, DC. 99, p. 13342-13347.

SINCLAIR, A. (2003) - Art of the ancients. *Nature*. London. 426, p. 774-775.

SORESSI, M.; ARMAND, D.; D'ERRICO, F.; JONES, H. L.; PUBERT, E.; RINK, W. J.; TEXIER, J.-P.; VIVENT, D. (2002) - Pech de l'Azé I (Carsac, Dordogne): nouveaux travaux sur le Moustérien de tradition acheuléenne. *Bulletin de la Société Préhistorique Française*. Paris. 99:1, p. 1-7.

STRAUS, L. G. (2003) - "The Aurignacian"? Some thoughts. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the*
A
of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001). Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 11-17.

STRINGER, C. (2002) - Modern human origins: progress and prospects. *Philosophical Transactions of the Royal Society*. London. B, 357, p. 563-579.

STUART, A. J. (2005) - The extinction of woolly mammoth (*Mammuthus primigenius*) and straight-tusked elephant (*Palaeoloxodon antiquus*) in Europe. *Quaternary International*. Oxford. 126-128, p. 171-177.

TEYSSANDIER, N. (2003) - *Les débuts de l'Aurignacien en Europe. Discussion à partir des sites de Geißenklösterle, Willendorf II, Krems-Hundssteig et Bacho Kiro*. Ph. D. Thesis, University of Paris X-Nanterre, Nanterre.

TRINKAUS, E.; MOLDOVAN, O.; MILOTA, Ş.; BÎLGĂR, A.; SARCINA, L.; ATHREYA, S.; BAILEY, S. E.; RODRIGO, R.; MIRCEA, G.; HIGHAM, Th.; BRONK RAMSEY, C.; VAN DER PLICHT, J. (2003) - An early modern human from the Peştera cu Oase, Romania. *Proceedings of the National Academy of Sciences of the United States of America*. Washington, DC. 100:20, p. 11231-11236.

TRINKAUS, E.; ZILHÃO, J. (2002) - *Phylogenetic implications*. In ZILHÃO, J.; TRINKAUS, E., eds. - *Portrait of the artist as a child. The Gravettian human skeleton from the Abrigo do Lagar Velho and its archeological context*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 22), p. 497-518.

VALLADAS, H.; TISNÉRAT-LABORDE, N.; CACHIER, H.; ARNOLD, M.; BERNALDO DE QUIRÓS, F.; CABRERA VALDÉS, V.; CLOTTES, J.; COURTIN, J.; FORTEA PÉREZ, J.; GONZÁLEZ SÁINZ, C.; MOURE ROMANILLO, A. (2001) - Radiocarbon AMS dates for Paleolithic cave paintings. *Radiocarbon*. Tucson, AZ. 43 (2B), p. 977-986.

ZILHÃO, J. (1997) - *O Paleolítico superior da Estremadura Portuguesa*. 2 vols. Lisboa: Colibri.

ZILHÃO, J.; D'ERRICO, F. (1999) - The chronology and taphonomy of the earliest Aurignacian and its implications for the understanding of Neandertal extinction. *Journal of World Prehistory*. New York, NY. 13:1, p. 1-68.

ZILHÃO, J.; D'ERRICO, F. (2003) - The chronology of the Aurignacian and transitional technocomplexes. Where do we stand? In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 313-349.

ZILHÃO, J.; TRINKAUS, E. (2001) - Troubling the Neandertals. A reply to Langbroek's 'The trouble with Neandertals'. *Archaeological Dialogues*. Leiden. 8:2, p. 135-142.

Looking for names and missing the point. The case of the Portuguese “Aurignacian V” in the framework of definitions of the Aurignacian

FRANCISCO ALMEIDA

ABSTRACT Based on a study of the technological variability of lithic assemblages dating to the Terminal Gravettian, a period of the Portuguese Upper Paleolithic where carinated technology is dominant and chronologically parallel to the French “Aurignacian V”, this paper exemplifies a way of defining a period based on more than typological criteria only. The variability of technological choices in assemblages dating to ca.21 500 BP is presented, following the *chaîne opératoire* concept, from a data set analyzed through attribute analysis and refitting. The combination of both methods results in a more complete view of the period’s technological spectrum: while refitting provides a dynamic view of the production techniques but can only be applied to appropriate samples, attribute analysis can be applied to any assemblage, thus allowing the evaluation of technological variability at a wider scale.

Introduction

The title of this presentation might seem odd, especially within a volume where most of the contributions deal with the origins and definitions of the Aurignacian, and chronologically are mainly focused on the initial stages of the technocomplex. The definition of an archaeological period or technocomplex is, however, quite time independent, and stands as one of the problems that we as archaeologists face almost on a daily basis. Most of the ideas that will be presented here are the result and a summary of the work carried out on the scope of my doctoral dissertation (Almeida, 2000), where I dealt with definitional problems of a transition period — the Portuguese Terminal Gravettian — one of the periods of the Portuguese Upper Paleolithic where the lithic assemblages are dominated by carinated technology. Such dominance encounters clear parallels both in assemblage content and chronology, as we shall see below, with one of perhaps the most problematic assemblages in the history of archaeological thought — the Aurignacian V from Laugerie-Haute (France).

The purpose of this contribution is therefore to summarize the main aspects of the Portuguese Terminal Gravettian/Aurignacian V, and illustrate how the respective definition was carried out, having as a starting basis its technological variability.

Carinated elements: non diagnostic artifacts of the Portuguese Upper Paleolithic

One of the peculiarities of the Portuguese Upper Paleolithic is that some of the usual “diagnostic tools” of the Aurignacian are present in almost all assemblages, independent of the complex to which they belong: carinated and thick-nosed elements are ubiquitous throughout most of the sequence, the Middle Solutrean being the single exception, and they even have their proportional peak during the Epipaleolithic (ca.8750 BP). Thus, the sole presence of carinated or thick-nosed elements is not sufficient to give an assemblage either a clear chronological or technocomplex positioning within the sequence. Fig. 1 shows the general distribution of thick scrapers and marginally retouched bladelets throughout the main technocomplexes presently recognized in the Upper Paleolithic of Portuguese Estremadura. While thick scrapers appear in almost all assemblages, they dominate in assemblages dated to the Terminal Gravettian/Aurignacian V and to the Epipaleolithic. Although in the Lowest Level of locus IIIs of the site of Cabeço de Porto Marinho (CPM) they are frequent, it is during the Epipaleolithic that bladelets with marginal retouch [designated by Bicho (1992) and Marks (Marks et al., 1994) as Dufour bladelets, and differentiated by Zilhão (1995, 1997), because their retouch is mostly direct and length <15 mm, as Areeiro bladelets] are most frequent. From the data in Fig. 1 it must therefore be concluded that the attribution of an assemblage from Central Portugal to the Aurignacian complex has to be grounded on more than simple typological criteria.

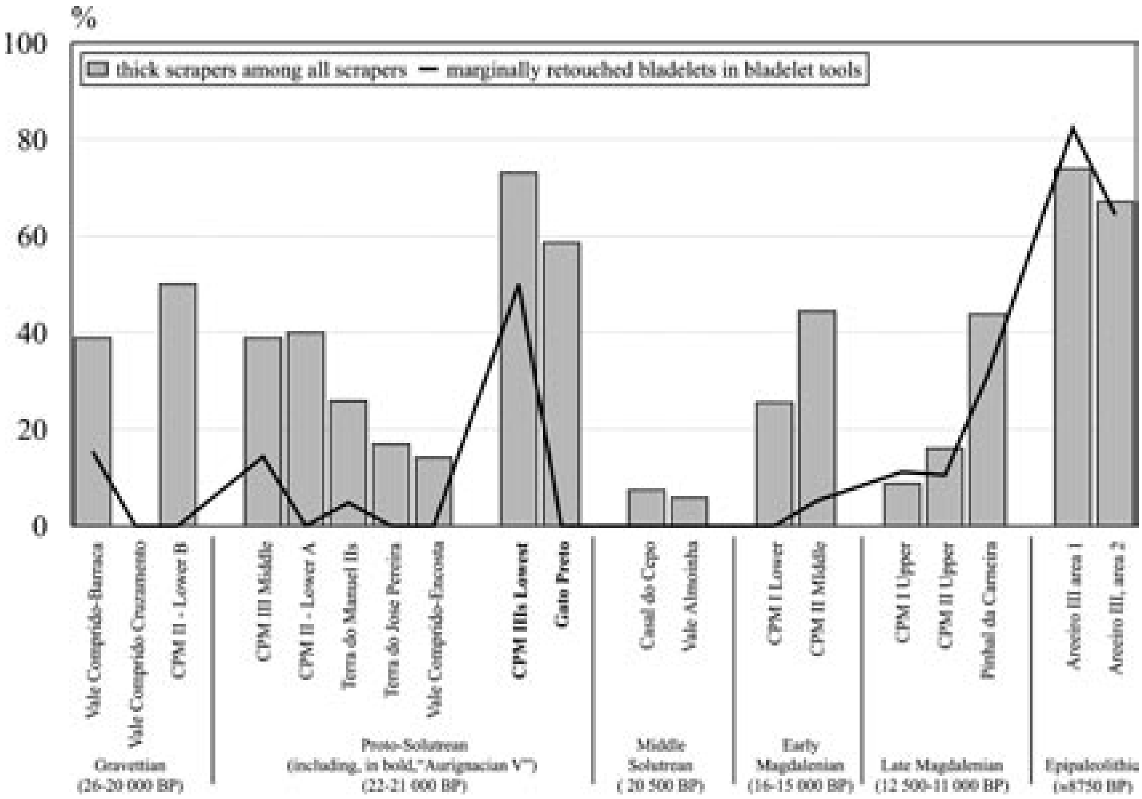

FIG. 1 – General tendencies in the presence of thick scrapers and marginally retouched bladelets in Portuguese Upper Paleolithic lithic assemblages (Zilhão, 1995, 1997; Marks and Almeida, 1996; Almeida, 2000).

Perhaps one of the most important contributions of the last two decades of research in Portugal has been the discovery and excavation of a cluster of sites the assemblages of which show typological patterns that easily could be considered as "Aurignacian", on the basis of their high percentages of thick "scrapers". Contrary to what one should expect at typical Aurignacian sites, however, these assemblages date to ca.21 500 BP, and lack Dufour bladelets, a type which, according to Zilhão (1995, 1997), is restricted in both of its subtypes — Dufour and Roc-de-Combe — to Portuguese assemblages pre-dating 26 000 BP. That late date is at odds with the generally accepted upper chronological limit for the Aurignacian in Europe, ca.28-26 000 BP (Marks and Almeida, 1996). Instead of predating the Gravettian (and, thus, following the general chronological scheme of the European Upper Paleolithic), they are at the temporal transition from the Gravettian to the Solutrean, that is, in clear synchrony with the "Aurignacian V" of Laugerie-Haute.

The Aurignacian V: an old archaeological problem

Since its discovery, the Aurignacian V has been one of the most controversial "cultural entities" in French archaeology (Bordes, 1958; Bordes and Sonneville Bordes, 1958, 1960; Brézillon, 1969; Laville, 1975; Lumley, 1976; Laville et al., 1980; Sonneville-Bordes, 1982), as well as in Paleolithic research, in general. As Laville et al. (1980) correctly argued, one of the main reasons for the problem was that the Aurignacian V appeared at only one site, and had been defined mostly in terms of the absence of Gravettian or Perigordian characteristics.

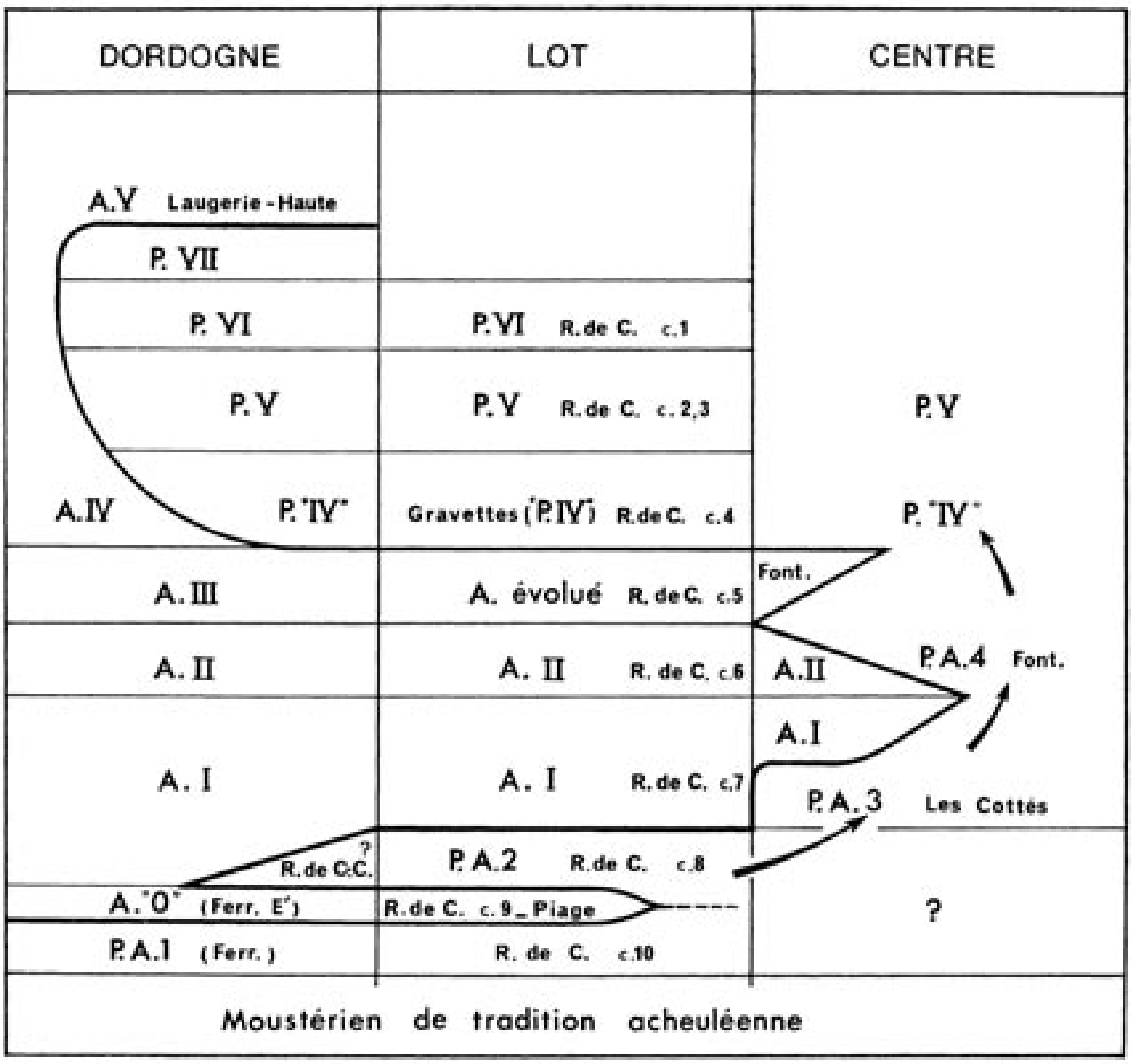

FIG. 2 – Typologically driven normative interpretation of the Laugerie-Haute Aurignacian V: the return of Aurignacian people to the Dordogne (Bordes, 1968).

The Aurignacian V at Laugerie-Haute shows some of the "typical" characteristics of the earlier stages of the Aurignacian complex, such as carinated and nosed burins and thick scrapers. It lacks, however, several characteristics of the same complex, namely the Dufour bladelets and the "typical" Aurignacian blades. Within the scraper class, there is a high percentage of denticulated endscrapers. Notches and denticulates are also numerous. This led the excavators to call this assemblage *Aurignacien denticulé*. The bone industry repertoire also seems to differ typologically from the earlier stages of the Aurignacian (Sonneville-Bordes, 1960; Leroy-Prost, 1975, 1978). In spite of all these apparent differences, early French investigators included this assemblage in the "Aurignacian tradition" (Peyrony, 1933; Peyrony and Peyrony, 1938). That several "Upper Perigordian" (Gravettian) levels and a "Proto-Magdalenian" level [(considered Gravettian/Perigordian VII by Bordes (Brézillon 1969)] separated the "typical" Aurignacian from this "Aurignacian V" at Laugerie-Haute was explained by the arrival of "Perigordian" people into the Périgord, which would have led the "Aurignacians" to leave the area until a later comeback represented by the Aurignacian V of Laugerie-Haute (Bordes, 1973; Lumley, 1976), as illustrated by the scheme in Fig. 2.

It must be said, however, that, not all French archaeologists accepted that the Aurignacian V of Laugerie-Haute was a continuation of the earlier stages of the Aurignacian complex. François Bordes (1973, p. 221) himself wrote: "Of course, the Aurignacian V at Laugerie--Haute is situated above a very evolved Perigordian, but while this Aurignacian V is more Aurignacian-like than anything else, its roots in the older Aurignacian are not clearly known". Later, Denise de Sonneville-Bordes (1982) reached the conclusion that the Aurignacian V could not be regarded as the final stage of the long Aurignacian sequence.

The fact that, until very recently, the Aurignacian V was a singular entity — one assemblage/one site — prevented researchers from clearly incorporating it into the general scheme of European Upper Paleolithic complexes. Recent discoveries, both in France and in Portugal, however, shed some new light into the Aurignacian V problem, especially when seen through a different perspective from the traditional and mostly typological point of view.

New data and new perspectives

In any science, archaeology included, one of the most profitable ways to solve theoretical problems and/or test hypotheses is to enlarge the scale of approach. That is, if a model seems to fit the data for a single case, and before any generalizations, that model needs to be tested against other, similar and appropriate, data sets. Thus, if a problem such as the Aurignacian V seems to have reached a dead-end, research scope needs to be enlarged, either by studying other sites with similar chronologies, artifact samples, or contexts, or by formulating different hypotheses, in order to explain the problem in hand. For a long time, the uniqueness of the Laugerie-Haute Aurignacian V was a strong obstacle to attempts to enlarge the scale of research. Thanks to the last two decades of research both in France and in Portugal, however, it is now possible to readdress the interpretation of the Aurignacian V. Two major developments occurred in this field: first, from a theoretical perspective, the adoption of alternative models to the traditional (normative/culture-historical) typological "school" and its consequent interpretations of the archaeological record; and, second, from the record itself, a set of new sites has been found, the assemblages of which clearly parallel the Laugerie-Haute Aurignacian V, both chronologically and typologically.

In France, an emergency excavation related to the construction of the new Museum of National Prehistory (Les Eyzies-de-Tayac) revealed a small rockshelter (the Abri Casserole) with a complex stratigraphy of >3 m that contained fourteen archaeological layers (Aubry et al., 1995). Layers 10b to 8b represent the period spanning the Late Gravettian to the Early Solutrean, and show similar typological patterns to the Laugerie-Haute Aurignacian V. In Portugal, not one but, at least, five assemblages clearly parallel the French Aurignacian V: Gato Preto, CPM III S (lowest), CPM II (lower A)/CPM III (middle), Lapa do Anecrial (level 2), and Lagar Velho (level 6). Of these, the two assemblages from CPM and that from Gato Preto, open air sites, have yielded reasonably large artifact samples. Lapa do Anecrial, on the other hand, is an ephemerally occupied cave that, in spite of a smaller artifact sample, showed excellent post-depositional preservation, attested to by the spatial distribution of artifacts and by the high level of refitting success (Zilhão, 1995, 1997; Almeida, 1998, 2000, 2001, in press).

One important characteristic of Portuguese "Aurignacian V"-like assemblages is their close chronological proximity, if not overlap, with other Portuguese assemblages which have been attributed, both technologically and typologically, to the Late Gravettian (Zilhão, 1995, 1997). Fig. 3 shows some of the ^{14}C dates available for these assemblages. From its reading, another interpretive problem stands out: with such a small time gap between them, what are the relationships of the Aurignacian V assemblages with those from the Late Gravettian? What do the apparent typological differences between them mean? Do these typological differences have parallels in their respective technological patterns? Is there continuity between them, or are they the archaeological remnants of the replacement of one cultural system by another (read one population by another)? Also, previous work by Zilhão (1995, 1997) with these assemblages suggested two possible alternative chronological interpretations for the Portuguese "Aurignacian V" meant to characterize the transition from the Gravettian to the Solutrean in Portuguese Estremadura; they were designated as the Two-Phase Model and the Three-Phase Model. The first considered the "Aurignacian V"-like assemblages as representing a functional facies of a wider cultural complex, the "Proto-Solutrean" and, thus, not chronologically differentiated from other assemblages whose characteristics are less "Aurignacian V"-like. The second model placed "Aurignacian V" assemblages in a temporally intermediate stage between the Final Gravettian and the Proto-Solutrean, the latter being mainly characterized by the dominance of "Vale Comprido points" and by a decrease in the "Aurignacian" characteristics. In this case, thus, the "Aurignacian V" gains chronological meaning. My dissertation work involved the testing of these hypotheses, having as a basis the technological study of a set of Portuguese and French assemblages.

The aims of my dissertation project were essentially three: first, to define and clearly characterize the technological variability present in the lithic assemblages from the Portuguese "Aurignacian V"; second, to build a critical database for these industries, so that future sites or assemblages from this period could readily be identified as such, and not confounded with either Epipaleolithic or "real" Aurignacian ones (i.e., pre-dating 26 000 BP); and, third, to access the relationship between the Portuguese "Aurignacian V" and the Late Gravettian, through the technological study of assemblages from both complexes (Almeida, 2000).

It would be impossible in the framework of this paper to summarize the entire theoretical and methodological framework that served as a basis for my dissertation project. Nevertheless, I think that some of the ideas concerning the definition of the Portuguese Aurignacian V/ Terminal Gravettian and its relations with the previous Late Gravettian should be at least summarized, having in mind that this symposium deals essentially with definitional problems.

From the outset, I was conscious that a study having as a basis the technological variability of lithic assemblages from a certain period could at best represent a small contribution for its definition. Lithic artifacts are but a part, a very small part, of the archeological record.

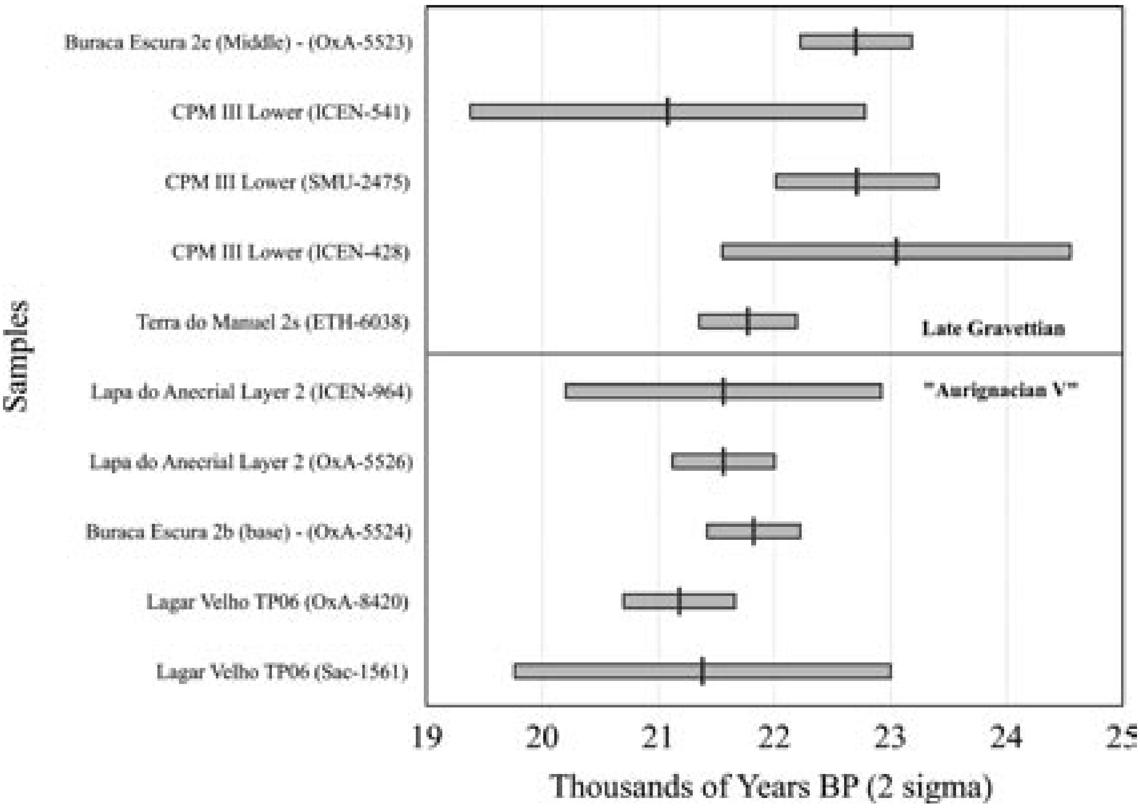

FIG. 3 – Late Gravettian and "Aurignacian V" ^{14}C dates in Portuguese Estremadura (Zilhão, 1995, 1997; Almeida, 2000; Zilhão and Trinkaus, 2002).

In order to clearly evaluate the degree of variability of a period or technocomplex, to discern between continuity and disjunction between two archaeological periods, it would be preferable to compare several aspects of their past organizational properties that the archaeological record can provide: settlement data, subsistence data, and mobility data. To simply assume that a variable (stone tools) that usually represents a small percentage of the lithic assemblages can have ethnic relevance and, thus, be used to infer migratory events (movement of people), or diffusion (movement of ideas), is simple wishful thinking. In the realm of lithics, I think that if such arguments can be made, they cannot be grounded on simple comparisons of tool assemblages. That negates all the evolution that lithic studies have undergone since the Bordes-Binford debate.

My opinion on processes of cultural change, instead, is that, first, continuity should be considered the null hypothesis — it is more reasonable than to attribute any change to the entrance of a new group into a specific area; second, that hunter-gatherer systems are not static and, thus, have the capacity to adapt to very different circumstances; and, third, that the apparent sudden appearance of a specific cultural trait in a region does not necessarily indicate that such item was previously completely unknown to the people who inhabited that same region (it may simply represent a hierarchical change in the range of choices which make part of the total cultural "baggage" of the group). Continuity, thus, might be considered to be the most common case in the prehistoric record, especially when considering hunter-gatherer societies. Still, disjunction certainly occurred in the past, and should be monitored through other variables than stone tool assemblages.

Although my dissertation focused on the Terminal Gravettian, one of its main theoretical problems was the evaluation of the relationship between that time period and the immediately preceding Final Gravettian. Surely, there exist typological differences between the two periods. In France, such typological changes were traditionally interpreted as a result of different people entering and exiting the Dordogne region, as shown in Fig. 2 (Bordes, 1968). In so doing, French researchers missed not only a large parcel of lithic technological variability, but also dismissed other types of data that seemed to show continuity between the "Aurignacian V" and the earlier Proto-Magdalenian, such as the bone assemblages (Leroi-Prost, 1975, 1978).

The evaluation of the relationships between the Terminal Gravettian and the Final Gravettian of Portugal was conducted differently. Although considering only lithic assemblages, I compared the two periods not only in their typologies, but in the whole technological spectrum, following essentially the *chaîne opératoire* approach. In doing so, I was able to compare the two periods more completely and, thus, I did not restrict my analysis to a simple aspect of their organization, such as tool patterns, which, moreover, could be extremely affected by functional variation and not as much cultural or traditional factors (e.g. Binford, 1983).

I further considered that apparent typological changes could be explained in the context of continuity processes (i.e., different choices undertaken by a same population), without necessarily invoking processes of migration and diffusion. Still, since diffusion and migration are processes which can have affected cultural change, they must, therefore, be evaluated in the archeological record. If either cultural continuity or disjunction (migration or diffusion) are to be detected, one essentially has to consider the more stable strategies of hunter-gatherers, especially through the detection of those involuntary and unconscious traits that Binford considered when criticizing Sackett's approach to style (Binford, 1989). The problem, thus, is how to differentiate those traits from others which are essentially functionally adaptive. In the specific case of lithic materials, it is considered that unconscious traits can be detected through the *chaîne opératoire* approach to lithic technology. Being a holistic approach to lithic systems, this method permits the detection of technological patterns which are, or may be, independent of typological constellations and, thus, are more stable.

Such patterns, from which the main units of analysis applied to the study of the Portuguese Aurignacian V/Terminal Gravettian were the reduction strategy and reduction sequence, are indicative, at least in part, of unconscious actions by prehistoric knappers. Contrary to simple typological studies, where only part of the assemblage (the tools) is studied, the *chaîne opératoire* methodology considers the totality of the lithic system: from the original core to the discarded tool, even including the apparently insignificant chip. It provides, thus, a much more dynamic view of prehistoric knapping. When this approach is combined with refitting and microwear, it is possible actually to monitor the actions of the original knappers, as well as to hypothesize about the possible actual functions of specific lithic implements (retouched or not).

The importance of applying a dynamic approach to past cultural traits is essential when dealing with processes of cultural change and, as a consequence, when dealing with the always difficult monitoring of cultural continuity or disjunction. This applies not only to lithic studies, but to all types of data available to the archeologist. Within the subsistence range, for example, it is perhaps reasonable to assume that, instead of studying changes or stability in species lists, one should try to cross-test such data with others that may be more unconscious in character, such as butchering practices, cutting techniques (as revealed by cutmark patterns), or specific strategies of processing subsistence items. The study of continuity, of migration or diffusion cannot take into consideration a single aspect of cultural adaptation, such as tool types. In the best of all possible worlds, one should be able to compare all aspects of past organization, from lithic systems to subsistence systems.

The scope of my dissertation, for instance, was merely the study of lithic technological and typological change at the end of the Estremaduran Gravettian. Previous work had shown that there were typological differences between the Final Gravettian and the Proto-Solutrean (or Terminal Gravettian as we prefer to designate it) (Zilhão, 1995, 1997). Zilhão had also advanced the hypothesis that such typological changes were not accompanied by major technological ones. Through the combined analysis of attribute based technological analysis and refitting, that hypothesis was tested in the framework of my dissertation project.

If no major technological changes were detected, if the differences of Final Gravettian and Terminal Gravettian were of degree and not of kind, if both periods presented similar or common reduction strategies of blank production, independent of typological differences, then it would be considered that the continuity hypothesis should be the most parsimonious. If, on the contrary, the technological patterns from both periods differed in a high degree, then the disjunction hypothesis would be considerably strengthened, and therefore grounded on a more solid basis than simple comparison of typological patterns.

Since it was considered necessary to analyze as completely as possible the lithic strategies, independent of context, special care was taken in the choice of assemblages for study. Taking into consideration that functional variables could affect the contents of several contemporaneous sites, it was decided to select a sample which included different type sites: a base camp (CPM III, middle level), a temporary open air camp (Gato Preto), and an ephemeral cave occupation (Lapa do Anecrial). All the sites resulted from modern excavations and, thus, sampling biases were avoided. This was of particular importance, since in old excavations most of the non-flint materials were discarded (and, thus, quartz is much less represented in those assemblages), as were also the smaller lithic elements, like bladelets and chips.

The study of the technological variability of Terminal Gravettian assemblages (i.e., the definition of which reduction strategies were applied to lithic raw-materials) was performed through a combination of attribute analysis and refitting. These data were then compared with the general lithic patterns of the Final Gravettian, so that the existent models for the transition between the Final and Terminal Gravettian could be tested. Both a continuity model and a disjunction model were tested on the basis of technological characteristics. The goal was to assess if the differences between the Final and the Terminal Gravettian were of kind, and not of degree. What precisely does this mean? It was assumed that disjunction processes, such as migration or diffusion, would affect the general technological patterns of lithic assemblages, independent of typological variation. Following the *chaîne opératoire* approach, the main technological variables that were studied were: raw-material selection and exploitation, core preforming and preparation techniques, and blank production strategies (core reduction strategies). If large differences in these variables were to be found in the comparison between the two periods (both qualitatively and quantitatively) then the disjunction model would adapt more parsimoniously to the data. If, on the contrary, raw-material selection strategies, core preforming and reduction strategies were identical in both periods, then the continuity model would be the one which best fitted the data.

The raw-material variable was studied both through quantitative analysis (percentages of flint and non-flint materials in the assemblages) but also quantitatively: by analyzing if different reduction strategies were applied to different raw-materials. Core preparatory techniques were studied through the analysis of both platform preparation and maintenance techniques, as well as through the evaluation of the presence of the crest technique. In the specific case of reduction strategies for blank production, a set of different reduction strategies was defined and tested in both periods, with the goal of assessing the existence of qualitative differences. In addition, possible differences were studied quantitatively, i.e., as to the extent to which each reduction strategy defined was used, or dominant, in each studied period. If the study of variability in reduction strategy resulted in patterns indicating quantitative but not qualitative differences, then the interpretation would consider a change of degree, not kind, and thus, a sequence which fitted a continuity model. On the contrary, if there were major qualitative differences between the two periods (drastic raw-material selection changes, different preparatory patterns, and different reduction strategies) then the disjunction hypothesis would be considered as that which best fitted the data.

Table 1 summarizes the expectations of the two models for the comparative analysis of the technological patterns of the Final Gravettian and Terminal Gravettian in Portuguese Estremadura. Since typological variability was regarded as mainly affected by functional variability, it was considered as having little relevance in the evaluation of the two models. Although a comparison of the transported/curated tool kits between the two periods could also provide some information concerning continuity or disjunction processes, such an analysis was not conducted. And refitting was only performed on Terminal Gravettian assemblages.

TABLE 1

Two interpretive models for the Final to Terminal Gravettian transition in Portuguese Estremadura: expectations on technological patterns (Almeida, 2000).

Continuity Model	*Disjunction Model*
Raw Material Selection: Even if there are quantitative differences on the use percentages of different raw materials, the variability of different raw materials exploited should be similar.	*Raw Material Selection*: Differences in raw material exploitation can be expected. These can be monitored not only in quantitative differences in the use of different raw materials, but also in the use of different sources, at east during the initial period of contact/ migratory events.
Core Preparation and Maintenance Procedures: They should be similar between the two periods.	*Core Preparation and Maintenance Procedures*: They are expected to be different between the two periods, even if the blank types or tools are similar.
Reduction Strategies: Even if there are differences in quantitative representation of specific reduction strategies, the fan of technological variability should be similar between the two periods. That is, no different reduction strategies should be found between the two periods.	*Reduction Strategies*: Although it is possible that some Reduction Strategies might be common between the two periods, some qualitative differences are expected. That is, different reduction strategies should be found in the two periods, with no overlapping.

Technological patterns of Portuguese Terminal Gravettian lithic industries

The study of the assemblages from Lapa do Anecrial, Gato Preto and Cabeço de Porto Marinho (Almeida, 2000) allowed the definition, in a set of criteria, of the general technological patterns and variability of the Portuguese Terminal Gravettian/Aurignacian V. Although some of those criteria, when in isolation, may not be exclusive of the period (many of them are, in fact, common in almost all Portuguese Upper Paleolithic assemblages) it is their association that defines the technological particularities of assemblages dating to ca.21 500 BP in Portuguese Estremadura. The way to distinguish these assemblages, in the absence of direct dating, rests on the association of a multiple set of criteria, from raw-material preferences to lithic reduction strategies (in the strict sense of blank production) and use and discard of tools. Both attribute analysis and refitting were taken into consideration. If the attribute analysis resulted in an average view of the assemblages, refitting results provided more particularistic views at a smaller scale that were enlarged by applying the method to several assemblages in the same region.

Raw material economy: the case for a high frequency of quartz exploitation

One of the most striking characteristics of the Portuguese Terminal Gravettian is a high percentage of quartz use. With overall percentages sometimes as high as 40% of the total assemblage (as at Gato Preto), these assemblages show an extreme pattern, when compared with other Upper Paleolithic complexes from Estremadura. Although there are periods where quartz was intensively used as a raw material, such as the Early Magdalenian or even the Epipaleolithic, it is in the Terminal Gravettian that the presence of quartz reaches its highest peak (Zilhão, 1997), as shown in Figs. 4-6. It must be said, however, that the Terminal Gravettian seems to be in clear continuity with earlier Final Gravettian assemblages, where quartz was already used, but not to such a predominant degree (Zilhão, 1995, 1997).

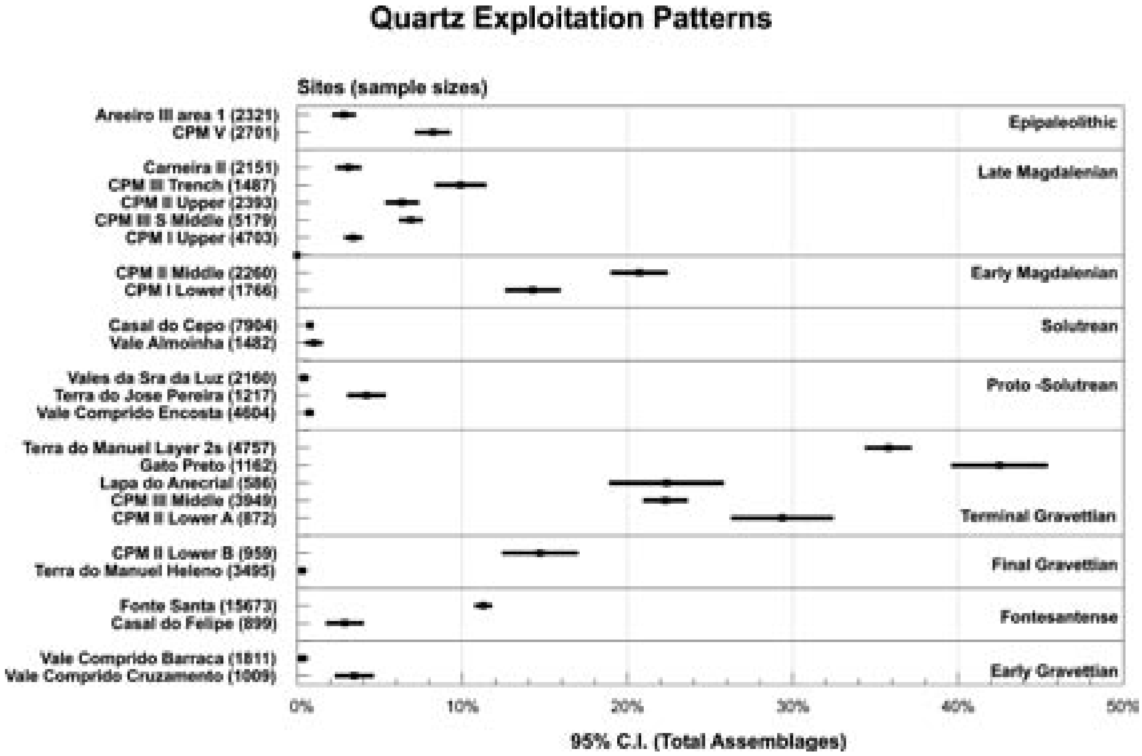

FIG. 4 – The exploitation of quartz in the Upper Paleolithic of Portuguese Estremadura. 95% confidence interval of total assemblages (Bicho, 1992; Marks and Almeida, 1996; Zilhão, 1997; Almeida, 2000).

The explanation of such a preference for quartz is clearly not to be related to an absence of good flint. The studied assemblages clearly contradict such an idea. It is generally agreed that Estremadura as a whole is the main flint source of Portugal. Although flint has been said to be ubiquitous in Estremadura, there are several small areas where good flint sources are at least 8-15 km away. Although essentially considered as within the "local" scale, such distances were long enough to affect the general raw material preferences in periods of the Upper Paleolithic other than the Terminal Gravettian. In such cases, as one goes further away from good flint sources, the percentages of non-siliceous raw materials increase considerably in the assemblages. Thacker (1996) has clearly shown this pattern for the Rio Maior area. The technological patterns of the assemblages which fit such a distance-related pattern show usually the use of quartz and quartzite for expedient flake production, whereas flint remains mostly used for elongated blanks and "formal" tools.

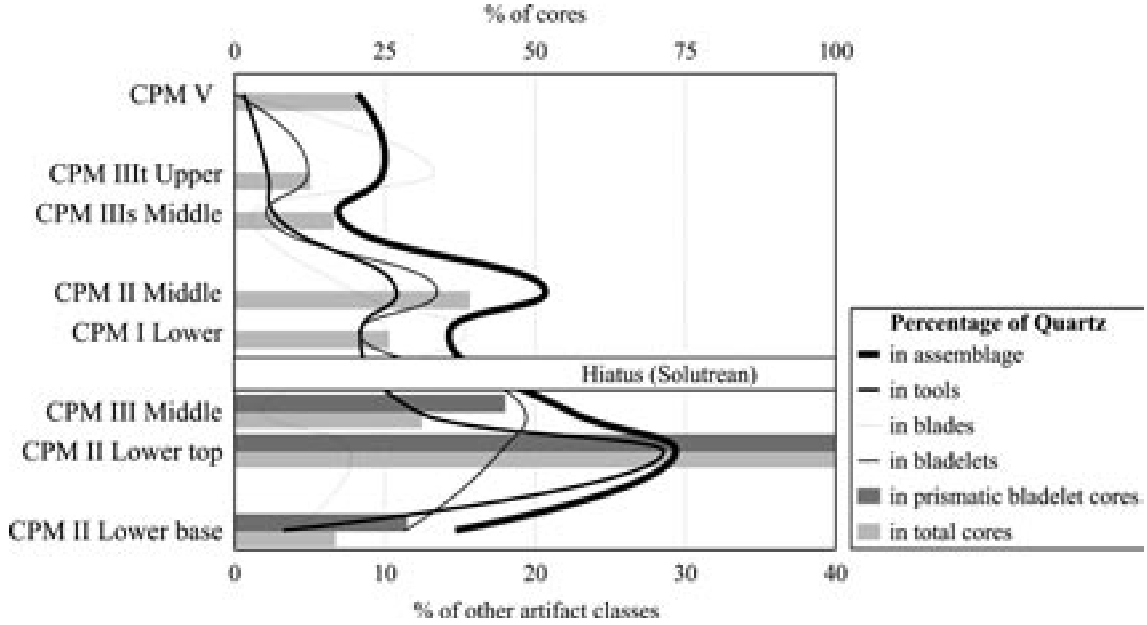

FIG. 5 – Tendencies in the use of quartz in the Cabeço de Porto Marinho sequence (Bicho, 1992; Zilhão, 1997; Almeida, 2000).

What makes the Terminal Gravettian so different? The distance to flint sources is not a determining factor of the choice of raw materials for exploitation. The site of CPM, for instance, with its multiple levels spanning from Final Gravettian to the Epipaleolithic (at least) is a good example of how the Terminal Gravettian is unique in what concerns the (ab)use of quartz. It is reasonable to assume that the distances of CPM to the major flint sources of the Rio Maior area (Azinheira and Vale Comprido) did not change drastically during the Upper Paleolithic. If such was the case, the differences in the percentage of quartz use in the various moments of the CPM sequence cannot be tied directly to distance to raw material. Fig. 5 shows the general trends of quartz use in the CPM sequence. Although data on prismatic bladelet cores are missing for the Early Magdalenian (CPM I, lower level, and CPM II, middle level), Upper Magdalenian (CPM IIIs, middle level, and CPM IIIt, upper level) and Final Magdalenian/Epipaleolithic (CPM V) (Bicho, 1992), the patterns relating to total assemblage, cores, tools, blades and bladelets show how the Terminal Gravettian (CPM III, middle level, and CPM II, top of lower level) stands out as the period where quartz was more intensively exploited.

Although the Final Gravettian (represented in Fig. 5 by CPM II, base of lower level) already featured a relatively high use of quartz, it is in the subsequent period that almost all the indicators increase to a degree never seen before or after in the Upper Paleolithic of Portuguese Estremadura, both in quantity and technological variability. While throughout the CPM sequence quartz blades are always rare, all the other classes represented concur in showing how quartz was almost as important as flint during the Terminal Gravettian/Aurignacian V. This becomes particularly evident in the indicators related to bladelet production: the bladelets themselves, and the prismatic bladelet cores. Not only was the Terminal Gravettian the period of the Upper Paleolithic where more quartz bladelets were produced (Fig. 6), but it is also the case that such production proceeded through reduction strategies which were virtually identical to those applied to flint (at least when quartz presented good knapping qualities). Gato Preto is another paradigmatic case of how high quartz use is not related to distance to flint sources: less than 1 km away from one of the major flint sources of Portuguese Estremadura (Azinheira), this site presents the highest exploitation of quartz of all the Upper Paleolithic assemblages in the Rio Maior area.

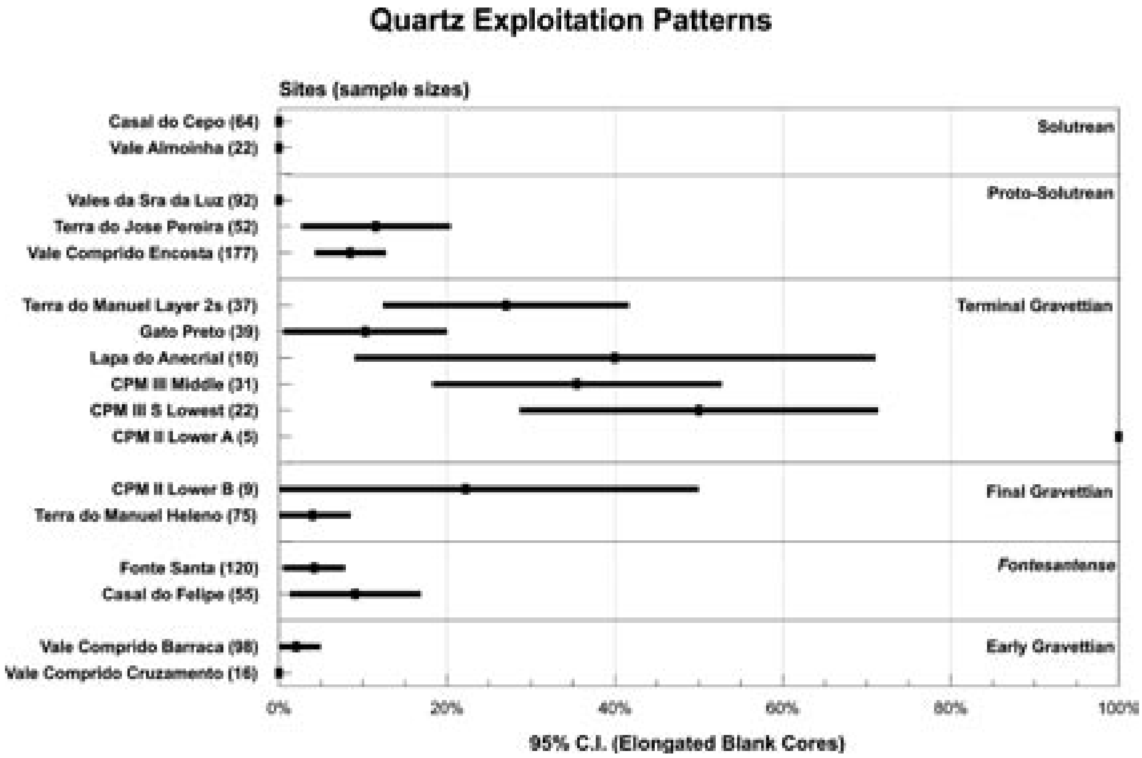

FIG. 6 – The exploitation of quartz in the early Upper Paleolithic of Portuguese Estremadura. 95% confidence interval of cores for elongated blanks (Bicho, 1992; Marks and Almeida, 1996; Zilhão, 1997; Almeida, 2000).

Lapa do Anecrial, the first archaeological site where refitting procedures clearly demonstrated that carinated elements served as bladelet cores (Zilhão, 1995, 1997; Almeida, 1998, 2000, 2001, in press) is perhaps the best example of how the use of quartz was not a result of distance to flint sources. Distance to any flint or quartz source was more than 8 km, yet quartz represents 22% of the total assemblage. Plus, as the refitting work demonstrated, most of the elongated blanks exported from the site at abandonment were quartz bladelets. The technological patterns of flint and quartz are identical. Lapa do Anecrial shows, thus, that quartz was considered a raw material as good as flint and essential to the technological necessities of the Terminal Gravettian people. The transportation of quartz cobbles for more than 8 km contradicts the idea that quartz exploitation was only local (read on-site).

When compared to flint, quartz is generally regarded as an inferior raw material. As we have seen, that didn't seem to have affected the choices of the human communities which exploited Portuguese Estremadura during the period concerned. We must emphasize, however, that the "high use of quartz" can hide some variability within this type of raw material. The quartz exploited in the studied assemblages varied from poor quality milky quartz to excellent rock crystal. In most of the cases, however, crystal quartz was rarely used, the vast majority of the assemblages showing the use of variable quality milky quartz, generally collected in the shape of cobbles. The heterogeneity in the quality of the exploited quartz naturally affected the reduction strategies used in the various assemblages.

This is the reason why, at Gato Preto, where most of the exploited quartz was of poor knapping quality, most products were flakes; all good quality quartz blocks, however, were exploited as prismatic bladelet cores. At CPM, on the other hand, most of the quartz showed qualities which made possible an intensive production of bladelets essentially through prismatic strategies. Lapa do Anecrial, due to its excellent post-depositional conditions, is the most significant case of how the differences of quality in the available quartz affected the reduction strategies: of the four cobbles knapped at the site, three were of very good quality translucent milky quartz, and another of poor knapping qualities. Table 2 presents the differences in exploitation in each of the quartz cobbles from Anecrial. The three good quality volumes (QZ 1, QZ 2 and QZ 4) show not only a higher degree of reduction, as indicated by their high core to cobble ratio, and by the percentage of the initial block that was knapped (here calculated in weight), but also a wider variability in reduction strategies, most of them applied in order to produce bladelets. Block QZ 3, however, due to its inferior quality, presents essentially different patterns: less technological variability, no bladelet production, and soon aborted exploitation (64% of the cobble remained unworked at abandonment). While for the other three volumes there is evidence that either the core or blanks extracted from it were exported from the site, all products from block QZ 3 were abandoned there.

TABLE 2
Quartz exploitation in Lapa do Anecrial.

Block	*Raw Material Description*	*Core/ Cobble Ratio*	*Number of refitted pieces*	*Reduction Strategy variability*	*Mainly Produced Blanks*	*Degree of Exploitation*			
						Refitted weight	*Main core Abbandonment weight*	*Evidence of Core or blank exportation*	*Percentage of Cobble exploited*
QZ 1	Milky opaque quartz with small internal voids. Medium quality.	2	6	Unidirectional Prismatic + Unidirectional Thick-nosed	Flakes	52 g	Main Core absent	YES	Unknown
QZ 2	Milky Demi--translucid quartz with veins. Good Quality.	3	7	Unidirectional Prismatic + Unidirectional Carinated	Bladelets	50 g	17 g	YES	66%
QZ 3	Milky Demi--Translucid quartz with veins and ironized cortex. Bad quality. Numerous internal cleavages.	2	11	Unidirectional Prismatic + Unidirectional Carinated (attempt)	Flakes	183 g	118 g	NO	36%
QZ 4	Milky Demi--translucid quartz, with veins of mica. Good quality.	9	45	Unidirectional Prismatic + Unidirectional Thick-nosed + Unidirectional Carinated + Bi-directional Prismatic	Bladelets + Flakes	205 g	14 g	YES	93%

Where the process of raw material acquisition is concerned, almost all the indicators from the studied assemblages show that most of the quartz was collected in cobble shape. Acquisition could have been done in the vicinity of sites (when possible), either at gravel deposits, or drainages (in the case of Gato Preto and CPM). Most of the quartz cobbles were transported to the sites with no preforming, although there were some obvious cases of raw material testing at the source. Lapa do Anecrial is the only case where such raw material testing at the source was detected with certainty. All the four blocks show, when refitted, scars of one or two very thin cortical flakes that were not recovered at the site. On the other hand, this pattern is perfectly justifiable, taking into consideration that the cave is at least 8 km away from any gravel deposit, and has no quartz in its vicinity. A similar pattern was present, for example, at CPM, where most of the flint blocks from the source of Azinheira (3 km away) showed a higher degree of selection than sites nearer to the source (Zilhão, 1995, 1997). Thus, whenever quartz was immediately available, the cobbles were brought in complete, testing being done directly at the site, in the process of exploitation. If the exploited cores were still considered useful, they could still be exported at abandonment, showing thus a curation pattern similar to flint. When quartz cobbles had to be transported for longer distances, raw material testing was done immediately at the source.

At a wider scale, other assemblages dating to the same period but not studied in this dissertation seem to agree with the pattern presented here, especially if from recent excavations. Thus, overall, quartz seems to have been a raw-material of choice during the Terminal Gravettian, not a second-rate material for expedient technologies, as was the case in other Upper Paleolithic complexes of Estremadura. This is particularly evident in the comparative study of reduction strategies used for quartz and flint, which are virtually identical whenever quartz was of good quality. Under Perlès's (1992) approach, the Estremaduran Terminal Gravettian could be singled out as an example of the importance of group traditions affecting raw material choices: the strength of tradition may be manifested by a pronounced and recurring preference for a particular raw-material which cannot be explained by either technical or economic considerations.

The importance of quartz during the Portuguese Terminal Gravettian, however, should not overshadow the fact that flint continued to be always used in high proportions. The flint acquisition and transportation patterns from the studied assemblages show that this type of raw-material was transported essentially in four shapes: as whole cortical cobbles; as preformed cores; as unretouched blanks; and as finished tools. In the three studied sites the four types of transport have been detected, but in variable proportions. At Gato Preto, a temporary camp less than 1 km away from a major flint source, the assemblage was dominated by whole cobbles whose testing was performed directly at the site. At CPM and Lapa do Anecrial, are located further away from raw-material sources, the imported items in the assemblages are whole cobbles, preformed cores, unretouched blanks and finished tools in comparable proportions.

The evidence for importation of preformed cores and unretouched blanks of flint at base camps (CPM) and temporary camps (Gato Preto and Anecrial) suggests that, although not yet found, there may have been specialized workshop sites during the Terminal Gravettian. Since quartz was mostly transported unmodified, such Terminal Gravettian workshops should differ from camp sites in a lower degree of quartz exploitation and in flint assemblages showing a balance between testing, decortification and preforming stages, with very few tools and abandoned cores. Such a relative lack of cores in hypothetical Terminal Gravettian workshops would differentiate them from workshop sites of other periods; as seen at Quinta do Sanguinhal, an earlier Gravettian workshop in the Rio Maior region, most exported items were blanks, and almost all exploited cores were left at the site. Future survey work may provide the data required for the testing of this hypothesis.

Terminal Gravettian reduction strategies

The combined application of attribute analysis and refitting to the studied assemblages provided data of importance for the definition of technological criteria for the identification of Terminal Gravettian assemblages. As mentioned before, such assemblages present a dual preference for flint and quartz. Contrary to other periods, when quartz was exploited as a second choice for expedient technologies related to flake production, in the Terminal Gravettian quartz was exploited through the same strategies that were applied to flint. When quartz cobbles presented knapping qualities as good as flint, bladelet production was attempted, following the dominant reduction strategies of this period. These were the prismatic unidirectional (on single platform, or applied sequentially in multiple platforms), the carinated, and the thick-nosed. The equivalence between quartz and flint thus applies not only to the intended endproducts and reduction strategies but also to the intermediate stages of the *chaîne opératoire*, from platform preparation to blank curation.

The main differences between testing of flint and quartz derive from the states in which the different materials entered the studied sites. At Gato Preto, where both raw materials were for the most part collected in the immediate vicinity, testing was performed directly at the site. At CPM, quartz was immediately available, but the flint source was at least 3 km away. This difference resulted in that quartz seems to have been tested at the site, whereas various flint nodules were tested at the source. Actually, some of the CPM flint cores underwent all their decortification off site, thus being imported as core preforms. At Lapa do Anecrial, a site more than 8 km distant to any flint or quartz source, off-site testing was the rule: all reconstructed quartz cores show evidence for testing at the source, and flint items were small cortical nodules, core preforms, blanks ready to be exploited, or finished tools. The overall testing patterns are consistent with a rational system characterized by a rather intense degree of anticipation (Table 3).

TABLE 3
Terminal Gravettian lithic testing and transport patterns.

	Sites near flint and quartz sources	*Sites distant from flint sources but where quartz was immediately available*	*Sites which were distant from both flint and quartz sources*
	GATO PRETO	*CPM*	*ANECRIAL*
Flint Testing	*At site*	*At the source + At the site*	*At the source*
Quartz Testing	*At site*	*At site*	*At the source*
Flint Imported Items	*Whole cobbles* *Finished Tools* *Very rare Core Preforms* *Unretouched Blanks?*	*Small to medium sized whole cobbles* *Preforms* *Finished Tools* *Unretouched Blanks*	*Small size whole cobbles* *Preforms* *Unretouched Blanks* *Finished Tools*
Quartz Imported Items	*Whole Cobbles*	*Whole Cobbles*	*Tested Cobbles*
Flint Exported Items	*Cores?* *Bladelets* *Tools?*	*Cores?* *Bladelets* *Tools?*	*Cores* *Bladelets*
Quartz Exported Items	*Bladelets?*	*Bladelets?*	*Cores* *Bladelets*

The preparation of cores varied according to the reduction strategy to be used. On flint, when prismatic strategies were utilized, decortification started with the removal of flakes, creating the debitage surface, and of generally thick, cortical flakes creating flat (unfacetted) platforms. Carinated and thick-nosed flint cores, when set up on cortical or partly cortical flake blanks, decortification was limited to the production area (debitage surface). In the specific case of thick-nosed cores, such decortification was made alongside the initial "nose", or during maintenance procedures, the remainder of the block remaining unmodified. In flint and quartz materials, the crest technique of core preforming was extremely rare. At CPM, crested elements represented 0,32% of the total debitage, and that is the highest value recorded in this study.

The preparation of the striking platforms of flint cores was limited to the creation of unfacetted platforms; in prismatic cores this was done through the removal of core tablets, and in carinated cores the striking platforms were the ventral surfaces of the original flakes and, thus, naturally unfacetted. The low frequency of facetted and abraded platforms, as well as of lipping, suggests that, during the Terminal Gravettian, little investment was put into platform preparation, and that, probably, most of the reduction was carried out with direct percussion, often with hard hammers. The assemblage from layer 6 of Lagar Velho (Almeida et al., 2002), however, showed a significantly higher percentage of abraded platforms, suggesting that preparation was very variable in this period.

Quartz cores showed patterns of decortification similar to those of flint. There is, however, a difference in platform preparation in flake cores. Whereas, with flint, decortification included the creation of flat platforms in most flake cores, with quartz decortification of flake cores is limited to the debitage surfaces, the platforms remaining cortical. This pattern is particularly evident at Gato Preto, where quartz reduction strategies were rather simple (single platform prismatic, informal, or discoidal), and associated with poor quality raw-material. Whenever quartz bladelets were produced, more care was taken in the preparation of platforms, namely by the removal of thin, cortical core tablets; this pattern was detected in all three Terminal Gravettian sites studied.

Reduction strategies used with flint were mostly prismatic and carinated, and mainly aiming at the production of elongated blanks. Among these, bladelets were certainly the principal intended products. Whereas at Anecrial and Gato Preto carinated and thick-nosed reduction dominates the assemblages, at CPM those strategies are less represented; most CPM bladelets were extracted from prismatic cores. CPM also stands out as the only studied site where the production of blades was significant. A significant part of these blades, however, was produced in the scope of bladelet core preforming and initial phases of debitage.

Independently of the studied assemblage, prismatic reduction was predominantly unidirectional, with abandoned cores showing single platforms, or multiple platforms, sequentially used, as shown in all cases where refitting could be applied. Terminal Gravettian multiple platform cores thus indicate an intensive exploitation of cores through consecutive unidirectional prismatic strategies. Bidirectional reduction was extremely rare during the period.

Flint bladelets were also produced through an alternative, or complementary, reduction strategy: the exploitation of carinated and thick-nosed cores. These artifacts, traditionally considered as tools, were in fact cores, at least in the Terminal Gravettian. The results achieved, combining attribute analysis, refitting, and a microwear case-study, clearly allow us to state that the vast majority of carinated and thick-nosed "scrapers" in these assemblages were bladelet cores, not tools in a functional sense. These cores resulted from the re-exploitation of thick flakes produced through different reduction strategies. While at Anecrial and CPM most of the thick blanks for carinated reduction were produced from prismatic cores, at Gato Preto the majority of flakes were produced through informal strategies. The significant representation of carinated and thick-nosed bladelet cores is the characteristic which gives the Terminal Gravettian its "Aurignacian V" typological resemblance. The Portuguese data show that the later designation is erroneous, since these assemblages are essentially Gravettian in nature (Zilhão, 1995, 1997; Zilhão et al., 1999; Almeida, 2000, in press).

Although the Terminal Gravettian is not the only period where carinated cores are frequent in the Portuguese Upper Paleolithic, it is, perhaps, the only period where this type of reduction was applied intensively both to initial flakes (mostly cortical) and to non-cortical flakes. Furthermore, several of the reconstructions from Gato Preto and Anecrial indicate an intentional reduction of raw-material blocks in order to create flakes or volumes whose dimensions where more convenient for carinated and thick-nosed reduction. Such an intense re-exploitation of almost all the thick blanks resulted, in all assemblages, in blocks with high core to cobble ratios. If at CPM only two cases were detected (mainly because refitting was not systematic), at Gato Preto and Anecrial the core to cobble ratios in some of the flint blocks were sometimes as high as 6:1! The presence of high core to cobble ratios, thus, seems to be a defining characteristic of the Portuguese Terminal Gravettian. Comparative refitting studies (at the assemblages from Quinta do Sanguinhal and Quartel dos Bombeiros) indicate that, during both earlier stages of the Gravettian and during the Epipaleolithic, blocks with high core to cobble ratios are uncommon, when they exist, the application of carinated type reductions is limited to initial cortical flakes.

As mentioned above, the Terminal Gravettian stands out in the Portuguese Upper Paleolithic sequence as the period when quartz was exploited in higher frequencies. But quartz was important also in qualitative terms: it was exploited through the exact same strategies applied to flint, and with the same goals, that is, the production of bladelets using prismatic and carinated reduction strategies. The equivalence between quartz and flint reductions is particularly evident at CPM and Lapa do Anecrial, where prismatic bladelet cores of quartz are quite frequent and, at the second site, associated with carinated and thick-nosed bladelet cores. At Gato Preto, however, quartz bladelet production was much less common, as a result of the generally poorer knapping qualities of available quartz. It is in this regard significant that the small sample of prismatic pieces among the quartz cores from this site is in a variety of much better knapping qualities than the vast majority of the sample, composed mostly of informal and discoidal cores.

As with flint, whenever quartz was good enough, prismatic strategies were applied in conjunction with carinated and thick-nosed technologies. At Lapa do Anecrial this is particularly evident, resulting in equally high core to cobble ratios; in one instance, a single quartz block yielded at least nine cores (Table 2)! During the Terminal Gravettian, thus, quartz, besides being expediently exploited for flakes as normal throughout the Portuguese Upper Paleolithic, was of major importance in the production of bladelets. With very rare exceptions, carinated, thick-nosed and prismatic reduction sequences are unidirectional in nature (even if applied from multiple platforms) as with flint.

Quartzite was the raw-material least represented in the studied assemblages, and displays reduced variation in reduction strategies. All artifacts suggest an expedient production of flakes (very rarely retouched), through chopper/chopping-tool strategies, and parallel, non-prismatic strategies.

The Aurignacian V: a non-existent archaeological entity in Portugal

Some of the technological and typological patterns of the Terminal Gravettian are not exclusive of the period. There are, however, some characteristics which stand out as unique, or, at least, as much more frequent. I believe that, in future research, differentiation between the Terminal Gravettian and other “Aurignacian”-like lithic assemblages may be achieved through a combination of several definition criteria:

- A high percentage of quartz exploitation.
- Exploitation of quartz for both flake and bladelet production, through prismatic or carinated strategies.
- High core to cobble ratios (a pattern only possible to detect through refitting or minimal nodule analysis).
- Similar reduction strategies applied to both flint and quartz.
- Minimal preparation of striking platforms
- “Formal tool” samples where carinated and thick-nosed forms are present or dominant, but where the blanks extracted (bladelets) are rarely retouched and, when that is the case, mostly exhibit marginal retouch.

The intended products of Terminal Gravettian core reduction were, for the most part, bladelets. Even at sites where blades occur, such as at Cabeço de Porto Marinho, they result from the initial phases of bladelet production and core preforming. The most common reduction strategies during the Terminal Gravettian were, in both quartz and flint, of unidirectional character. Whenever refitting permitted detailed analysis of the chronology of multiple platform prismatic cores, they were always sequential, not alternate. Two main reduction strategies were used for bladelet production: prismatic, and carinated/thick-nosed. Whereas the first resulted in typical prismatic cores, the second resulted in artifacts that would fit the “scraper” class in a traditional typology. Both experimental knapping, refitting and microwear data indicate (Almeida, 2000, in press), however, that most of the carinated and thick-nosed elements from the Terminal Gravettian were exclusively bladelet cores. The dominance of such types in the tool “samples” gives a general “Aurignacian” character to the assemblages, but has no direct functional significance.

Although carinated and thick-nosed elements were not tools in a strict sense, their presence in traditional type-lists can be indirectly useful: they reflect the importance of carinated/thick-nosed reduction in the framework of bladelet production strategies. Thus, assemblages rich in carinated and thick-nosed “scrapers” should not be considered as assemblages where a great part of the activities implied scraping actions carried out on organic materials. On the contrary, they should be considered as assemblages where especial importance was given to the production of lithic barbs. Unlike other periods in the Portuguese Upper Paleolithic, the blanks for carinated reduction show a wide variability of forms: from cortical flakes, derived from phases of decortification, to thick core tablets and thick byproducts of prismatic core exploitation. In some cases, the production of such flakes was simply obtained by informal strategies, a pattern particularly evident at Gato Preto. Such an intense re-exploitation of thick flakes as carinated and thick-nosed bladelet cores resulted, in all studied assemblages, in high core to cobble ratios: for each initial block of raw-material, several cores were obtained.

Almost all the above criteria were already present, although in a somewhat smaller degree, in Portuguese assemblages dating to the Final Gravettian, the main differences between the two periods being essentially typological in character. Even within the typological spectrum, differences are limited to the presence, during the Final Gravettian, of blades with “Proto-Magdalenian” retouch (knives), and backed bladelets (generally truncated or bi-truncated). If backing seems to disappear during the Terminal Gravettian (although some such artifacts were still found at CPM III, middle level), marginally retouched bladelets (whose blanks result clearly from carinated reduction) are clearly present in the Final Gravettian.

In sum, the typological differences between the Final Gravettian and the Terminal Gravettian in Portuguese Estremadura are not accompanied by major technological changes. The technological differences between the two periods are not as much of kind as they are of degree. The data clearly suggest continuity in all the variables which were considered relevant. On raw-material selection patterns, the range of raw materials was the same, although in the Terminal Gravettian quartz was more intensively exploited. On core preparation and maintenance procedures, all the variability found during the Terminal Gravettian was already present in Portuguese Estremadura during the Final Gravettian. Finally, in reduction strategies, the only visible changes are a decrease in bidirectional and an increase in carinated/thick-nosed methods. All reduction strategies detected in the Terminal Gravettian were already known to Final Gravettian inhabitants of Portuguese Estremadura. The pattern thus suggests that the Terminal Gravettian, even in spite of its "Aurignacian"-like typological structure, was in clear technological continuity with the Final Gravettian.

The proposed technological continuity between the Final Gravettian, whose absolute dates center around 22 000 BP, and the Terminal Gravettian, whose dates cluster at 21 500 BP, needs further testing, namely by the discovery and analysis of stratified sites where both periods are superimposed. For the moment, and having in mind that the Portuguese "Aurignacian V"-like assemblages (both typologically and chronologically) seem to be in clear technological continuity with the Final Gravettian, use of the term "Aurignacian" in their characterization should be abandoned in favor of Terminal Gravettian.

Back to old problems

Reassessment of the Aurignacian V from Laugerie-Haute (Almeida, 2000), combined with recent data from the rockshelter of Casserole (Aubry et al., 1995) indicates that similar developments took place at the scale of southwestern France and Iberia as a whole (Zilhão et al., 1999). Perhaps if the excavators from Laugerie-Haute had not limited their studies and their characterization to the typological analysis of the lithic industries, the problem of the Aurignacian V would have been solved long ago, as Christiane Leroi-Prost had already suggested, back in 1975:

> "*Il semble, en effet, y avoir très peu de différences entre l'industrie osseuse de l'Aurignacien V et celle du Protomagdalénien. Et, si l'abondance des grattoirs carénés et à museau, auxquels s'associent quelques burins busqués typiques, ne permet guère de discuter le caractère aurignacien de cet outillage (Sonneville-Bordes 1960, p. 64), il n'en va pas de même pour l'industrie osseuse*" (Leroy-Prost, 1975, p. 123).

Later, the same author reinforced this idea:

> "*Si, d'après l'avis des spécialistes, l'industrie lithique de Laugerie-Haute ouest, couche D, et de Laugerie-Haute est, couche 33, présente bien les caractères d'un Aurignacien terminal, par contre il nous semble que l'industrie osseuse ne justifie pas vraiment ce rattachement. Elle nous paraît monter une filiation très nette avec l'outillage osseux protomagdalénien, mais ne révèle aucune tradition aurignacienne.*" (Leroy-Prost, 1978, p. 289).

These arguments were, unfortunately, almost ignored. The apparent contradiction between a discontinuity in lithic tool samples from the Proto-Magdalenian and the "Aurignacian V" and the continuity between their bone industries clearly demanded further investigation. Instead, French researchers opted to avoid the problem, either by completing ignoring the "Aurignacian V", or by considering it a *mélange*. A close analysis of the Laugerie-Haute East materials suggests that the supposed *mélange* took place after excavation, in the lab, when François Bordes, Denise de Sonneville-Bordes, and P. Smith, not without a small typological bias, decided to remove all the carinated elements, which "could only be Aurignacian", from the Proto-Magdalenian (Layer 36) and Early Solutrean (Layer 31) levels and group them together with the materials from the Aurignacian V level (Layer 33). No wonder that the Aurignacian V lithic assemblage seemed so different from the Proto-Magdalenian: all the "Aurignacian"-like artifacts from the latter were "exported" into the former! This operation implied not only the mixing of samples which, as the Portuguese data and the Casserole rock shelter (less than 1 km away from Laugerie) show, were complete, and originally not "mixed", but also a questionable re-drawing of the published stratigraphic sections (Zilhão et al., 1999; Almeida, 2000).

If in France and Portugal, the final stages of the Gravettian seem to have followed, in general, a similar technological and typological sequence, the lack of sites representing the period prevent us from clearly characterizing the same transition in Spain. Still, the scarce available data suggests a similar process: at El Pendo, Bernaldo de Quirós (1982a, 1982b) interprets layers III and IV as representing the "Aurignacian V", based on typological and stratigraphic criteria. Below those two layers there is another (layer V) rich in truncated backed bladelets, which, as mentioned above, characterize the Final Gravettian/Proto-Magdalenian.

A complete reanalysis of "Aurignacian"-like sites in southwest Europe whose dates are seemingly late is thus essential (Sacchi, 1986; Sacchi et al., 1996). Such late dates should not be a priori rejected but, instead, serve as a stimulus for a more complete technological study of those industries. It may well be that the dates are wrong, but it may also be the case that the "Aurignacian" aspects of those assemblages in fact mask their true "Gravettian" age.

The definition of an archaeological period or technocomplex is a hard task, which involves a clear evaluation of its internal variability. The methodological approaches to such an endeavor are not unidirectional and preferably should in fact be multidirectional: as multidirectional as were the prehistoric behaviors we study. Giving names to assemblages may seem easy, since we tend to do it quite often. But the easier the way we go about definitions, the higher the risk of... missing the point.

REFERENCES

ALMEIDA, F. (1998) - O método das remontagens líticas: enquadramento teórico e aplicações. *Trabalhos de Arqueologia da EAM*. Lisboa. 3, p. 1-40.

ALMEIDA, F. (2000) - *The Terminal Gravettian of Portuguese Estremadura*. Ph.D. Dissertation. Dallas, TX: Southern Methodist University.

ALMEIDA, F. (2001) - Cores, tools, or both? Methodological contribution for the study of carinated lithic elements: the Portuguese case. In HAYS, M.; THACKER, P., eds. - *Questioning the answers: re-solving fundamental problems of the Early Upper Paleolithic*. Oxford: Archaeopress (*British Archaeological Reports International Series*; 1005), p. 91-98.

ALMEIDA, F. (In press) - Refitting at Lapa do Anecrial: studying technology and micro scale spatial patterning through lithic reconstructions. In SCHURMANS, U.; DE BIE, M., eds. - *XIVth International Congress of Prehistoric and Protohistoric Sciences (UISPP), Symposium The Big Puzzle Revisited*, September 2001 Liège, Belgium.

ALMEIDA, F.; GAMEIRO, C.; ZILHÃO, J. (2002) - The artifact assemblages. In ZILHÃO, J.; TRINKAUS, E., eds. - *Portrait of the artist as a child. The Gravettian human skeleton from the Abrigo do Lagar Velho and its archeological context.* Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 22).

AUBRY, T.; DETRAIN, L.; KERVAZO, B. (1995) - Les niveaux intermédiaires entre le Gravettien et le Solutréen de L'Abri Casserole (Les Eyzies de Tayac): mise en evidence d'un mode de production original de microlithes et implications. *Bulletin de la Société Préhistorique Française*. Paris. 92, p. 296-301.

AUBRY, T.; ZILHÃO, J.; ALMEIDA, F.; FONTUGNE, M. (1997) - Production d'armatures microlithiques pendant le Paléolithique supérieur et le Mésolithique du Portugal. In BALBÍN, R.; BUENO, P., eds. - *II Congreso de Arqueología Peninsular. Paleolítico y Epipaleolítico*. Zamora: Fundación Rei Afonso Henriques, p. 259-272.

BERNALDO DE QUIRÓS, F. (1982a) - L'Aurignacien en Espagne. In *Aurignacien et Gravettien en Europe. Actes des réunions de la 10ème commission de l'UISPP: Aurignacien-Périgordien-Gavettien et cultures derivées*, 1, Nice, 1976. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 13:1), p. 50-63.

BERNALDO DE QUIRÓS, F. (1982b) - The Early Upper Paleolithic in Cantabrian Spain (Asturias-Santander). In *Aurignacien et Gravettien en Europe. Actes des réunions de la 10ème commission de l'UISPP 2, Cracovia-Nitra, 1980*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 13:2), p. 65-78.

BICHO, N. (1992) - *Technological change in the Final Upper Paleolithic of Rio Maior, Portuguese Estremadura*. Ph.D. Dissertation. Dallas, TX: Southern Methodist University.

BINFORD, L.(1973) - Interassemblage variability: the Mousterian and the functional argument. In RENFREW, C., ed. - *The explanation of cultural change: models in Prehistory*. London: Duckworth, p. 227-254.

BINFORD, L. (1983) - *In Pursuit of the Past. Decoding the Archaeological Record*. London: Thames and Hudson.

BINFORD, L. (1989) - *Debating Archaeology*. San Diego, CA [etc.]: Academic Press.

BORDES, F. (1958) - Nouvelles fouilles à Laugerie-Haute Est: premiers résultats. *L'Anthropologie. Paris*. 62:3-4, p. 205-244.

BORDES, F. (1960) - Evolution in the Paleolithic cultures. In TAX, S., ed. - *Evolution after Darwin: II, the evolution of Man*. Chicago, IL: University of Chicago Press, p. 99-110.

BORDES, F. (1968) - *Le Paléolithique dans le monde*. Paris: Hachette.

BORDES, F. (1973) - On the chronology and the contemporaneity of different paleolithic cultures in France. In RENFREW, C., ed. - *The explanation of cultural change: models in Prehistory*. London: Duckworth, p. 217-226.

BORDES, F.; SONNEVILLE-BORDES, D. (1958) - Position stratigraphique de l'Aurignacien V à Laugerie-Haute Est. *L'Anthropologie*. Paris. 62:3-4, p. 378-382.

BREZILLON, M. (1969) - *Dictionnaire de la Préhistoire*. Paris: Librairie Larrouse.

LAVILLE, H. (1975) - *Climatologie et chronologie du Paléolithique en Périgord. Étude sedimentologique de dépôts en grottes et sous-abris*. Marseille: Laboratoire de Paleontologie Humaine et de Préhistoire.

LAVILLE, H.; RIGAUD, J.-Ph.; SACKETT, J.R. (1980) - *Rock shelters of the Périgord. Geological stratigraphy and archaeological succession*. New York, NY: Academic Press.

LEROY-PROST, Ch. (1975) - L'industrie osseuse aurignacienne. Essai régional de classification: Poitou, Charentes, Périgord. *Gallia Préhistoire*. Paris. 18:1, p. 65-156.

LEROY-PROST, Ch. (1978) - L'industrie osseuse aurignacienne. Essai régional de classification: Poitou, Charentes, Périgord (suite). *Gallia Préhistoire*. Paris. 22:1, p. 205-370.

LUCAS, G. (1997) - Les lamelles Dufour du Flageolet I (Bézenac, Dordogne) dans le contexte Aurignacien. *Paleo*. Les Eyzies--de-Tayac. 9, p. 191-219.

LUCAS, G. (1999) - Production expérimentale de lamelles torses: approche préliminaire. *Bulletin de la Société Préhistorique Française*. Paris. 96:2, p. 145-151.

LUMLEY, H., ed. (1976) - *La Préhistoire française. Tome I: Les civilizations paléolithiques et mésolithiques de la France*. Paris: CNRS.

MARKS, A.; ALMEIDA, F. (1996) - The late Aurignacian and "Aurignacian" elements in the Upper Palaeolithic of the Portuguese Estremadura, Portugal. In *XIII International Congress of Prehistoric and Protohistoric Sciences: the Upper Palaeolithic, the Late Aurignacian*. Forlí: ABACO Edizioni, p. 11-21.

MARKS, A.; ZILHÃO, J; BICHO, N.; FERRING, R. (1994) - Upper Pleistocene Prehistory in Portuguese Estremadura. Preliminary results. *Journal of Field Archaeology*. Boston, MA. 21:1, p. 53-68.

PERLES, C. (1992) - In search of lithic strategies: a cognitive approach to prehistoric chipped stone assemblages.In GARDIN, J.-C.; PEEBLES, Ch., eds. - *Representations in archaeology*. Bloomington, IN: Indiana University Press, p. 223-247.

PEYRONY, D. (1933) - Les industries "aurignaciennes" dans le bassin de la Vézère. *Bulletin de la Société Préhistorique Française* Paris. 30, p. 543-559.

PEYRONY, D.; PEYRONY, E. (1938) - *Laugerie-Haute, prés des Eyzies*. Paris: Institut Paleontologique Humaine.

RIGAUD, J.-Ph. (1993) - L'Aurignacien dans le Sud-Ouest de la France. Bilan et perspectives. In BÁNESZ, L.; KOZŁOWSKI, J. K.; eds - *Aurignacien en Europe et au Proche Orient. Actes du XII[e] Congrès International des Sciences Préhistoriques et Protohistoriques. Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 181-186.

SACCHI, D. (1986). - *Le Paléolithique supérieur du Languedoc occidental (Bassin de l'Aude) et du Roussillon*. Ph. D. Dissertation. Pierre et Marie Curie University.

SACCHI, D.; SOLER I MASFERRER, N.; MAROTO I GENOVER, J.; DOMENECH FAUS, E. (1996) - La question de l'Aurignacien tardif dans le domaine méditerranée nord-occidental. In *XIII International Congress of Prehistoric and Protohistoric Sciences: the Upper Palaeolithic, the Late Aurignacian*. Forlí: ABACO Edizioni, p. 23-40.

SONNEVILLE-BORDES, D. (1960) - *Le Paléolithique supérieur en Périgord*. Bordeaux: Delmas.

SONNEVILLE-BORDES, D. (1963) - Aurignacien et Périgordien entre Loire et Garonne. *Bulletin de la Société Méridionale de Spéléologie et de Préhistoire*. Toulouse. 6-9, p. 51-62.

SONNEVILLE-BORDES, D. (1982) - L'évolution des industries aurignaciennes. In *Aurignacien et Gravettien en Europe. Actes des Reunions de la 10[ème] Comission de l'UISPP "Aurignacien-Perigordien-Gravettien et Cultures Derivées". Cracovia-Nitra 1980*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège - ERAUL; 13:2), p. 339-360.

THACKER, P. (1996) - *A landscape perspective on Upper Paleolthic settlement in Portuguese Estremadura*. Ph.D. Dissertation. Dallas, TX: Southern Methodist University.

ZILHÃO, J. (1995) - *O Paleolítico Superior da Estremadura Portuguesa*. Ph.D. Dissertation. Faculdade de Letras da Universidade de Lisboa.

ZILHÃO, J. (1997) - *O Paleolitico Superior da Estremadura Portuguesa*. Lisboa: Colibri.

ZILHÃO, J.; AUBRY, T. (1995) - La pointe de Vale Comprido et les origines du Solutréen. *L'Anthropologie*. Paris. 99, p. 125-142.

ZILHÃO, J.; MARKS, A.; FERRING, C. R.; BICHO, N. F.; FIGUEIRAL, I. (1995) - The Upper Paleolithic of the Rio Maior basin (Portugal). Preliminary results of a 1987-1993 Portuguese-American research project. *Trabalhos de Antropologia e Etnologia*. Porto. 35, p. 69-88.

ZILHÃO, J.; AUBRY, T.; ALMEIDA, F. (1997) - L'utilisation du quartz pendant la transition Gravettien-Solutréen au Portugal. *Préhistoire Anthropologie Méditerranéennes*. Aix-en-Provence. 6, p. 289-303.

ZILHÃO, J.; AUBRY, T.; ALMEIDA, F. (1999) - Un modèle technologique pour le passage du Gravettien au Solutréen dans le sud-ouest de l'Europe. In SACCHI, ed. - *XXIV Congrès Préhistorique de France: les faciès leptolithiques du Nord-Ouest méditerranéen: milieux naturels et culturels*, p. 165-183.

ZILHÃO, J.; TRINKAUS, E., eds. (2002) - *Portrait of the artist as a child. The Gravettian human skeleton from the Abrigo do Lagar Velho and its archaeological context*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 22).

The Middle-to-Upper Paleolithic transition in Portugal: an Aurignacian phase or not?

THIERRY AUBRY ▌MIGUEL ALMEIDA ▌MARIA JOÃO NEVES

ABSTRACT Several hypotheses to explain the absence in stratigraphic sequences of the Sicó limestone massif that span the Middle-to-Upper Paleolithic transition of lithic assemblages that can be techno-typologically classified as Aurignacian on the basis of the criteria adopted in southwestern Europe are discussed in light of the evidence from the technological analysis of Middle Paleolithic and recent Aurignacian assemblages from open air sites near flint sources from two regions of Portugal. This approach suggests that a certain lack of coherence exists in the choice of the criteria that have been utilized in the classical scheme to define breaks in sequences and to isolate cultural phases.

This study uses a technological approach to define operational schemes and flaking techniques present in lithic assemblages recovered from sites in central Portugal. It is an attempt to clarify the available data and to discuss the criteria used for the characterization of Middle and Early Upper Paleolithic cultural-technological phases. The assemblages from this cluster of sites, located at the western extremity of Eurasia, have been studied according to Middle and Upper Paleolithic schemes of classification used in southwestern France. However, the dating results obtained in the past decades have revealed a distinct chrono-stratigraphic sequence. It is generally accepted (Zilhão, 1993, 1997; Raposo and Cardoso, 1998; Zilhão and Trinkaus, 2002) that Portugal has been the "end of the line" for the diffusion of the "Aurignacian package" associated with the expansion of modern humans. This is represented by the persistence, at least until 30 000 BP, of an operational scheme and stone tools considered to be Middle Paleolithic markers, and of Neandertal manufacture.

Two transition models have been proposed for Portugal. In the first, artifacts recovered in the area of the open air settlements of Rio Maior, plus a few "Dufour" bladelets recovered in caves (Zilhão, 1993, 1997; Thacker, 2001; Zilhão and Trinkaus, 2002), are attributed to a final phase of the Aurignacian technocomplex. This indicates a permanent settlement of the region during a final phase of the "classical" Aurignacian sequence, as proposed for the southern part of Spain (Soler and Maroto, 1993). In this version, the scarcity of Aurignacian and Early Gravettian evidence is not related to population density but explained as the result of a destruction of settlements during a major erosional phase between 27 000 and 25 000 BP (Zilhão and Trinkaus, 2002). Others (Bicho, 2000; Marks, 2000; Straus et al., 2000) consider that no assemblage in Portugal can definitely be attributed to the Aurignacian technocomplex. They also conclude that assemblages considered as Aurignacian by Zilhão and by Thacker could be of a more recent age and, therefore, correspond to an undefined phase of the Magdalenian, or even of more recent times. Under this hypothesis and using the number of recorded sites as an indication of population density, these authors consider that the Gravettian occupations dated to about 25 000 BP correspond to the first permanent phase of occupation of Portugal by modern humans.

The goal of this study is to examine new data in order to reach a better understanding of this "transitional" phase, through taphonomical and technological analyses of lithic assemblages recovered recently in the Sicó region. This area has yielded many stratified sequences preserved in limestone caves and rock shelters. For comparison, we considered a recently discovered cluster of open air sites, associated with Bajocian flint sources. Finally, we compared these data to the Rio Maior open air assemblage of Vale de Porcos, attributed by Zilhão to the Aurignacian, located on good quality Cenomanian flint sources, 50 km to the south.

Data from the Sicó cave and shelter sequences

A research project begun in 1991 has permitted us to recognize Middle and Early Upper Paleolithic lithic assemblages preserved in occupation levels of caves and shelters in the Sicó area. This is a limestone highland rising to less than 600 m and located 40 km east of the Atlantic coast (Fig. 1).

Buraca Grande is a cave located on the northern slope of a deeply incised valley formed in Middle Jurassic limestone. The site was discovered during a systematic survey and excavated between 1991 and 2002 (Aubry et al., 1997). Two distinct sequences were recognized: 1) at the entrance and in the first hall of the cave, and 2) in the second hall, where excavation work uncovered a 3 m thick sequence of Holocene and Pleistocene occupation levels (Fig. 2). The bottom of the sequence, consisting of layers 9a, 9b and 10, was excavated in a small area

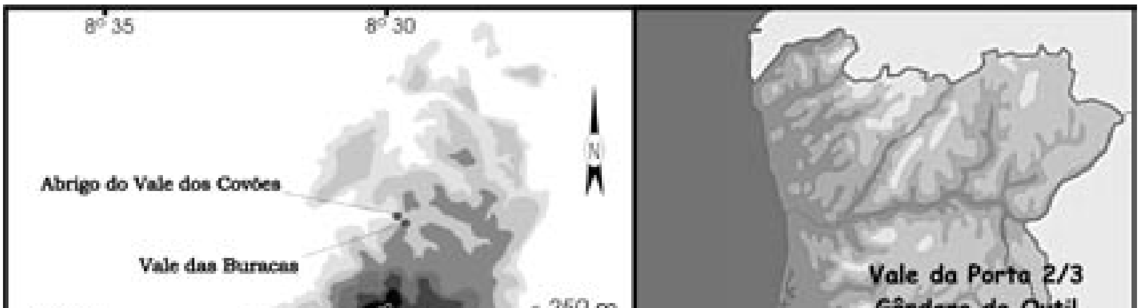

FIG. 1 – Location of the studied sites.

of <4 m². During the last excavation in 2002, new geological and archeological subdivisions were distinguished in unit 9b (9b1, 9b1-base, 9b2) (Fig. 2). Layers 10 and 9b2 contained a few *Capra ibex* remains and scarce artifacts (three quartz flakes and one quartzite flake obtained through a Levallois reduction process). Level 9b1-base showed evidence of erosion by runoff and contained a lithic assemblage of <100 flint pieces, the only retouched tools being notches (Fig. 2). The assemblage of layer 9b-1 is impossible to date on the basis of bone material; preliminary analysis in the Gif laboratory showed that the bones did not contain enough collagen. Level 9b yielded backed and truncated bladelets, as well as retouched bladelets, in its upper part, and microgravettes in the lower part (Fig. 2). The latter were produced from truncated burin cores or from splintered pieces. An AMS date on a charcoal fragment collected in layer 2b of the entrance, overlying layer 2a (which contained retouched tools and reduction processes similar to those of layer 9b), yielded a date of 23 920±300 BP (GifA-93048).

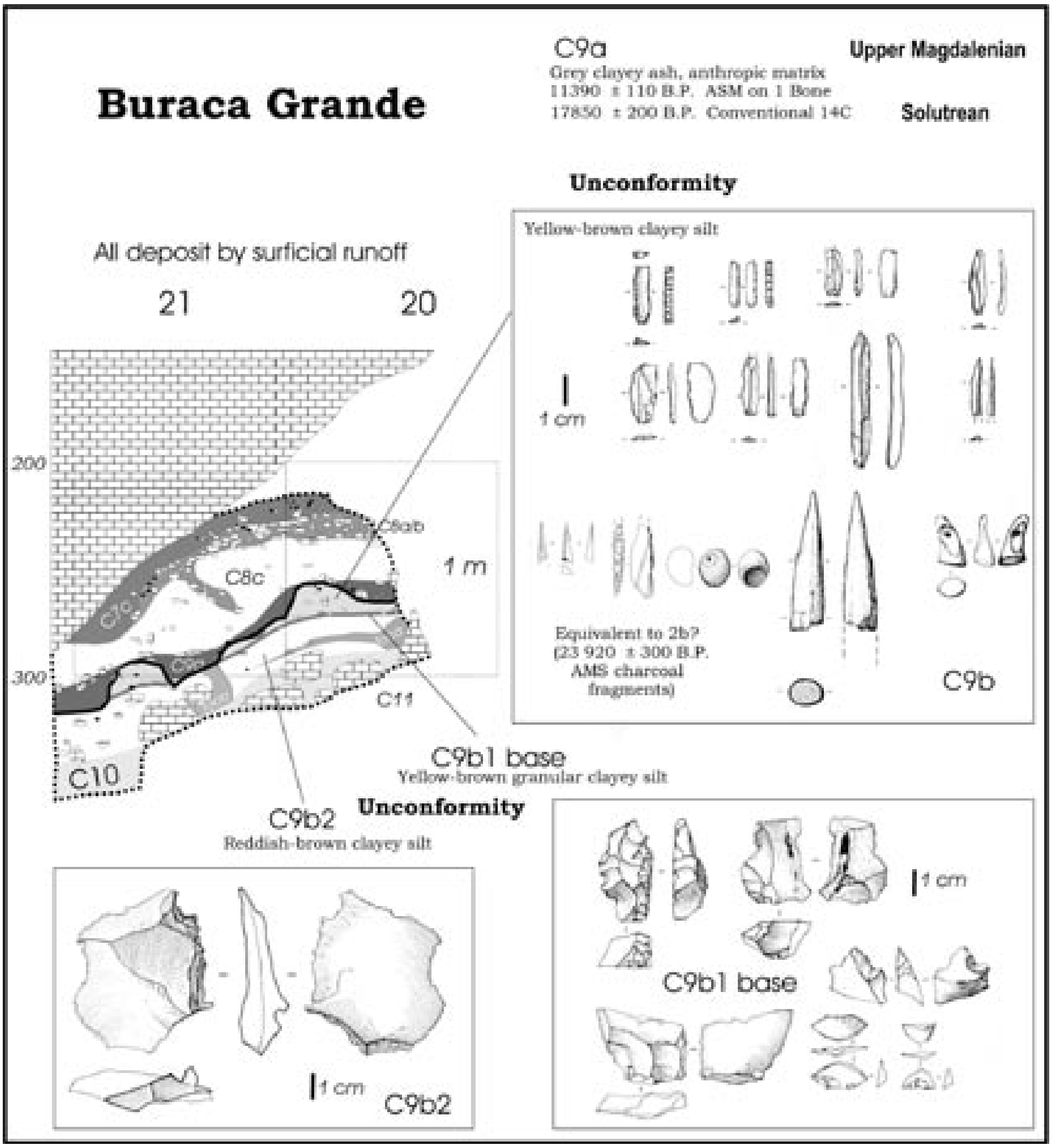

FIG. 2 – Buraca Grande. Profile, and a selection of artifacts from different archeological levels of the cave.

The Buraca Escura cave is located in the same valley as Buraca Grande, but on the opposite slope. Excavations conducted at the same time revealed a Middle Paleolithic sequence of occupation (Fig. 3). There were fewer than 15 flaked stone pieces in two levels excavated over some 12 m², all produced (but not in the cave) from Levallois, discoidal and bipolar cores, and with a hard hammer (Almeida et al., 2003). Animal bone accumulations were related to carnivore activity at the cave (Aubry et al., 2001). Three dates obtained by the U-Th method have a large statistic error and show an inversion: 70 000 BP (40 000/100 000)±30 000; 50 000 (20 000/70 0000)±30 000 BP; and 81 000 (65 000/97 000)±16 000 BP. Locally in the cave, Early Upper Paleolithic deposits are preserved (Fig. 3) in a sequence dated by AMS on bones with high collagen content (Aubry et al., 2001). Level 2e contained a single fragment of a Gravette point, associated with *Capra ibex* remains and dated to 26 560±450 BP (GifA-97258). As indicated by Zilhão and Almeida (in Zilhão and Trinkaus, 2002), the association of these bones with the Gravettian material is not clear, but artifact typology is distinct from the middle and recent Gravettian of Portugal (Zilhão, 1997), and the chronology obtained is compatible with the French sequence.

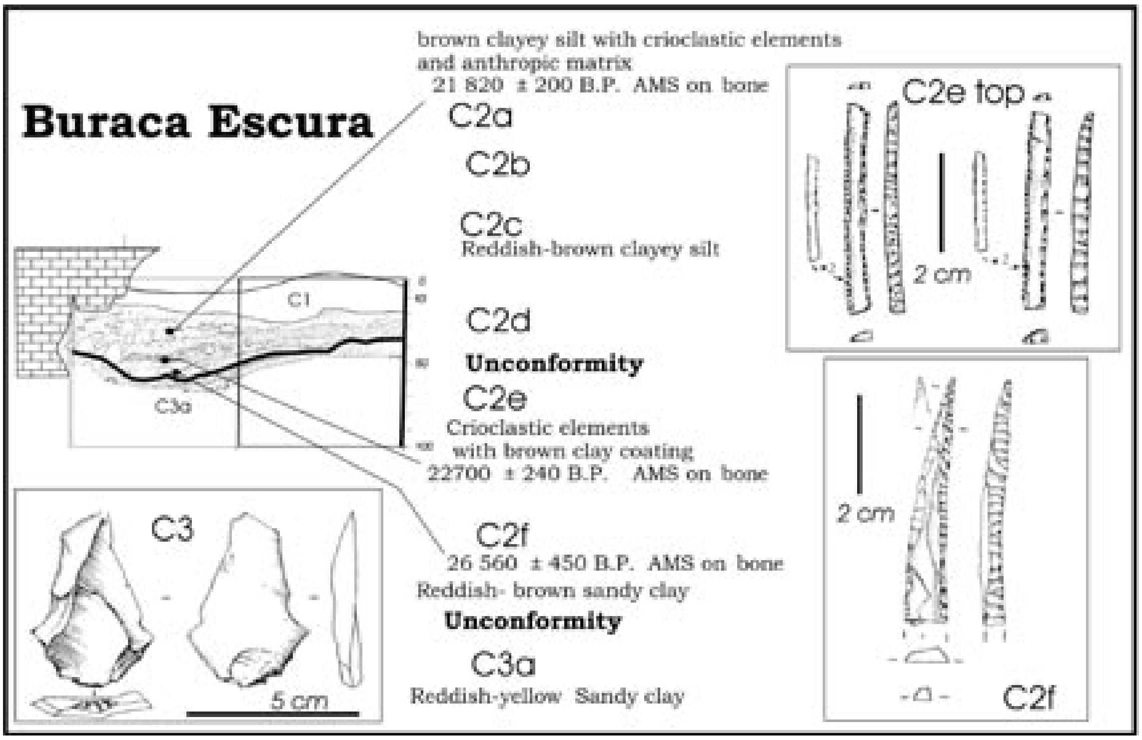

FIG. 3 – Buraca Escura. Profile, and a selection of artifacts in the lithic assemblages from the cave.

Five kilometers to the north, in a small intensively karstified limestone hill, two caves were excavated under the direction of Jean Roche and João Pedro Cunha Ribeiro (Ribeiro, 1982; Zilhão, 1997). One of these two cavities, with a vertical entrance that was originally filled with deposits, revealed a Neolithic funerary occupation. Excavations during 1995 and 2002 showed that the Neolithic occupation was underlain by older occupations in a 1 m thick sequence (Fig. 4). Macrofauna is rare and does not contain collagen, and the stalagmitic floor formations are not pure enough for dating. Technologically, cores were reduced by a process of progressive centripetal flaking with a hierarchy of face preparations and with faceting of the striking platforms (Almeida et al., in press). This process is associated with a Kombewa

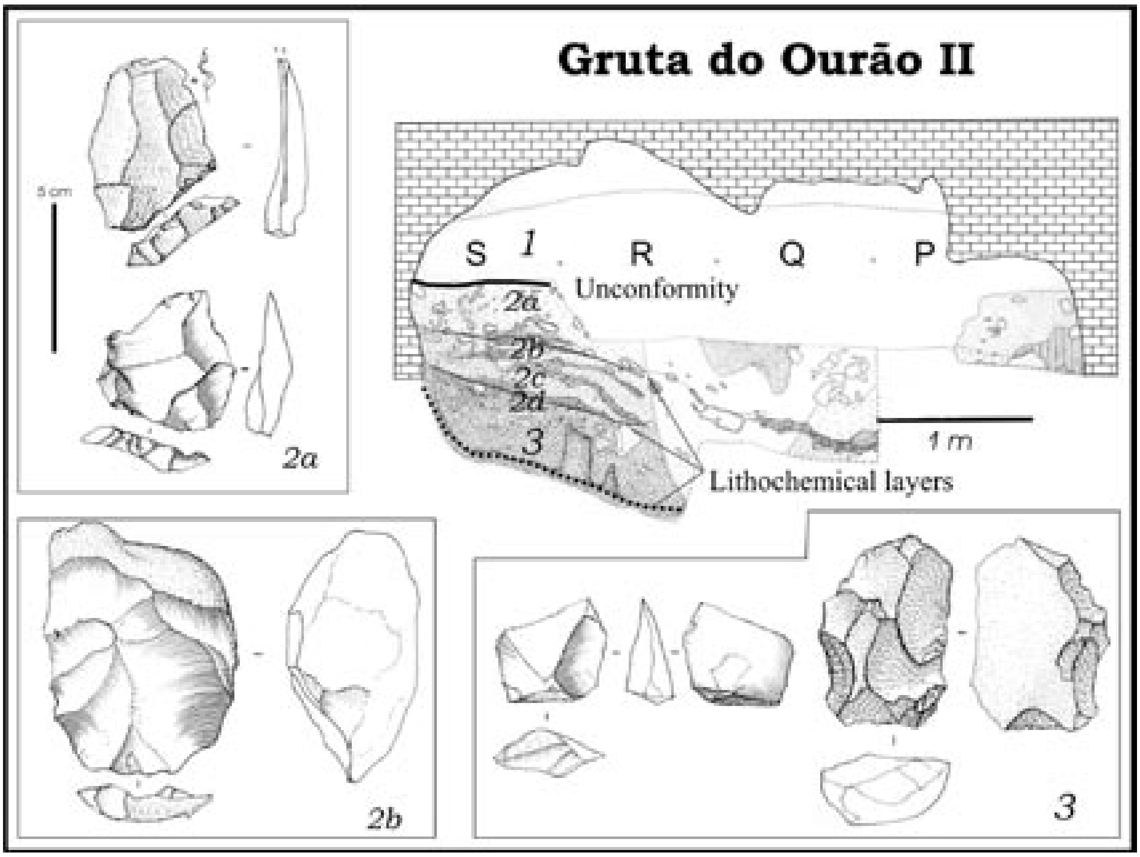

FIG. 4 – Ourão. Profile, and a selection of artifacts in the lithic assemblages from the cave.

reduction process, as seen also in the Buraca Escura assemblage (Almeida et al., 2003) and in assemblages from other sites (Marks et al., 2001).

Eight kilometers northeast (Fig. 5), the same project excavated two other sites in a similar incised valley on the western limit of the relief. The first sequence, in secondary position, comprises three layers. The lowermost layer contained microgravettes and retouched bladelets. The core reduction process was bidirectional bladelet production from burin cores with facetted striking platforms and removal by soft hammer.

The second sequence was preserved in a limestone shelter, named Abrigo do Vale dos Covões, located 1 km downstream. The shelter (Fig. 5) was tested during 2001 and then 9 m^2 of it were excavated in 2004. The almost 2 m thick stratigraphic sequence consisted of eight layers and revealed at least three different cultural-technological phases of human occupation (Fig. 5). The 211 pieces recovered in the base of layer 8b include two "Dufour bladelets", five fragments of retouched bladelets, and a bone point fragment. Analysis of the lithic assemblage and refitting work indicates that bladelet production used a soft-stone hammer on carinated and burin cores and is associated with a blade production using a soft-stone or soft organic hammer. The typological association of backed bladelets and bladelets with alternate retouch is not similar to that in the tool assemblage from level 2b of the Pego do Diabo cave, where bladelet retouch is either alternate or, when direct, marginal (Zilhão, 1997). The rich lithic assemblages in layers 5 to 7 contained more than 250 fragments of microgravettes and backed bladelets obtained from truncated burin cores. Layers 3 and 4 contained micro-retouched bladelets extracted from flakes by a carinated core process.

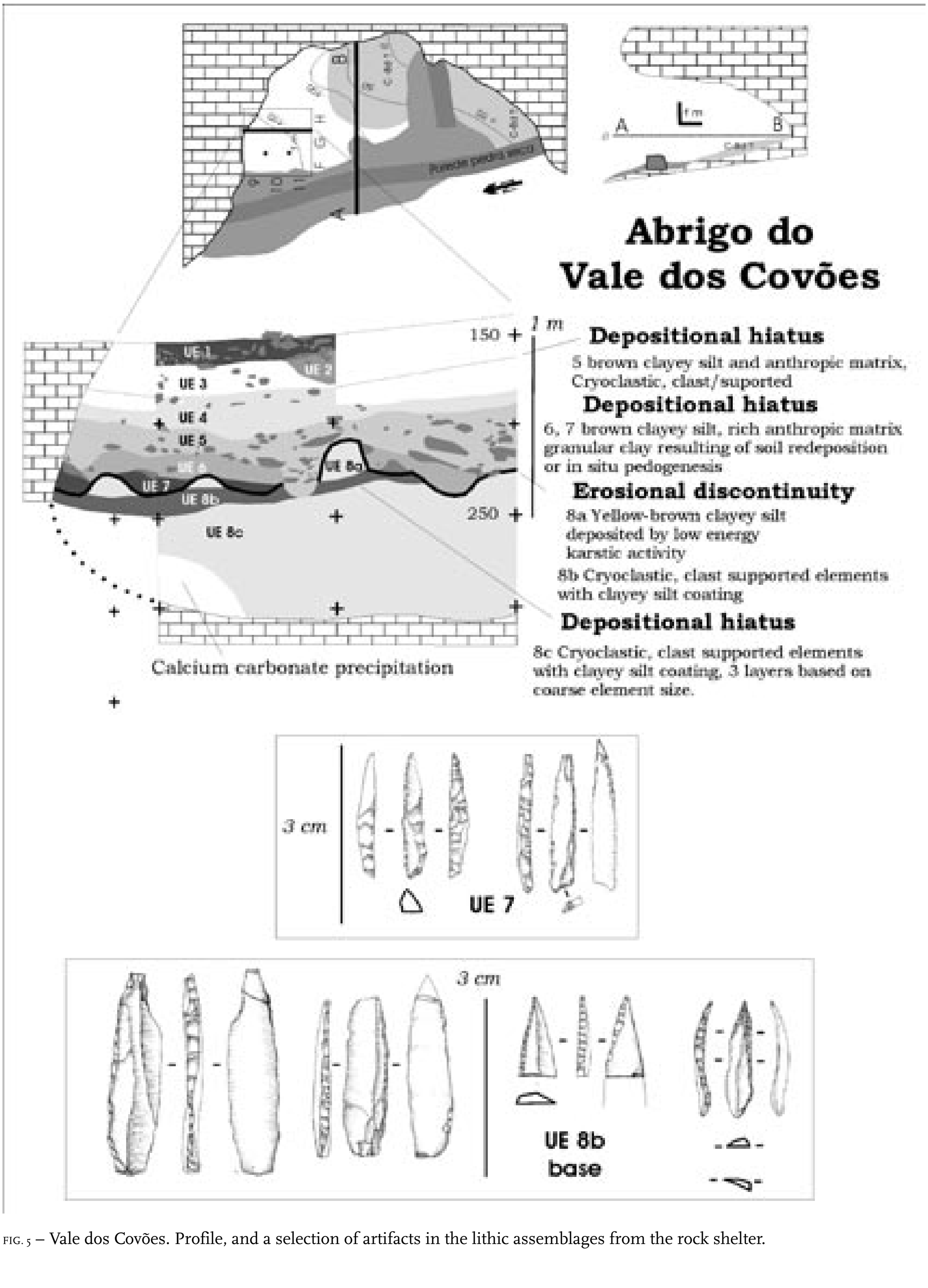

FIG. 5 – Vale dos Covões. Profile, and a selection of artifacts in the lithic assemblages from the rock shelter.

Open air occupations on the Cantanhede/Ançã Bajocian flint sources

The Cantanhede/Ançã region is located in the Geria river basin, a left bank tributary of the Mondego, 20 km north of the Sicó relief (Fig. 1). In this area, the same Bajocian limestone formation bears large and numerous poor quality flint nodules in primary position, and better quality ones in secondary position. This limestone has been intensively exploited for stone construction materials, mainly for the city of Coimbra. Exploration of the formation has revealed some caves but no archeological sites have yet been detected.

The two open air sites of Vale da Porta 2 and 3 were discovered and excavated under the direction of Miguel Almeida and Maria João Neves, during salvage work related to a highway project. These sites lay on the two banks of a secondary tributary of Vale da Grota River, directly on Bajocian flint outcrops (Almeida et al., in press; Almeida and Neves, in press). The stratigraphic sequence of deposits overlying the limestone has been studied by D. Angelucci (2002) (Fig. 6).

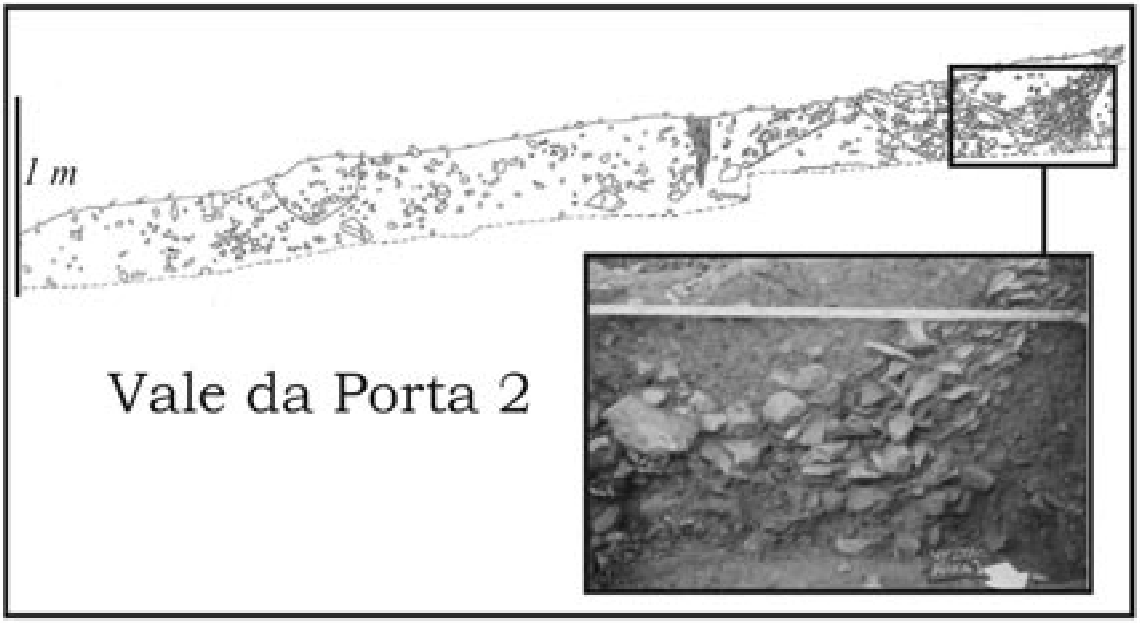

FIG. 6 – Vale da Porta 2 and 3. Profile of the open air site on a flint outcrop.

Several thousand flaked stone blanks and shatter, obtained exclusively by hard stone hammer removal, exhibit a centripetal discoidal and Levallois production of triangular, circular, and oval flakes. In association with this centripetal concept, small flakes and "bladelet-like" flakes were produced using a carinated core scheme. Blade-like flakes and flakes were also produced using a hard stone hammer, on prismatic unidirectional or bidirectional cores prepared by cresting in an "Upper Paleolithic" manner (Fig. 7). OSL dating of wind-deposited sediments, below and above an archeological level, is in progress.

Not directly on the flint outcrop, and 1 km from Vale da Porta, the site of Gândara de Outil 1 was discovered during a systematic survey after deep soil preparation for tree plantation. The section cut by the road shows a thick wind-accumulated deposit. The lithic assemblage (1784 pieces) exhibits a primary core reduction strategy based on carinated burin and busked burin techniques. These were produced from flakes made by hard hammer following a discoidal core reduction method; their extraction, however, was carried out elsewhere, and those flake blanks introduced into the site. Manufacture of bladelets discarded on the site was done with a hard stone hammer, with technological analysis indicating that some bladelets are missing (Fig. 8). Associated with this process is the production of flakes and large bladelets removed by hard hammer from prismatic cores, both uni- and bidirectional.

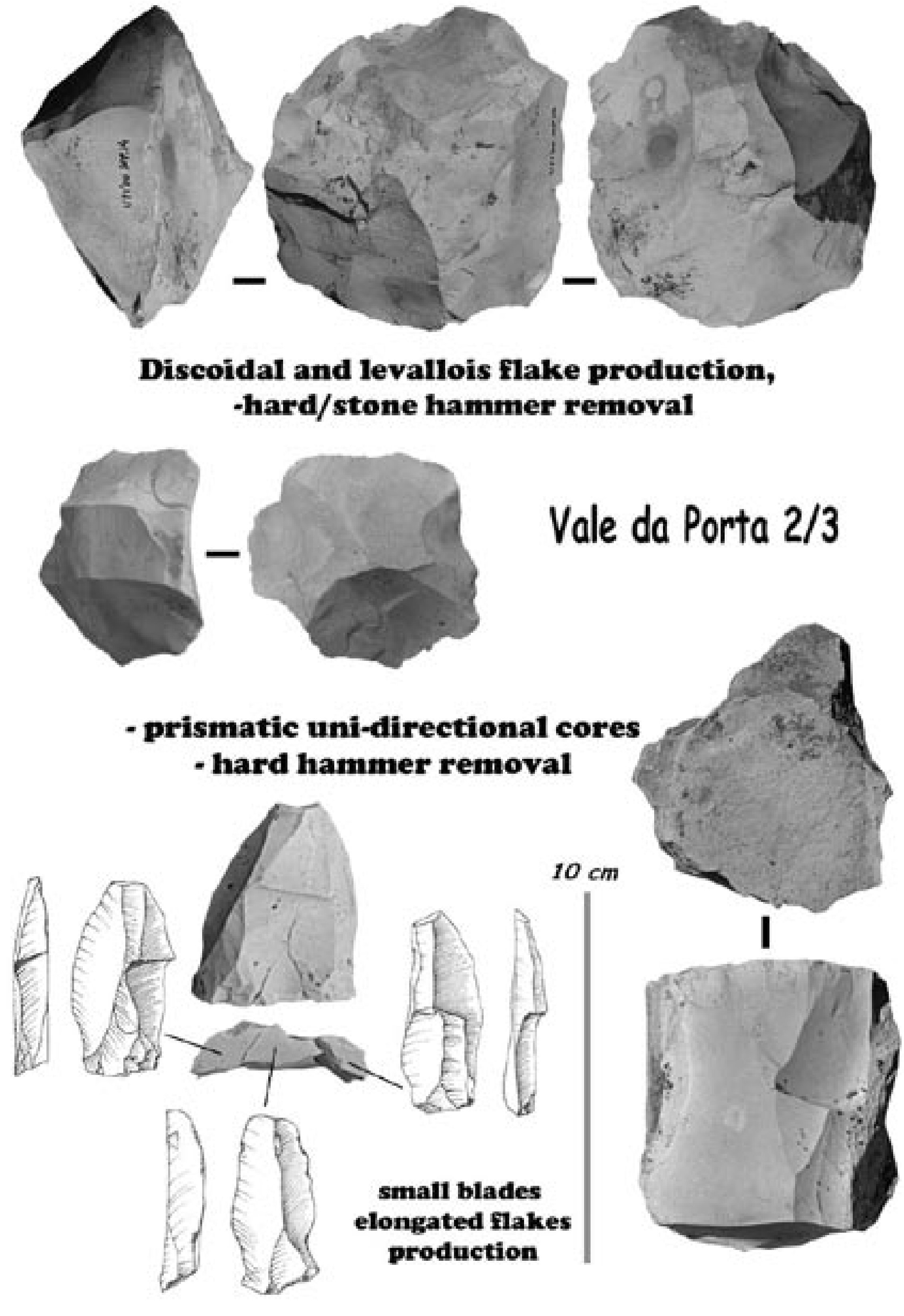

FIG. 7 – Vale da Porta 2 and 3. Stone tool technology and operational scheme represented in the lithic assemblage.

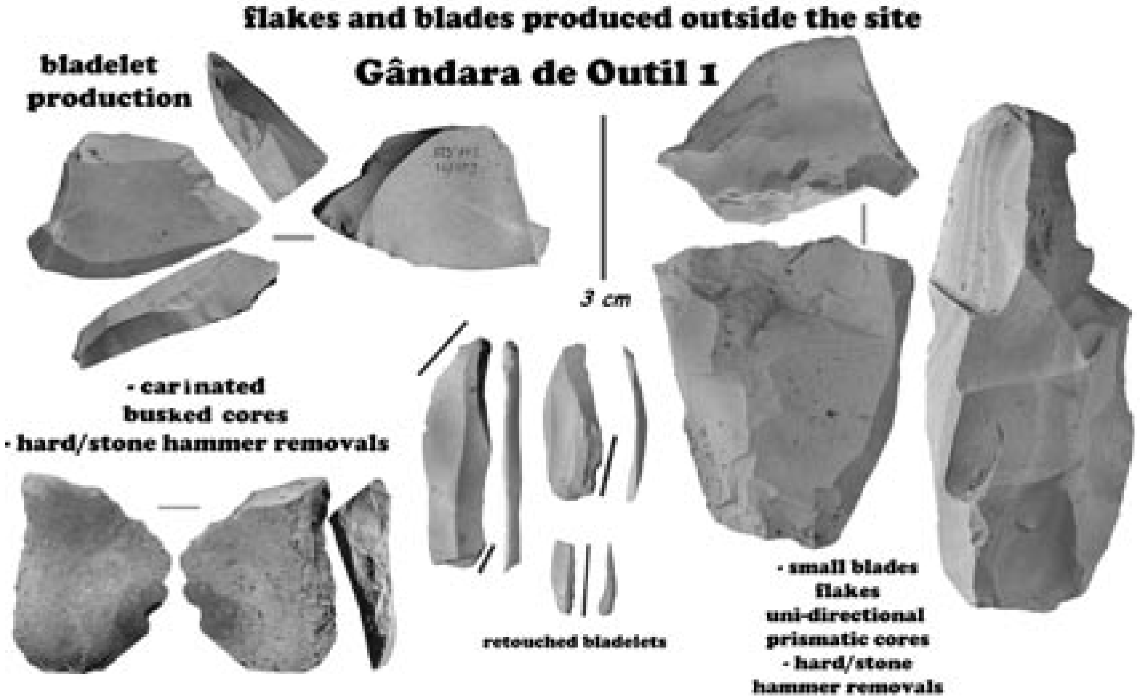

FIG. 8 – Gândara de Outil. Operational scheme represented in the lithic assemblage and carinated core reduction sequence.

The evidence from the Mondego basin: Aurignacian occupation or not?

The only flaked stone assemblage recovered from the cave and shelter sequences of the Sicó area that could correspond to the typo-technological attributes of the Aurignacian as described in the southwest French "classical model sequence" is the lithic assemblage uncovered in the basal level of the Abrigo do Vale dos Covões (Fig. 5). However, the typological similarity of the Dufour and retouched bladelets with some of the *fléchettes* from level 5 (rear) of the Abri Pataud (Bricker, 1995) must be pointed out. Dates for this level are of 28 150 BP±225 BP (GrN-4634) and of 28 400 BP±1100 (OxA-169), identical to the single result available in Portugal for a sample accepted to be in association with a lithic assemblage containing the same type of retouched bladelets, that obtained on bone fragments from level 2b of Pego do Diabo cave: 28 120/+860/-780 BP (ICEN-732) (Zilhão, 1997).

In the other regional cave sequences, layers containing typo-technological Gravettian assemblages overlie levels containing few stone artifacts where blade and bladelet production is completely lacking. Those artifacts were all produced by hard hammer removal from Levallois discoidal cores (Almeida et al., 2003) and, in one case (level 9b base of Buraca Grande), are typologically dominated by notches.

Two interpretations have been proposed to explain these patterns. Bicho (2000), Marks (2000) and Straus et al. (2000) think that Middle Paleolithic assemblages (technologically defined) survived until 30 000 BP or later, and that the Aurignacian would be represented only by "incursions" originating from northern Iberia. In the second interpretation, the Aurignacian I is lacking and the expansion of modern humans took place in a recent phase of the Aurignacian (Zilhão in Zilhão and Trinkaus, 2002, 2003). The scarcity of sites from this phase could be explained by geological bias induced by post-depositional processes eroding away Aurignacian and initial Gravettian occupation levels in open air sites (Zilhão, 2001). However, it is difficult to argue along these lines to explain the absence of diagnostic Aurignacian remains, in secondary position, not only in the open but also in the Middle-to-Upper Paleolithic sequences of every single hydrological karst system of Portugal. In this respect, it must be noted that some "Dufours bladelets" were indeed identified in early Upper Paleolithic palimpsests that also contained Gravettian material at the caves sites of Salemas and Escoural, and that technologically "Aurignacian" blades were recovered in secondary position in fluviatile deposits at the open air sites of Arneiro and Passal, in the Rio Maior basin, downstream from Vale de Porcos (Zilhão, 1997).

These patterns may also be used to support an explanation of Aurignacian subsistence/settlement patterns as being distinct from Middle Paleolithic and Gravettian ones, along the lines suggested by White (1982) for the Middle-to-Upper Paleolithic transition in southern France. As a matter of fact, all Middle Paleolithic and Gravettian occupation levels in caves and rock shelters seem to correspond to seasonal/logistic explorations of highland faunal resources, and not to residential sites, which are still missing (Zilhão, 1997; Aubry et al., 2001).

It is also possible that the interassemblage variability of Middle and Early Upper Paleolithic flaked stone assemblages was greater than generally accepted when we try to apply the classical French sequence. This kind of problem appears obvious when we analyze the Vale da Porta 2 and 3 assemblages according to the classical chrono-cultural classification of the Paleolithic.

The carinated core reduction process represented in the Gândara assemblage may be typo-technologically compared to the most recent Aurignacian phase of the southern French classical sequence (Bordes, 2002). However, we must keep in mind that such a bladelet production process on flake cores has been described in Final Gravettian, Magdalenian and Mesolithic assemblages as well, and thus is not chronologically meaningful (Almeida, this volume). In a French site, recent dating of bones associated with artifacts attributed to the Aurignacian (Lebrun-Ricalens and Brou, 2003) has revealed an age compatible with a Tardiglacial chronology for an assemblage previously attributed to a recent Aurignacian phase.

To examine this issue objectively, we compared the Gândara assemblage with the flaked stone artifacts of the Vale de Porcos site, considered by Zilhão (1997) to belong to the final phase of the Aurignacian in Portugal.

Comparison with the Vale de Porcos lithic assemblage

The only possible typo-technological comparisons with other sites in Portugal are with the lithic assemblages from the Rio Maior region (50 km to the south), excavated by Manuel Heleno in 1952-1953. The sites of Vascas and Vale de Porcos I are both located on Cenomanian flint sources, a good quality material available in large quantities as regular nodules. We discuss here only the assemblage from Vale de Porcos I (783 pieces), studied by João Zilhão. In his work, he identified a change in the morphological attributes of blade platforms as one progressed along the core reduction sequence (Zilhão, 1997).

Technological analysis and preliminary refitting of this assemblage by Thierry Aubry and Miguel Almeida identified a phase of core preparation by cresting, flakes being removed by hard hammer, and a phase when blades were produced by soft organic hammer, with linear, unfaceted or faceted striking platforms, as observed by Zilhão (1997). The cores resulting from this production are morphologically distinct from those published for the initial Aurignacian phase in France and northern Spain (Bon, 2002; Bordes, 2002). They were reused to obtain elongated flakes, blade-like flakes, and large bladelets, removed by a hard stone hammer, after reaching a width of about 1,5 cm (Fig. 9). Refitting shows that some thick flakes removed with a hard stone hammer were used for bladelet production on carinated cores, or for a distinct reduction sequence of flakes using a discoidal method (Fig. 9).

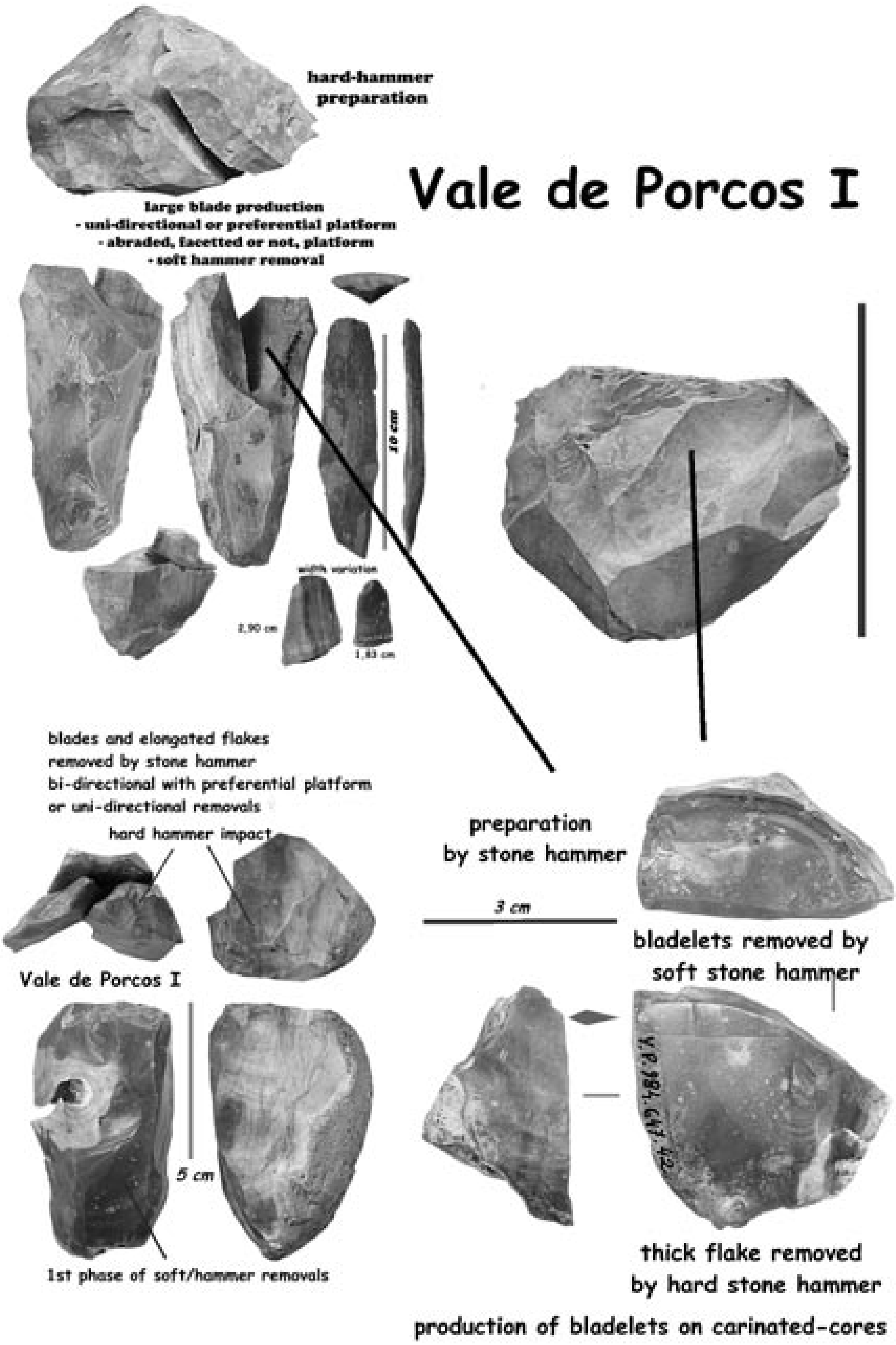

FIG. 9 – Vale de Porcos. Operational scheme represented in the lithic assemblage.

The chronology of these assemblages recovered from open air sites, where no material for dating has been found, has been established on the basis of geological inference and morphological correlation of bladelets produced from flake cores (Zilhão, 1997). Retouched Dufour bladelets recovered from the sites of Pego do Diabo, Escoural and Salemas have also been used for typological dating. Zilhão (1997) has used these positive correlations and the presence of a production of large blades unlike any other in the entire Upper Paleolithic sequence to suggest that these assemblages are the result of functional specialization between Aurignacian workshops located on flint outcrops and Aurignacian logistical sites located in caves and dominated by Dufour bladelets, residential sites still having not been found. The only date accepted to be in association with such occupations is that of ca.28 000 BP mentioned above for level 2b of Pego do Diabo. This date corresponds with the younger limit of the statistical distribution of dates obtained for occupations attributed to a final Aurignacian phase in southern Spain (Zilhão and Trinkaus, 2002). The similarity with some bladelets with alternate retouch found in Perigordian IV assemblages from the Dordogne, however, must not be forgotten. The dating of charcoal in stratigraphic association with the lithic assemblage at the base of level 8b of Abrigo do Vale dos Covões may eventually contribute to clarify these issues.

Bicho (2000) has criticized this model and suggested a Magdalenian chronology for the Rio Maior workshop sites. His solution, however, is not convincing, because the association of bladelets produced from flake cores with large blades removed by direct percussion with soft hammer is unknown in the entire Magdalenian of Portugal and Spain (Zilhão, 1997; Bicho, 1998).

Concluding remarks

In Portugal, the variability and chronology of the Middle Paleolithic sequence is still under evaluation (Raposo and Cardoso, 1997; Marks et al., 2001; Zilhão and Trinkaus, 2002; Almeida et al., in press), with blade and bladelet production sequences being one possible component of flaked stone production (Zilhão, 2001). The comparison of the data obtained by the technological study of the newly discovered Gândara assemblage and of level 8b of Abrigo do Vale dos Covões, comparisons with the classical French sequence, the features of the lithics from Vale de Porcos, and the morphological and technological correlation of "Dufour bladelets", all argue for an attribution to a recent phase of the Aurignacian or to an initial Gravettian. This proposition will be verified by radiochronometric dating of Gândara do Outil 1 burnt stone pieces (TL) and sediments (OSL), as well as of charcoal (^{14}C) uncovered in basal level 8b of the Abrigo do Vale dos Covões. Technological differences between these lithic assemblages and the southern French series must be explained through the integration of flake production in the reduction sequence of blade cores, the strategy of preparation of large blade cores, and the reduction processes used in the production of blades and bladelets. If, on the basis of available data, Zilhão's proposal seems to us to be the most parsimonious, there are problems that remain unexplained and that do not yet allow for other chronological hypotheses to be removed from further consideration.

A combined archeological and geological approach to both cave and open air site sequences would probably allow us to establish the real biases introduced in the data set by the differential preservation of regional deposits dated to the time of the Middle-to-Upper Paleolithic transition. Such an approach might also allow us to define a method for the detection of open air residential sites in the hydrographic basins now covered by dunes that are located between the limestone highlands and the coast.

In the course of this study, based on a technological approach, and on a comparison with the "classical French sequence", we observed a European-wide lack of information on technology and raw-material sourcing concerning the later Aurignacian and the transition to the Gravettian, in contrast with the special attention given in the last decade to the Aurignacian I. Moreover, it is apparent to us that the establishment of sequences is usually based on a kind of circular reasoning where the typologies of bone tools and ornaments, accepted as markers of the age and unity of the different phases of the Aurignacian, mask the great diversity in flaked stone production methods and in types of retouched tools. This diversity may in turn obscure the complex contacts and exchanges that may have existed between very distinct contemporaneous cultural groups living in the vast geographical area encompassed by the Aurignacian phenomenon.

REFERENCES

ALMEIDA, M.; AUBRY, T.; NEVES, M. J.; MOURA, M. H. (2003) - A first approach to Middle Palaeolithic technological variability in the Lower Mondego: the Redinha sector (Pombal, Leiria). *Journal of Iberian Archaeology*. Porto. 5, p. 21-49.

ALMEIDA, M.; NEVES, M. J.; AUBRY, T.; MOURA, M. H. (in press) - Prospecção arqueológica da margem norte do Baixo Mondego: problematização, metodologia e resultados preliminares. In *Actas das I Jornadas de Arqueologia e Património do Litoral Centro, Porto de Mós, 31 de Maio-1 de Julho de 2001*.

ALMEIDA, M.; NEVES, M. J. (in press) - 3,5 kms na A14: dados para uma reflexão sobre a arqueologia de emergência em Portugal: Paleolítico e Mesolítico. In *Actas das I Jornadas de Arqueologia e Património do Litoral Centro, Porto de Mós, 31 de Maio-1 de Julho de 2001*.

ANGELUCCI, D. (2002) - *Geoarqueologia dos sítios pré-históricos do Vale da Porta 2 e Vale da Porta 3*. Lisboa: Instituto Português de Arqueologia, policopiado (Trabalhos do CIPA; 29).

AUBRY, T.; FONTUGNE, M.; MOURA, H. (1997) - Les occupations de la grotte de Buraca Grande depuis le Paléolitique supérieur et les apports de la séquence Holocène à l'étude de la transition Mésolithique/Néolithique au Portugal. *Bulletin de la Société Préhistorique Française*. Paris. 94:2, p. 182-190.

AUBRY, T.; BRUGAL, J.-P.; CHAUVIÈRE, F.-X.; FIGUEIRAL, I.; MOURA, M. H.; PLISSON, H.; (2001) - Modalités d'occupation au Paléolithique supérieur dans la grotte de Buraca Escura (Redinha, Pombal, Portugal). *Revista Portuguesa de Arqueologia*. Lisboa. 4:2, p. 19-46.

BICHO, N. F. (1998) - Spatial, technological and economic organization after the Last Glacial Maximum in Portuguese Prehistory. In FULLOLA I PERICOT, J.; SOLER I MASFERRER, N., eds - *El món mediterrani després del Pleniglacial (18000 – 12000 BP). Col.loqui. Banyoles 1995*. Girona: Museu d'Arqueologia de Catalunya-Centre d'Investigacions Arqueològiques (Serie Monográfica; 17), p. 213-223.

BICHO, N. F. (2000) - Revisão crítica dos conhecimentos actuais do Paleolítico superior português. In *Actas do II Congresso de Arqueologia Peninsular* (Vila Real, 1999) Porto: ADECAP, p. 425-442.

BON, F. (2002) - *L'Aurignacien entre mer et océan: réflexion sur l'unité des phases anciennes de l'Aurignacien dans le Sud de la France*. Paris: Société Préhistorique Française (Mémoire de la Société Préhistorique Française; 29).

BORDES, J.-G. (2002) - *Les interstratifications Châtelperronien/Aurignacien du Roc-de-Combe et du Piage (Lot, France). Analyse taphonomique des industries lithiques, implications archéologiques*. Thèse de doctorat de Préhistoire et Géologie du Quaternaire de l'Université de Bordeaux I.

LE BRUN-RICALENS, F.; BROU, L. (2003) - Burins carénés-nucleus à lamelles: identification d'une chaîne opératoire particulière à Thèmes (Yonne) et implications. *Bulletin de la Société Préhistorique Française*. Paris. 100:1, p. 67-83.

MARKS, A. E. (2000) - Upper Paleolithic occupation of Portugal: resident vs. visitors. In *Actas do III Congresso de Arqueologia Peninsular (Vila Real, 1999)*. Porto: ADECAP, 2, p. 341-349.

MARKS, A. E.; MONIGAL, K.; ZILHÃO, J. (2001) - The lithic assemblages of the Late Mousterian at Gruta da Oliveira, Almonda, Portugal. In ZILHÃO, J.; AUBRY, Th.; CARVALHO, A.-F., eds. - *Les premiers hommes modernes de la Péninsule Ibérique. Actes du Colloque de la commission 8 de l'UISPP, Vila Nova de Foz Côa, octobre 1998*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 17), p. 145-154.

RAPOSO L.; CARDOSO, J. L. (1998) - *O sítio do Paleolítico Médio da Conceição* (Alcochete). Lisboa: Centro de Estudo e Monitorização Ambiental Lusoponte.

RIBEIRO, J. P. C. (1982) - A indústria lítica da Gruta do Ourão (Redinha, Pombal): notícia preliminar. *Arqueologia*. Porto. 5, p. 27 -31.

SOLER, N.; MAROTO, J. (1993) - Les nouvelles datations de l'Aurignacien dans la Péninsule Ibérique. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche Orient. Actes du XII[e] Congrès International des Sciences Préhistoriques et Protohistoriques. Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 162-181.

STRAUSS, L. G.; BICHO, N.; WINEGARDNER, A.-C. (2000) - The Upper Palaeolithic settlement of Iberia: first generation maps. *Antiquity*. Cambridge. p. 553-566.

THACKER, P. (2001) - The Aurignacian campsite at Chainça, and its relevance for the earliest Upper Palaeolithic settlement of the Rio Maior vicinity. *Revista Portuguesa de Arqueologia*. Lisboa. 4:1, p. 5-15.

WHITE, R. (1982) - Rethinking the Middle/Upper Paleolithic transition. *Current Anthropology*. Chicago, IL. 23:2, p. 169-192.

ZILHÃO, J. (1993) - Le passage du Paléolithique moyen au Paléolithique supérieur dans le Portugal. In CABRERA, V., ed. - *El origen del hombre moderno en el suroeste de Europa*. Madrid: Universidad Nacional de Educación a Distancia, p. 127-145.

ZILHÃO, J. (1997) - *O Paleolítico Superior da Estremadura Portuguesa*. 2 vols. Lisboa: Colibri.

ZILHÃO, J. (2001) - Le Paléolithique supérieur du Portugal. Bilan quinquennal. 1997-2001. In *XIV[e] Congrès U.I.S.P.P. - commission 8 (Liège, 2001)*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 97), p. 161-171.

ZILHÃO, J.; TRINKAUS, E., eds. (2002) - *Portrait of the artist as a child. The Gravettian human skeleton from the Abrigo do Lagar Velho and its archaeological context*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 22).

Archaic Aurignacian lithic technology in Cueva Morín (Cantabria, Spain)

JOSÉ MANUEL MAÍLLO FERNÁNDEZ

ABSTRACT Over the last years, the characteristics of the beginning of the Upper Paleolithic in the Cantabrian region as put forth by F. Bernaldo de Quirós have suffered a very important renovation. The identification of new industrial groups and the dates for El Castillo have promoted this "revolution". Cueva Morín is located in the region of Cantabria, 9 km to the south of the city of Santander. This cave, known since the beginning of past century, presents a stratigraphic sequence spanning from the Mousterian to the Azilian in 22 archeological levels. The study of the lithics from levels 9 and 8 (Archaic Aurignacian) have allowed us to know the lithic technology of this period in the Cantabrian region. These levels provide relevant bladelet production linked to two different operative schemes: prismatic core and carinated endscraper reduction. The characteristic bladelets have straight profiles and no torsion. The production of bladelets is mainly oriented to obtain Dufour bladelets. Blades are less important in these levels, but there is a continuum between blade and bladelet production. On the other hand, we must stress the importance of the production of flakes through a single, discoidal operative scheme. Flake production is mainly to obtain sidescrapers, denticulates and notches.

Introduction

The last twenty years have seen some interesting innovations in studies on the beginning of the Upper Paleolithic in Cantabrian Spain. After the end of the Mousterian, two groups of industries developed that can be called "transitional": the Châtelperronian and the Transitional Aurignacian. After these we find a clearly differentiated Archaic Aurignacian. In spite of this promising panorama, the Aurignacian often has been neglected in Paleolithic studies in Cantabrian Spain. This article therefore aims at reviving interest in this techno-complex, looking at it from a technological point of view, and at situating it in its regional framework.

Cueva Morín

Located in Villanueva de Villaescusa, Cueva Morín is also known as Mazo Moril or Cueva del Rey ("King's Cave", alluding to a visit made by King Alfonso XIII). It is situated in a small hill of Urgonian limestone, in the Solia drainage basin, 60 m above sea level, and 6 km from the present coastline (Fig. 1). The entrance faces northwest, and the cave is at first oriented to the southeast, and further inside to the southwest. The entrance is 2 m high (González Echegaray and Freeman, 1971).

The cave was discovered scientifically by H. Obermaier and P. Wernet in 1910. Two years later, in 1912, J. Carballo and L. Sierra carried out a trial dig, which was not published, although some time later O. Cendrero gave a description of some of the artifacts which had

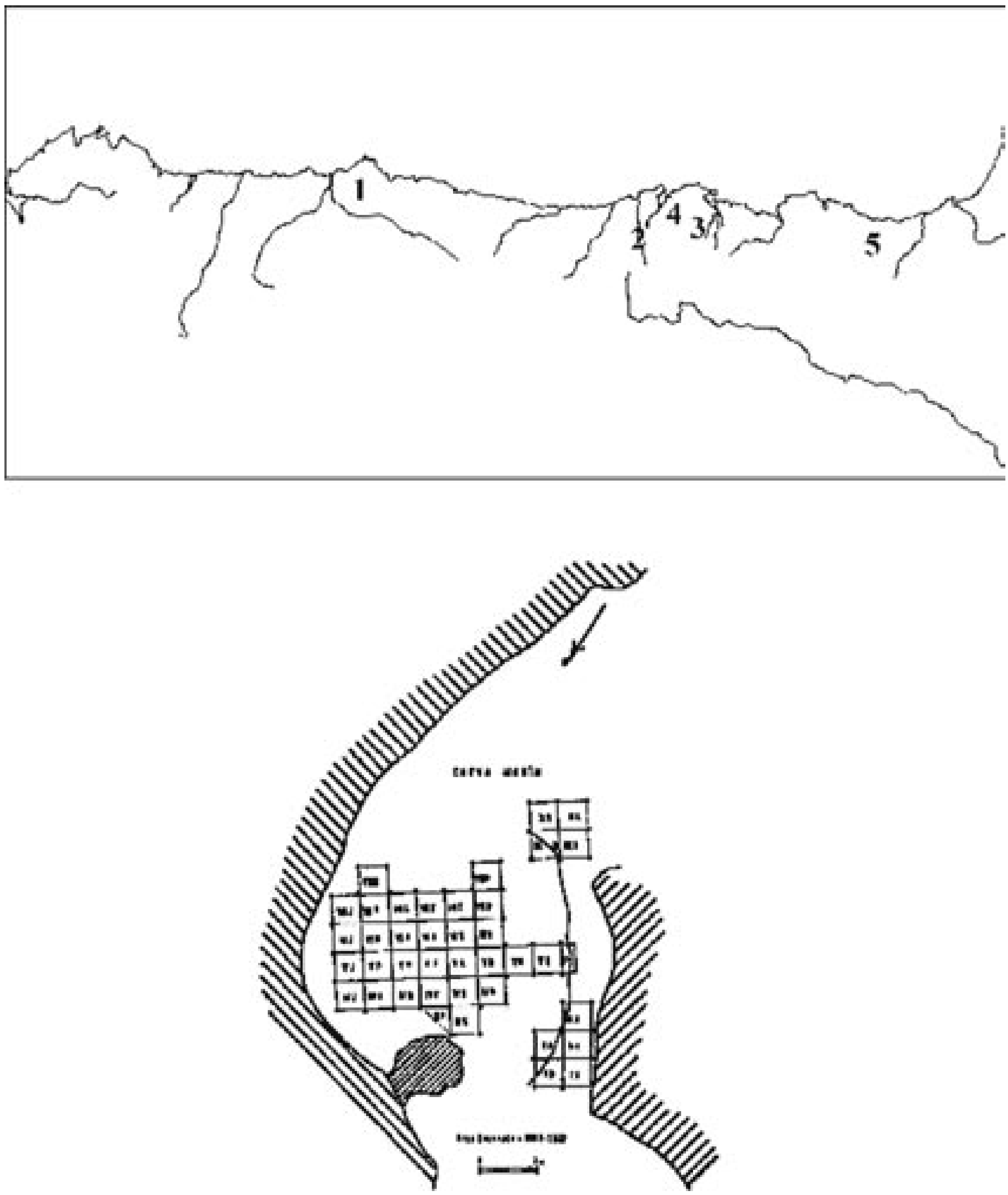

FIG. 1 – A) Map of Cantabrian Spain: 1. La Viña; 2. El Castillo; 3. El Pendo; 4. Cueva Morín; 5. Labeko Koba. B) Plan of Cueva Morín.

been excavated by the two prehistorians (Cendrero, 1915). Between 1917 and 1919, J. Carballo began a new study and carried out what can be considered as the first serious archeological work in the site. At this time, the layers of Upper Paleolithic age and two Middle Paleolithic layers were dug (Carballo, 1923). In 1918, after the first season of digs, Carballo invited the Count of the Vega del Sella to perform more excavations in the site, after he had finished his work. The results of these new studies of Cueva Morín were soon made public (Vega del Sella, 1921). However, it was not until 1966 that the site was studied again, in a series of seasons ending in 1969. These digs, by a Spanish-American team directed by J. González Echegaray and L. G. Freeman (1971, 1973, 1978), made two vital contributions to

Spanish Prehistory: first, the application of modern excavation methods, and second, the discovery of the first complete sequence between the Middle and Upper Paleolithic in Spain. This stratigraphic sequence revealed the presence of a Châtelperronian layer, and therefore the solution to the debate on the Moustero-Aurignacian (González-Echegaray, 1969; Moure Romanillo, 1969-70).

The site's stratigraphic sequence consists of 22 layers, whose assemblages are assigned as follows: layer 1, Azilian; layer 2, Magdalenian; layer 3, late Solutrean; layers 4 and 5b, Gravettian; layer 5a, Evolved Aurignacian; layers 6 and 7, Typical Aurignacian; layers 8 and 9, Archaic Aurignacian; layer 10, Châtelperronian; layers 11 to 17, Mousterian; layers 18 to 21, sterile; and layer 22, Mousterian.

The archaic Aurignacian: layers 9 and 8

Sedimentology

Layer 8 forms a single stratigraphic unit with underlying layer 9. Sedimentologically, it corresponds to reddish-brown silty-clays, with some disperse, altered gravel. It is formed of fine material transported by low energy, laminar water flow, that would occasionally be diffuse and not channeled (Laville and Hoyos, 1994).

Faunal remains

Very few faunal remains were found. In layer 8, they consist of only 22 remains, corresponding to a MNI of two individuals of *Equus caballus* and single individuals of *Capreolus capreolus*, *Cervus elaphus* and *Sus scropha*. From layer 9, the four remains belong to a bovid and a single *Equus caballus* individual (Altuna, 1971).

Bone tool assemblage

Layer 9 yielded a distal fragment of a sagaie point, probably with a split base, although it is badly degraded (González Echegaray, 1971). No artifacts in bone, elements of adornment, or symbolic objects, were found in layer 8.

Lithic assemblage: general aspects

Layer 8 is very rich in materials, both quantitatively and qualitatively. Nearly 3100 debitage products and 9462 pieces of knapping waste have been recorded. The debitage products are divided into 1010 flakes, 690 blades and 1023 bladelets.

The lithic assemblage of Layer 9 is less rich, being composed of over 1300 debitage products and over 3000 pieces of knapping waste. The former consist of 791 flakes, 178 blades and 167 bladelets.

The Aurignacian occupants of the site made use of a wide range of raw materials, including quartzite, sandstone, ophite, rock crystal, oligist, quartz and limonite. Nevertheless, the most common raw material is flint: 85% in layer 8, and 57% in layer 9.

Flint is also the material most often used to manufacture blades and bladelets. The debitage of flakes is carried out in a greater number of raw materials, and following a discoidal concept. All the stages of the *chaîne opératoire* are present in the site.

The number of retouched artifacts is 234 in layer 9, and 581 in layer 8. In layer 9, the most numerous objects belong to the substrate (sidescrapers, denticulates, splintered pieces, and notches) in a proportion of 44%. The next most important group of objects is that with continuous retouch (19%). In layer 8, the inverse pattern is found, as the objects with lateral retouch are the most numerous (25%), followed by tools from the substrate (24,7%). The group of retouched bladelets is significant in layer 9 (7%), and very important in layer 8 (20,3%).

Blade/bladelet debitage

The methods for the production of blades have been studied and known thanks to numerous research programmes in different sites, examining prismatic shaped cores (Ortega, 1998; Bon, 1998; Klaric, 1998; Chiotti, 1999). Recent studies on the production of bladelets in the Aurignacian propose three ways in which these artifacts can be obtained. These are carinated cores, burins, and prismatic cores (Schmider and Perpère, 1995; Lucas, 1997, 1999, 2000, 2001; Soriano, 1998; Chiotti, 1999, 2000; Bon, 1998, 2000; Chazan, 2001). In the Archaic Aurignacian assemblage of Cueva Morín, the morphology and technological characteristics of the objects and the cores themselves allow us to propose the existence of two methods for the production of blades.

Method I: prismatic cores

Thirty-seven examples of this type of core were found in layer 8 and fifteen in layer 9. They are made from small nodules or from flakes, and to a lesser degree, from thermoclasts or small slabs. It can be seen that there is a gradual reduction in the size of objects obtained, blades and bladelets being continuously produced along the reduction process.

Preforming of these cores is apparently simple, and debitage begins with the first blades. There is a previous morphometric preparation of the object, so that lateral crests are not found, except when the initial form is cubic, in which case some lateral crests develop, although not systematically (Fig. 2). From this first blade, the table is developed in the direction of the two flanks, due to the extraction of laminar flakes. This could explain the small number of cortical or semi-cortical blades in the collection. The objects are of different morphology, above all rectangular or square, with a certain tendency to a distal convergence.

The striking platform is prepared by extracting a core tablet, leaving a smooth and slightly concave surface. This surface is also rejuvenated in the course of the debitage, due to the numerous scars observed in the planes of percussion. These are not used when the blank of the prismatic core is a large flake. In this case, the bulbar face is used as the striking platform, and it is never rejuvenated. This gives them a very similar morphology to that of the large carinated cores (Fig. 2).

Most cores have a single debitage surface, which is developed parallel to the longitudinal axis of the object, on its widest face. This could indicate that the longest possible objects, of proportional width, were intended (depending on the limitations imposed by the size of the raw material). In the cores that have been examined, the mean size of the scars of the larger extractions is between 24,5 mm and 41 mm.

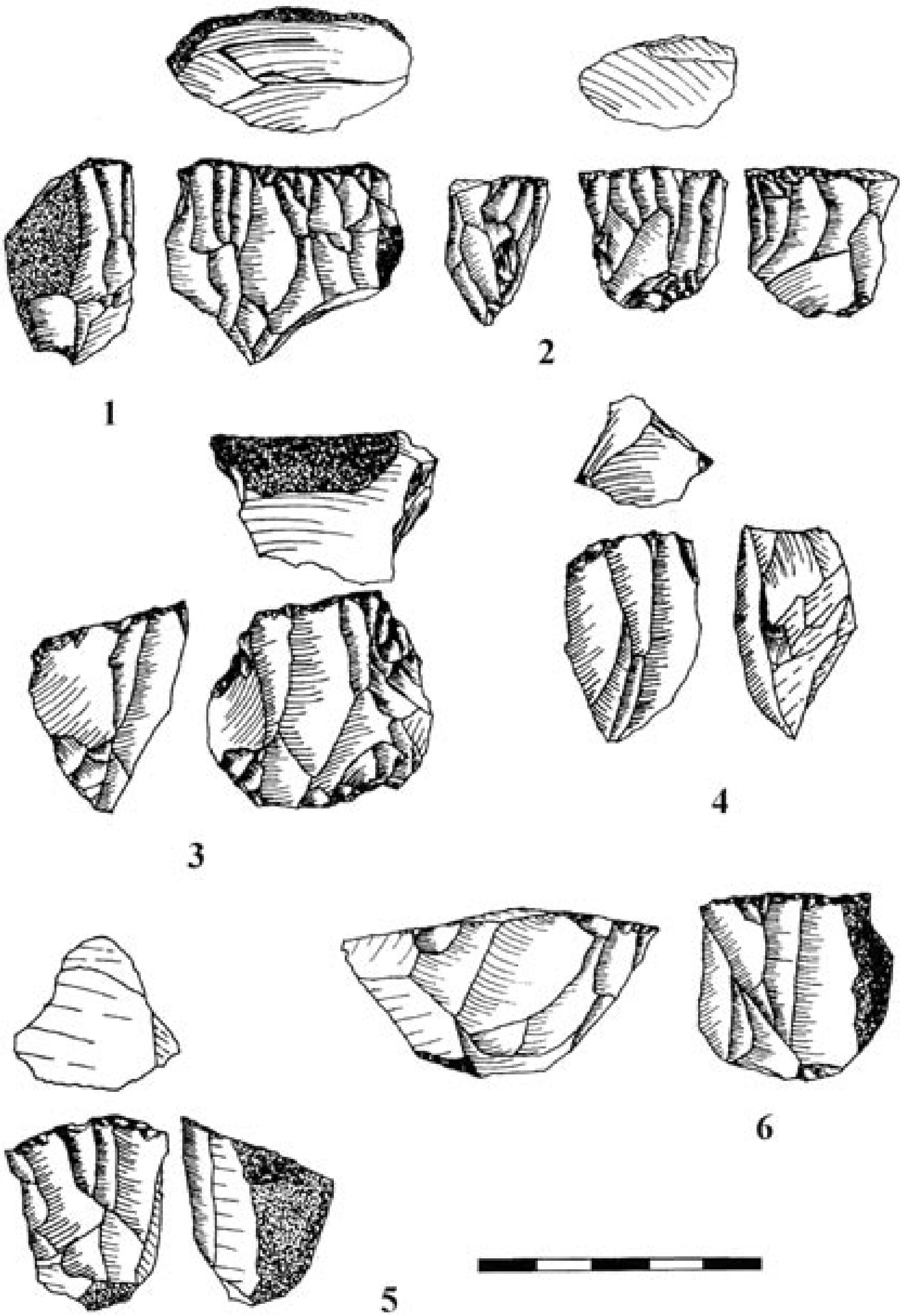

FIG. 2 – Cueva Morín, level 8. Prismatic cores.

The full debitage is unipolar, and two types of cores can be distinguished, the morphology of which is in relation to the position of the debitage surfaces. On one hand, there are cores of rectilinear shape, which show a slight curve, with parallel negatives of their dorsal face, extracted from the central part of the face and that do not cover its full length. On the other hand, there are cores with convergent scars and a definite curve in their profile (mostly in the distal part). Sometimes they have a lateral cortical face and are exploited in the contact between the debitage surface and a flank, so that the carination and curvature of the core are controlled. This can be completed (or replaced) by the creation of neo-crests or of semi-crests when the shape of the core allows it, for example when it has a cubic shape, in which case the debitage surface becomes almost perpendicular to the flank (Fig. 2, nos. 3-5).

The search for rectilinear objects can be seen in cores of this kind. In some cases, we can see a variation involving the intercalation of small straight bladelets with other, larger ones. This process of intercalation makes it possible for the small blades to be more regular and straighter, these parameters being in principle more variable in the larger blades. Nevertheless, the larger-sized blades/bladelets are not especially curved either. The reason for this could be that in some cores a basal zone is demarcated by large extractions which impede the existence of a curvature (Fig. 2, nos. 1, 3).

Most cores show a *semi-tournant* debitage, but some examples exist where it is *tournant*. Opposed platforms are rarely used and, when that is the case, only in the last stage of the core's exploitation (Fig. 2, no. 2).

In both core varieties, the edges of the cores are frequently regularized and reduced by small extractions or abrasion. Preparation products not only correct the carination and curvature of the debitage surface, but also, in many cases, are used to correct the lay-out of the guiding ridges or to recondition surfaces damaged by knapping accidents (generally, hinge fractures).

Many cores show serious knapping accidents or do not have the right morphotechnical conditions to be able to continue with debitage (inappropriate carination and curvature), which causes production to be halted. However, there are other apparently "apt" cores in which production was also halted. This fact suggests that the end of production could be linked in some way to economic aspects. Perhaps working of the smaller cores was not useful for these Aurignacian groups.

Method II: carinated cores

Many articles based on the observation of archeological material (Lucas, 1997, 2001; Chiotti, 1999; Bon, 2000; Chazan, 2001), as well as on experimentation (Soriano, 1998; Lucas, 2000; Chiotti, 1999; Hays and Lucas, 2001) have dealt with the description of quantitative and qualitative aspects of bladelet production using this method.

At Cueva Morín, carinated cores (52 examples in layer 8, and 11 in layer 9) are made from flakes or from termoclasts (28 in layer 8, and 8 in layer 9), but also, marginally, on small slabs or on blades. In all cases, the blank is morphometrically adjusted to the type of exploitation to be carried out. When the object is a flake or a blade, the bulbar face is used as the striking platform, and the extraction face is developed at the distal end or on one of the sides (Fig. 2). In the case of the termoclasts, the relationship between the striking platform and the face depends on the natural characteristics of the object.

Exploitation is initiated using the intersection between the flanks and the debitage surface. A notch or a lateral crest creates a ridge from which the extraction of bladelets can be

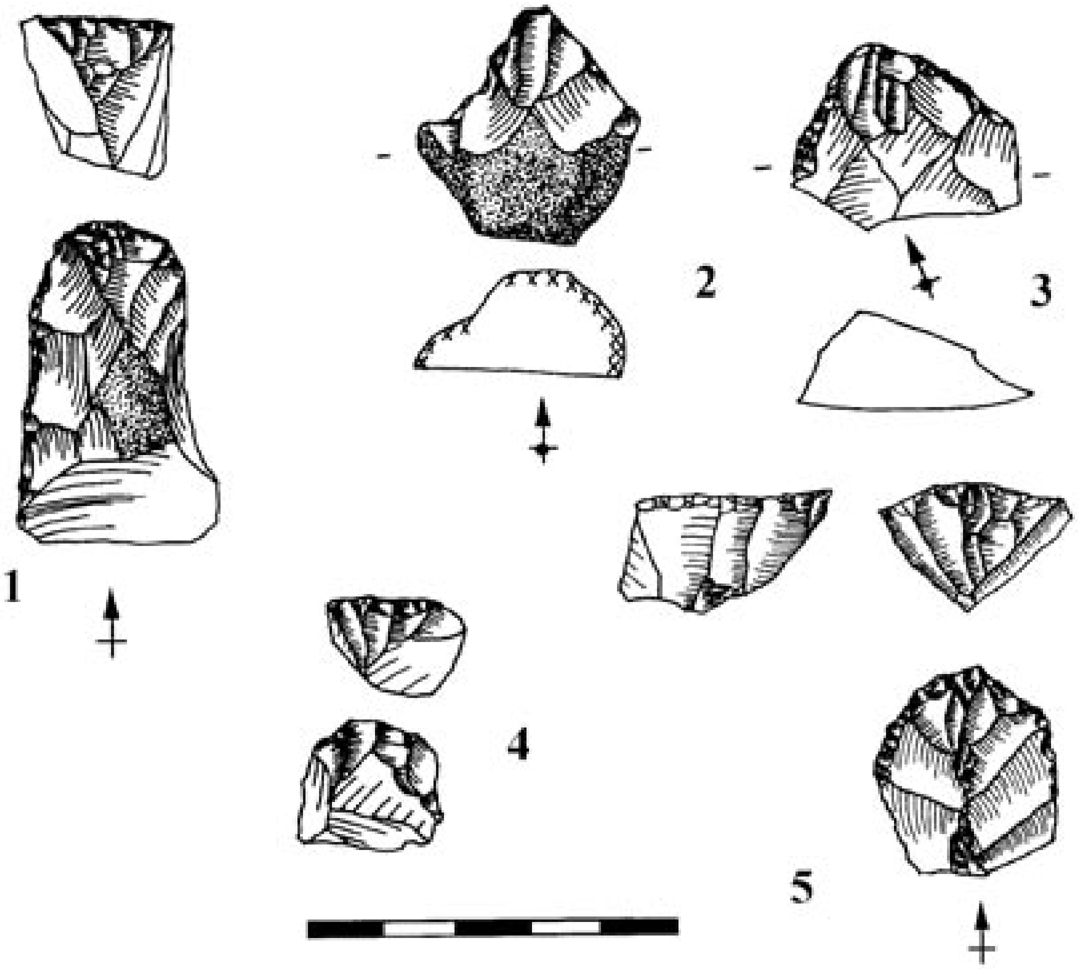

FIG. 3 – Cueva Morín, level 8. Carinated endscrapers.

developed. After having been prepared in this way, the face takes on a rectangular or triangular shape, and is generally laterally deviated towards the side where the notch or crest was made. The face is noticeably oblique in relation to the plane of percussion.

Debitage is unipolar. This type of exploitation requires the frequent reconditioning of the ridge surrounding the face, using conditioning flakes which reprepare the curvature. Numerous flakes of this type have been recognized during the study of the collection. In a single case, the carination is also controlled by means of a distal crest (a variation widely known in other collections, such as Tuto de Camalhot — Bon, 2000), as can be seen in Fig. 3 (no. 5). On occasions, the correction of the carination and curvature of the face is carried out by means of distal neo-crests whose preparation scars are very small and leave no marks on the core-scraper (Fig. 4, nos. 17-19).

Torsion bladelets are typical of this type of exploitation. They are the result of the extraction of objects along the ridges generated by the contact between the face and the scars of the lateral preparatory notches. This makes them appropriate for producing Roc-de-Combe type bladelets, which are not particularly numerous in our series (only eight retouched bladelets are of this type in layer 8, and none in layer 9), whereas there are 67 examples among the unworked objects. In any case, their proportion is very small in comparison with the total number of bladelets in the layer.

Most of the extracted bladelets display, as said earlier, a curved profile, whereas torsion is less characteristic. The objects showing these characteristics could have been made from

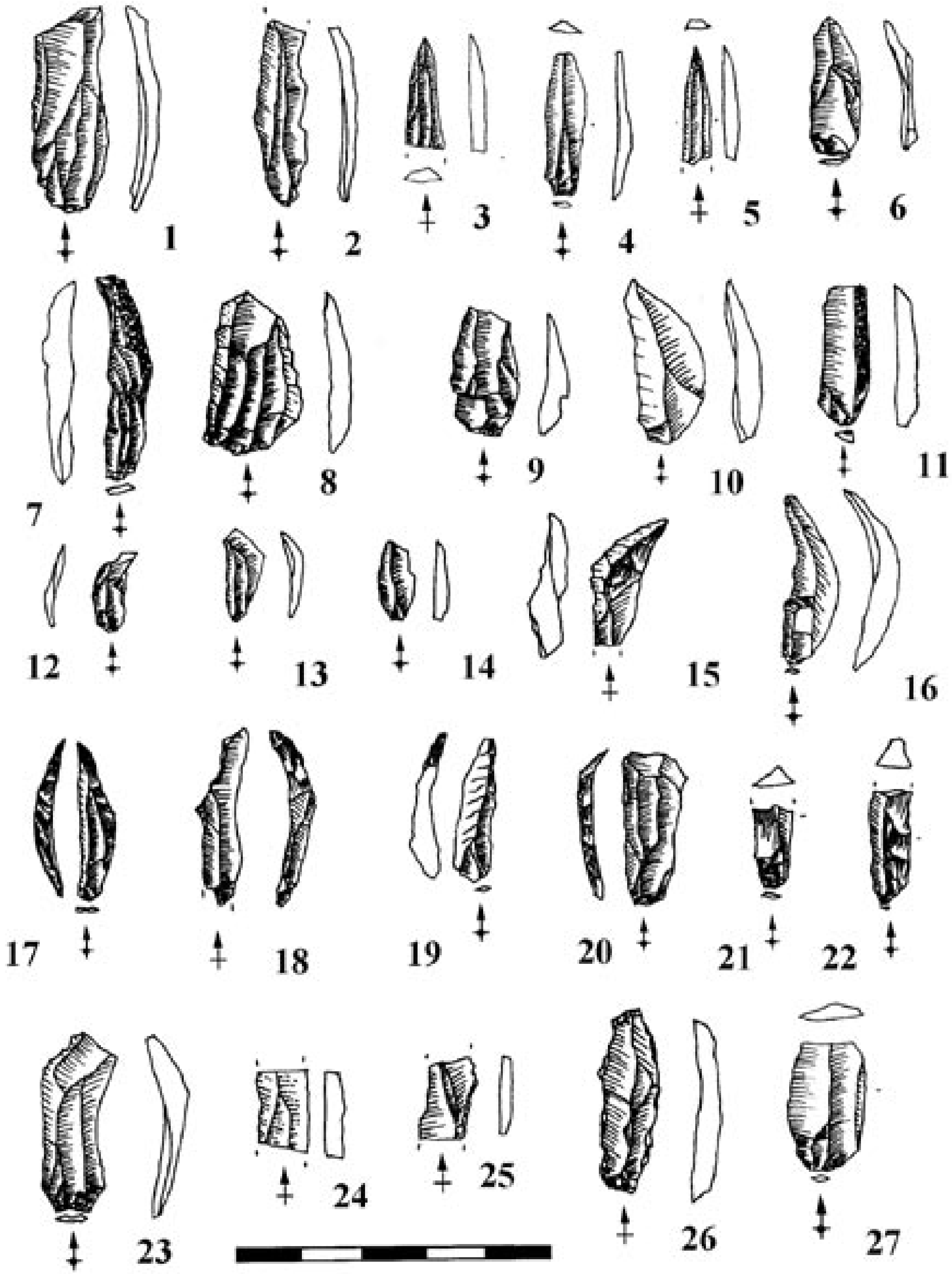

FIG. 4 – Cueva Morín, level 8. Unretouched bladelets.

carinated endscrapers which were extracted from the centre of the face and not from the side, in contact with the edge. This fact has been proved on numerous occasions, both archeologically (Bon, 2000) and experimentally (Lucas, 1999). The regularity and width of the objects could be related to the size of the face, which is considerable in the studied collection.

It is difficult to appreciate the degree to which carinated endscrapers were used, due to the heterogeneity of their measurements. But most of them display knapping accidents, mostly hinge fractures, which impeded further debitage (Fig. 3). In spite of their large number, these cores do not play an important role in the production of bladelets, retouched or unretouched, as suggested by the fact that number of bladelets characteristic of this type of exploitation is not large (Fig. 4, nos. 12-14).

The role of burins in the production of bladelets

Burins do not play an important role in the production of bladelets in these layers. None belong to the categories normally accepted as possible bladelet cores (busked and carinated). By observing the number of extractions they have, it can be seen that in layer 8 only two thirds have one or two bladelet scars (a fact corroborated also by the burin spalls, most of which are of first and second order). Their length suggest that small bladelets were produced (with a mean length of 19,9 mm). Therefore, after examining the morphology of these extractions, their rarity, as well as the simple preparation of the striking platforms, we have preferred not consider that these artifacts were involved in bladelet production.

Summary

To recapitulate, the production of bladelets in the Archaic Aurignacian of Cueva Morín is characterized by the following aspects:

a) There is a continuum between the production of blades and bladelets.
b) The most usual method of exploitation is with prismatic cores worked in a unipolar way.
c) The preforming is simple, and consists of a simple preliminary morphometric preparation of the shape; debitage begins with the first blades opening an exploitation surface; the striking platforms are prepared and rejuvenated during the debitage process through the extraction of core tablets.
d) Two types of artifacts are obtained:
- straight bladelets which are regular in form and would be obtained from the center of the face;
- bladelets with a curved profile, especially at the distal end, and with lateral cortex (which could be substituted by neo-crests), obtained at the intersection between the debitage surface and the core flank (Figs. 4-5); the purpose of these extractions is to control the curvature of the surface, allowing the core to reach the right shape for the production of bladelets of the first type.

e) The bladelet blanks are used to make Dufour bladelets of the Dufour subtype; retouched blades are of more diverse typology.

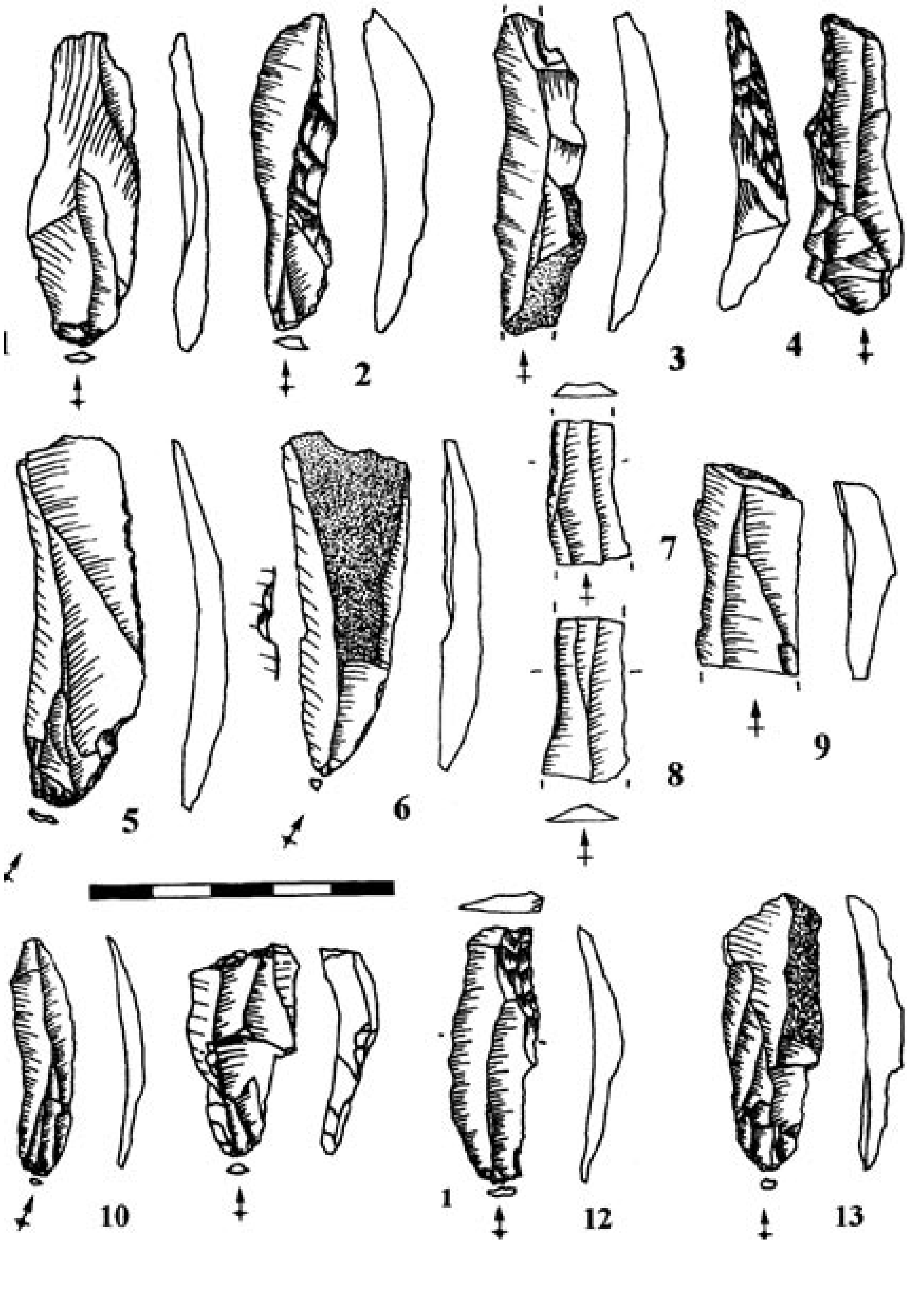

FIG. 5 – Cueva Morín, level 9. Retouched and unretouched blades.

Flake production

Flakes are a common component of the lithic assemblage in the Archaic Aurignacian from Cueva Morín. Layer 9 has 660 unworked flakes and 131 retouched flakes, whereas layer 8 has 768 unworked flakes and 234 retouched ones. Although some of these flakes come from the shaping out of the blade cores, most result from a discoidal concept of debitage. Regarding the cores, we have fourteen examples from layer 9 and three from layer 8 (Fig. 7).

The raw-materials are quite diverse, although sandstone and ophite are frequently utilized, as this is the only method used to knap these materials. We also find this type of production in quartzite, limestone and flint. The objects worked are cobbles or small slabs; only rarely are flakes used, in which case the ventral surface is exploited.

All the discoidal cores were exploited with unifacial methods, which is to say that exploitation is carried out from a single surface. The cores therefore show a hierarchy: one surface acts as the striking platform, and the other as the surface of exploitation. The latter is prepared by a series of secant, non-invasive extractions around the whole perimeter of the core. When the angles have the right conditions, the natural surface of the core is kept. The core is not decorticated prior to working; hence, the first products of discoidal knapping have a dorsal surface partially or fully with cortex.

The artifacts obtained with this method of production have been repeatedly described in numerous papers (Boëda, 1988, 1993, 1994, 1995). Two debitage directions can be observed in this kind of working: centripetal and cordal. These two forms maintain a paradoxical relationship, since centripetal removals eliminate the convexity required by the method, whereas cordal removals rejuvenate it (Fig. 6).

Typical centripetal flakes are wider than longer, and square in shape. Cordal flakes, in turn, are pseudo-Levallois points, *débordant* flakes and *à dos limité* flakes (Meignen, 1993), very common in our collection. They are not usually prepared on the obverse face, and when they are it is usually by means of small extractions (Figs. 6-7).

In the final phases, the exploitation surface flattens, giving the cores a morphology similar to that of recurrent centripetal Levallois. One of the cores from layer 9 has extraction scars that can be described as laminar; in this same core, the last extraction was bifacial (Fig. 7, no. 3). The exploitation of flakes ends when the core is used up, as well as a result of knapping accidents such as hinging.

In sum, flake production in the Archaic Aurignacian of Cueva Morín has the following characteristics:

a) Flake production takes place under debitage methods with a discoidal concept.
b) The discoidal method used is unifacial; preforming is simple, a debitage surface being exploited from a peripheral striking platform.
c) The artifacts obtained are typical of this kind of exploitation, with two directions, cordal and centripetal.
d) The blanks are mostly used to manufacture artifacts of the substrate (sidescrapers, denticulates and notches), but also endscrapers, or pieces with lateral retouch.

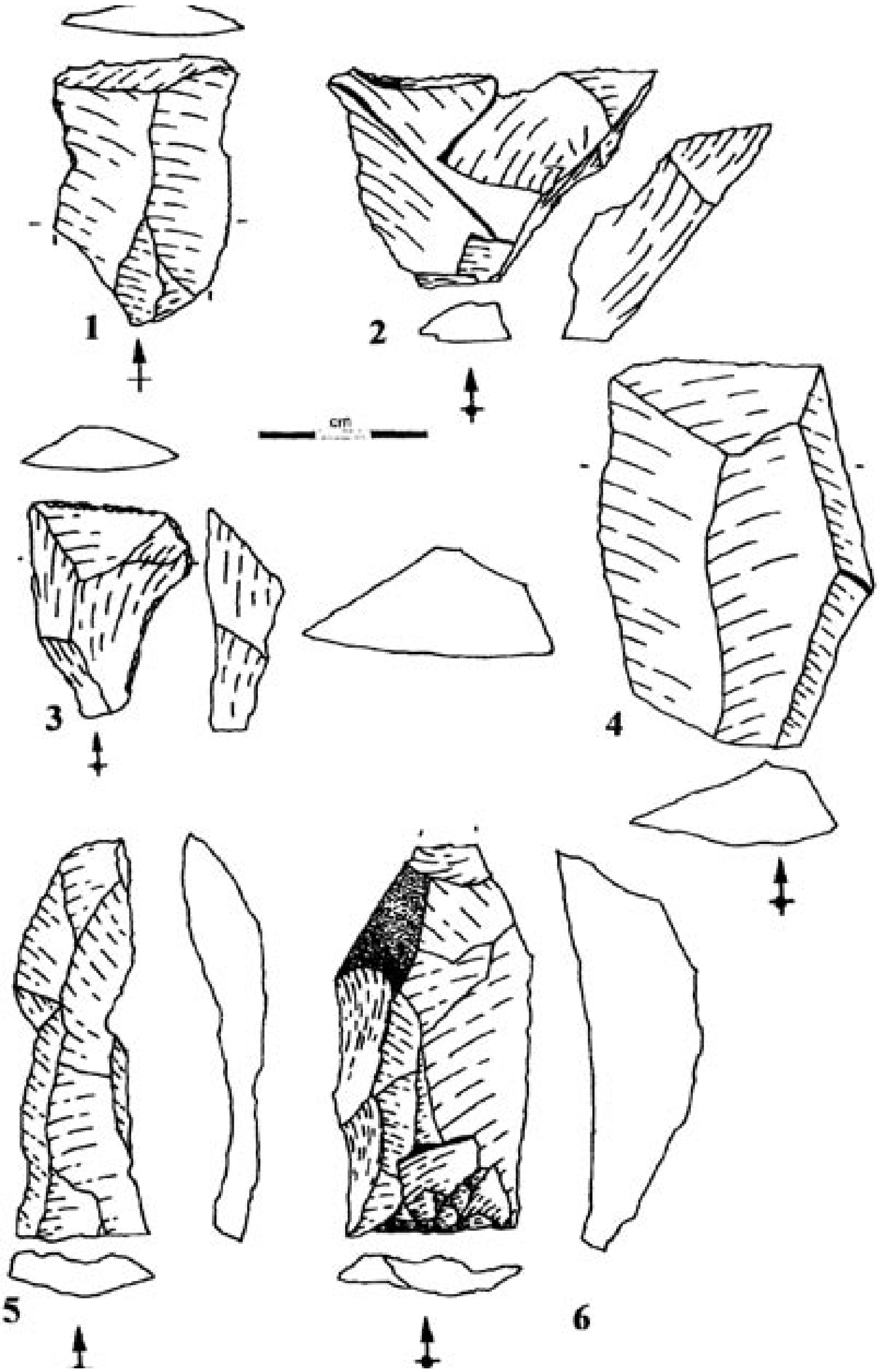

FIG. 6 – Cueva Morín, level 8. Discoidal flakes.

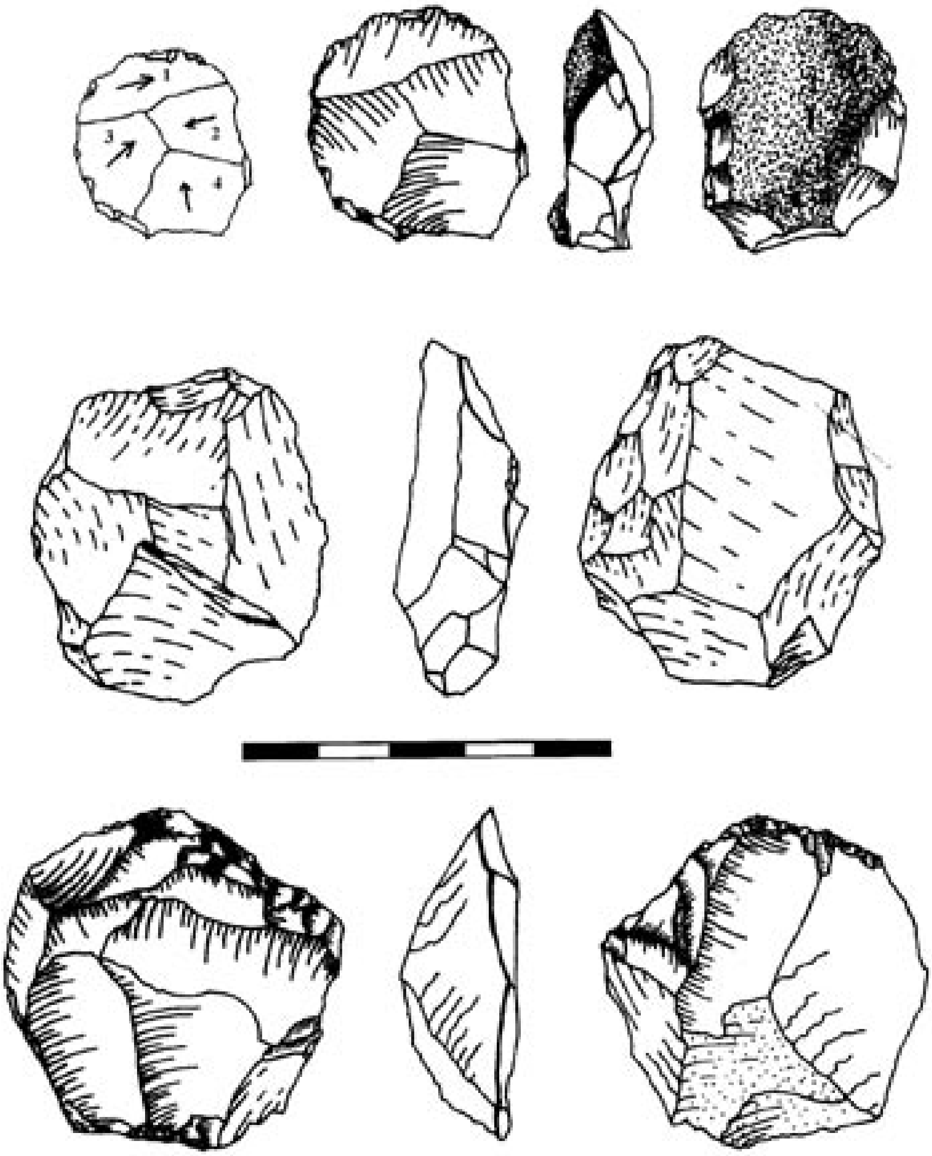

FIG. 7 – Cueva Morín, level 9. Discoidal cores.

Production goals

The production of lithic tools is clearly differentiated, according to the type of blank intended. In this way, blades and, above all, bladelets are produced from cores with prismatic morphology, worked with a unipolar approach. In contrast, flakes are made with a discoidal debitage concept, using the unifacial method.

Together with this dichotomy in the production of blanks, we find a dichotomy in the use of these blanks in the assemblages of retouched tools from both layers. Bladelets were used almost exclusively for the manufacture of Dufour bladelets, subtype Dufour (Fig. 8). Blade blanks had more varied uses, mostly for pieces with lateral retouch, as well as burins and endscrapers (in the latter case, in similar proportions to flakes). This is seen most clearly in layer 8, where retouched blades are more abundant. The massive use of bladelets for a single type, and the diversity of typological categories manufactured from blades, shows, from our point of view, that laminar production had a clear goal: bladelets.

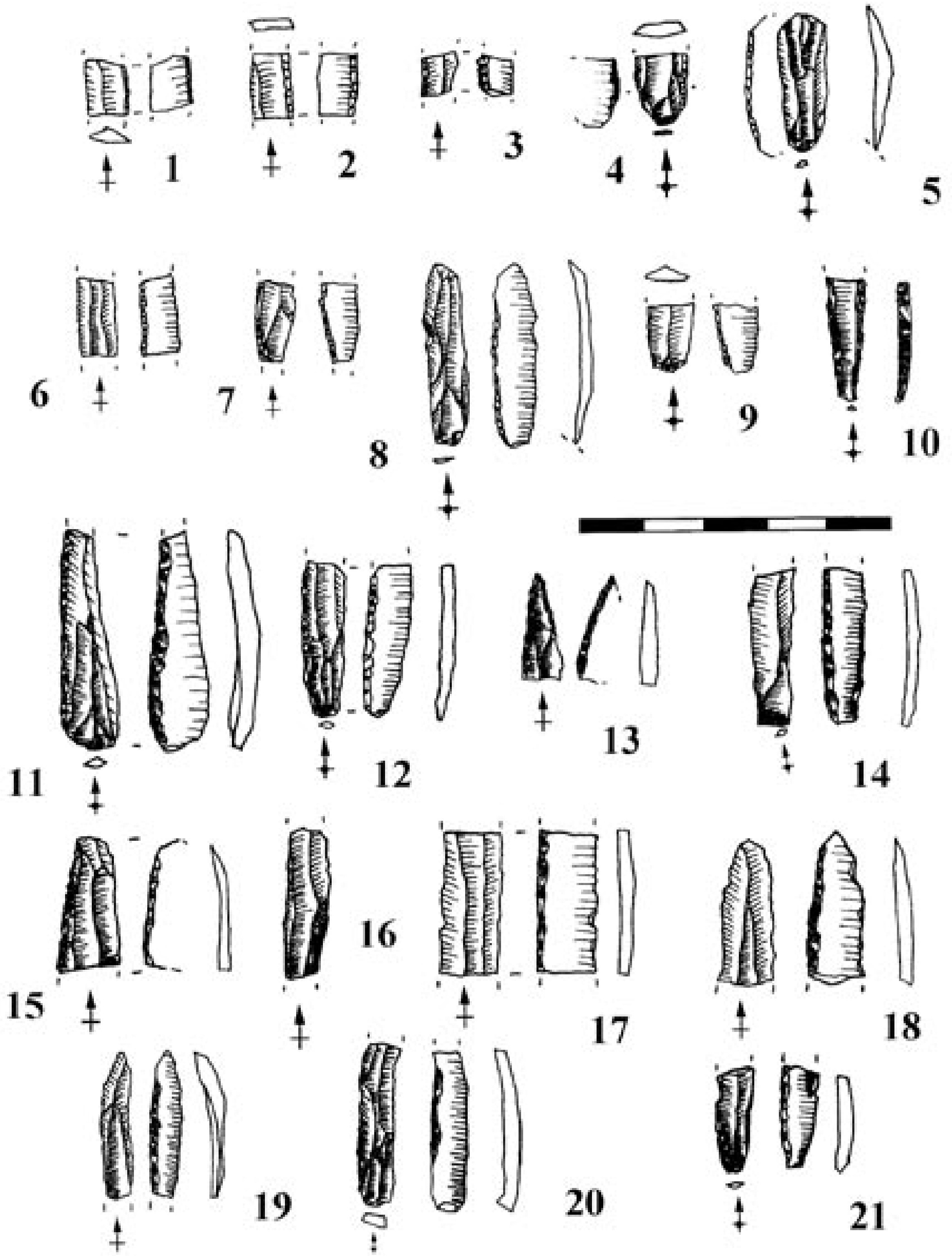

FIG. 8 – Cueva Morín, level 8. Dufour bladelets.

On the other hand, flake production was aimed at artifacts not as long as the blades, and "massive", i.e. thick and broad. We think that this desire for robust blanks is related to the function for which these elements were used. Furthermore, it must be pointed out that the flakes from the discoidal exploitation of sandstone and ophite are much larger and not retouched, possibly because they were used in unmodified form.

Cueva Morín in the context of Cantabrian Spain

Very few stratigraphies in Cantabrian Spain have levels from the beginning of the Upper Paleolithic. The sites with occupation layers that can be ascribed with a degree of certainty to the first phases of the Aurignacian are Labeko Koba in the Basque Country (Arrizabalaga, 1995; Arrizabalaga and Altuna, 2000), El Castillo in Cantabria (Cabrera, 1984), and La Viña in Asturias (Fortea, 1995, 1999). There are other sites where the archeological evidence does not allow us to be so sure about their chronology: Otero (layers 8 and 7), Covalejos and El Pendo, in Cantabria; Venta de la Perra, Polvorín, Ekain, Usategui and Lezetxiki, in the Basque Country (Fig. 1).

There are similarities between all these sites from both the technological and the typological points of view. At Castillo (layer 16) and Labeko Koba (layer VII), the same debitage method was applied: production of blades/bladelets from prismatic cores worked in a unipolar way, with a continuum in the production of blades and bladelets from the same prismatic cores as they became reduced in size. The blanks obtained are straight, non-twisted blades, with the extraction of *débordant* blades to maintain the core curvature. In all cases, the bladelets are the goal of the production. Typologically, the Dufour bladelets, subtype Dufour, are the most characteristic element in all these sites. In this group, we should also catalogue the assemblage from layer XII at La Viña (Fortea, 1999). Where the other typological categories are concerned, there is more variation, for example in Labeko Koba VII the burins predominate and pieces of the substrate are rare, the opposite of the situation in Morín levels 8 and 9.

Comparing the Archaic Aurignacian at Morín with the sites in Aquitaine, we find some important differences. Blades are be made with similar operative systems, but bladelet production is radically different, as is in the Aquitaine sites it uses carinated cores, as is the case at Brassempouy, Garet, Corbiac-Vignoble, Pataud or Barbas, although in the latter site bladelets are also made from prismatic cores (Tixier and Reduron, 1991; Ortega, 1998; Klaric, 1998; Chiotti, 1999; Bon, 2000). In none of these sites is there a continuum between blade and bladelet production.

In fact, the Archaic Aurignacian of Morín shows greater similarities with the Archaic Aurignacian or Proto-Aurignacian of the Mediterranean area. If we compare this site with others like Arcy-sur-Cure (Bon, 2000; Bon and Bodu, 2002) or, in the Mediterranean proper, L'Arbreda (Ortega et al., in press), Esquicho-Grapaou, La Laouza (Bazile et al., 1981; Bazile and Sicard, 1999), Riparo Mochi or Fumane (Bartolomei et al., 1994; Broglio et al., 1996; Kuhn and Stiner, 1998; Khun and Bietti, 2000), the similarities are important. At the technological level, except at L'Arbreda, there is a continuum between blade and bladelet production from prismatic cores worked with a unipolar method, with *débordant* blades to control the carination of the core, and extraction of straight blades in the middle of the surface. From a typological point of view, Dufour bladelets of the subtype Dufour are amply represented.

In the same way, similarities can be found with the sites of Gatzarria (Laplace, 1966; Sáenz de Buruaga, 1991) and Isturitz (Normand and Turq, in press). The former has two Proto-Aurignacian layers (Cjn1 and Cjn2). The first of these has recently been reclassified as early Aurignacian, whereas Cjn2 would not be classed as Proto-Aurignacian, nor does it bear relation with the Mediterranean Region (Bon, 2000). Cjn2 is in fact different from all the other in the morphological similarity of the carinated endscrapers and the bladelets with those of layers higher up in the sequence; it shows great similarity with Labeko Koba VII in that the percentage of burins is higher than that of endscrapers. It should not be forgotten that in series from Cantabrian Spain, it is less difficult to see similarities between levels from any given site than between different contemporary sites. Finally, to judge from the figures published for this site (Laplace, 1966; Sáenz de Buruaga, 1991), we think there are not sufficient arguments to decide one way or the other, but that Cjn2 of Gatzarria cannot be far removed from the Cantabrian Archaic Aurignacian.

Layer C4d is at the base of the Aurignacian sequence of the second site, Isturitz; it features laminar production based on prismatic cores with *débordant* blades/bladelets, and a large proportion of Dufour bladelets in the retouched assemblage, just as in Morín 8 and 9. Two dates are available for this layer, 34 630±560 BP (Gif-98237) and 36 650±610 BP (Gif-98238) which could place the base of the Aurignacian sequence in a similar time to the layers Morín 8 and 9, and La Viña XII. However, the area that has been dug is too small for this hypothesis to be proved, and it is not impossible, according to the excavators of this site, that there was a degree of local originality at that time (Normand and Turq, in press).

Bone assemblages must also be taken in account when classifying Aurignacian layers. The split-based sagaie point has traditionally been associated with the early Aurignacian or Aurignacian I. However, this type of sagaie points appears in numerous layers catalogued as Archaic Aurignacian or Proto-Aurignacian. Such is the case of L'Arbreda H, Fumane, or layer 9 of Cueva Morín, where a distal sagaie fragment has been classified in this way (González Echegaray, 1971). A similar situation pertains in layer XIII of La Viña (Fortea, 1999).

There are few absolute dates for the Archaic Aurignacian in Cantabrian Spain. Only La Viña, Labeko Koba and Morín have radiocarbon dates. Those from Labeko Koba are on bone, and the others from charcoal. In the 1970s, a series of dates were obtained from Cueva Morín which gave quite incoherent results (Stuckenrath, 1978). Recently, new dates have provided more precise data on the chronology of the site and, more exactly, on the chronology of the Archaic Aurignacian in the region (Valladas et al., in press). As can be seen in Table 1, the new date from layer 8 in Cueva Morín is similar to that from La Viña XIII, which means (if the assemblage from La Viña is Archaic Aurignacian) that this lithic complex was fully implanted in the region by 36 000 BP. Therefore, these sites are directly related with the Mediterranean Proto-Aurignacian. The dates from Labeko Koba VII could reflect the duration in time of this complex, or that these dates have some taphonomic problems (Arrizabalaga, 2000).

Discussion

The Archaic Aurignacian identified and described for Cueva Morín (layers 9 and 8) shows, from a technological point of view, close similarity with other sites in the region, such as Labeko Koba VII or Castillo 16. Typologically, in spite of a certain internal variability, these sites have elements in common, such as the great importance of microlaminar tools, especially Dufour bladelets of the Dufour subtype. The first Aurignacian layers in La Viña are similar in this respect. Chronologically speaking, Cueva Morín and La Viña have similar dates, around 36 500 BP.

These technological and typological elements relate both Cueva Morín and the other Archaic Aurignacian or Proto-Aurignacian sites (*sensu* Laplace) with those in the Mediterranean area, such as L'Arbreda, La Laouza, Esquicho-Grapaou, Fumane, Riparo Mochi, or Arcy-sur-Cure, although the latter site is outside that region. This Cantabrian-Mediterranean relationship accentuates the dichotomy existing between the Proto-Aurignacian and the early Aurignacian of the Aquitaine, both geographically and technologically (Bon, 2000). This situation regarding the beginning of the Aurignacian is further revealed by the older age of the Archaic Aurignacian: sites such as Fumane or L'Arbreda have been dated to between 42 000 and 36 000 BP, whereas the oldest date for the early Aurignacian comes from Castanet, whose basal layer has a date of 35 200±1100 BP (Bon, 2000).

The route communicating the Archaic Aurignacian of Cantabrian Spain with the Mediterranean region is still unknown. There are two possible ways: 1) via the north of the Pyrenees, or 2) up the Ebro river valley. No evidence has been found along either of these routes to indicate its possible use, although the Ebro valley has not been explored so systematically as the area north of the Pyrenees. Furthermore, the only sites that could be related with the Cantabrian Archaic Aurignacian are Gatzarria and Isturitz, and the data they provide do not clarify the situation. But the latter site, Isturitz, has flint that was brought in from the Ebro valley (Normand and Turq, in press).

The role played by elements that are called "archaic" or "substrate" in Aurignacian lithic collections from Cantabrian Spain is one of the most diagnostic features of this complex. As we have seen, the flake production method in Cueva Morín using a discoidal concept is very important, not only in the two layers belonging to the Archaic Aurignacian, but also in the Châtelperronian of layer 10. This importance has also been observed in Castillo 16, Labeko Koba VII, or Gatzarria Cjn2. The appearance, especially in Cueva Morín, of discoidal debitage, together with numerous substrate tools (sidescrapers, endscrapers and notches) should make us consider the extent to which earlier technological traditions were inherited. However, the study of flake debitage is all too often neglected in Upper Paleolithic research (Bracco, 1999). In the case of Cueva Morín, this type of exploitation on such a large scale, and in all kinds of raw materials, indicates a reality which allows these assemblages to be related to previous ones (Châtelperronian, or even final Mousterian).

Finally, following the technological identification and character of the beginning of the Aurignacian in Cantabrian Spain, we consider it is correct to maintain the name of Archaic Aurignacian, not only for the sites along the Cantabrian coast, but also for those in the Mediterranean region. This is due to the fact that the term Proto-Aurignacian has certain interpretative connotations which it should not lose, although de facto it has already been stripped of them.

TABLE 1

Radiocarbon dates for the Archaic Aurignacian of Cantabrian Spain.

Site	*Level*	*Method*	*Lab N.°*	*Result*	*Source*
La Viña	XIII	AMS	Ly-6390	36 500±750	Fortea, 1999
Morín	8	AMS	GifA-96263	36 590±1100	Maíllo et al., 2001
Labeko Koba	VII	AMS	Ua-3321	31 455±915	Arrizabalaga, 2000

REFERENCES

ALTUNA, J. (1971) - Los mamíferos del yacimiento prehistórico de Morín. In GONZÁLEZ ECHEGARAY, J.; FREEMAN, L. G. (1971) - *Cueva Morín. Vol. 1: excavaciones, 1966-1968*. Santander: Patronato de las Cuevas Prehistóricas de la Provincia de Santander (Publicaciones; 6), p. 369-398.

ARRIZABALAGA, A. (1995) - *La industria lítica del Paleolítico Superior Inicial en el Oriente Cantábrico*. Tesis Doctoral. Universidad del País Vasco.

ARRIZABALAGA, A.; ALTUNA, J., eds. (2000) - *Labeko Koba (País Vasco): hienas y humanos en los albores del Paleolítico Superior*. San Sebastián-Donostia: Sociedad de Ciencias Aranzadi (Munibe-Antropologia Arkeologia; 52).

BARTOLOMEI, G.; BROGLIO, A.; CASSOLI, P. F.; CASTELLETTI, L.; CATTANI, L.; CREMASCHI, M.; GIACOBINI, G.; MALERBA, G.; MASPERO, A.; PERESANI, M.; SARTORELLI, A.; TAGLIACOZZO, A. (1994) - La Grotte de Fumane: un site aurignacien au pied des Alpes. *Preistoria Alpina*. Trento. 28:1, p. 131-179.

BAZILE, F.; BAZILE-ROBERT, E.; BRUGAL, J-Ph.; DJINDJIAN, F.; GUILLERAULT, Ph.; RENAULT-MISKOVSKY, J.; ROGER, L. (1981) - *L'abri sous roche de La Laouza (Sanilhac-Sagries-Card)*. Gard: Centre de Recherches et de Documentation Préhistoriques du Gard (Etudes Quaternaires Languedociennes, Memoire; 1).

BAZILE, F.; SICARD, S. (1999) - Le premier Aurignacien du Languedoc Oriental dans son contexte méditerranéen. In SACCHI, D. ed. - *Les faciès leptolithiques du nord-ouest méditerranéen: milieux naturels et culturels. Carcassonne (Actes du XXIV[e] Congrès préhistorique de France, Carcassonne, 26-30 septembre 1994)*. Paris: Société Préhistorique Française, p. 117-125.

BOËDA, E. (1988) - Le concept Levallois et évaluation de son champ d'application. In OTTE, M, ed. - *L'Homme de Neandertal. Actes du colloque international de Liège (1986)*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 4), p. 13-26.

BOËDA, E. (1993) - Le débitage discoïde et le débitage Levallois récurrent centripète. *Bulletin de la Société Préhistorique Française*. Paris. 90, p. 392-404.

BOËDA, E. (1994) - *Le concept Levallois: variabilité des méthodes*. Paris: CNRS (Monographies du CRA; 9).

BOËDA, E. (1995) - Caractéristiques techniques des chaînes opératoires lithiques des niveaux micoquiens de Külna (Tchécoslovaquie). In *Les industries à pointes foliacées d'Europe centrale: actes du colloque commémoratif international, Miskolc, 10-15 septembre 1991. Colloque organisé avec le concours du Musée Herman Ottó et du Musée National de Hongrie, du Musée Historique de Budapest*. Les Eyzies de Tayac-Sireuil: Société des Amis du Musée National de Préhistoire et de la Recherche Archéologique; Miskolc: Musée Herman Ottó: Département des Recherches Historiques de l'Université de Miskolc (Hongrie), 10-15 septembre 1991 (Paléo, supplément; 1), p. 57-72.

BON, F. (1998) - Réflexions sur les productions laminaires et lamellaires aurignaciennes à travers l'étude de quelques séries des Pyrénées françaises. In *Rapport du projet collectif de recherche comportements techniques et économiques des sociétés au Paléolithique supérieur dans le contexte pyrénéen, apports de la technologie lithique*, p. 20-31.

BON, F. (2000) - *La question de l'unité technique et économique de l'Aurignacien: réflexions sur la variabilité des industries lithiques à partir de l'étude comparée de trois sites des Pyrénées françaises: La Tuto de Camalhot, Régismont-le-Haut et Brassempouy*. Thèse de Doctorat, Université Paris I.

BON, F.; BODU, P. (2002) - Analyse technologique du débitage Aurignacien. In SCHMIDER, B., ed. - *L'Aurignacien de la grotte du Renne. Les fouilles d'André Leroi-Gourhan à Arcy-sur-Cure (Yonne)*. Paris: CNRS, p. 115-133.

BRACCO, J.-P. (1999) - Le débitage d´éclats au Paléolithique Supérieur: quelques exemples, quelques réflexions. In Project Collectif de Recherche: *Comportements techniques et économiques des Sociétés au Paléolithique supérieur dans le contexte pyrénéen*. Rapport, 1999, p. 34-53.

BROGLIO, A.; ANGELUCCI, D. E.; PERESANI, M.; LEMORINI, C.; ROSSETTI. P. (1996) - L'industrie protoaurignacienne de la Grotta di Fumane: données préliminaires. In *Actes du XIIIe Congrès de l'UISPP, Forlí, Italie, septembre 1996*, vol. 2. Forlí: Abaco, p. 495-509.

CARBALLO, J. (1923) - *Excavaciones en la cueva del Rey, en Villanueva (Santander*). Madrid: Junta Superior de Excavaciones y Antigüedades (Memorias; 9).

CENDRERO, O. (1915) - *Resumen de los bastones perforados de la Provincia de Santander*. Comisión de Investigaciones Paleontológicas y Prehistóricas. Notas 1 y 2.

CHAZAN, M. (2001) - Bladelet production in the Aurignacian of La Ferrassie (Dordogne, France). *Lithic Technology*. Tulsa, OK. 26:1, p. 16-28.

CHIOTTI, L. (1999) - *Les industries lithiques des niveaux aurignaciens de l'Abri Pataud, les Eyzies-de-Tayac (Dordogne): étude technologique et typologique*. Paris: Thèse de Doctorat du Muséum d'Histoire Naturelle, Institut de Paléontologie Humaine.

CHIOTTI, L. (2000) - Lamelles Dufour et grattoirs aurignaciens (carénés et à museau) de la couche 8 de l'abri Pataud, Les Eyzies-de-Tayac, Dordogne. *L'Anthropologie*. Paris. 104, p. 239-263.

FORTEA PÉREZ, J. (1995) - Abrigo de la Viña. Informe y primera valoración de las campañas 1991 a 1994. *Excavaciones Arqueológicas en Asturias 1991-1994*. Oviedo, p. 19-32.

FORTEA PÉREZ, J. (1999) - Abrigo de La Viña. Informe y primera valoración de las campañas de 1995 a 1998. *Excavaciones Arqueológicas en Asturias 1995-1998*. Oviedo, p. 31-41.

GONZÁLEZ ECHEGARAY, J. (1969) - El paso del Paleolítico Medio al Superior en la costa cantábrica. *Anuario de Estudios Atlánticos*. Las Palmas de Gran Canaria. 15, p. 273-279.

GONZÁLEZ ECHEGARAY, J. (1971) - El Paleolítico Superior. In GONZÁLEZ ECHEGARAY, J.; FREEMAN, L. G. (1971) - *Cueva Morín. Vol. 1: excavaciones, 1966-1968*. Santander: Patronato de las Cuevas Prehistóricas de la Provincia de Santander (Publicaciones; 6), p. 190-297.

GONZÁLEZ ECHEGARAY, J.; FREEMAN, L. G. (1971) - *Cueva Morín. Vol. 1: excavaciones, 1966-1968*. Santander: Patronato de las Cuevas Prehistóricas de la Provincia de Santander (Publicaciones; 6).

GONZÁLEZ ECHEGARAY, J.; FREEMAN, L. G. (1973) - *Cueva Morín. Vol. 2: excavaciones, 1969*. Santander: Patronato de las Cuevas Prehistóricas de la Provincia de Santander (Publicaciones; 10).

GONZÁLEZ ECHEGARAY, J.; FREEMAN, L. G. (1978) - Vida *y muerte en Cueva Morín*. Santander: Institución Cultural de Cantabria.

HAYS, M. A.; LUCAS, G. (2001) - Experimental investigations of Aurignacian Dufour bladelets. In HAYS, M. A.; THACKER, P. T., eds. - *Questioning the answers: re-solving fundamental problems of the Early Upper Paleolithic. Papers from a symposium held at the Society for American Archaeology meeting in Chicago, 1999*. Oxford: Archaeopress (BAR International Series; 1005), p. 109-116.

KLARIC, L. (1998) - Etude de l'industrie lithique du site de Garet (Landes). In CAZALS, N., ed. - Project Collectif de Recherche: *Comportements techniques et économiques des Sociétés au Paléolithique supérieur dans le contexte pyrénéen*, p. 32-41.

KUHN, S. L.; BIETTI, A. (2000) - The Late Middle and Early Upper Paleolithic in Italy. In BAR-YOSEF, O.; PILBEAM, D., eds. - *The Geography of Neanderthals and modern humans in Europe and the Greater Mediterranean*. Cambridge, MA: Peabody Museum (Peabody Museum Bulletin; 8), p. 49-76.

KUHN, S. L.; STINER, M. C. (1998) - The earliest Aurignacian of Riparo Mochi (Liguria, Italy). *Current Anthropology*. Chicago, IL. 39 (suppl. 1), p. S175-S189.

LAPLACE, G. (1966) - Les niveaux Castelperronien, Protoaurignacien et Aurignaciens de la Grotte Gatzarria à Suhare en Pays Basque. *Quartär*. Bonn. 17, p. 117-140.

LAVILLE, H.; HOYOS, M. (1994) - Algunas precisiones sobre la estratigrafía y sedimentología de cueva Morín (Santander). In BERALDO DE QUIRÓS, F., ed. - *El cuadro geocronológico del Paleolítico Superior Inicial*. Santander: Museo y Centro de Investigación de Altamira (Monografías; 13), p. 200-209.

LUCAS, G. (1997) - Les lamelles Dufour du Flageolet I (Bézenac, Dordogne) dans le contexte Aurignacien. *Paléo*. Les Eyzies--de-Tayac. 9, p. 191-219.

LUCAS, G. (1999) - Production expérimentale de lamelles torses: approche préliminaire. *Bulletin de la Société Préhistorique Française*. Paris. 96:2, p. 145-151.

LUCAS, G. (2000) - *Les industries lithiques du Flageolet I (Dordogne), approche économique, technologique, fonctionnelle et analyse spatiale*. 2 vols. Thèse de Doctorat. Université Bordeaux I.

LUCAS, G. (2001) - The origin of Dufour bladelet torsion. In HAYS, M. A.; THACKER, P., eds. - *Questioning the answers: re-solving fundamental problems of the Early Upper Paleolithic*. Oxford: Archaeopress (British Archaeological Reports International Series; 1005), p. 99-107.

MAÍLLO, J. M.; VALLADAS, H.; CABRERA, V.; BERNALDO DE QUIRÓS, F (2001) - Nuevas dataciones para el Paleolítico superior de Cueva Morín (Villanueva de Villaescusa, Cantabria). *Espacio, Tiempo y Forma. Serie I, Prehistoria y Arqueología*. Madrid. 14, p. 145-150.

MEIGNEN, L., ed. (1993) - *L'abri des Canalettes: Un habitat moustérien sur les grands Causses (Nant, Aveyron)*. Paris: CNRS.

MOURE ROMANILLO, A. (1969-1970) - Industrias auriñacienses y preauriñacienses en la Región Cantábrica española. *Ampurias*. Barcelona. 31-32, p. 71-90.

NORMAND, Ch.; TURQ, A. (in press) - L'Aurignacien de la grotte d'Isturitz (France): la production lamellaire dans la séquence de la salle Saint-Martin. In LE BRUN-RICALENS, F., ed. - *Productions lamellaires attribuées à l'Aurignacien: chaînes opératoires et perspectives techno-culturelles*. Liège: Symposium 6-7, XV[e] Congrès de l'UISPP, 2-8 Septembre 2001. Université de Liège.

ORTEGA COBOS, D.; SOLER, N.; MAROTO, J. (in press) - La production des lamelles pendant l'aurignacien archaïque dans la grotte de l'Arbreda (Espagne): organisation de la production, variabilité des méthodes et des objectifs. In LE BRUN--RICALENS, F. - *Productions lamellaires attribuées à l'Aurignacien: chaînes opératoires et perspectives techno-culturelles*. Liège: Symposium 6-7, XV[e] Congrès de l'UISPP, 2-8 Septembre 2001. Université de Liège.

ORTEGA, I. (1998) - Présentation des productions laminaires et lamellaires aurignaciennes du niveau aurignacien de Barbas (Dordogne). In Projet Collectif de Recherche: *Comportements techniques et économiques des sociétés au Paléolithique supérieur dans le contexte pyrénéen, apports de la technologie lithique*, p. 42-54.

SÁENZ DE BURUAGA, A. (1991) - *El Paleolítico Superior de la Cueva de Gatzarria (Zuberoa, País Vasco)*. Bilbao: Universidad del País Vasco.

SCHMIDER, B.; PERPÈRE, M. (1995) - Production et utilisation des lamelles dans l'Aurignacien de la Grotte du Renne, à Arcy-sur-Cure. In PAUTRAT, Y.; THÉVENIN, A., eds. - *Paléolithique supérieur et Epipaléolithique dans le Nord-Est de la France. Actes de la table ronde de Dijon, 7.10. - 8.10.1995*. Dijon: Direction Régionale des Affaires Culturelles (Cahiers Archéologiques de Bourgogne; 6), p. 4-10.

SORIANO, S. (1998) - La production de lamelles torses dans les niveaux du Paléolithique supérieur ancien d'Umm El Tlel (Syrie): exploration théorique et expérimentale de ses modalités. In OTTE, M., ed. - *Préhistoire d'Anatolie. Genèse de deux mondes. Actes du colloque international de Liège, 28 avril-3 mai 1997*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 85), p. 731-748.

STUCKENRATH, R. (1987) - Dataciones de carbono 14. In GONZÁLEZ ECHEGARAY, J.; FREEMAN, L. G. - *Vida y muerte en Cueva Morín*. Santander: Institución Cultural de Cantabria, p. 215.

TIXIER, J.; REDURON, M. (1991) - Et passez au pays des silex: rapportez-nous des lames ! In *25 ans d'études technologiques en Préhistoire. XIèmes Rencontres Internationales d'Archéologie et d'Histoire d'Antibes*. Juan-les-Pins: APDCA, p. 235-243.

VEGA DEL SELLA, C. (1921) - *El Paleolítico de Cueva Morín (Santander) y notas para la climatología cuaternaria*. Madrid: Comisión de Investigaciones Paleontológicas y Prehistóricas (Memoria; 29).

A brief overview of Aurignacian cultures in the context of the industries of the transition from the Middle to the Upper Paleolithic

FRANÇOIS BON

ABSTRACT Recent technological studies devoted to lithic industries from many Aurignacian sites of western Europe have made it possible to better define the earliest stages of this culture in the area. Such studies show the existence of two principal facies (Archaic and Early Aurignacian), whose chronological position and geographical dispersion are still in need of refinement; the evidence available in any case already enables some discussion of the unity of the technocomplex, in time as in space. The technological approach also shows the important role played in the characterization of these different industries by the production of elements (bladelets, in this context) associated with the manufacture of projectile points. This paper proposes to see in the search of technical solutions to make better hunting weapons one of the factors explaining some of the main technical changes observed during the Middle-to-Upper Paleolithic transition.

In the past, studies of the Aurignacian have been strongly directed towards the identification of the origins of a culture interpreted by a majority of researchers as evidence for the migration of a population. However, instead of representing a homogenous culture progressing across the European continent, the initial stages of the Aurignacian appeared in the form of several facies identified in various areas of Europe. The emergence of this culture thus offers a rather confusing taxonomic picture — Protoaurignacian in some parts of Spain and Italy, Archaic or Initial Aurignacian in southeast France, Aurignacian "0" in southwest France, etc.

Over the last few years, studies devoted to the technological analysis of lithic industries have contributed to overcome this situation. In fact, such studies have made it possible to clarify the nature of the different facies and to make inferences regarding the degree of their relationship. If, for example, we consider southwest Europe, in particular France and the Iberian Peninsula, two distinct facies can now be defined within the earliest phases of the Aurignacian. After summarizing the elements of definition upon which rest the description of these facies, we will consider questions and models suggested by these results.

The Early Aurignacian in Aquitaine

Since the Aurignacian was first recognized, in the beginning of the 20th century, the industries belonging to the Early Aurignacian of Aquitaine have constituted the basis for the analysis of this culture as a whole; this is illustrated, for instance, by the seminal research of Breuil (1913) and Sonneville-Bordes (1960). Indeed, the main attributes classically associated with the Aurignacian (carinated scrapers, Aurignacian blades, split-based points) belong in this facies. Over the last few years, lithic industries from different sites in southwest France occupied by human groups of the Early Aurignacian were studied from a technological point of view (Fig. 1): Brassempouy, Landes (Bon, 1996, 2002); Caminade, Dordogne (Bordes, 2000); Castanet, Dordogne (Pelegrin and O'Farrell, in press); Garet, Landes (Klaric, 1999); Hui et Toulousete, Lot-et-Garonne (Le Brun-Ricalens, 1993); Abri Pataud (Chiotti, 1999); Le Piage and Roc-de-Combe, Lot (Bordes, 2002); La Tuto de Camalhot, Ariège (Bon, 2002; Bon et al., 2005). To these we can also add several sites where knapping activities were dominant, all located on sources of raw material in the area of Bergerac (Dordogne): Barbas (Ortega, 1998; Teyssandier, 2000), Corbiac-Vignoble II (Tixier, 1991; Bordes and Tixier, in press), and Champ-Parel (Chadelle, 1990).

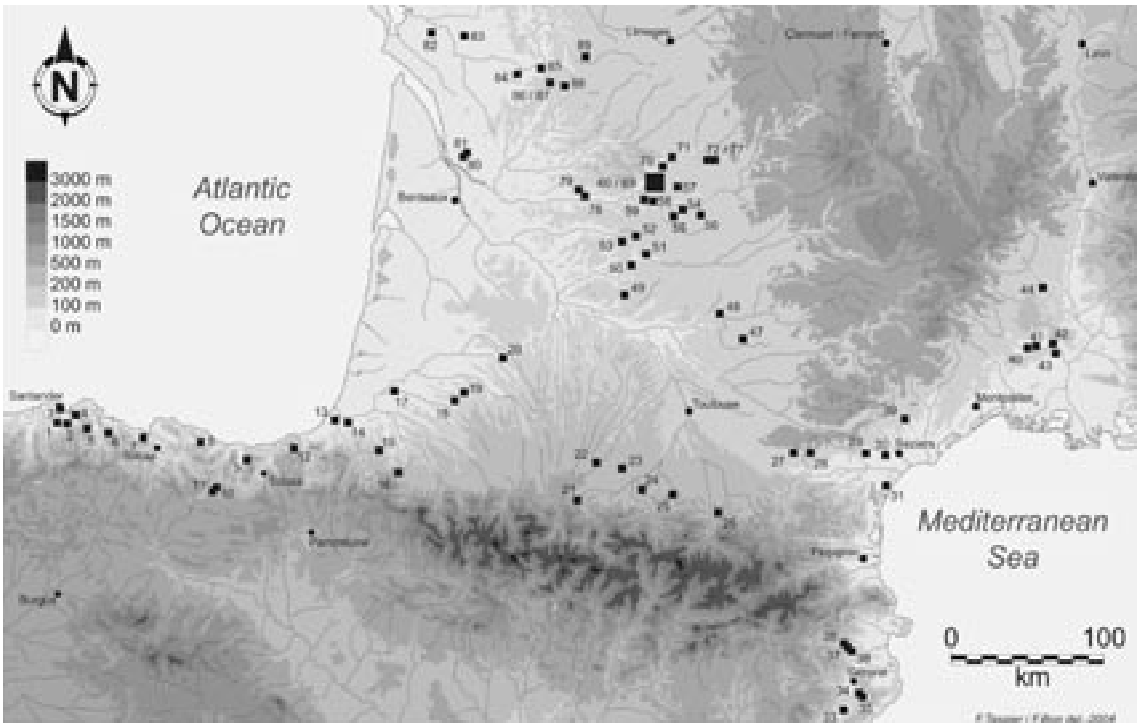

FIG. 1 – Location of the main Aurignacian sites in Southern France and Northern Spain.

1. Hornos de la Pena;
2. Castillo;
3. Pendo;
4. Morín;
5. Salitre;
6. Otero;
7. Polvorin;
8. Santimamine;
9. Ekain;
10. Labeko Koba;
11. Lezetxiki;
12. Aitzbitarte;
13. Chabiague;
14. Le Basté;
15. Isturitz;
16. Gatzarria;
17. Tercis, Moulin de Bénesse;
18. Brassempouy;
19. Garet;
20. Cazaubon (Drouilhet);
21. Gargas;
22. Les Abeilles;
23. Aurignac;
24. Tarté;
25. Mas d'Azil;
26. Tuto de Camalhot;
27. Canecaude I;
28. Les Cauneilles-Basses;
29. Bize (Tournal);
30. Régismont-le--Haut;
31. La Crouzade;
32. Romani;
33. Cal Coix;
34. Can Crispins;
35. Bruguera;
36. Arbreda;
37. Mollet I;
38. Reclau Viver;
39. Rothschild;
40. L'Esquicho--Grapaou;
41. La Laouza;
42. La Balauzière;
43. La Salpêtrière;
44. Le Figuier, Les Pêcheurs;
47. Ségalar;
48. La Moulinière;
49. Beauville (Hui et Toulousète);
50. Las Pélénos;
51. Les Ardailloux;
52. Laburlade;
53. Abri Peyrony;
54. Le Piage;
55. Roc de Combe;
56. Les Fieux;
57. Laussel;
58. Le Flageolet, grotte XVI;
59. Caminade;
60. La Ferrassie;
61. La Faurélie;
62. Lartet et Poisson;
63. Pataud;
64. Cro-Magnon;
65. La Rochette;
66. Cellier;
67. Le Facteur;
68. Vallon de Castelmerle (abris Castanet, Blanchard, La Souquette);
69. Labattut;
70. Belcayre;
71. La Bombetterie;
72. Bos del Ser;
73. Dufour;
74. Font-Yves;
75. Bassaler-Nord;
76. Chanlat;
77. Comba del Bouïtou;
78. Barbas;
79. Champ-Parel;
80. Pair-non-Pair;
81. Roc de Marcamps;
82. Rochecourbon;
83. Gros Roc;
84. Grotte à Melon;
85. Combe de Rolland;
86. Les Rois;
87. Les Vachons;
88. La Quina;
89. La Chaise.

These studies have shown the great industrial homogeneity that characterizes the Early Aurignacian of southwest France:

- The assemblages of "domestic" tools are for the most part made on blades, with some tools made on flakes as well. The range of domestic tools is dominated by endscrapers and retouched blades, but includes also burins and splintered pieces in variable proportions (see the assemblages from Brassempouy in Figs. 2-3).

- The main principles of blade debitage are as follows (Fig. 4a)
  – Debitage conceived in an unipolar way;
  – Core volume consisting of a flaked surface with parallel edges, framed by one or two perpendicular sides;
  – Not much elaboration of shaping out methods, beginning with the removal of cortical pieces, possibly laminar flakes, and with crests being set up only if need be;
  – Frequent extraction of products from the intersection between the flaked surface and one of the sides (possibly after the creation of a new crest), which makes it possible to then detach robust blades in the center of the flaked surface, while at the same time the volumetric properties of the core are maintained;
  – Very frequent preparation (faceting, short *éperon*) of the impact zone, associated with a nearly exclusive use of direct, soft hammer percussion;
  – Detachment of robust products, facilitated by the mode of preparation of the impact zone, and seemingly taking precedence over the search for regularity.

- The production of bladelets corresponds to a separate *chaîne opératoire*, and is mostly carried out through the reduction of "carinated scrapers", which in fact are bladelet cores (Lucas, 1997). The bladelets produced are small-sized, about 10-30 mm in length, and

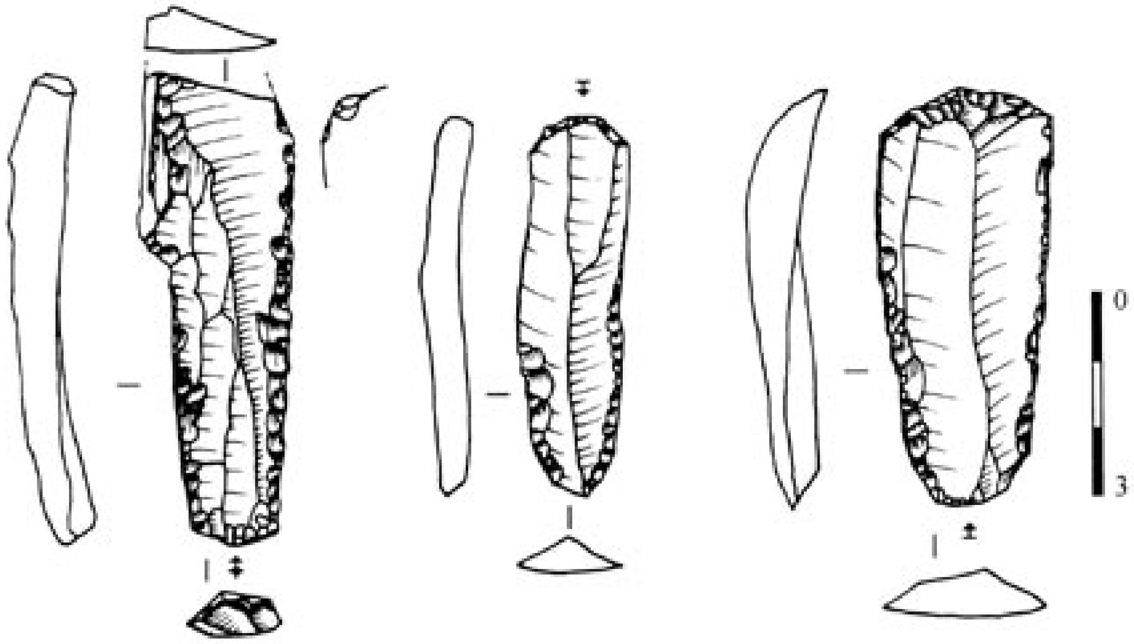

FIG. 2 – Brassempouy (Landes, France), grotte des Hyènes, level 2F: scrapers and retouched blade.

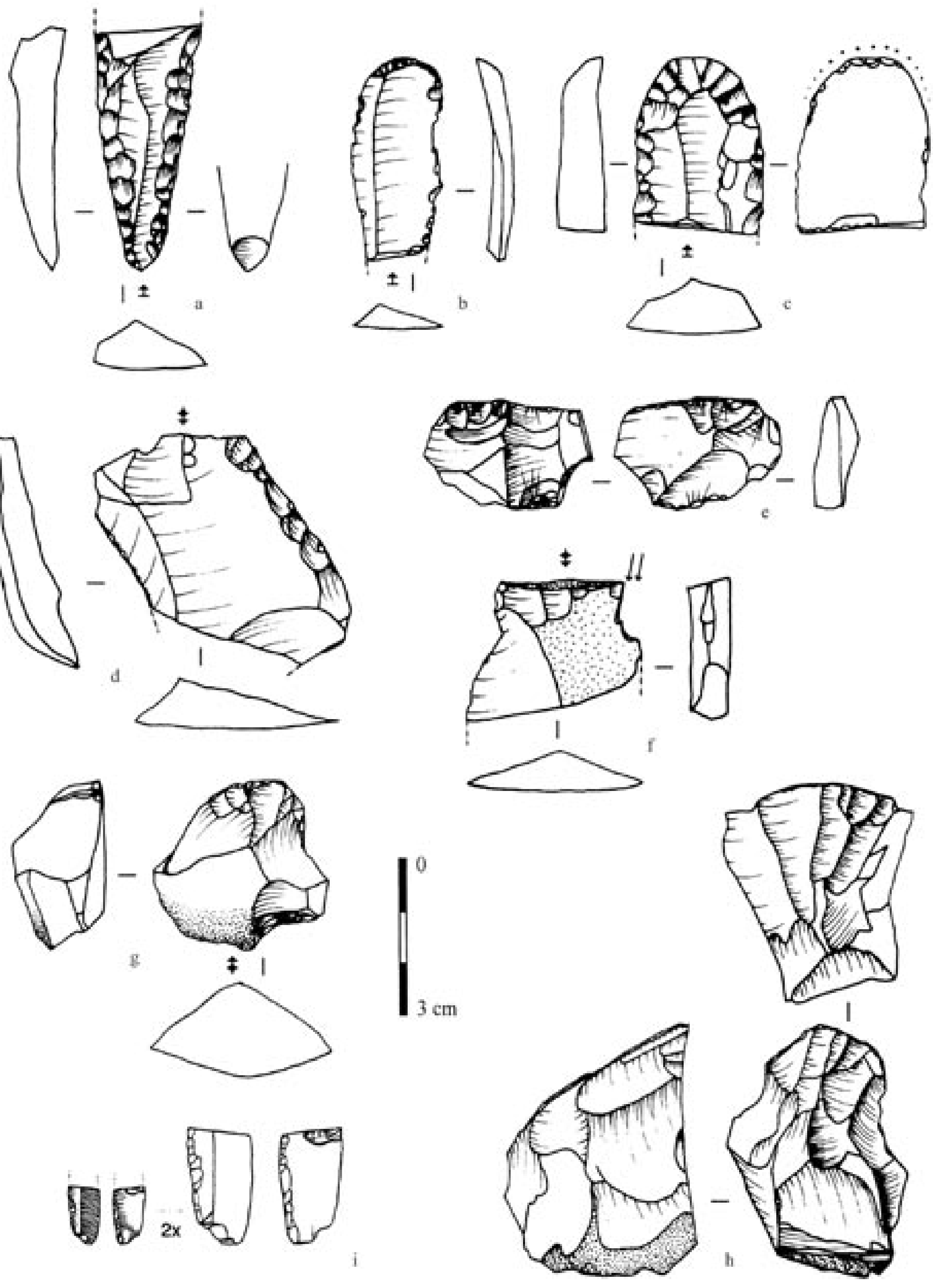

FIG. 3 – Brassempouy (Landes, France), grotte des Hyènes, level 2A. a-c. scrapers and retouched blade; d: sidescraper; e. splintered piece; f. burin; g. nosed scraper (core?); h. carinated core; i. Dufour bladelet (after O'Farrell, 2005).

very few are retouched. This suggests that they were used with no retouch; perhaps only after segmentation into smaller fragments; when transformed by retouch, the latter is often inverse or alternate. Recent analyses of the material from Brassempouy (Landes) and Castanet (Dordogne) show that at least some of these objects were used as projectile components (O'Farrell, 2005).

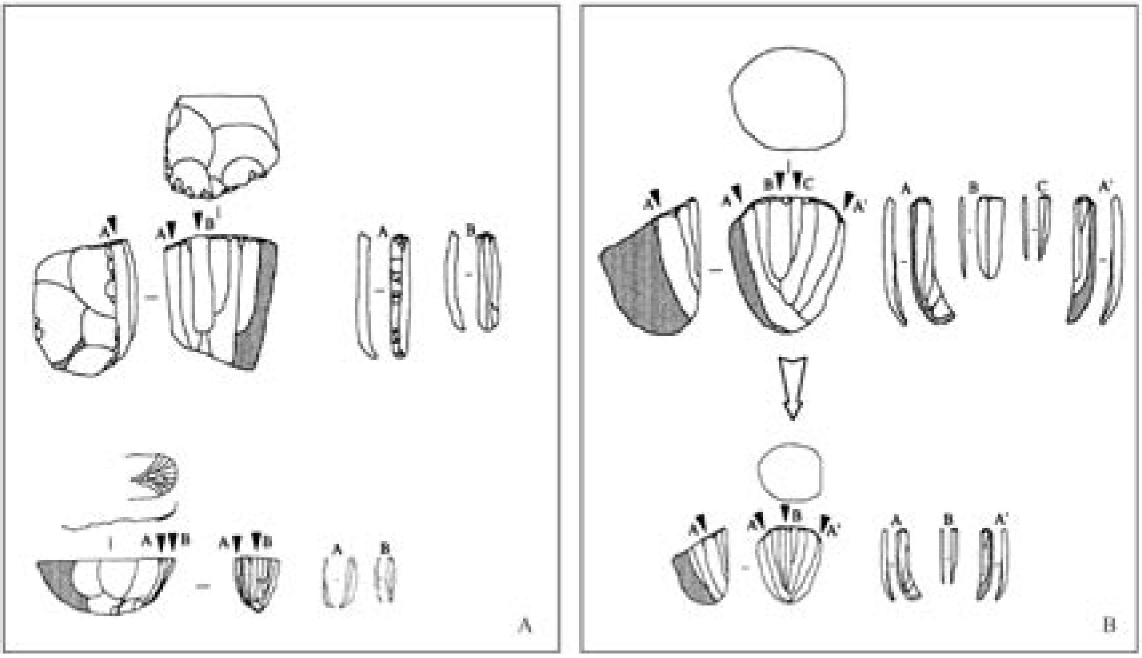

FIG. 4 – A. Dissociated productions: two independent *chaînes opératoires* to produce blades and bladelets (based on the industries from Brassempouy and La Tuto de Camalhot, Aquitaine, France). B. Integrated productions: only one *chaîne opératoire* to produce blades and bladelets (based on the industry from Arcy-sur-Cure, Burgundy, France) (after Bon et Bodu in Schmider, 2002).

These various studies have enabled us to identify a suite of technological features defining the Early Aurignacian. The dissociation between blade and bladelet productions is especially important: these two productions correspond to distinctive *savoirs-faire* and respond to different consumption requirements (domestic tools and projectiles). A techno-economic dissociation is also illustrated by the fact that, at some sites, blades and bladelets are produced in different moments, or in different places (see Fig. 5, for an example from La Tuto de Camalhot).

Proto-, Archaic, Initial Aurignacian: behind the multiplicity of words

Several sites which have been interpreted as occupied by groups variously designated as Protoaurignacian (cf. the seminal research by Laplace, 1966), Archaic Aurignacian, or Initial Aurignacian, have yielded industries which, in fact, are all rather similar. In France and northern Spain, the main sites featuring such kinds of occurrences are: Arbreda, Catalonia (Ortega Cobos et al., 2005); Arcy-sur-Cure, Burgundy (Schmider, 2002); Esquicho-Grapaou and La Laouza, Gard (Bazile, 1999, Bazile and Sicard, 1999); Gatzarria (Laplace, 1966) and Isturitz, Atlantic Pyrenees (Normand, in press); Labeko Koba, Basque Country (Arrizabalaga and Altuna, 2000); Mandrin, Drôme (Slimak et al., in press); Morín, Cantabria (Maíllo, 2003); l'observatoire, Monaco (Onoratini et al., 1999); Le Piage, Lot (Bordes, 2002).

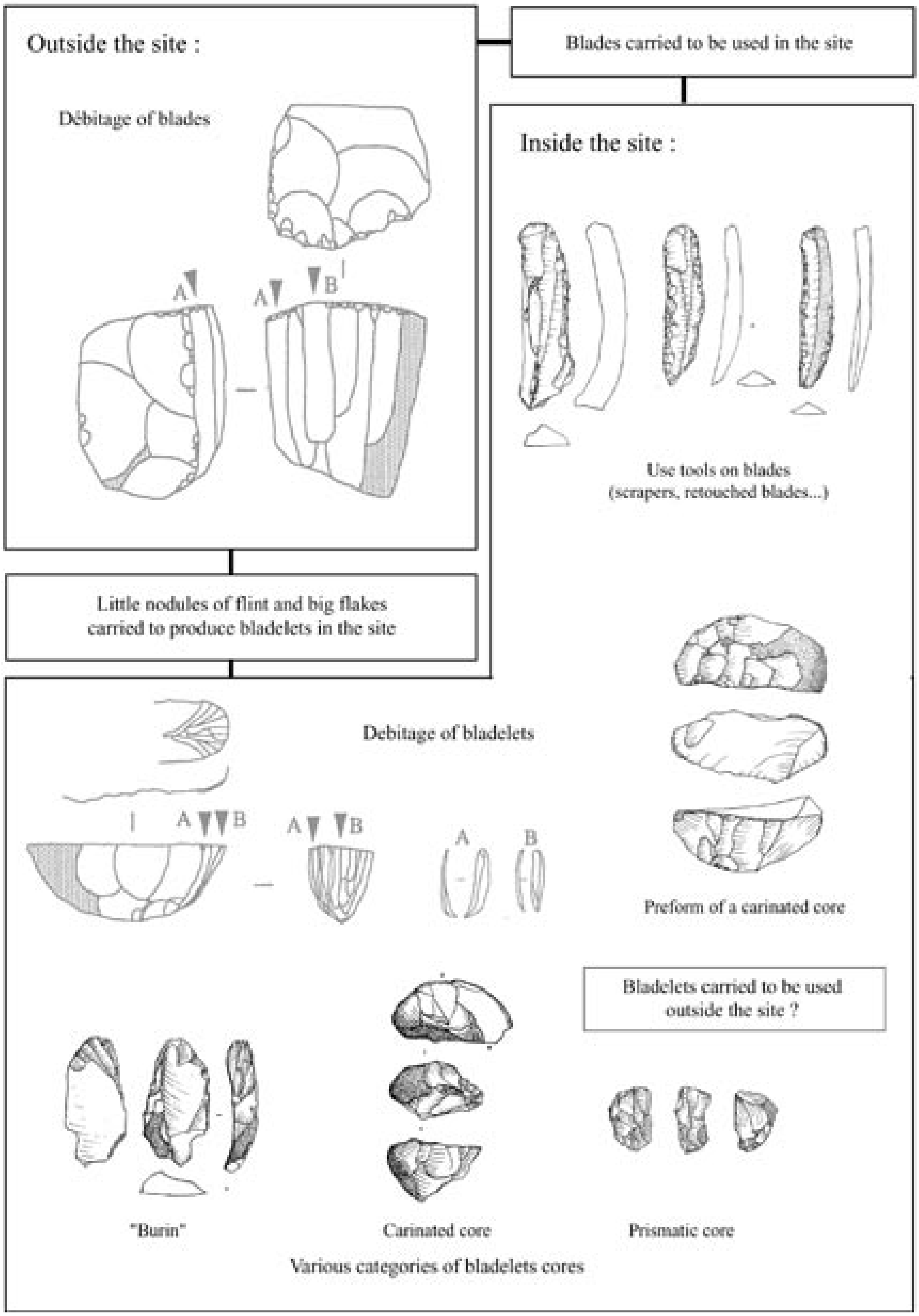

FIG. 5 – Lithic production system, based on the industry from La Tuto de Camalhot (Ariège, France) (after Bon et al., 2005). Black: artefacts from level 70-80; grey: production schemes.

In spite of an internal variability greater than that observed among industries belonging to the Early Aurignacian, the industries from these sites have the following characteristics:

- In contrast with the Early Aurignacian, there is often an operational continuum between the production of blades and bladelets; even if bladelets can be produced separately (using small cores, or obtained along the edges of big flakes), the debitage of blades frequently continues into the debitage of bladelets (Fig. 4b).

- This operational continuity is evident in the morphological resemblance between some of the blades and some of the bladelets: thin, regular, and, especially, rectilinear. At the end of production, the knapper chooses the most robust blades as blanks for domestic tools, such as endscrapers, retouched blades, or burins; the bladelets are transformed by retouch, mainly into Dufour bladelets of the Dufour subtype (Demars and Laurent, 1992; for examples from the Arcy-sur-Cure industry, see Fig. 6); the blades of intermediate size are seldom retouched and were most likely used as knives.

- Certain aspects of the debitage evoke knapping methods used in the Early Aurignacian (unipolar reduction; use of soft hammer; little preparation of cores), but others set the two facies apart (Fig. 4):
  - Cores are often of pyramidal shape, which conditions the extraction of lateral removals and is intended at maintaining the volumetric properties that make it possible to detach rectilinear products from the middle of the flaking surface;
  - The striking platform remains almost systematically flat.

Towards the description of two distinct traditions

The technological study of industries from many French and Spanish Aurignacian sites tends to show the existence of two separate technological systems. In one, corresponding to the Early Aurignacian, there are two distinct *chaînes opératoires* to obtain blades and bladelets; in the other, corresponding to the Archaic (also referred to as Initial or Proto-) Aurignacian, only one *chaîne opératoire* is required to obtain these various categories of objects. These differences reflect the existence of different *savoirs-faire*. Of especial importance is the fact that the manufacture of weapon components (made on bladelets) and of domestic tools (made on blades) is not necessarily integrated in a single *chaîne opératoire*.

The aim of current research is to determine the chronological position and the geological distribution of each of these two technical traditions. It seems that the Archaic Aurignacian is more common in Mediterranean and southern Pyrenean areas. In contrast, the Early Aurignacian is better represented in southwest France. But industries close to the Archaic Aurignacian have also been described in some Aquitaine sites — as Le Piage, Lot (Bordes, 2002), and Dufour, Corrèze (Bordes and Bon, in press) — and even as far north as Arcy-sur--Cure, Burgundy (Schmider, 2002).

More work is necessary to verify whether these industries indeed have significantly different geographical distributions, and the question of their position in time is also not an easy one. With some exceptions as Le Piage (Bordes, 2002), or Labeko Koba (Arrizabalaga and Altuna, 2000), the two traditions do not occur stratified at a single site, although the Isturitz sequence will undoubtedly bring much to bear on this issue (Normand, in press). Thus, the chronological position of these two industrial facies must rest at present mainly on the com-

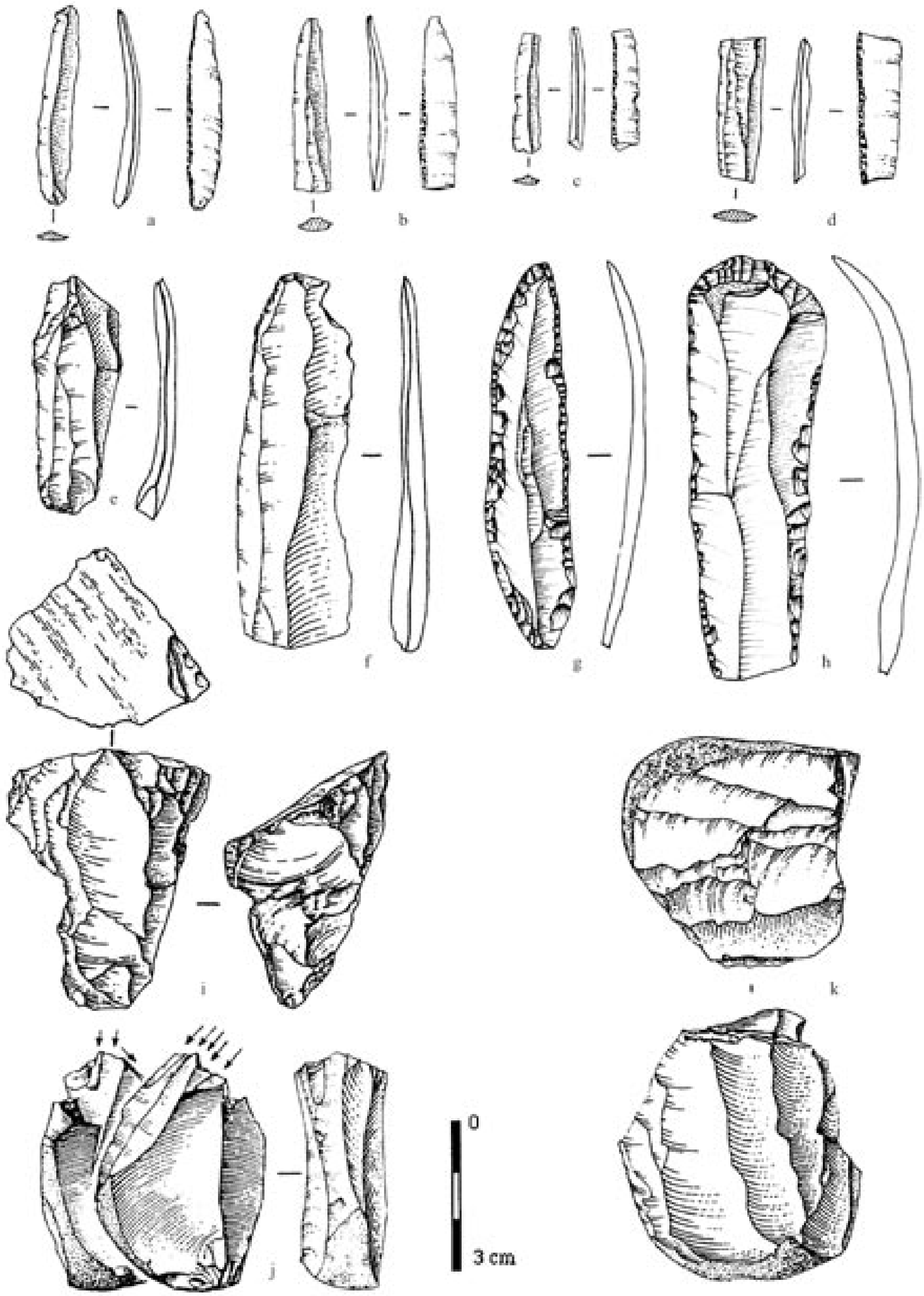

FIG. 6 – Arcy-sur-Cure (Yonne, France), grotte du Renne, level VII. a-d. Dufour bladelets; e-f. unretouched blades; g-h. scraper and retouched blade; i, k: cores; j. burin (after Schmider, 2002, modified).

parison of radiocarbon dates. These results seem to show that the Archaic Aurignacian appears at several sites in southern Europe between 38 000 and 35 000 BP, in particular at Arbreda (Soler and Maroto, 1993; Maroto et al., 1996) and Fumane (Bartolomei et al., 1994), although its real age seems to be closer to 35 000 than to 40 000 BP (Zilhão and d'Errico, 1999); the emergence of the Early Aurignacian (dated to between ca.35 000 and ca.32 000 BP) is somewhat later. However, it remains possible that these two industries were also in part synchronous after 35 000 BP (Bon, 2002).

Towards the definition of new models

We have seen that both the chronological position and the geographical distribution of industries belonging to these two traditions pose as yet unsolved problems. It is in any case clear that the existence of different traditions inside what we designate as the Aurignacian alters the vision of a homogenous wave of settlement. This forces consideration of new models for the explanation of the Middle-to-Upper Paleolithic transition.

One way to tackle this problem is by asking the question of what brings together these various Aurignacian industries when compared with such transitional industries as the Châtelperronian. Ultimately, it seems that it is mainly the importance of microlith production. We saw that Archaic Aurignacian and Early Aurignacian knappers did not produce the same kinds of bladelets, the difference residing in the nature of the *chaînes opératoires*. But the production of microliths itself can be seen as a novelty in comparison with previous transitional industries. Did it arise to fulfill new requirements? Bearing in mind that the bladelets were intended as blanks for components of hunting weapons, the answer probably has to be no. In fact, there is a high probability that Châtelperronian points were intended, at least to some extent, for use as projectile points (Pelegrin 1990), a major difference by comparison with most Middle Paleolithic technologies. What is new with the Aurignacian, thus, is not the search for projectiles but the fact that the microliths are serially, laterally hafted along the shaft of projectiles, not mounted at their extremities. This Aurignacian innovation represents a technical solution which will be followed throughout the Upper Paleolithic: that of arming projectiles with microliths made from bladelets.

On the basis of these considerations about the search of a technological solution for the manufacture of hunting weapons we can thus propose the following model:

- Between 40 000 and 35 000 BP, European prehistoric societies are changing their industries, particularly where experiments with technical solutions to make projectile points are concerned. It is in this period that such points begin to occupy an important place in the equipment of prehistoric groups. Is this in relation to the diffusion of a new type of hunting weapon, for example the spear-thrower? If so, these changes in lithic industries are perhaps in part related to, and in part explain, first the emergence and then the surge in the manufacture of bone projectiles.

- Although this focus on lithic armatures is a shared feature of industries belonging to this period, it can also be used to divide them on the basis of the various technical solutions adopted to achieve a common purpose. One solution was that of hafting the points at the tip of the projectiles, as with Châtelperronian points. Another— that of laying out along the shaft a series of microlithic components — soon became essential, and this solution undoubtedly appears among industries of the Archaic Aurignacian, and is be developed in the Early Aurignacian.

Was this innovation related to constraints posed on human groups by their displacements? One possibility is that bladelets are a technical solution providing a perfect balance between 1) concerns regarding the production of standardized hunting weapons, and 2) the exploitation of vast territories in which resources of mineral raw-materials are of diverse quality and uneven distribution (Bon, 2005). In fact, no matter what raw-materials are available, producing bladelets is almost always possible, and it is also easy to transport raw materials in small amounts. Is this an argument in favor of the hypothesis that the Aurignacian is related to migration? Perhaps, if we consider the extension of the phenomenon, but diffusion of ideas is also a viable explanation.

This model expresses the fact that the Aurignacian has many things in common with other European industries of the period between 40 000 and 30 000 BP. These shared features relate to the development of technical solutions for the manufacture of projectiles, and possibly explain the "cultural mosaic" that develops during the period. Therefore, the Archaic Aurignacian can be seen as an industry of transition, more precisely one within which a very promising technical solution was developed: the use of microliths. This model, which can now be tested, proposes that hunting had a major role in the Middle-to-Upper Paleolithic transition, and that it is the realm of hunting activities, in their full socio-economic (and even symbolic) dimension, that undoubtedly underlies the changes observed in the technical dimension which was the focus of this paper.

REFERENCES

ARRIZABALAGA, A.; ALTUNA, J., eds. (2000) - *Labeko Koba (País Vasco): hienas y humanos en los albores del Paleolítico superior.* San Sebastián-Donostia: Sociedad de Ciencias Aranzadi (Munibe-Antropologia Arkeologia; 52).

BARTOLOMEI, G.; BROGLIO, A.; CASSOLI, P. F.; CASTELLETTI, L.; CATTANI, L.; CREMASCHI, M.; GIACOBINI, G.; MALERBA, G.; MASPERO, A.; PERESANI, M.; SARTORELLI, A.; TAGLIACOZZO, A. (1994) - La Grotte de Fumane: un site aurignacien au pied des Alpes. *Preistoria Alpina.* Trento. 28:1, p. 131-179.

BAZILE, F. (1999) - *Le Paléolithique supérieur en Languedoc Oriental: de 35 000 à 12 000 ans avant le présent.* Mémoire en vue de l'habilitation à diriger des recherches. Université de Perpignan.

BAZILE, F.; SICARD, S. (1999) - Le premier Aurignacien du Languedoc Oriental dans son contexte méditerranéen. In SACCHI, D. ed. - *Les faciès leptolithiques du nord-ouest méditerranéen: milieux naturels et culturels. Carcassonne (Actes du XXIVe Congrès Préhistorique de France, Carcassonne, 26-30 septembre 1994).* Paris: Société Préhistorique Française, p. 117-125.

BON, F. (1996) - L'industrie lithique aurignacienne de la couche 2A de la grotte des Hyènes à Brassempouy (Landes). In DELPORTE, H.; CLOTTES, J., eds. - *Pyrénées préhistoriques, arts et sociétés. Actes du 118e Congrès National des Sociétés Historiques et Scientifiques.* Paris: CTHS, p. 439-455.

BON, F. (2002) - *L'Aurignacien entre mer et océan: réflexion sur l'unité des phases anciennes de l'Aurignacien dans le Sud de la France.* Paris: Société Préhistorique Française (Mémoire de la Société Préhistorique Française; 29).

BON, F. (2005) - Little big tool. Enquête autour du succès de la lamelle. In LE BRUN-RICALENS, F.; BORDES, J.-G.; BON, F., eds. - *Productions lamellaires attribuées à l'Aurignacien: chaînes opératoires et perspectives techno-culturelles.* Actes de la table--ronde organisée dans le cadre du XVe Congrès de l'UISPP, Liège, 2001. *Archéologiques*, 1, Luxembourg, p. 479-484.

BON, F.; SIMONNET, R.; VÉZIAN, J. (2005) - *L'équipement lithique des Aurignaciens à la Tuto de Camalhot (Saint-Jean--de-Verges, Ariège), sa relation avec la mobilité des groupes et la répartition de leurs activités dans un territoire.* In JAUBERT, J.; BARBAZA, M., eds. - *Territoires, déplacements, mobilité, échanges durant la Préhistoire. Actes du 126e Congrès National des Sociétés Historiques et Scientifiques. Toulouse, 2001.* Paris: CTHS, p. 173-184.

BORDES, J.-G. (2000) - La séquence aurignacienne de Caminade revisitée: l'apport des raccords d'intérêt stratigraphique. *Paléo.* Les Eyzies-de-Tayac. 12, p. 387-407.

BORDES, J.-G. (2002) - *Les interstratifications Châtelperronien/Aurignacien du Roc-de-Combe et du Piage (Lot, France). Analyse taphonomique des industries lithiques, implications archéologiques.* Thèse de doctorat de Préhistoire et Géologie du Quaternaire de l'Université de Bordeaux I.

BORDES, J.-G.; BON, F. (in press) - Analyse techno-typologique de l'industrie de la grotte Dufour (Corrèze, France): anciennes fouilles, nouvelles données. In CABRERA VALDÉS, V., ed. - *En el centenario de la cueva de El Castillo: el ocaso de los Neandertales*. Actes du colloque de Santoña, 2003.

BORDES, J.-G.; TIXIER, J. (in press) - Sur l'unité de l'Aurignacien ancien dans le sud-ouest de la France: la production des lames et des lamelles. In BON, F.; MAÍLLO FERNÁNDEZ, J. M.; ORTEGA COBOS, D., eds. - *Autour des concepts de Protoaurignacien, d'Aurignacien initial et ancien: unité et variabilité des comportements techniques des premiers groupes d'hommes modernes dans le Sud de la France et le Nord de l'Espagne*. Actes de la Table-ronde organisée à Toulouse, 2003. *Espacio, Tiempo y Forma*. Madrid. 15.

BREUIL, H. (1913) - Les subdivisions du Paléolithique supérieur et leur signification. In *Congrès International d'Anthropologie et d'Archéologie préhistoriques. Compte-rendu de la 14ème session, Genève 1912*. 1, p. 165-238.

CHADELLE, J.-P. (1990) - Le site de plein air de Corbiac-Vignoble à Bergerac (Dordogne): Technologie lithique et mode d'occupation. In *Le silex de sa genèse à l'outil: actes du Vème Colloque Internationale sur le silex, Bordeaux, 17 septembre-2 octobre 1987*. Bordeaux: CNRS (Cahiers du Quaternaire; 17:2), p. 385-390.

CHIOTTI, L. (1999) - Les industries lithiques des niveaux aurignaciens de l'Abri Pataud, les Eyzies-de-Tayac (Dordogne): étude technologique et typologique. Paris: Thèse de Doctorat du Muséum d'Histoire Naturelle, Institut de Paléontologie Humaine.

DEMARS, P.-Y.; LAURENT, P. (1992) - *Types d'outils lithiques du Paléolithique supérieur en Europe*. Paris: CNRS (1ère impression en 1989).

KLARIC, L. (1999) - Le site de Garet à Serreslous-et-Arribans (Landes): un gisement aurignacien de plein air. *Archéologie des Pyrénées Occidentales et des Landes*. Anoye. 18, p. 101-112.

LAPLACE, G. (1966) - *Recherches sur l'origine et l'evolution des complexes leptolithiques*. Paris: De Boccard.

LE BRUN-RICALENS, F. (1993) - Réflexions préliminaires sur le comportement litho-technologique et l'occupation du territoire du Pays des Serres à l'Aurignacien: le gisement de "Toulousète" à Beauville (Lot-et-Garonne), une occupation moustérienne et aurignacienne de plein air. *Paléo*. Les Eyzies-de-Tayac. 5, p. 127-153.

LUCAS, G. (1997) - Les lamelles Dufour du Flageolet I (Bézenac, Dordogne) dans le contexte aurignacien. *Paléo*. Les Eyzies-de--Tayac. 9, p. 191-219.

MAÍLLO FERNÁNDEZ, J. M. (2003) - La transición Paleolítico medio-superior en Cantabria: análisis tecnológico de la industria lítica de Cueva Morín. Thèse de doctorat de l'Université de l'UNED, Madrid.

MAROTO, J.; SOLER, N.; FULLOLA, J. M. (1996) - Cultural change between Middle and Upper Palaeolithic in Catalonia. In CARBONNEL, E.; VAQUERO, M., eds. - *The last Neandertals, the first anatomically modern human: cultural and human evolution: the crisis at 40 ka BP*. Tarragona: Universitat Rovira i Virgili, p. 219-250.

NORMAND, Ch. (in press) - Nouvelles données sur la séquence aurignacienne de la grotte d'Isturitz (Saint-Martin-d'Arbreroue, Pyrénées-Atlantiques. In BON, F.; MAÍLLO FERNÁNDEZ, J. M.; ORTEGA COBOS, D., eds. - *Autour des concepts de Protoaurignacien, d'Aurignacien initial et ancien: unité et variabilité des comportements techniques des premiers groupes d'hommes modernes dans le Sud de la France et le Nord de l'Espagne*. Actes de la Table-ronde organisée à Toulouse, 2003. *Espacio, Tiempo y Forma*. Madrid. 15.

O'FARRELL, M. (2005) - Etude préliminaire des éléments d'armature lithique de l'Aurignacien de Brassempouy. In LE BRUN--RICALENS, F.; BORDES, J.-G.; BON, F., eds. - *Productions lamellaires attribuées à l'Aurignacien: chaînes opératoires et perspectives techno-culturelles*. Actes de la table-ronde organisée dans le cadre du XIVe congrès de l'UISPP, Liège 2001. Archéologies, 1, Luxembourg, p. 395-412.

ONORATINI, G.; SIMON, P.; SIMONE, S. (1999) - Mise en évidence du Protoaurignacien à la grotte de l'Observatoire. *Bulletin du Musée d'Anthropologie Préhistorique de Monaco*. Monaco. 40, p. 43-56.

ORTEGA, I. (1998) - Présentation des productions laminaires et lamellaires aurignaciennes du niveau aurignacien de Barbas (Dordogne). In Projet Collectif de Recherche – *Comportements techniques et économiques des sociétés au Paléolithique supérieur dans le contexte pyrénéen, apports de la technologie lithique*, p. 42-54.

ORTEGA COBOS, D.; SOLER MASFERRER, N.; MAROTO GENOVER, J. (2005) - La production des lamelles pendant l'Aurignacien archaïque dans la grotte de l'Arbreda: organisation de la production, variabilité des méthodes et des objectifs. In LE BRUN-RICALENS, F.; BORDES, J.-G.; BON, F., eds. - *Productions lamellaires attribuées à l'Aurignacien: chaînes opératoires et perspectives techno-culturelles*. Actes de la table-ronde organisée dans le cadre du XIVe congrès de l'UISPP, Liège, 2001. *Archéologies*, 1, Luxembourg, p. 359-373.

PELEGRIN, J. (1990) - Observations technologiques sur quelques séries du Châtelperronien et du MTA B du Sud-Ouest de la France: une hypothèse d'évolution. In FARIZY, C., ed. - *Paléolithique moyen récent et Paléolithique supérieur ancien en Europe. Ruptures et transitions: examen critique des documents archéologiques*. Nemours: APRAIF (Actes du Colloque International de Nemours, 1988. Mémoires du Musée de Préhistoire d'Ile-de-France; 3), p. 195-201.

PELEGRIN, J.; O'FARRELL, M. (in press) - L'industrie lithique. In *L'abri Castanet: une occupation de l'Aurignacien ancien en Périgord*. Suppl. à Paléo.

SCHMIDER, B., ed. (2002) - *L'Aurignacien de la Grotte du Renne: les fouilles d'André Leroi-Gourhan à Arcy-sur-Cure (Yonne)*. Paris: Centre National de la Recherche Scientifique (*Gallia Préhistoire*. Supplément; 34).

SLIMAK, L.; PESESSE, D.; GIRAUD, Y. (in press) - La grotte Mandrin et les premières occupations du Paléolithique supérieur en Occitanie orientale. In BON, F.; MAÍLLO FERNÁNDEZ, J. M.; ORTEGA COBOS, D., eds. - *Autour des concepts de Protoaurignacien, d'Aurignacien initial et ancien: unité et variabilité des comportements techniques des premiers groupes d'hommes modernes dans le Sud de la France et le Nord de l'Espagne*. Toulouse (Actes de la Table-ronde), 2003. *Espacio, Tiempo y Forma*. Madrid. 15.

SOLER, N.; MAROTO, J. (1993) - Les nouvelles datations de l'Aurignacien dans la Péninsule Ibérique. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche Orient. Actes du XII^e Congrès International des Sciences Préhistoriques et Protohistoriques. Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 162-181.

SONNEVILLE-BORDES, D. de (1960) - *Le Paléolithique supérieur en Périgord*. Bordeaux: Delmas.

TEYSSANDIER, N. (2000) - L'industrie lithique aurignacienne du secteur II de Barbas (Creysse, Dordogne): analyse technique et implications archéologiques. *Ateliers*. Paris. 20, p. 29-59.

TIXIER, J.; REDURON, M. (1991) - Et passez au pays des silex: rapportez-nous des lames ! In *25 ans d'études technologiques en Préhistoire. XI^èmes Rencontres Internationales d'Archéologie et d'Histoire d'Antibes*. Juan-les-Pins: APDCA, p. 235-243.

ZILHÃO, J.; D'ERRICO, F. (1999) - The chronology and taphonomy of the earliest Aurignacian and its implications for the understanding of Neandertal extinction. *Journal of World Prehistory*. New York, NY. 13:1, p. 1-68.

News from the West: a reevaluation of the classical Aurignacian sequence of the Périgord

JEAN-GUILLAUME BORDES

ABSTRACT The sequences from four sites in northern Aquitaine — Caminade-Est, Roc-de--Combe, Le Piage and Corbiac-Vignoble II — were reevaluated under a two-step approach: first, the integrity of each assemblage was assessed through taphonomic analysis and, second, the assemblages or parts thereof thus validated were the object of a technological analysis. Results are that 1) the classical regional sequence is globally confirmed and refined, and 2) at Le Piage, the Early Aurignacian is preceded by an industry thus far unknown in northern Aquitaine. This Aurignacian in turn features two clearly differentiated, successive episodes: in an early phase, corresponding to the classical Early Aurignacian or Aurignacian I, "Aurignacian retouch" is common and bladelet cores are of the "carinated scraper" type, with a wide front, and produce straight or curved blanks; in a recent phase, corresponding to the Aurignacian II-IV, bladelet cores are of the "nosed scraper" or "busked burin" types, and mostly produce small, twisted blanks. Both phases share several technological features: 1) blade debitage is unipolar and has the purpose of producing large, thick blanks retouched into a diverse range of tools; and 2) blades and bladelets are obtained through separate procedures. The industry preceding the Early Aurignacian at Le Piage is characterized by continuity in the production of blades and bladelets, the latter being straight and rather long; its features evoke both the Archaic Aurignacian of Mediterranean regions and the Châtelperronian. These results force a reconsideration of the "Aquitaine model" of the Middle-to-Upper Paleolithic transition.

Introduction

The model according to which the Aurignacian marks the colonization of Eurasia by anatomically modern humans is currently favored by some scholars (e.g. Kozłowski and Otte, 2000), while in the opinion of others (e.g., Bar-Yosef, 2000, 2002) that colonization was done by bearers of earlier Initial Upper Paleolithic cultures. In this context, the term "Aurignacian" is systematically used whenever there is reason to believe that a given assemblage corresponds to the earliest Upper Paleolithic industry attributable to anatomically modern humans. This tendency to adapt the archeological facts to the dominant model must be countered by an effort to be more precise when characterizing the empirical data. Only by doing so, for instance through better descriptions of the industries from this period, will we be able to discuss the actual reality of that famous "break" so often diagnosed when the Aurignacian is compared with the technocomplexes of the transition, leading to such statements as that the Aurignacian is everywhere intrusive (Mellars, 1996). By the same token, only by finer analyses of existing collections will we be able to assess the identity of the Aurignacian technocomplex at the scale of its total extension.

To approach these questions, we need reliable regional sequences, and such is the scope of this paper, which offers a reevaluation of the Aurignacian sequence of northern Aquitaine, based on lithic analysis. The goal is that of testing the "Aquitaine model" (e.g. Harrold and Otte, 2001), taken here as a fully representative manifestation of the notion that Neandertal populations were replaced by a population of anatomically modern humans. The choice of this region is justified also by its historical role in the definition of the Aurignacian. Moreover, a large number of multistratified sites allow the definition of detailed archeostratigraphic sequences and of a framework of relative chronology that has better temporal resolution than available radiocarbon dates. The nature of this empirical data base also makes it possible to successfully apply refitting studies to issues of stratigraphy (Tixier, 1978; Villa, 1982; Bordes, 2000), and allows for fine comparisons between the different archeological assemblages. The four sequences studied (Fig. 1) feature such a level of coherence as to make it possible to present them in synthetic fashion as chronocultural phases; a higher level of detail has been provided elsewhere (Bordes, 2000, 2002, 2003, 2006; Bordes and Lenoble, 2002).

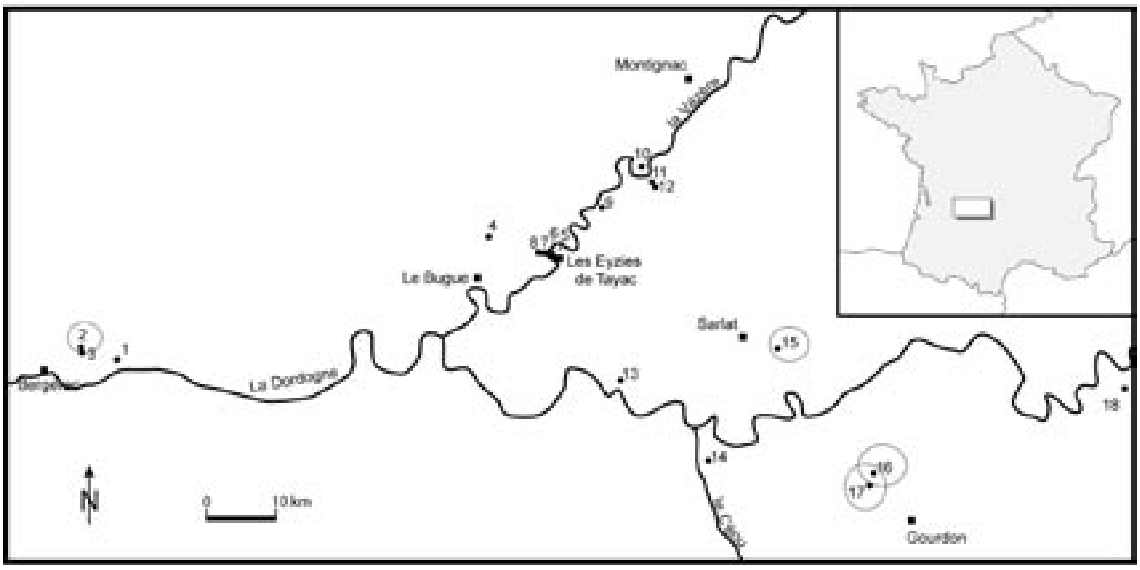

FIG. 1 – Some key Aurignacian sites in northern Aquitaine. Encircled sites are those considered in this study. 1. Barbas III; 2. Corbiac-Vignoble II; 3. Champarel; 4. La Ferrassie; 5. Pataud; 6. Cro-Magnon; 7. Abri Lartet; 8. Abri du Poisson; 9. Le Facteur; 10. La Rochette; 12. Blanchard; 13. Castanet; 14. Le Flageolet; 15. Grotte XVI; 16. Caminade; 17. Le Piage; 18. Roc de Combe; 19. Les Fieux.

Historical framework and studied corpus

A brief history

Once it was differentiated from the industries nowadays designated as Châtelperronian (previously lower Aurignacian), and Gravettian (previously upper Aurignacian), the Aurignacian was structured in four phases, on the basis of its bone tools (Peyrony, 1933, 1934, 1946). This chronological seriation was confirmed by the typological analysis of lithic assemblages (Sonneville-Bordes, 1960) and is still a reference today.

However, as a result of new excavations (Delporte, 1964, 1984), or of the application of new analytical techniques (Djindjian, 1986, 1993; Demars, 1992, 1998), this scheme grew in complexity. Rigaud (1982, 1993) also argued that site function explained the differences more than chronology, but the other authors retained time as the key factor underlying the observed variability.

The formulation of these different alternatives to the classical model led to an abandonment of the terminology. Today, for instance, most researchers use "Early" or "Recent" Aurignacian instead of Aurignacian "I" or "III". However, the underlying model remains that of Sonneville-Bordes, especially where the earliest manifestations of the Aurignacian are concerned: "Given the large number of sites occupied by this civilization since its very earliest moments, and the rich material those sites yielded, it would seem as though, by the beginning of the third stadial of the last glaciation, powerful, organized tribes took possession of the shelters, bringing with them techniques, rites and perhaps artistic fashions, the whole forming a rather elaborated civilization" (Sonneville-Bordes, 1960, p. 150). Although conceived in a different framework, this view is in good agreement with the replacement model.

To sum up, we stress that the Aurignacian sequence of northern Aquitaine is characterized by a rich and relatively old corpus. Although it has undergone various reconstructions, this corpus nowadays serves as the basis for a single model which, in particular, postulates that the Aurignacian is intrusive in the region and that its earliest manifestation is the Early Aurignacian, "I", with split-based sagaie points.

Sites and assemblages analyzed

At all sites — except for Corbiac-Vignoble II, a lithic workshop — each assemblage contains several hundred tools. Only a qualitative description of the industrial features of these industries will be given here, but quantitative data are either published (Bordes, 1998, 2000, 2002, 2003, 2006; Bordes et al., 2005).

1) Caminade-Est

Caminade-Est is a rockshelter excavated between 1953 and 1966 by D. de Sonneville-Bordes, who recognized four Aurignacian levels. At the base, G and F were assigned to the Aurignacian "I" (a split-based point was found in F). Above, D2inf and D2sup were assigned to the Aurignacian "II" (Sonneville-Bordes, 1970). The contents of layer G were qualified as Aurignacian "0" (Delporte, 1964; Djindjian, 1993), on the basis of the presence of an "archaic" component (sidescrapers, denticulates) in the tool assemblage.

Taphonomic analysis (Bordes, 2000) indicates that this "archaic" component results from mixing with the underlying Mousterian levels. Systematic refitting across the Aurignacian sequence has shown that only two independent clusters of objects exist at Caminade-Est (Fig. 2); they correspond to levels F and G, on one hand (Early Aurignacian), and to levels D2inf and D2sup on the other (Recent Aurignacian).

New excavations, carried out between 1999 and 2001 (Bordes and Lenoble, 2001, 2002), confirmed the lithic taphonomy results. Moreover, the full recovery of the lithic objects sieved through a 2 mm mesh allowed further precision on the nature and importance of bladelet tools in the Aurignacian. The rarity of retouched bladelets in the Early Aurignacian, previously recognized at Abri Castanet (Pelegrin, in press) and Grotte des Hyènes, Brassempouy (Bon, 2002), is thus confirmed. Where the Recent Aurignacian is concerned, Caminade is the only Aquitaine site where the material from the sieve was fully recovered; as a result, the percentage of retouched bladelets is exceptionally high (Fig. 3). The large number of such small objects allowed a study of their variability. A new tool-type, the "Caminade bladelet" (the spall from a busked burin featuring direct retouch opposed to an abrupt back) could thus be defined (Fig. 13, nos. 4-6; Bordes and Lenoble, 2002).

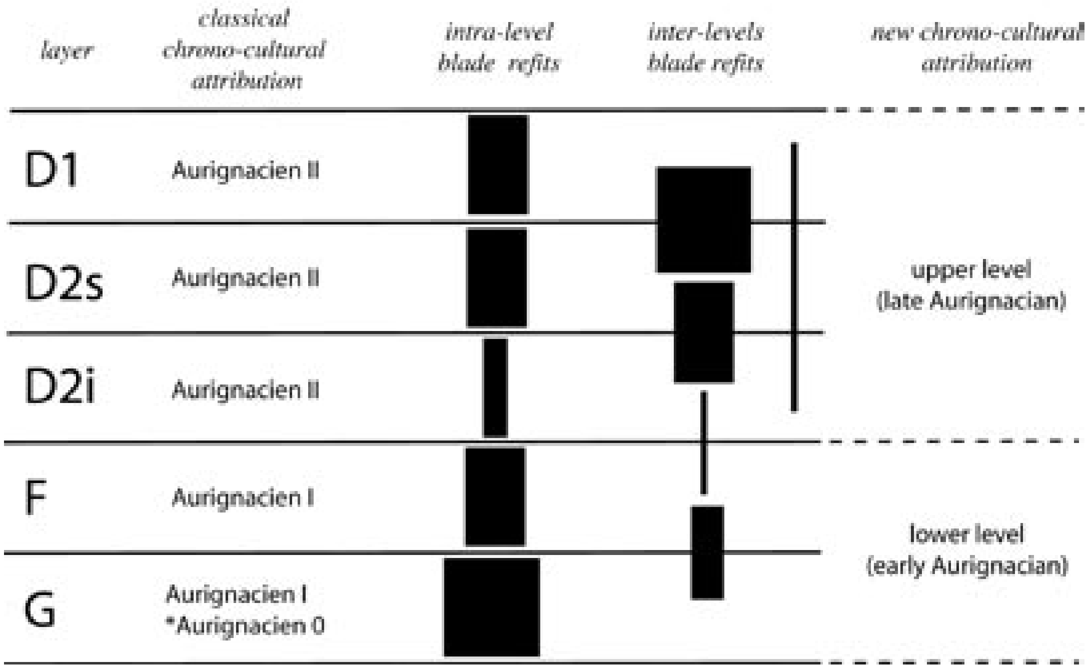

FIG. 2 – Caminade Est. Results from a systematic search for conjoining blade fragments. The width of black rectangles represents the number of conjoins relative to the number of blade fragments considered. Chronocultural attribution is after Sonneville Bordes (1970) or, marked with an asterisk, after Delporte (1964) and Djindjian (1993).

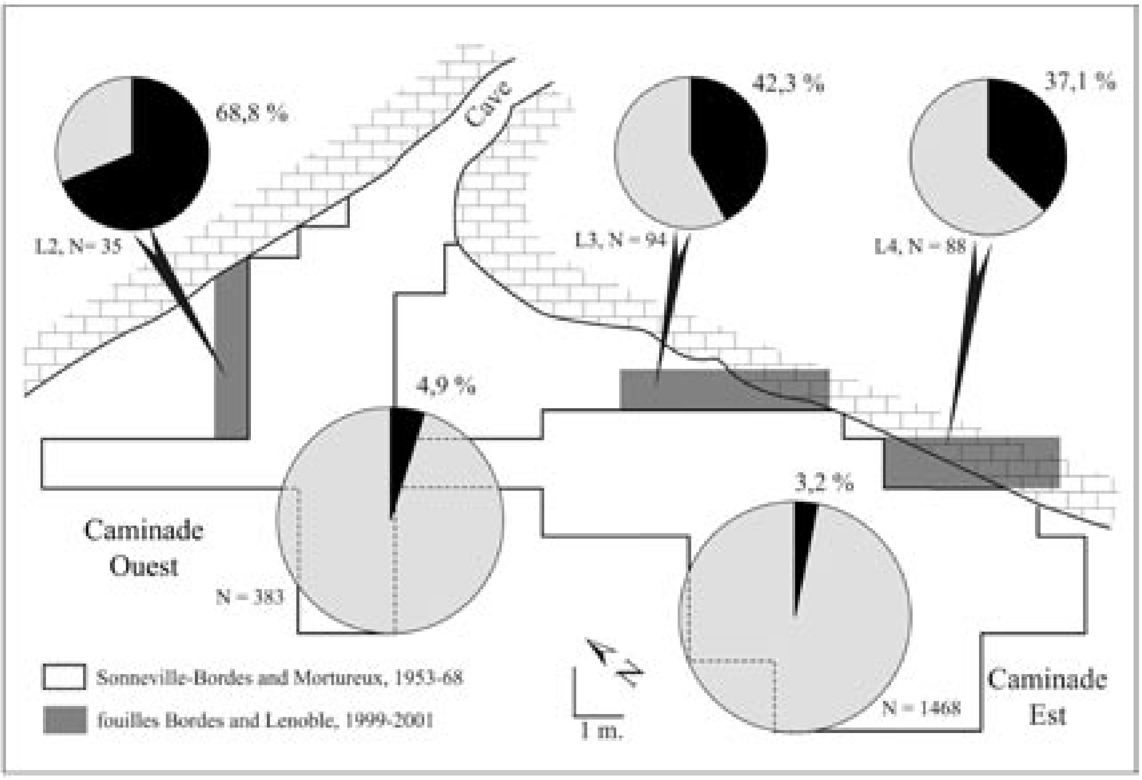

FIG. 3 – Caminade. How excavation method influences the number of retouched bladelets. Bottom: Mortureux and Sonneville-Bordes's excavations (dry sieving with 2 mm mesh, selective sorting); Caminade Ouest, after Sonneville-Bordes (1960), Caminade Est, after Sonneville-Bordes (1970). Top: Bordes and Lenoble's excavations, loci 2, 3 and 4 (wet sieving with 2 mm mesh, exhaustive sorting).

2) Roc-de-Combe

This site is a small cave continuing laterally as a rockshelter, excavated by J. Labrot in 1959, and by F. Bordes in the summer of 1966. Our study concerns the collection from Bordes' work. The archeological sequence is exceptional (Bordes and Labrot, 1967; Sonneville-Bordes, 2003): Mousterian (levels A, B and C), Châtelperronian (level 10), Aurignacian (level 9), Châtelperronian (level 8), Early Aurignacian (level 7), Aurignacian II (level 6), Evolved Aurignacian (level 5), and Gravettian (levels 4-1).

Taphonomic analysis (Bordes, 2002, 2003) has shown that levels 9 and 10 were defined through a post-excavation selection of objects coming from a disturbed part of the site: they are not valid analytical units, as is also the case (the Mousterian excepted) with the entire sequence excavated outside the cave porch. Inside, however, the archeological sequence is well preserved (Fig. 4). Where the Aurignacian is concerned, two main ensembles are clearly distinct: 7 (Early Aurignacian), and 6-5 (Recent Aurignacian). It remains possible that a finer analysis than hitherto undertaken may eventually lead to further refinement of the sequence, and that differences between levels 6 and 5 will become apparent. But it is clear that any such differences will be significantly less important than those separating 7 from 6-5.

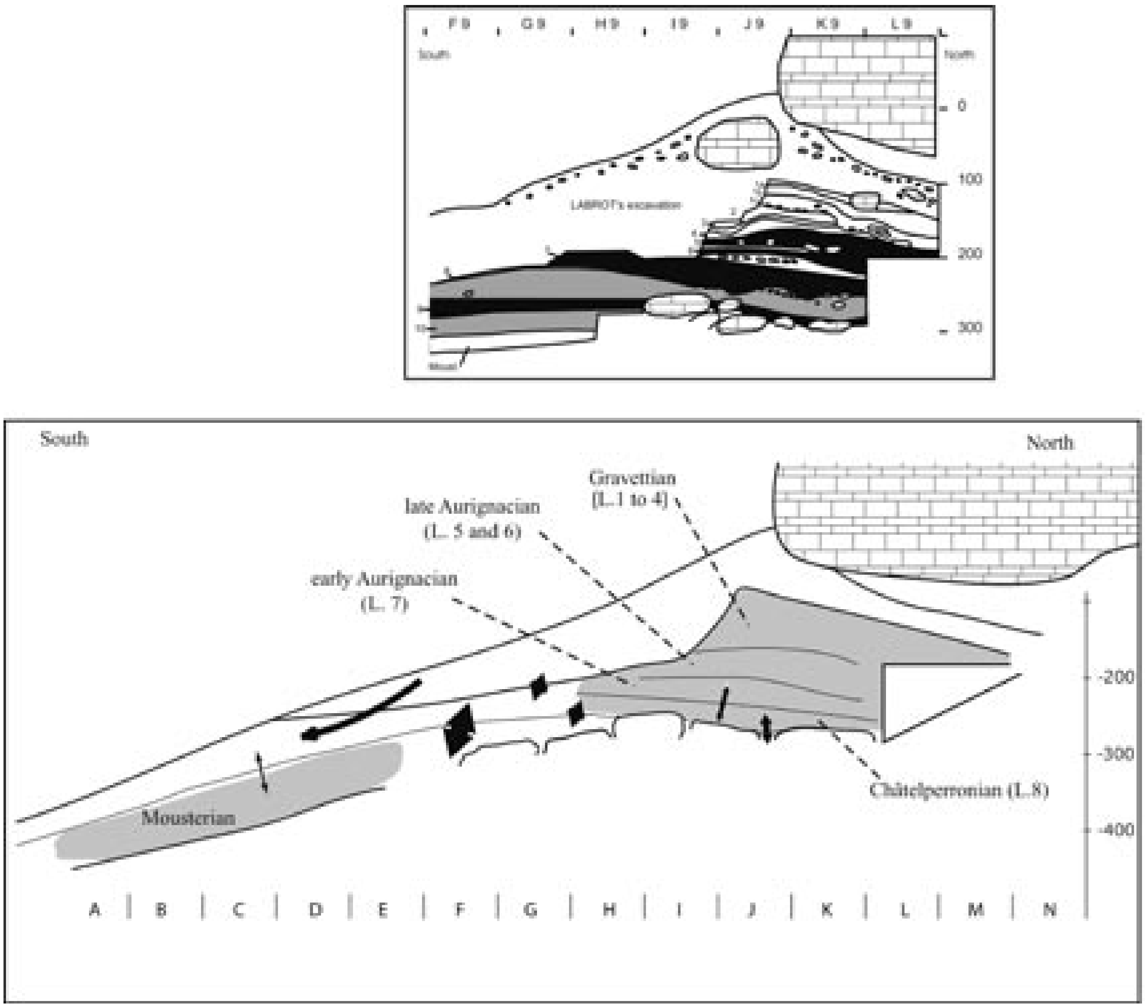

FIG. 4 – Roc-de-Combe, synthetic sagittal projection. Top: the sequence as published by Bordes and Labrot (1967). Bottom: the sequence as inferred from lithic taphonomy analysis (Bordes, 2002); only the assemblages from the areas in gray are valid.

3) Le Piage

Le Piage is situated at the foot of a cliff. It was excavated by F. Champagne and R. Espitalié between 1954 and 1968 (Champagne and Espitalié, 1967, 1981), and yielded a sequence composed, from bottom to top, of three Aurignacian I levels (K, J and GI), a Châtelperronian level (F1), and an Aurignacian level (F), plus a mix of Solutrense and Badegoule (CDE).

Taphonomic analysis (Bordes, 2002, 2003) — refitting studies coupled with spatial analysis of the distribution of diagnostic pieces — led to a different interpretation of this sequence (Fig. 5). In the northern part of the site, where F1 had been defined, all levels are mixed and probably relate to redeposition by gravity of deposits originally accumulated in a rockshelter located above the excavated site; moreover, there is no stratigraphic continuity with the southern part. In the latter, the basal deposits are remnants of Mousterian (of Acheulian tradition) and Châtelperronian; above, two Aurignacian levels can be differentiated. Originally, these levels were on a slope, but this was not perceived at the time of excavation, leading to their artificial admixture. In order to minimize the impact of this problem, the material from intermediate level J was excluded from the analyses, which dealt only with levels K (whose chronological and cultural affinities will be discussed below) and GI (Early Aurignacian) of the southern part of the site. The nature of the data preventing any finer analytical resolution (because all objects are provenienced by square and level only), residual contaminations cannot be excluded. New excavation work, scheduled for 2004, will hopefully clarify remaining uncertainties.

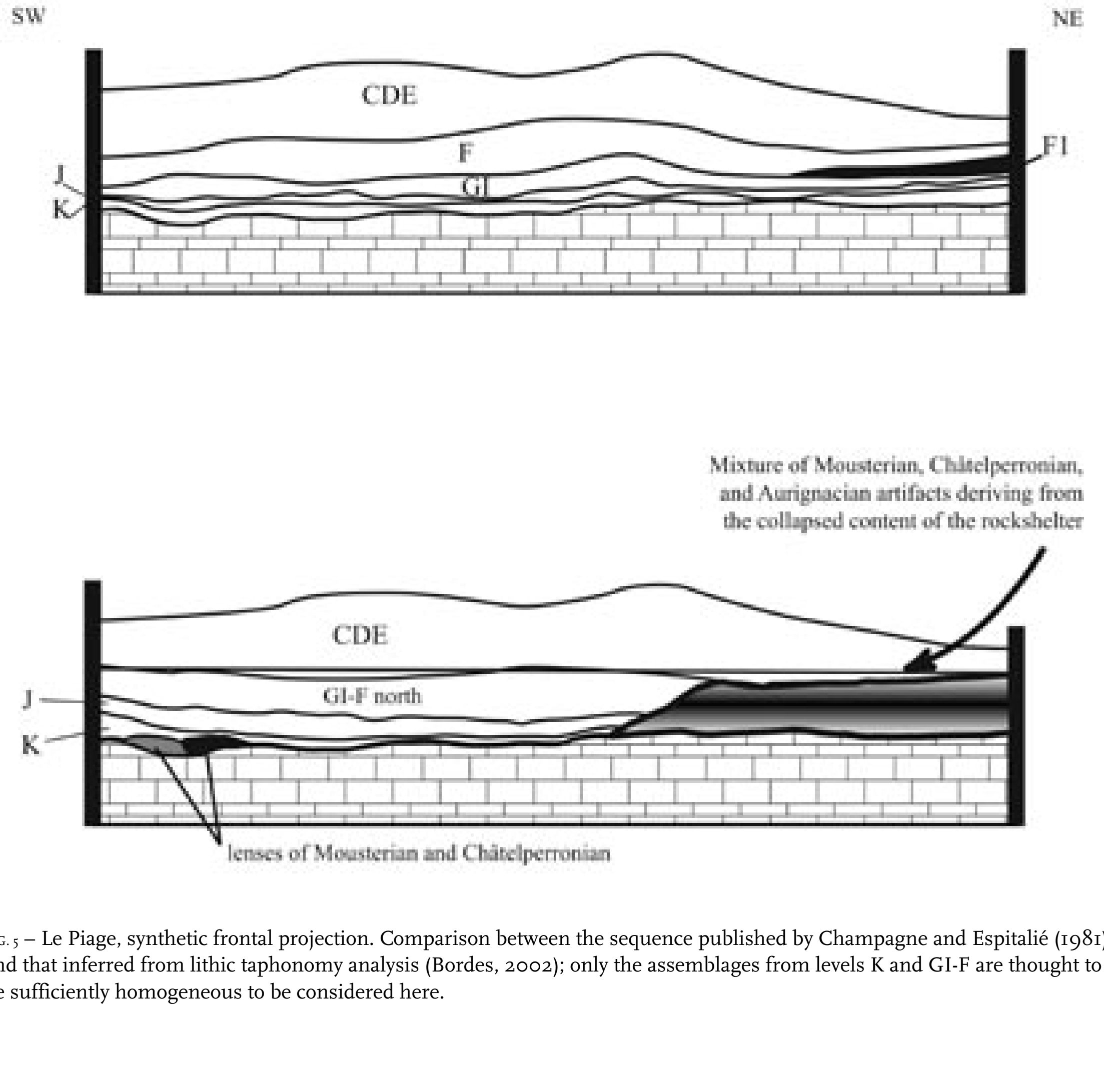

FIG. 5 – Le Piage, synthetic frontal projection. Comparison between the sequence published by Champagne and Espitalié (1981) and that inferred from lithic taphonomy analysis (Bordes, 2002); only the assemblages from levels K and GI-F are thought to be sufficiently homogeneous to be considered here.

4) Corbiac-Vignoble II

This is an open air site in the Bergerac region, excavated by J. Tixier between 1987 and 1989. It is located close to a source of excellent lithic raw-material, available in large amounts. A first technological analysis showed that the site was a workshop for the production of blades and bladelets, attributed to the Aurignacian (Tixier and Reduron, 1991).

Ongoing and unfinished taphonomical analysis shows evident spatial structuration (Fig. 6), a large number of refits (>1000 already), and a very high degree of homogeneity of the lithic assemblage (no other remains are preserved), suggesting instantaneous occupation. The type of bladelet production unquestionably places this site in the Early Aurignacian. The ideal nature of the raw-material and the numerous refits make it possible to describe with great precision the fully expressed aims and modalities of the debitage.

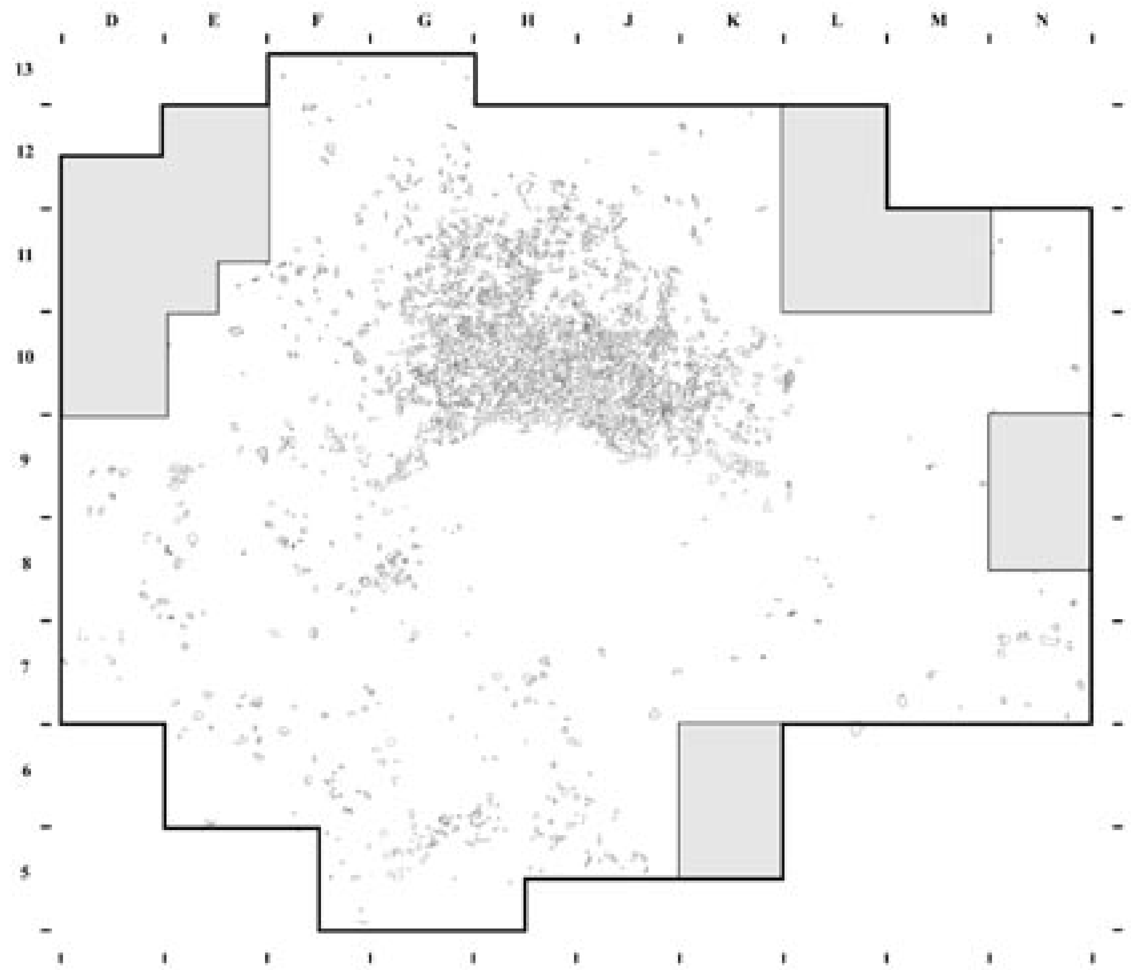

FIG. 6 – Corbiac-Vignoble II, excavation plan (excavation units are 1 m).

Development: the northern Aquitaine sequence

On the basis of their relative stratigraphic position and of their typo-technological characteristics, three types of Aurignacian assemblages can be distinguished. Because of its significant typo-technological homogeneity, the Early Aurignacian is the key of this structuration. In the region, it is represented by the material from Corbiac-Vignoble II and by levels FG of Caminade-Est, GI-F of Le Piage, and 7 of Roc-de-Combe. Levels D2 of Caminade-Est and 6-5 of Roc-de-Combe overlie Early Aurignacian deposits and also contain rather homogeneous collections, which we designate as Recent Aurignacian. Underlying the Early Aurignacian is the material from level K of Le Piage, which, at present, has no equivalent in the region. Its affinities must be discussed in the context of a description of this material; for the moment, we will call it Aurignacian "pre-I".

The Early Aurignacian

This is the most common and better known aspect of the Aquitainian Aurignacian. A strong identity in the intentions and modalities of blade and bladelet production is apparent from site to site. The "ideal" blade (i.e., that which will be used as a tool blank) is large and, above all, wide and thick; its profile is in general curbed, and extensions of cortex often remain. Pre-forming of cores tends to be minimal: crests are rather uncommon, and not well made. The single striking platform is rejuvenated through the removal of thick core tablets. The re-

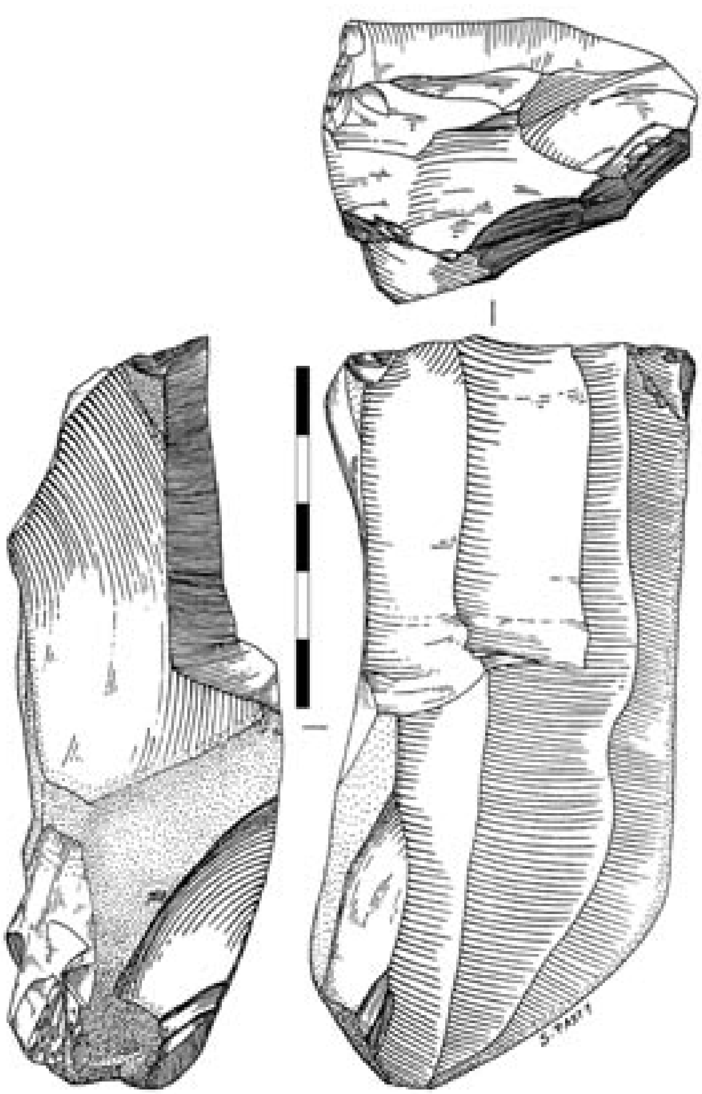

FIG. 7 – Caminade Est. Blade core from the Early Aurignacian.

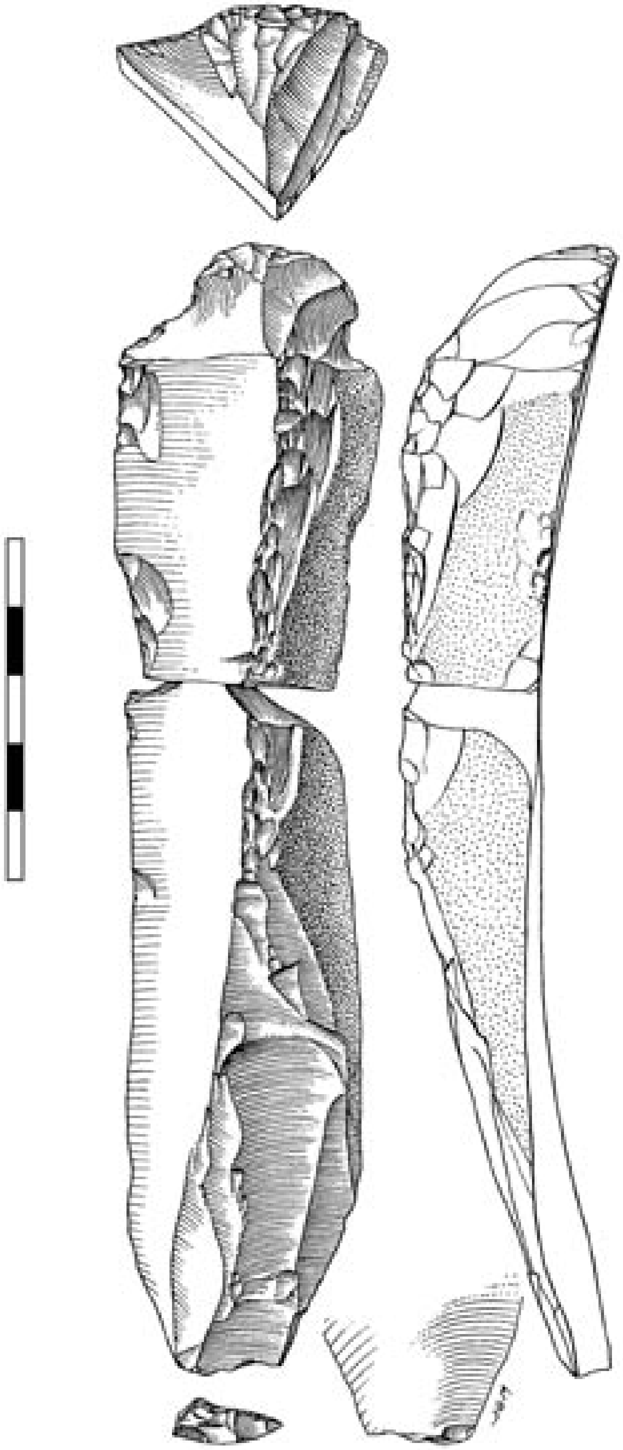

FIG. 8 – Corbiac-Vignoble II. Bladelet core from the Early Aurignacian ("carinated scraper").

moval of blades is always effected through direct soft hammer percussion, using an organic hammer, and is carefully prepared: facetted or spur butts predominate (Figs. 7 and 9).

Debitage is controlled throughout by the removal of large laminar flakes at the intersection between the edges of the core and the flaking surface, or by crests unilaterally prepared from the side of the flaking surface (Fig. 9). The size of blade cores does not vary with raw-material: blade production stops as soon as the length falls below 8-10 cm, at which

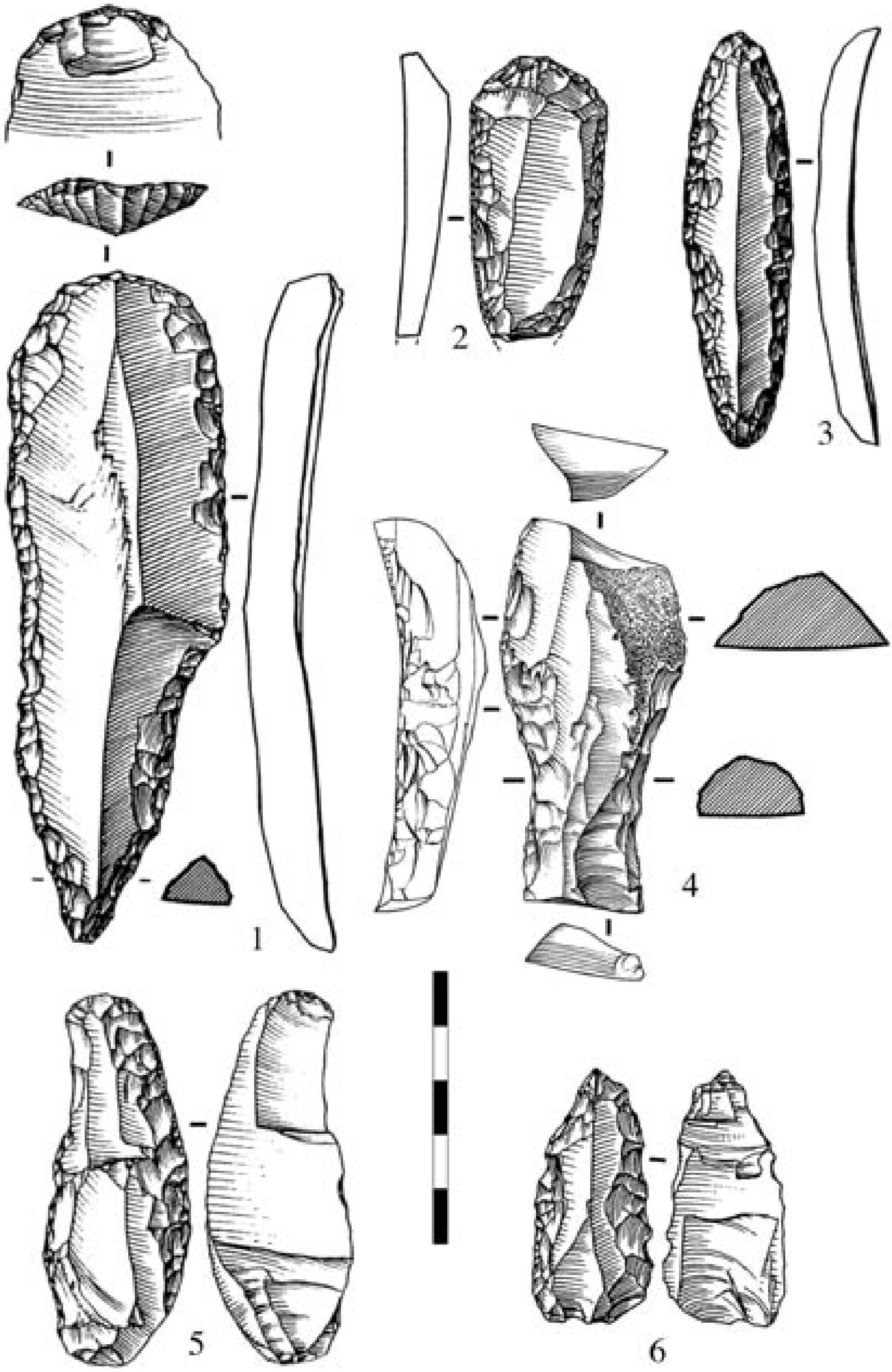

FIG. 9 – Early Aurignacian, blade tools. 1. endscraper on blade with Aurignacian retouch, splintered front; 2. endscraper on blade with Aurignacian retouch; 3. double endscraper on blade with Aurignacian retouch; 4. medial fragment of strangled blade; 5-6. splintered pieces on retouched blades. 1, 3, 5. Caminade Est, by P. Laurent, in Sonneville-Bordes (1970); 2, 6. Roc de Combe, by P. Laurent in Sonneville-Bordes (2002); 4. Corbiac-Vignoble II, by J.-G. Marcillaud.

time the width of blanks is of 2-3 cm (Fig. 7). Blade cores are rare at sites where tools are numerous. This fact can be explained, on one hand, by the eventual "destruction" of most cores in a last production stage where flakes are extracted with no apparent purpose, and, on the other, by a production of blades away from the settlement. Tools on blades are for the most part endscrapers and laterally retouched pieces (Fig. 9). More often than not, the size of the blanks is severely reduced through successive episodes of retouch, and the same blank may also go through different typological stages in the course of its technical life time (Fig. 9).

Bladelets are produced from cores made on flakes reduced along their thickness, traditionally called "carinated scrapers"; as in blade production, only direct soft hammer percussion, using an organic hammer, is used. Such cores feature a wide front and centripetal bladelet removals, organized symmetrically around the morphological axis of the core (Fig. 8), betraying an intention to produce bladelets indifferently straight or curved, but never twisted. Their length varies between to 2 and 4 cm, on average, and they are seldom retouched. When such is the case, retouch (semi-abrupt and marginal) tends to be inverse on the right edge (Fig. 10).

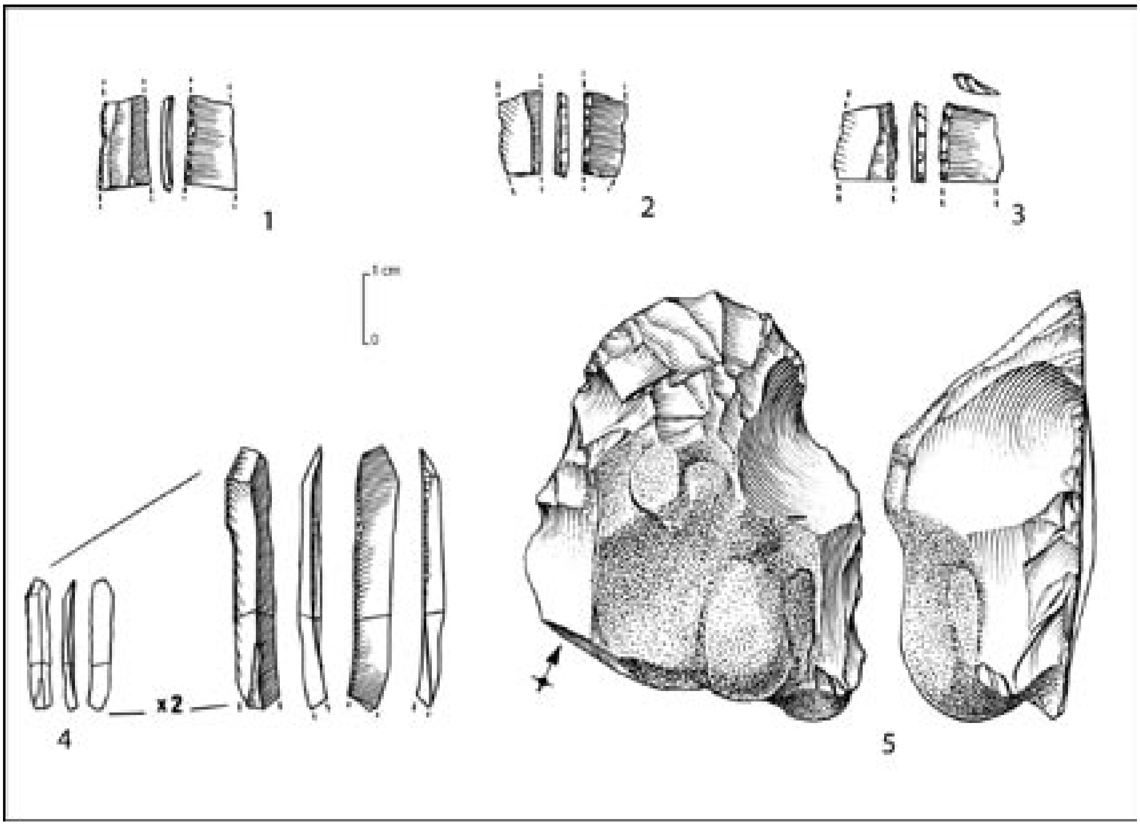

FIG. 10 – Bladelet production in the Early Aurignacian. 1-4. Dufour bladelets (no. 3 is truncated); 5. core for non-twisted bladelets of the "carinated scraper" type. 1-3, 5. Caminade Est; 4. Corbiac-Vignoble II. Drawings by J.-G. Marcillaud.

The variety and importance of non-local raw-materials are traditionally observed characteristics of this phase of the Aurignacian (e.g. Demars, 1994). The recent identification of material coming from the northern Pyrenees and the Charentes in a number of these sites (Fig. 11) carries the implication that traditional views of the mobility of these groups have to be considerably revised (Bordes et al., 2005).

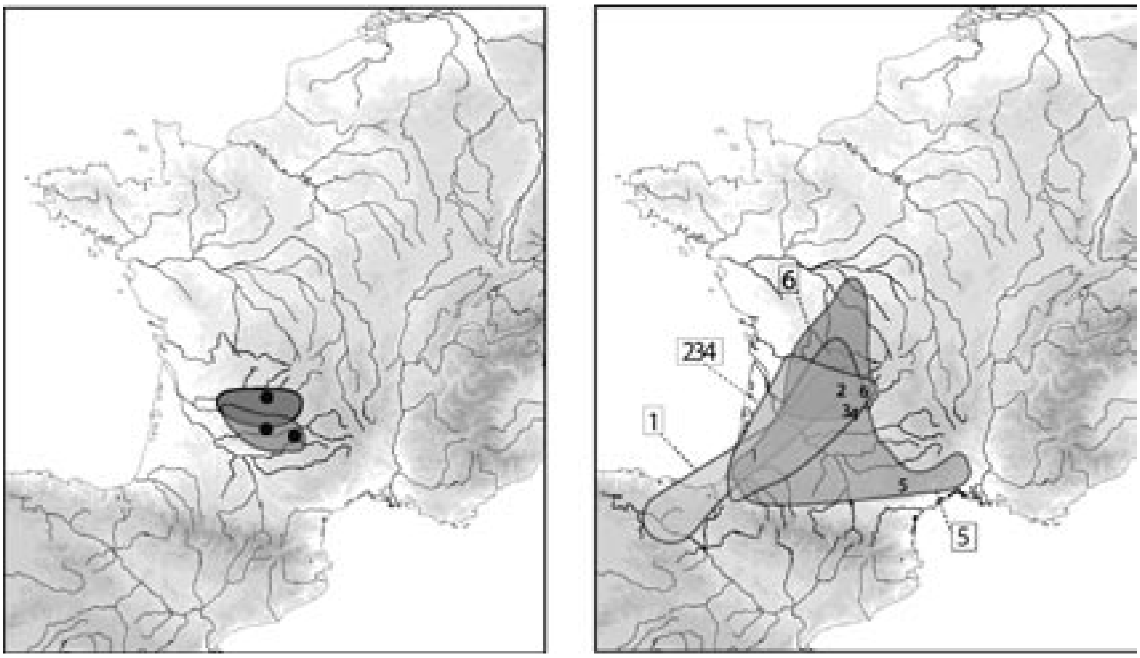

FIG. 11 – Lithic raw-material circulation in the Early Aurignacian of southwest France. Left: summary of previous results after, Féblot-Augustin (1997). Right: summary based recent analysis of the sites of Brassempouy (1), Caminade (2), Roc-de-Combe (3), Le Piage (4), Régismont-le-Haut (5) and Dufour (6), after Bordes et al. (2005). Framed numbers denote the lithic procurement territories of the different sites.

The typo-technological and economic variability of these series is low. It relates for the most part to variation in the relative frequencies of certain tool-types (especially splintered pieces and burins), to which no satisfactory explanation has yet been proposed.

In sum, it would seem that the very strong technical unity of this phase of the Aurignacian is related to extensive circulation of objects (and people?) and to a marked segmentation of lithic production systems (*chaînes opératoires*). These results also suggest an important pre-determination of raw-material management, and possibly indicate a great stability in the socio-economic organization of human groups of this key moment of the Aurignacian of northern Aquitaine.

The Recent Aurignacian

Although often recognized, this phase of the Aurignacian is less well defined than the Early Aurignacian. The number of sequences containing post-Early Aurignacian levels is relatively small, and inter-site variability seems higher, at least where the terminal episodes of the Aurignacian at La Ferrassie (Delporte, 1984) and at Pataud (Chiotti, 1999) are concerned. In a first approach to the collections, the contents of levels D2 of Caminade-Est and 6-5 of Roc-de-Combe were considered together, given their numerous shared features. It remains possible that this classification will be refined by further, more detailed analysis.

Recent Aurignacian blade production is close to that described for the Early Aurignacian (Fig. 12). The main differences relate to its representation in the lithic production system as a whole, particularly in relation to the importance of bladelet production. By comparison with the Early Aurignacian, there are fewer tools on blades, and a large part of the "tool assemblage" corresponds in fact to bladelet cores made on flakes or laminar flakes. Tools are dominated by endscrapers and burins (Fig. 12). Pieces bearing lateral retouch in general, and "Aurignacian retouch" in particular, are less common than in the Early Aurignacian.

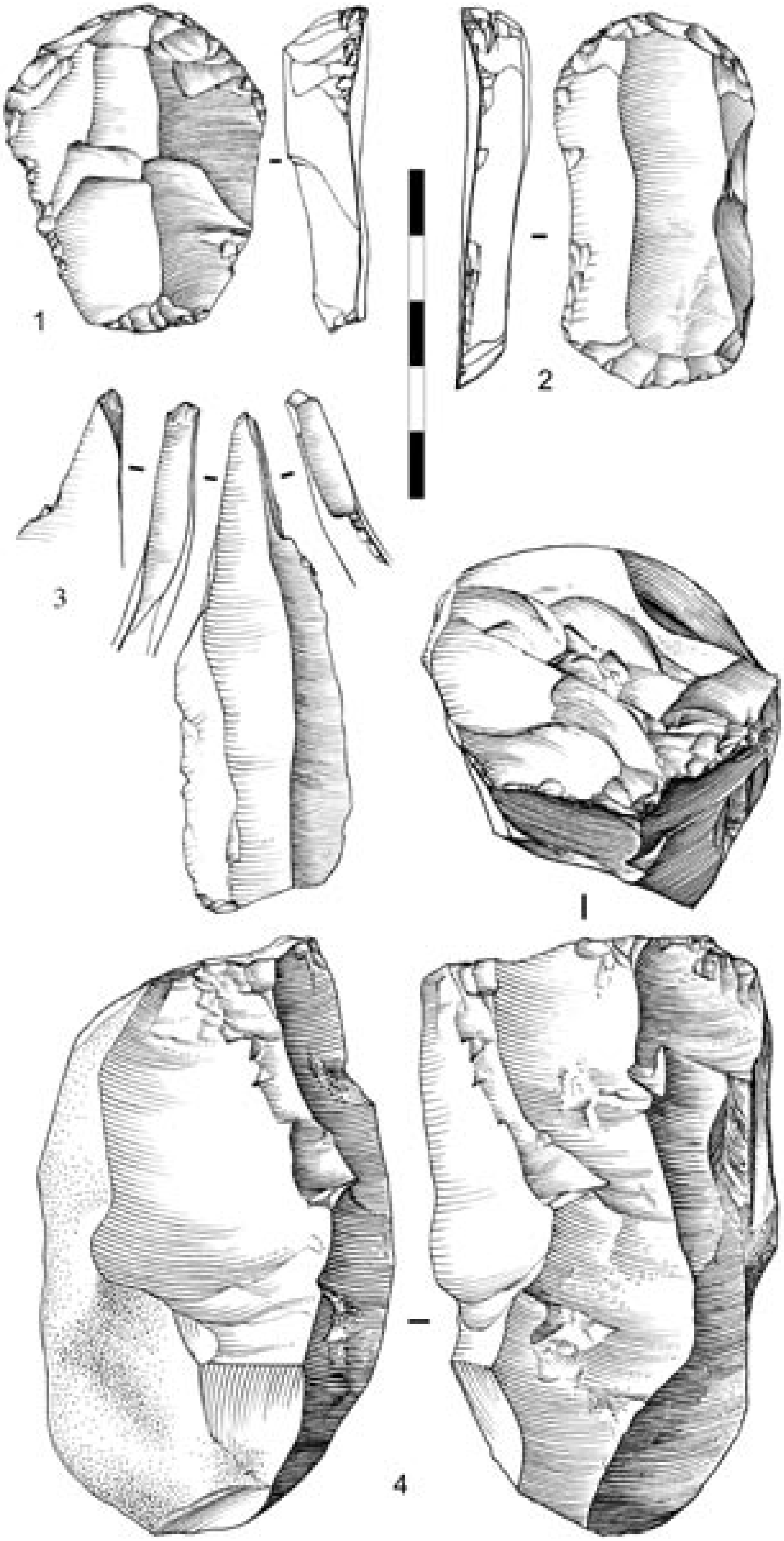

FIG. 12 – Caminade Est. Recent Aurignacian blade tools and blade production. 1. Simple endscraper; 2. Double endscraper; 3. Dihedral burin; 4. Blade core. Drawings by J.-G. Marcillaud.

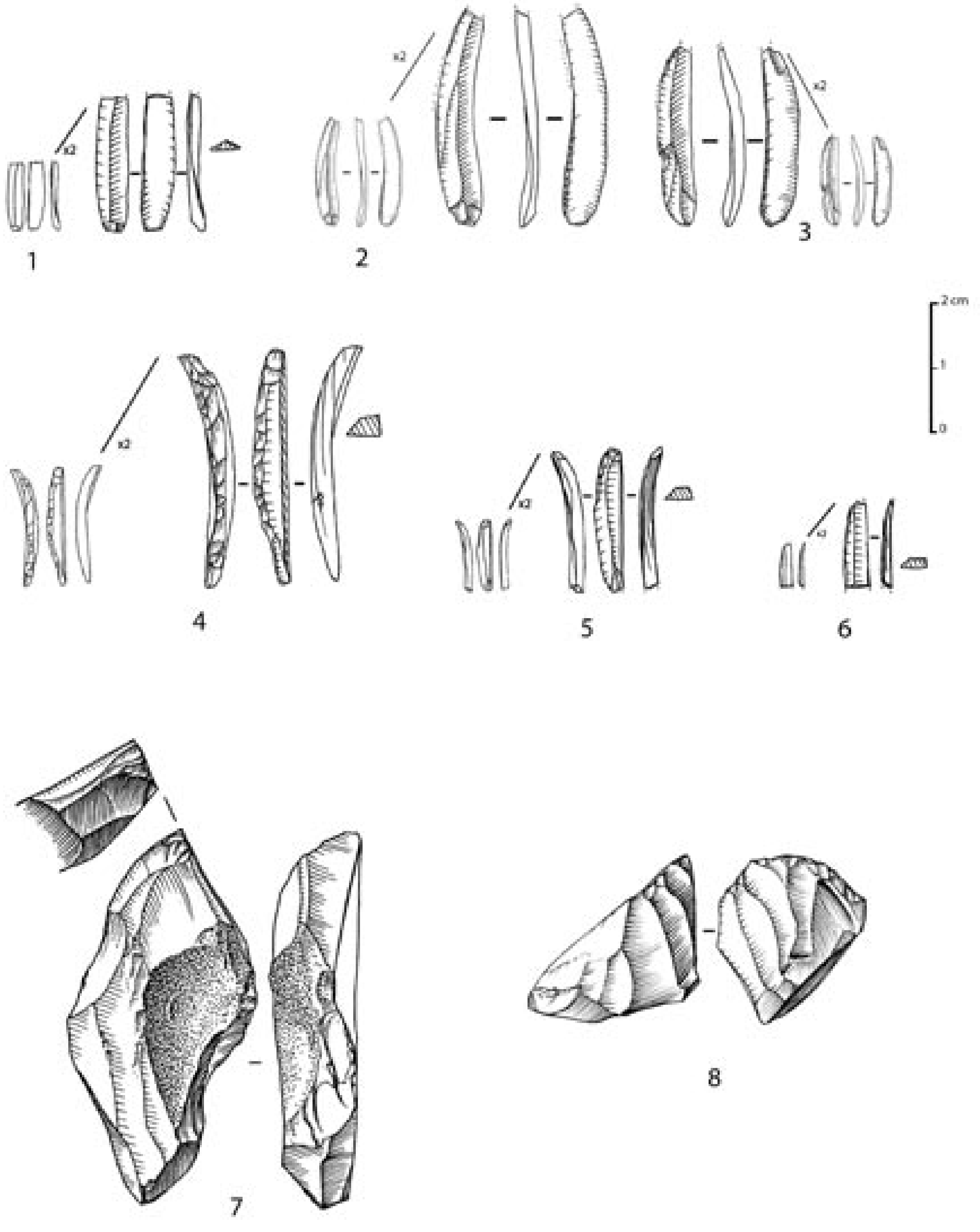

FIG. 13 – Caminade Est. Bladelet production of the Recent Aurignacian. 1-3: Dufour bladelets of the Roc-de-Combe subtype; 4-6. Caminade bladelets; 7. bladelet core of the "busked burin" type (in this case, double); 8. core for twisted blades of the "nosed scraper" type. Drawings by J.-G. Bordes (1-6) and J.-G. Marcillaud (7-8).

The main difference between the Recent and the Early Aurignacian concerns the goals and procedures involved in bladelet production. Bladelets are extracted from cores made on flakes, blades and laminar flakes; traditionally, such cores have been classified as "nosed scrapers" and "busked burins". "Nosed scrapers" differ from "carinated scrapers" in the nature of the intended products, which are very standardized in size, and twisted. In order to obtain this morphology, debitage follows very strict procedures, which translate into a marked lateralization of the flaking surface relative to the morphological axis of the "nose" (Fig. 13, no. 8). These twisted bladelets often bear retouch, which is inverse (on the right) or alternate (in which case the inverse retouch is still always on the right); they are called Dufour bladelets of the Roc-de--Combe subtype (Fig. 13, nos. 1-3; Demars and Laurent, 1989). Busked burins produce the same kinds of twisted bladelets. They also produce curbed or twisted bladelets with a natural back. When retouched on the opposite side, retouch of the latter is always direct; we have proposed for these pieces the designation of Caminade bladelets (Fig. 13, nos. 4-6).

Conclusions on the classical sequence

The classical, bipartite sequence of the Aquitainian Aurignacian is confirmed, with both episodes sharing a number of features justifying their treatment as part of a single technocomplex:

- Blades and bladelets are removed through direct, soft hammer percussion and make up the overwhelming majority of tool blanks.
- Blade production is very similar in both goals and procedures.
- Blade and bladelet productions are independent, carried out on different cores and clearly discontinuous in terms of the sizes of intended products.

On the other hand, these two episodes are clearly distinct in that:

- Bladelet production has different goals and follows different procedures, with the Early Aurignacian featuring mid-sized, straight or curbed, rarely retouched bladelets, and the Recent Aurignacian featuring often retouched, twisted bladelets (Dufour bladelets of the Roc-de-Combe subtype), as well as burin spalls with direct retouch.
- The importance of bladelet production relative to blade production increases in the Recent Aurignacian.
- The importance of lateral retouch, and especially of "Aurignacian retouch", decreases in the Recent Aurignacian.
- In all studied sites, the Recent Aurignacian unquestionably overlies the Early Aurignacian; moreover, no indication exists of a gradual transformation of one into the other that cannot be explained as a result of level mixing.

Le Piage level K: an industry stratigraphically and technologically intermediate between the Châtelperronian and the Early Aurignacian

Level K of Le Piage underlies level GI, which contains a rich Early Aurignacian assemblage (>3000 tools). Two components can be distinguished in the industry from level K. The first such component is identical to that in level GI. It is at present impossible to assess whether this minority component represents a true cultural feature of the industry in level K or whether it represents evidence of mixing with material from the overlying deposits.

The second component is characterized by the production of slender blades, i.e., blades which, for a similar width, are significantly thinner than those of the Early Aurignacian. Such blades are extracted from cores indifferently set up on blocks or on flakes, but always with unfacetted striking platforms (Fig. 16); regardless of blank type, blade and bladelet productions are continuous. Blade- and bladelet-sized blanks are often retouched, whereas blanks of intermediate size tend to bear only use wear (Fig. 14). Burins and endscrapers are the most common tools on blades (Fig. 15). Lateral retouch is rare, and "Aurignacian retouch" virtually absent. Retouched bladelets are extracted from the same cores as the blades, either intercalated or in succession (Fig. 16, no. 1). There are also many cores from which only bladelets were produced: these can be on block (they are then prismatic cores, as in Fig. 16, no. 1) or on flake, in which case debitage proceeds along the edge of the blank (they are then, typologically, "nucleiform burins", as in Fig. 16, nos. 2-3). Size variation in retouched bladelets (>20% of the tool assemblage) is quite significant but, morphologically, they are all curbed or straight, never twisted.

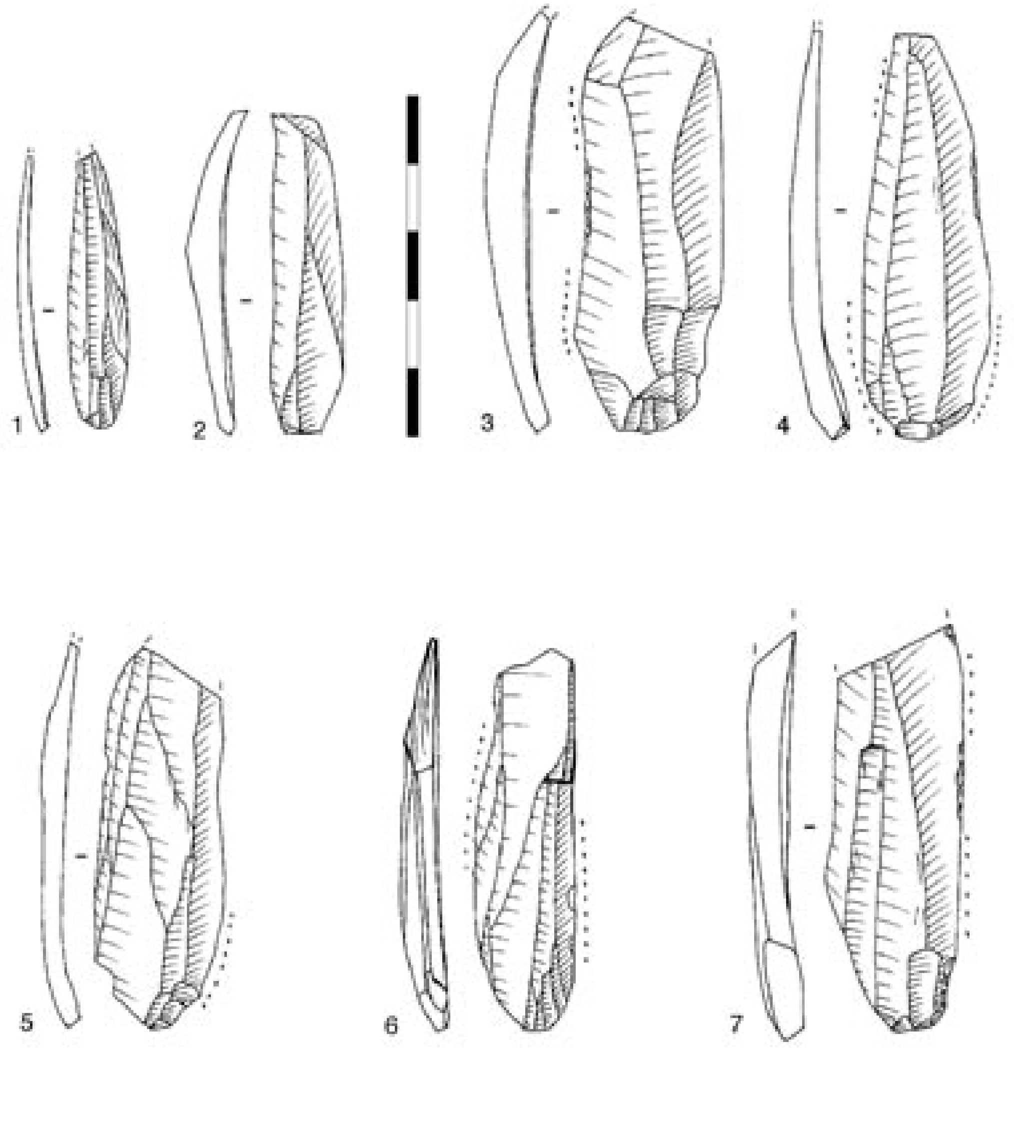

FIG. 14 – Le Piage level K. Blanks of intermediate size between blades and bladelets often exhibit use wear. The ventral surface of the flake whence it was extracted is still visible on no. 6. Butts are systematically unfaceted.

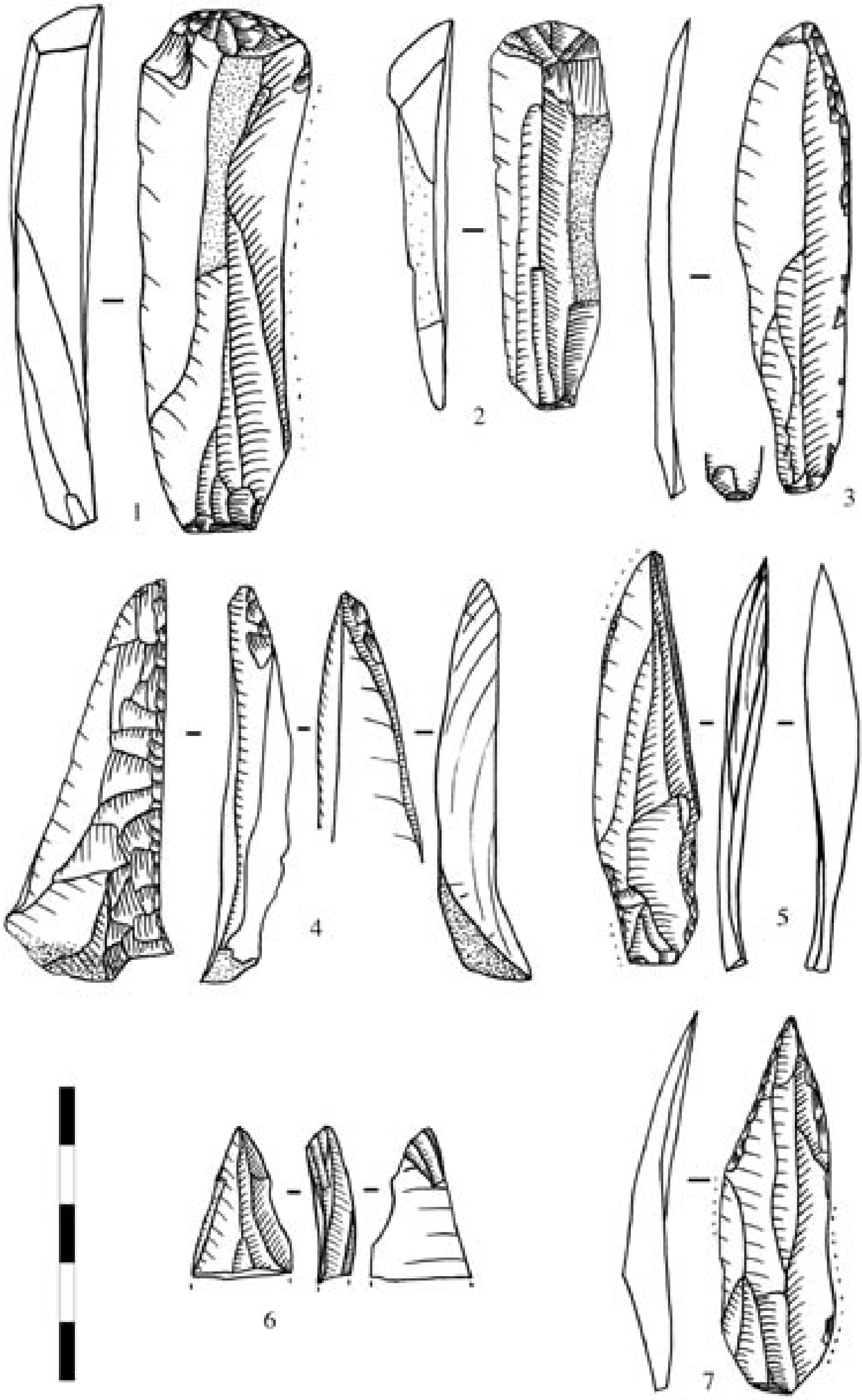

FIG. 15 – Le Piage level K. Endscrapers (1-2), burins (4, 6), retouched blades (3, 5), and pointed blade (7). Butts are systematically unfaceted. The ventral surfaces of the flakes whence they were extracted are still visible on nos. 4-5.

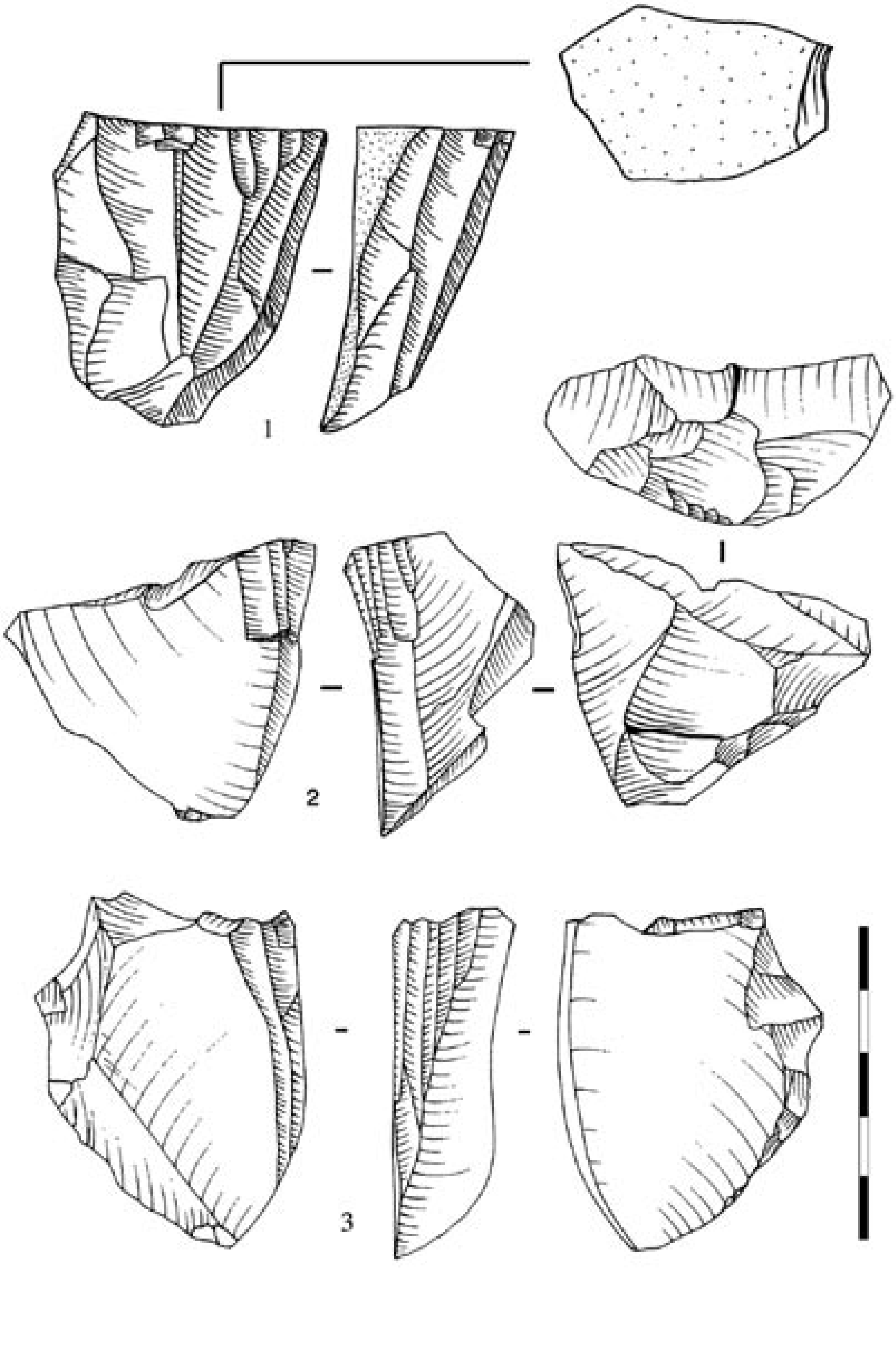

FIG. 16 – Le Piage level K. 1. Prismatic bladelet core; 2-3. Prismatic bladelet core on flake edge.

A first evaluation of Le Piage level K: some comparisons

When compared with the Aurignacian of northern Aquitaine, and leaving aside the issue of the presence of an Early Aurignacian component (robust blades, "Aurignacian retouch", "carinated scrapers") that may relate to level mixing, the industry from Le Piage level K shows both similarities and differences. The features of bladelet retouch (mostly inverse, in which case always on the right side, often alternate, marginal and semi-abrupt; Fig. 17) strongly evoke the Aurignacian tradition. In contrast, the continuity in blade and bladelet production as well as the rarity of lateral retouch and of platform faceting in blade cores are technical traits that separate this industry from the regional Aurignacian.

A wider comparison, both synchronically and diachronically, brings to light the following two points:

- There is a great level of affinity with the so-called "Archaic" Aurignacian of Mediterranean regions (cf. Bon, 2002, for a synthesis), as defined at sites in southeast France (Bazile and Sicard, 1999), northeast Spain (l'Arbreda) and northern Italy (Mochi rock-shelter, Fumane), and also known at Arcy-sur-Cure (Schmider et al., 2002), and Isturitz (Normand, in press). If level K of Le Piage is indeed similar to these assemblages, then Le Piage is at present the only site featuring the stratigraphic succession of "Archaic" Aurignacian and Early Aurignacian.
- The techno-economic characteristics of Le Piage level K — size and straightness of the intended products, continuity of blade and bladelet production, debitage guided along the edges of flakes (Fig. 18) — have parallels in the Châtelperronian (Pelegrin, 1995):

The identification of this industry thus questions, on one hand, the commonly assumed homogeneity of the earliest phases of the Aurignacian, and, on the other hand, the generally accepted notion that the Châtelperronian and the Aurignacian are separated by a marked break.

Preliminary conclusions

This report is a first summary of current research on the Aurignacian of Aquitaine. Results are preliminary and should not be generalized to the Aurignacian as a whole. However, in a wider framework, they support the following points:

1. As often suggested in the past (Sonneville-Bordes, 1960), the typo-technological variability of Aurignacian industries in northern Aquitaine is for the most part diachronic. It is thus legitimate to talk about a regional Aurignacian sequence. Three main episodes can at present be distinguished: the Recent Aurignacian, the Early Aurignacian, and the "pre-I" Aurignacian.

2. This latter industry, so far known only at Le Piage, presents similarities with both the Early Aurignacian and the Châtelperronian of the region. This observation, based on preliminary comparisons that need to be further developed, leads us to question the reality of the break so often postulated between the Châtelperronian and the Aurignacian. Consequently, we propose that the replacement model is not that which best explains the northern Aquitaine evidence.

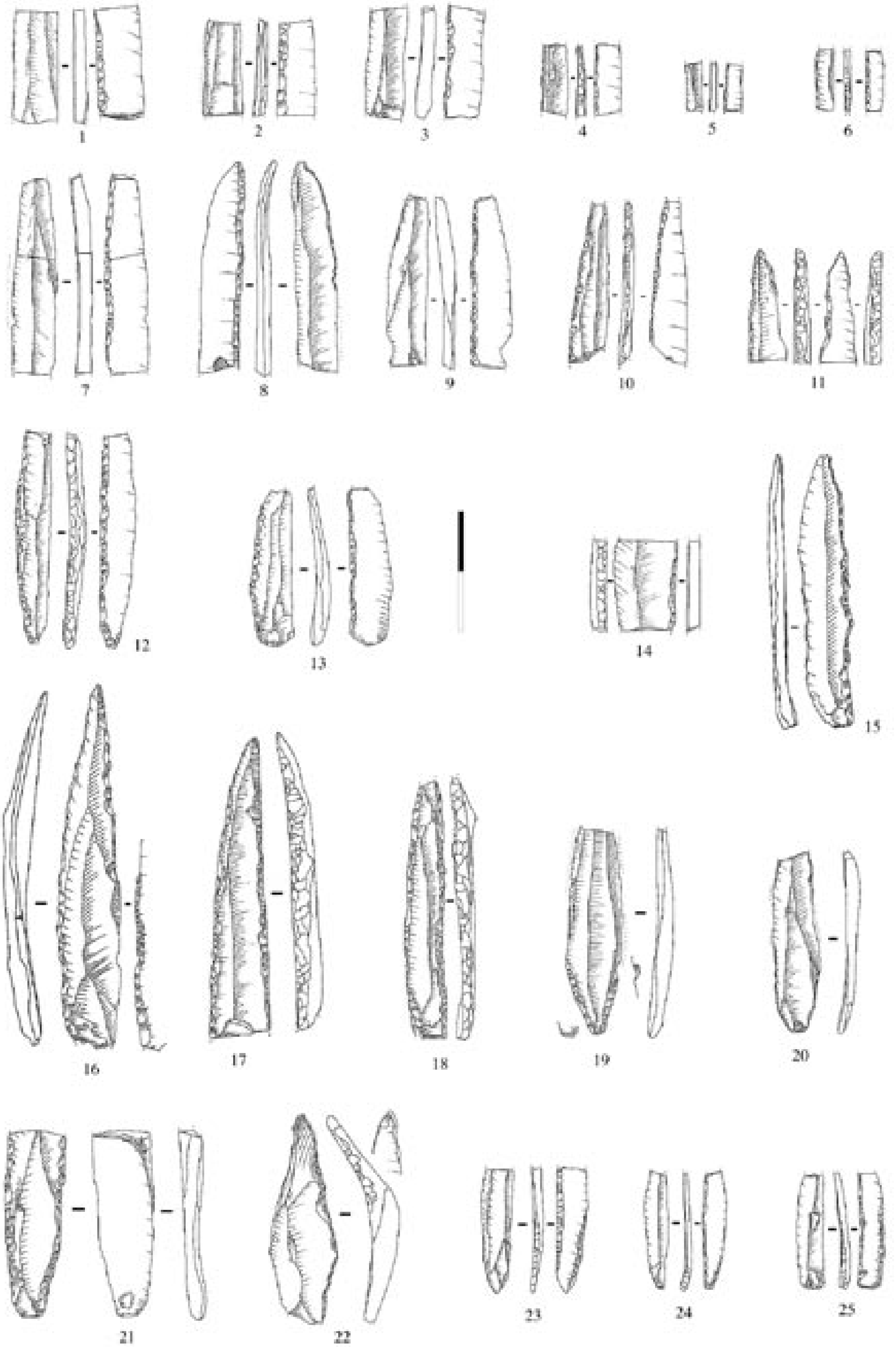

FIG. 17 – Le Piage level K. 1-13. Dufour bladelets; 14-15. Bladelets with unilateral abrupt retouch; 16-22. Bladelets with bilateral direct retouch (Font-Yves bladelets); 23-25. Bladelets with bilateral inverse retouch.

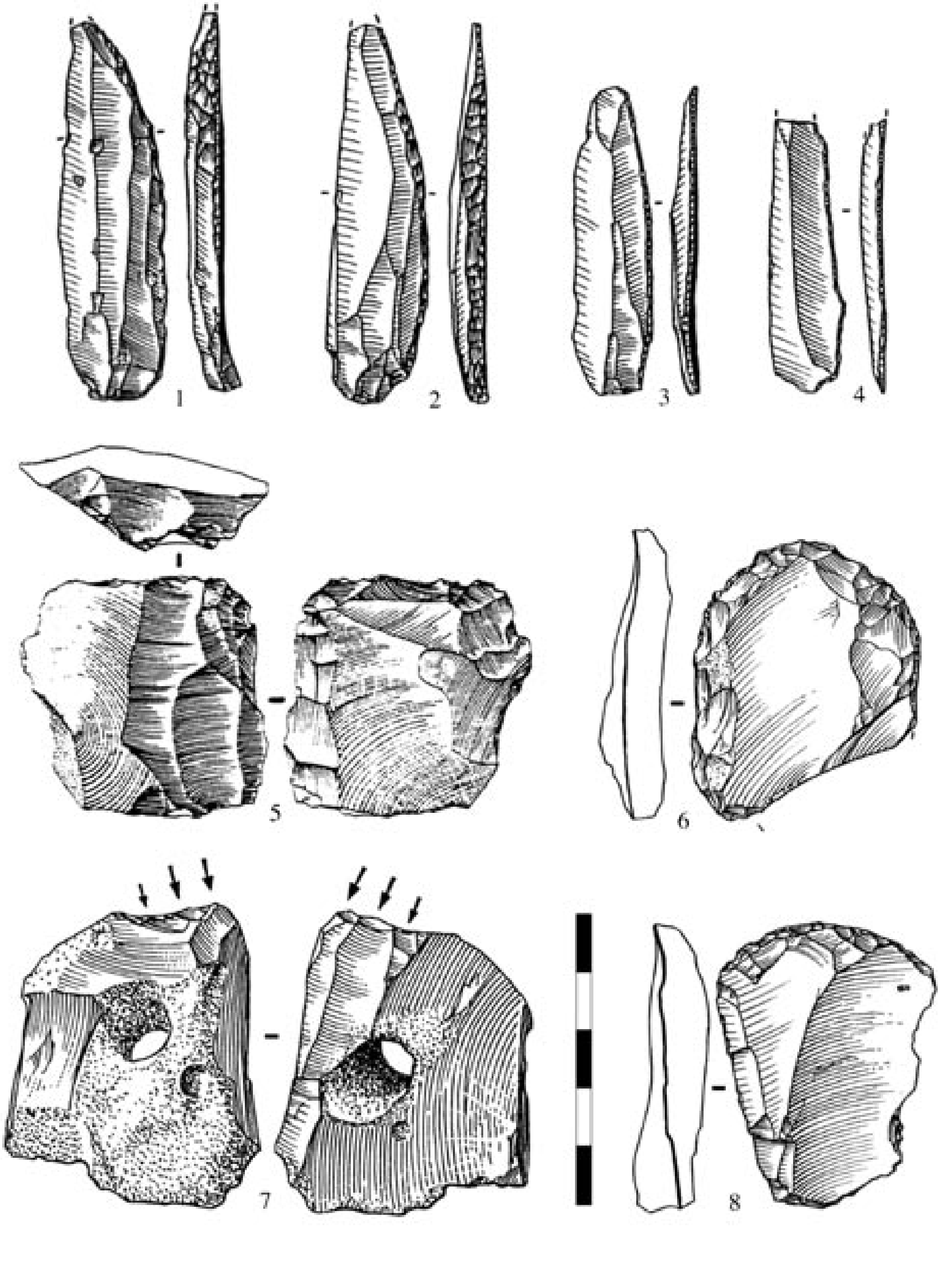

FIG. 18 – Roc-de-Combe level 8, Châtelperronian. 1-4. Châtelperron points; 5, 7. Blade cores on flake edge and flake ventral surface; 6, 8. Endscrapers on flake.

3. Outside Aquitaine, the circum-Mediterranean Proto-Aurignacian is the industry closest to Le Piage level K. More specifically, the production of large numbers of bladelets with a straight profile seems to be characteristic of the first manifestations of the Upper Paleolithic from the Atlantic façade to the Levant (Gorring-Morris and Belfer-Cohen, 2003; Ploux and Soriano, 2003) and the wider Near East (Olszewski, 2001; Bordes and Shidrang, 2004).

4. The rather marked techno-economical homogeneity of typical Early Aurignacian assemblages is largely confirmed. The important circulation of flint items in this period suggests that such homogeneity is the product of the widespread mobility and circulation of both people and ideas. It remains nonetheless important to note that these kinds of assemblages remain absent, or rare, in the southern fringe of the distribution of Aurignacian sites *sensu lato*.

5. Finally, the Evolved Aurignacian is mostly characterized by the production of twisted bladelets. The geographical extension of this facies is as considerable as in the basal Proto-Aurignacian/Ahmarian/Baradostian phase (idem). Beyond the variability in the methods used to produce those twisted bladelets, the fact remains that their morphology, size and types of modification by retouch are remarkably standardized at the scale of this immense space. It would seem, therefore, that diffusion more than convergence must explain the phenomenon, which, given availbale dates, seems to appear first in the eastern reaches of the distribution of the Aurignacian.

These results show how productive and necessary it can be to re-evaluate the key sequences from the beginning of the Upper Paleolithic, in order to achieve a better understanding of the forces underlying its emergence.

Acknowledgments

I am grateful to the *Service Archéologique Départemental de la Dordogne* for the illustrations by J.-G. Marcillaud. This paper is dedicated to those who excavated the sites upon which the research reported here was based: Denise de Sonneville-Bordes, François Bordes, Jean Labrot, Fernand Champagne, René Espitalié and Jacques Tixier.

REFERENCES

BAR-YOSEF, O. (2000) - The Middle and Early Upper Palaeolithic in Southwest Asia and neighboring regions. In BAR-YOSEF, O.; PILBEAM, D., eds. - *The geography of Neanderthals and modern humans in Europe and the greater Mediterranean*. Cambridge, MA: Peabody Museum of Archeology and Ethnology (Harvard University), p. 107-156.

BAR-YOSEF, O. (2002) - The Upper Paleolithic revolution. *Annual Review of Anthropology*. Palo Alto, CA. 31, p. 363-393.

BAZILE, F.; SICARD, S. (1999) - Le premier Aurignacien du Languedoc Oriental dans son contexte méditerranéen. In SACCHI, D., ed. - *Les faciès leptolithiques du Nord-Ouest méditerranéen: milieux naturels et culturels. Carcassonne (Actes du XXIV^{e} Congrès Préhistorique de France, Carcassonne, 26-30 septembre 1994)*. Paris: Société Préhistorique Française, p. 117-125.

BON, F. (1996) - L'industrie lithique aurignacienne de la couche 2A de la grotte des Hyènes à Brassempouy (Landes). In DELPORTE, H.; CLOTTES, J., eds. - *Pyrénées préhistoriques, arts et sociétés. Actes du 118^{e} Congrès National des Sociétés Historiques et Scientifiques*. Paris: CTHS, p. 439-455.

BON, F. (2002) - *L'Aurignacien entre Mer et Océan. Réflexion sur l'unité des phases anciennes de l'Aurignacien dans le sud de la France*. Paris: Société Préhistorique Française (Mémoire de la Société Préhistorique Française; 29).

BORDES, F. (1958) - Le Passage du Paléolithique moyen au Paléolithique supérieur. In *Hundert Jahre Neanderthaler: Neanderthal centenary*. Utrecht: Kemink en Zn, p. 175-181.

BORDES, F. (1968) - La question périgordienne. In *La Préhistoire, problèmes et tendances*. Paris: CNRS, p. 59-70.

BORDES, F.; LABROT, J. (1967) - La stratigraphie du gisement de Roc de Combe et ses implications. *Bulletin de la Société Préhistorique Française*. Paris. 64:1, p. 15-28.

BORDES, J.-G. (2000) - La séquence aurignacienne de Caminade revisitée: l'apport des raccords d'intérêt stratigraphique. *Paléo*. Les Eyzies-de-Tayac. 12, p. 387-407.

BORDES, J.-G. (2002) - La « lamelle Caminade », un nouvel outil aurignacien ? *Bulletin de la Société Préhistorique Française*. Paris. 99:4, p. 735-749.

BORDES, J.-G. (2002) - *Les interstratifications Châtelperronien/Aurignacien du Roc-de-Combe et du Piage (Lot, France). Analyse taphonomique des industries lithiques, implications archéologiques*. Thèse de doctorat de Préhistoire et Géologie du Quaternaire de l'Université Bordeaux.

BORDES, J.-G. (2003) - Châtelperronian/Aurignacian interstratifications at Roc-de-Combe and Le Piage (Lot, France): lithic taphonomy, stratigraphic re-evaluation and archaeological implications. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 223-244.

BORDES, J.-G. (2006) - Objectifs et modalités de quelques productions lamellaires dans le sud-ouest de la France: Caminade, Roc-de-Combe, Corbiac-Vignoble II et le Piage. In LE BRUN-RICALENS, F.; BORDES, J.-G.; BON, F., eds. - *Productions lamellaires attribuées à l'Aurignacien: chaînes opératoires et perspectives techno-culturelles*. Liège: Symposium 6-7, XV[e] Congrès de l'UISPP, 2-8 Septembre 2001. Université de Liège. Archeologiques 1. MNHA. Luxembourg. p. 123-156.

BORDES, J.-G.; BON, F.; LE BRUN-RICALENS, F. (2005) - Le transport des matières premières lithiques à l'Aurignacien ancien entre le Nord et Sud de l'Aquitaine: faits attendus, faits nouveaux. In JAUBER, J.; BARBAZA, M., eds. - *Territoires, déplacements, mobilité, echanges durant la préhistoire*. Toulouse: 126[e] Congrès National des Sociétés historiques et Scientifiques: 9-14 Avril 2001, p. 185-198.

BORDES, J.-G.; LENOBLE, A. (2001) - *Caminade (Sarlat, Dordogne)*. Document final de synthèse de fouille programmée, Service Régional de l'Archéologie d'Aquitaine, Bordeaux.

BORDES, J.-G.; SHIDRANG, S. (2004) - Les premières manifestations de la modernité culturelle au Moyen Orient: une première analyse des industries lithiques de Yafteh (Khorramabad, prvince de Lorestan). In JAUBERT, J.; BIGLARI, F. eds. - *Le Paléolithique d'Iran, Rapport de la mission archéologique française en Iran (période paléolithique)*, exemplaire multigraphié remis au Ministère des Affaires Etrangères, p. 110-124.

BRICKER, H. M., ed. (1995) - *Le Paléolithique supérieur de l'abri Pataud (Dordogne): les fouilles de H. L. Movius Jr.; suivi d'un inventaire analytique des sites aurignaciens et Périgordien de Dordogne*. Paris: Maison des Sciences de l'Homme (Documents d'Archeologie Française; 50).

BROGLIO, A.; ANGELUCCI, D. E.; PERESANI, M.; LEMORINI, C.; ROSSETTI. P. (1996) - L'industrie protoaurignacienne de la Grotta di Fumane: données préliminaires. In *Actes du XIII[e] Congrès de l'UISPP, Forlí, Italie, septembre 1996*, vol. 2. Forlí: Abaco, p. 495-509.

BROGLIO, A.; BERTOLA, S.; DE STEFANI, M.; LEMORINI, C.; ROSSETTI, P. (2006) - La production lamellaire de l'Aurignacien ancien de la grotte de Fumane. In LE BRUN-RICALENS, F.; BORDES, J.-G.; BON, F., eds. - *Productions lamellaires attribuées à l'Aurignacien: chaînes opératoires et perspectives techno-culturelles*, Symposium 6-7, XV[e] Congrès de l'UISPP, Liège, 2-8 Septembre 2001. Université de Liège. Archéologiques 1. MNHA. Luxembourg, p. 415-438.

CHAMPAGNE, F.; ESPITALIÉ, R. (1967) - La stratigraphie du Piage: note préliminaire. *Bulletin de la Société Préhistorique Française*. Paris. 64:1, p. 29-34.

CHAMPAGNE, F.; ESPITALIÉ, R. (1981) - *Le Piage, site préhistorique du Lot*. Paris: Société Préhistorique Française (Mémoire de la Société Préhistorique Française; 15).

CHIOTTI, L. (1999) - *Les industries lithiques des niveaux aurignaciens de l'Abri Pataud, les Eyzies-de-Tayac (Dordogne): étude technologique et typologique*. Paris: Thèse de Doctorat du Muséum d'Histoire Naturelle, Institut de Paléontologie Humaine.

CHIOTTI, L. (2000) - Lamelles Dufour et grattoirs aurignaciens (carénés et à museau) de la couche 8 de l'abri Pataud, Les Eyzies de Tayac, Dordogne. *L'Anthropologie*. Paris. 104, p. 239-263.

DELPORTE, H. (1967) - Les niveaux aurignaciens de la Rochette. Les Eyzies. *Bulletin de la Société d'Etude et de Recherches Préhistoriques*. Les Eyzies-de-Tayac. 13, p. 1-24.

DELPORTE, H. (1984) - L'Aurignacien de La Ferrassie. *Études Quaternaires*. Paris. 7, p. 145-234.

DELPORTE, H. (1998) - *Les Aurignaciens, premiers hommes modernes*. Paris: Editions de la Maison des Roches.

DEMARS, P.-Y. (1992) - L'Aurignacien ancien en Périgord: le problème du Protoaurignacien. *Paléo*. Les Eyzies-de-Tayac. 4, p. 101-122.

DEMARS, P.-Y. (1994) - *L'économie du silex au Paléolithique supérieur dans le Nord de l'Aquitaine*. Thèse d'Etat de l'Université de Bordeaux I.

DEMARS, P.-Y. (1996) - La place du Piage et de Roc-de-Combe dans la transition du Paléolithique moyen au Paléolithique supérieur. *Bulletin de Préhistoire du Sud-Ouest. Nouvelles Etudes*. Cressensac. 3, p. 11-35.

DEMARS, P.-Y.; LAURENT, P. (1992) - *Types d'outils lithiques du Paléolithique supérieur en Europe*. Paris: CNRS (1ère impression en 1989).

DJINDJIAN, F. (1988) - Recherches sur l'Aurignacien du Périgord à partir des données nouvelles de la Ferrassie. *L'Anthropologie*. Paris. 90:1, p. 89-106.

DJINDJIAN, F. (1993a) - L'Aurignacien en Périgord: une révision. *Préhistoire Européenne*. Liège. 29:3, p. 54.

DJINDJIAN, F. (1993b) - Les origines du peuplement aurignacien en Europe. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche Orient. Actes du XIIe Congrès International des Sciences Préhistoriques et Protohistoriques. Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 136-154.

GORING-MORRIS, A. N.; BELFER-COHEN, A., eds. (2003) - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow.

HARROLD, F.; OTTE, M. (2001) - Time, space and cultural process in the European Middle-Upper Paleolithic Transition. In HAYS, M. A.; THACKER, P. T., eds. - *Questioning the answers: re-solving fundamental problems of the Early Upper Paleolithic. Papers from a symposium held at the Society for American Archaeology meeting in Chicago, 1999*. Oxford: Archaeopress (BAR International Series; 1005), p. 3-12.

INIZAN, M.-L.; REDURON, M.; ROCHE, H.; TIXIER, J. (1995) - *Préhistoire de la pierre taillée. 4. Technologie de la pierre taillée*. Meudon: Centre de Recherches et d'Études Préhistoriques.

KOZŁOWSKI, J. K.; OTTE, M. (2000) - The formation of the Aurignacian in Europe. *Journal of Anthropological Research*. Albuquerque, NM. 56, p. 513-534.

KUHN, S. L.; STINER, M. C. (1998) - The Earliest Aurignacian of Riparo Mochi (Liguria, Italy). *Current Anthropology*. Chicago, IL. 39. Supplement 1, p. S175-S189.

LE BRUN-RICALENS, F. (1993) - Réflexions préliminaires sur le comportement litho-technologique et l'occupation du territoire du Pays des Serres à l'Aurignacien: le gisement de "Toulousète" à Beauville (Lot-et-Garonne), une occupation moustérienne et aurignacienne de plein air. *Paléo*. Les Eyzies-de-Tayac. 5, p. 127-153.

LE BRUN-RICALENS, F.; BORDES, J.-G.; BON, F., eds. (2006) - *Productions lamellaires attribuées à l'Aurignacien: chaînes opératoires et perspectives techno-culturelles*. Liège: Symposium 6-7, XVe Congrès de l'UISPP, 2-8 Septembre 2001. Université de Liège. Archeologiques 1. Musee National d'Histoire et d'Art. Luxembourg.

LE BRUN-RICALENS, F.; BROU, L. (2003) - Burins carénés-nucleus à lamelles: identification d'une chaîne opératoire particulière à Thèmes (Yonne) et implications. *Bulletin de la Société Préhistorique Française*. Paris. 100:1, p. 67-83.

LUCAS, G. (1997) - Les lamelles Dufour du Flageolet I (Bézenac, Dordogne) dans le contexte aurignacien. *Paléo*. Les Eyzies--de-Tayac. 9, p. 191-219.

LUCAS, G. (2000) - *Les industries lithiques du Flageolet I (Dordogne), approche économique, technologique, fonctionnelle et analyse spatiale*. Thèse de Doctorat. Université Bordeaux I. 2 vols.

MELLARS, P. A. (1996) - *The Neanderthal legacy. An archaeological perspective from Western Europe*. Princeton, NJ: Princeton University Press.

NORMAND, Ch. (in press) - Nouvelles données sur la séquence aurignacienne de la grotte d'Isturitz (Saint-Martin-d'Arbreroue, Pyrénées-Atlantiques. In BON, F.; MAÍLLO FERNÁNDEZ, J. M.; ORTEGA COBOS, D., eds. - *Autour des concepts de Protoaurignacien, d'Aurignacien initial et ancien: unité et variabilité des comportements techniques des premiers groupes d'hommes modernes dans le Sud de la France et le Nord de l'Espagne*. Actes de la Table-ronde organisée à Toulouse, 2003. *Espacio, Tiempo y Forma*. Madrid. 15.

OLSZEWSKI, D. I. (2001) - Ruminations on the Early Upper Paleolithic and a consideration of the Zagros Aurignacian. In HAYS, M.; THACKER, P., eds. - *Questioning the answers: re-solving fundamental problems of the Early Upper Paleolithic*. Oxford: Archaeopress (British Archaeological Reports International Series; 1005), p. 79-89.

ORTEGA COBOS, D.; SOLER, N.; MAROTO, J. (2006) - La production des lamelles pendant l'aurignacien archaïque dans la grotte de l'Arbreda (Espagne): organisation de la production, variabilité des méthodes et des objectifs. In LE BRUN--RICALENS, F.; BORDES, J.-G.; BON, F., eds. - *Productions lamellaires attribuées à l'Aurignacien: chaînes opératoires et perspectives techno-culturelles.* Liège: Symposium 6-7, XV[e] Congrès de l'UISPP, 2-8 septembre 2001. Université de Liège. p. 359-374.

PELEGRIN, J. (1995) - *Technologie lithique: le Châtelperronien de Roc-de-Combe (Lot) et de la Côte (Dordogne).* Paris: CNRS (Cahiers du Quaternaire; 20).

PELEGRIN, J. (2002) - Avant propos sur l'article de D. de Sonneville-Bordes: «Les industries du Roc-de-Combe (Lot, France), Périgordien et Aurignacien». *Préhistoire du Sud-Ouest. Nouvelles Études.* Cressensac. 9:2, p. 121-161.

PEYRONY, D. (1933) - Les industries aurignaciennes dans le bassin de la Vezère. Aurignacien et Périgordien. *Bulletin de la Société Préhistorique Française.* Paris. 30, p. 543-559.

PEYRONY, D. (1934) - La Ferrassie: Moustérien, Périgordien, Aurignacien. *Préhistoire* III, p. 1-92.

PEYRONY, D. (1946) - Une mise au point au sujet de l'Aurignacien et du Périgordien. *Bulletin de la Société Préhistorique Française.* Paris. 43, p. 232-237.

PLOUX, S.; SORIANO, S. (2003) - Umm el Tlel, une séquence du Paléolithique supérieur en Syrie centrale. Industries lithiques et chronologie culturelle. *Paléorient.* Paris. 29:2, p. 5-34.

RIGAUD, J.-Ph. (1985) - Réflexions sur la signification de la variabilité des industries lithiques paléolithiques. In OTTE, M. - *La signification culturelle des industries lithiques. Liège: 3-7 Octobre 1984.* Oxford: British Archaeological Reports (BAR, International Series; 239), p. 374-380.

SCHMIDER, B., ed. (2002) - *L'Aurignacien de la Grotte du Renne: les fouilles d'André Leroi-Gourhan à Arcy-sur-Cure (Yonne).* Paris: Centre National de la Recherche Scientifique (*Gallia Préhistoire.* Supplément; 34).

SONNEVILLE-BORDES, D. de (1960) - *Le Paléolithique supérieur en Périgord.* Bordeaux: Delmas.

SONNEVILLE-BORDES, D. de (1970) - Les industries aurignaciennes de l'abri de Caminade est, commune de la Canéda (Dordogne). *Quaternaria.* Roma. 12, p. 77-131.

SONNEVILLE-BORDES, D. de (2002) - Les industries du Roc-de-Combe (Lot, France), Périgordien et Aurignacien. *Préhistoire du Sud-Ouest. Nouvelles Etudes.* Cressensac. 9:2, p. 121-161.

SONNEVILLE-BORDES, D. de; PERROT, J. (1954-1956) - Lexique typologique du Paléolithique supérieur. Outillage lithique. *Bulletin de la Société Préhistorique Française.* Paris. 51-52-53, p. 327-335; p. 76-79; p. 408-412; p. 547-559.

TIXIER, J. (1978) - *Notice sur les travaux scientifiques.* Thèse de doctorat d'Etat de l'Université de Paris X, Nanterre.

TIXIER, J.; REDURON, M. (1991) - Et passez au pays des silex: rapportez-nous des lames ! In *25 ans d'études technologiques en Préhistoire. XI[èmes] Rencontres Internationales d'Archéologie et d'Histoire d'Antibes.* Juan-les-Pins: APDCA, p. 235-243.

VILLA, P. (1982) - Conjoinable pieces and site formation processes. *American Antiquity.* Washington, DC. 47:2, p. 276-290.

Re-evaluation of the principal diagnostic criteria of the Aurignacian: the example from Grotte XVI (Cénac-et-Saint-Julien, Dordogne)

GÉRALDINE LUCAS

ABSTRACT The goal of this paper is to launch a reflection about the use of some criteria for the recognition of the Aurignacian. I will study Aurignacian stone tools found in Dordogne, probably a little different from the ones found in the Near East or anywhere else. It is indeed generally accepted that the Aurignacian technocomplex is geographically and chronologically variable. We also have to bear in mind that the definition of the Aurignacian, based on the bone and the lithic industries, is typological, and that technological studies are now obligatory for any lithic analysis. Do we need, as a result, to modify our definition of the Aurignacian? As will be discussed, caution is in order.

Introduction

The Aurignacian is considered by some authors (Kozłowski, 1993) as the only real supraregional entity from the beginning of the Upper Paleolithic (between 45 000 and 25 000 years ago) with a regional distribution across Europe. In other respects, it is admitted that Aurignacian technocomplexes are variable both geographically and chronologically: indeed, the Dordogne Aurignacian is somehow quite different from that of central Europe or the Near East.

These two viewpoints, apparently contradictory, in fact reveal a complex archeological reality. The Aurignacian industry, while having certain general features in common, can also have features more specific to one chronological period or region. For example, the presence of carinated pieces, of bladelets and of a relatively abundant bone industry constitutes a permanent feature of the Aurignacian culture. In addition to this common group of tools, it is possible to observe objects which are specific to some regions, like the Caminade endscrapers in the Périgord (Rigaud, 1993) (Fig. 1), or the thinning of the Kostienki type encountered in the eponymous site in eastern Europe (Sinitsyn, 1993).

The aim is then to reflect upon the use of certain criteria for defining the Aurignacian, in particular the lithic tools. Until recently, the definition of the Aurignacian, based on the bone and the lithic industry, was essentially of a typological order. With the advancement of technological studies, should we or could we, change or modify our definition of the Aurignacian? As we are going to see, caution is necessary.

Within the bone industries, the different types of Aurignacian points seem to be good cultural markers: points with a split base for the Early Aurignacian and points with a simple base for the most recent Aurignacian. While these bone objects are very reliable diagnostically, there remains a problem of preservation (for example, Thèmes, Yonne — Le Brun-Ricalens and Brou, 2003). The bone points then cannot be the only criteria for defining the Aurignacian.

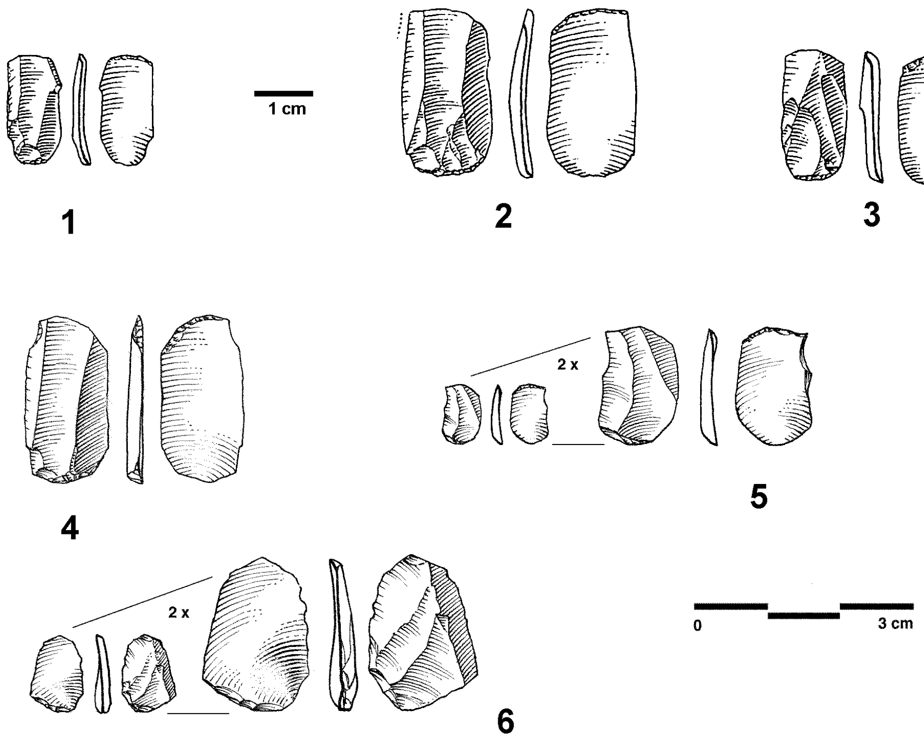

FIG. 1 – Caminade endscrapers: 1-3. Le Flageolet I, level IX (after Rigaud, 1982); 4-6 Cave XVI, level Abb (drawings by J.-G. Marcillaud).

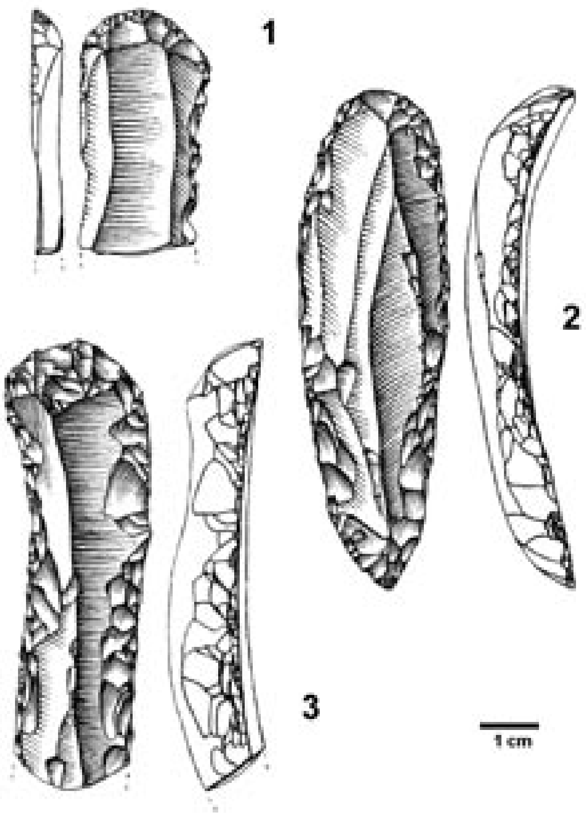

FIG. 2 – Aurignacian blades from Le Flageolet I, level XI (drawings by J.-G. Marcillaud) (after Rigaud, 1982).

A similar problem exists for lithics but for other reasons. Certain diagnostic tools are found only in specific regions, or specific chronological periods, of the Aurignacian. Therefore, the absence of Aurignacian blades in one level does not necessarily rule out "Aurignacian" as the cultural designation because these blades are rare in the Early Aurignacian (Fig. 2). In the case of Dufour bladelets there is an additional problem, their definition. The two subtypes described by Demars and Laurent (1989) have not yet resolved this problem because very different bladelets are grouped together under the same name (Fig. 3). Is one subtype more characteristic of the Aurignacian than the other? According to different studies, the Roc-de-Combe subtype ("small" Dufour) seems to be associated with carinated pieces. Are carinated pieces all characteristic of the Aurignacian?

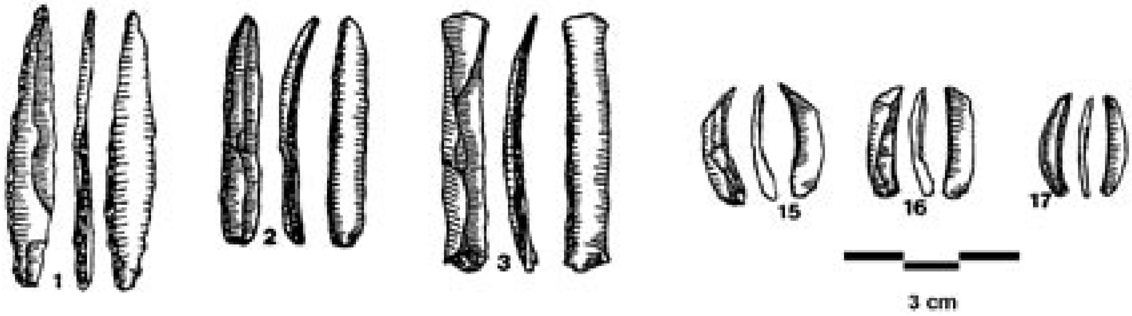

FIG. 3 – The two subtypes of Dufour bladelets: 1-3. Subtype Dufour; 15-17. sub-type Roc de Combe (extracted from Demars and Laurent, 1989).

The carinated and nosed scrapers, and the carinated and busked burins, are grouped together under the term of carinated pieces (Fig. 4). As illustrated in a number of studies (Sonneville-Bordes, 1963; Bordes, 1968; Delporte, 1968, 1984; Tixier and Inizan, 1981; Mellars and Tixier, 1989; Tixier, 1991; Aubry et al., 1995; Schmider and Perpère, 1995; Zilhão, 1995; Le Brun-Ricalens and Brou, 2003; Lucas, 1997, 2000; Chiotti, 1999; Bon, 2000; Almeida, 2000; Hays and Lucas, 2000), the position and the function in the reduction sequence of these objects, considered as typical of the Aurignacian, have been revised: the carinated pieces seem to be in fact very specific bladelet cores.

Re-evaluation of the diagnostic role of carinated pieces

Very specific bladelet production sequences have been described by a number of prehistorians (Sonneville-Bordes, 1963; Bordes, 1968; Delporte, 1968, 1984; Tixier and Inizan, 1981; Mellars and Tixier, 1989; Tixier, 1991; Aubry et al., 1995; Schmider and Perpère, 1995; Zilhão, 1995; Lebrun-Ricalens and Brou, 2003; Lucas, 1997, 2000; Chiotti, 1999; Bon, 2000; Almeida, 2000) at different Aurignacian sites. The most common operational sequence typologically equates the core with the carinated and/or nosed scraper. Here I briefly re-examine the main points:

- Selected blanks are generally more or less cortical thick flakes, small blocks, rejuvenation core flakes or core tablets, even crested pieces in some cases.
- The striking platform is generally situated on the ventral face of the blank.
- The shaped debitage surface is narrow and arched; the shaping of a crest on the lower surface of the flake will allow the maintenance of the longitudinal convexity.

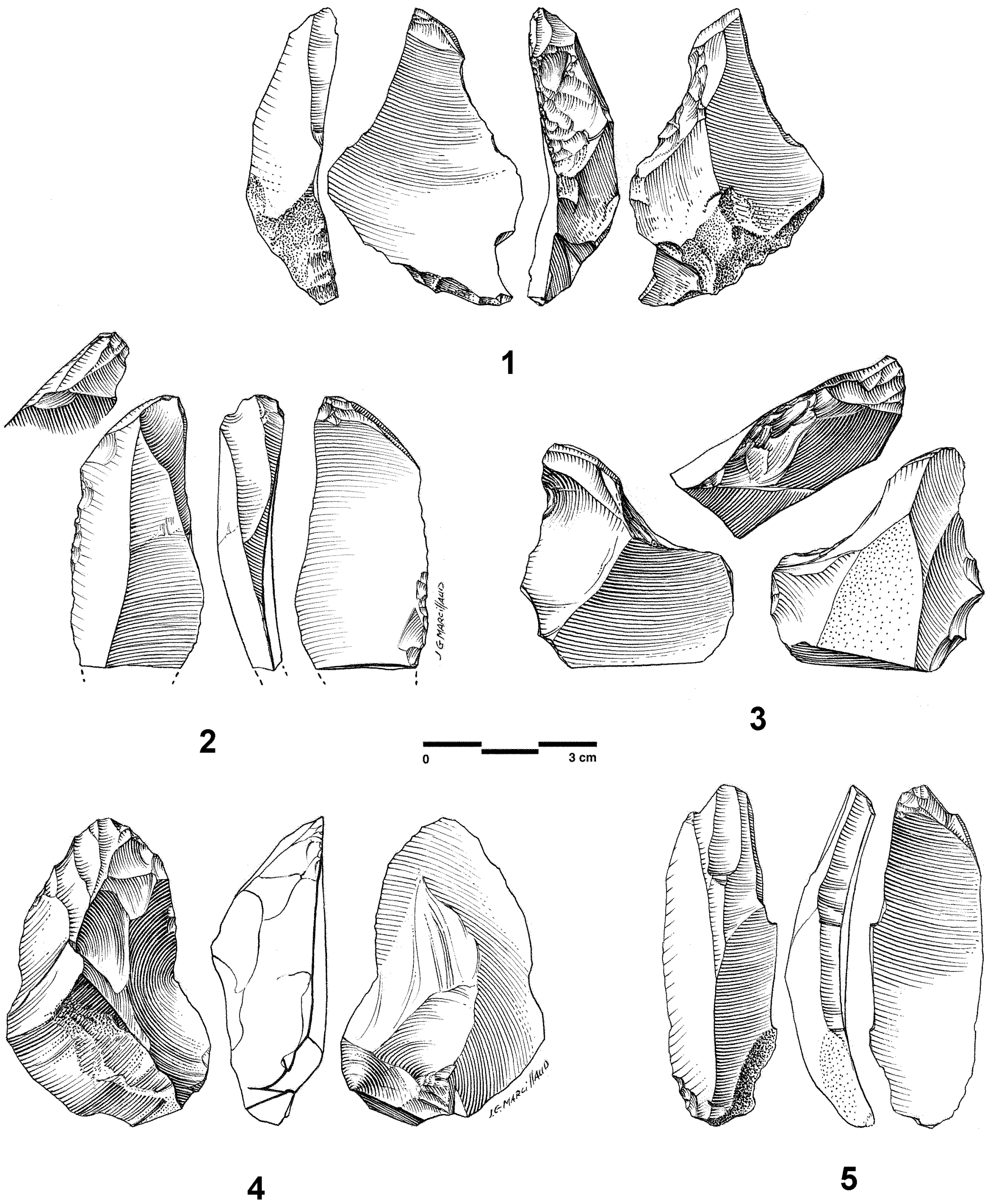

FIG. 4 – Aurignacian carinated pieces: 1, 3. busked burins; 2, 5. carinated burins; 4. carinated scraper (Cave XVI, level Abb) (drawings by J.-G. Marcillaud).

- During the debitage phase, thin bladelets are detached frontally (they will be curved) or laterally (they will be twisted) (Tixier, 1991; Aubry et al., 1995; Lucas, 1999).
- For the maintenance of the striking surface, no core tablets are removed during this bladelet production, the lower surface of the support being then preserved.
- The debitage surface is maintained in two ways:
  by the removal of side flakes, detached from the striking surface in order to maintain the transversal convexity (Fig. 5);
  by the removal of shaping flakes on the crest for the maintenance of the longitudinal convexity; these resharpening products are very characteristic when they are found complete (Fig. 6).

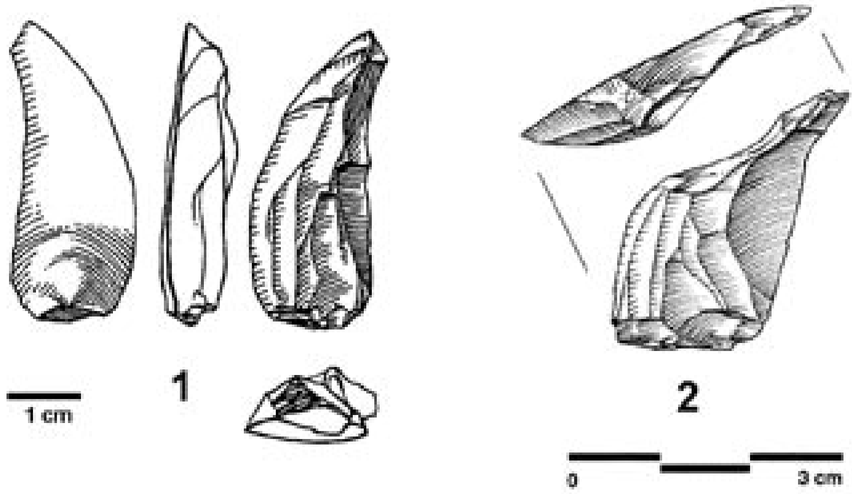

FIG. 5 – Rejuvenation flakes from lateral notches: 1. Le Flageolet I, level IX (after Lucas, 2000); 2. Cave XVI, level Abb (drawings by J.-G. Marcillaud).

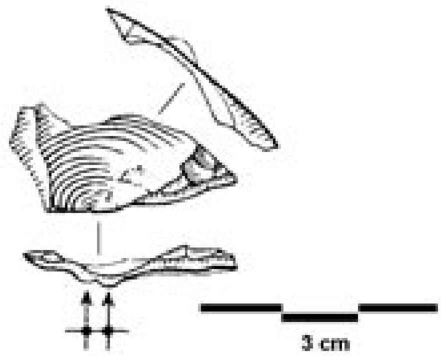

FIG. 6 – Rejuvenation flake from a crest or "opposed flake from lateral rejuvenation" (after Le Brun-Ricalens and Brou, 2003).

In spite of their specificity, these same objects (carinated and/or nosed scrapers) and these methods of bladelet production are described in other cultures: in the Protosolutrean of the Abri Casserole in the Dordogne by T. Aubry and his collaborators (1995), in the Badegoulian of Birac III and the Early Magdalenian of Saint-Germain-la Rivière in the Gironde by M. Lenoir (Lenoir, 1988; Lenoir et al., 1995) (Fig. 7). However, the bladelets issued from these cores are different from those observed in the Aurignacian in both morphology and retouch. The Aurignacian bladelets have a very peculiar torsion, not observed on the Protosolutrean or the Magdalenian bladelets (Figs. 8-9). The bladelets themselves appear more diagnostic than the core.

For the moment, these converging techniques are verified for only one type of carinated piece: the carinated and nosed scrapers. The carinated burins and the busked burins seem to be linked more specifically to the Aurignacian. These "tools" have been the subject of very precise descriptions from a technological point of view in the forthcoming publication by F. Le Brun-Ricalens (in preparation) but also partly in my doctoral dissertation (Lucas, 2000). Compared to the carinated and/or nosed scrapers, the exploited blanks are generally thick blades which are sometimes cortical. The striking platform is the negative of a burin spall removal. A retouch along the edge of the blade allows shaping of the debitage surface. The

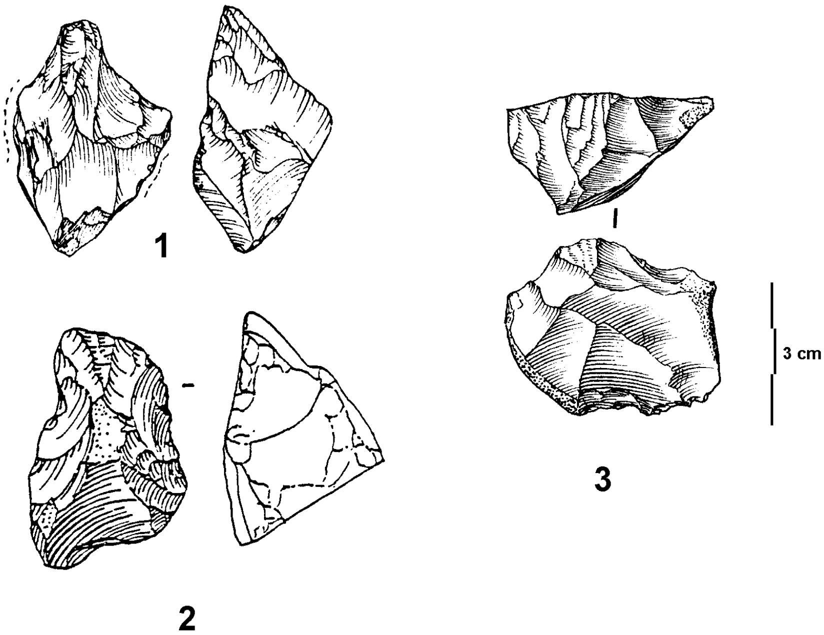

FIG. 7 – Carinated pieces: 1. Early Magdalenian, Birac III (after Lenoir, 1988); 2. Badegoulian, level C4 from Saint-Germain-la--Rivière (after Lenoir et al., 1995); 3. Protosolutrean, Abri Casserole (after Aubry et al., 1995).

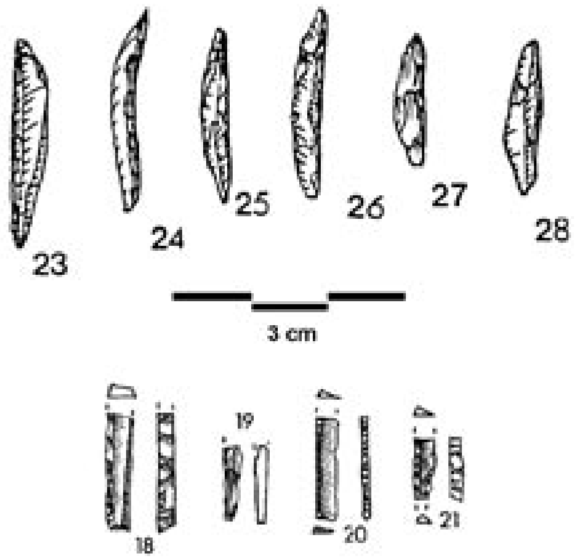

FIG. 8 – Retouched bladelets associated with carinated pieces: 23-28. Badegoulian, level C4 of Saint-Germain-la-Rivière (after Lenoir et al., 1995); 18-21. Protosolutrean, Abri Casserole (after Aubry et al., 1995).

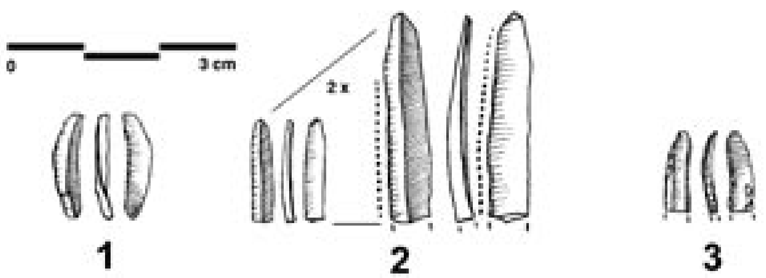

FIG. 9 – Dufour bladelets (Cave XVI, level Abb) (drawings by J.-G. Marcillaud).

surface is narrow and convex, which also allows the production of small and twisted bladelets. The striking platform is maintained by the removal of the bladelet core tablets (the "Thèmes" type) described by F. Le Brun-Ricalens (since their discovery, similar pieces have been found at other sites in Dordogne such as Le Flageolet I and the Grotte XVI) (Fig. 10). These flakes are very characteristic; in particular, their proximal face has on its butt the negative bulbs of the bladelet removals from the debitage surface. Two methods can then be used to maintain the striking surface:

- either by accentuation of the retouch along the edge of the blade until it forms a notch to restore some longitudinal convexity;
- or by the removal of a relatively thick curved bladelet from the striking platform which straightens out the debitage surface: this method can bear some debitage accident on its upper face (hinged removal for example) (Fig. 11).

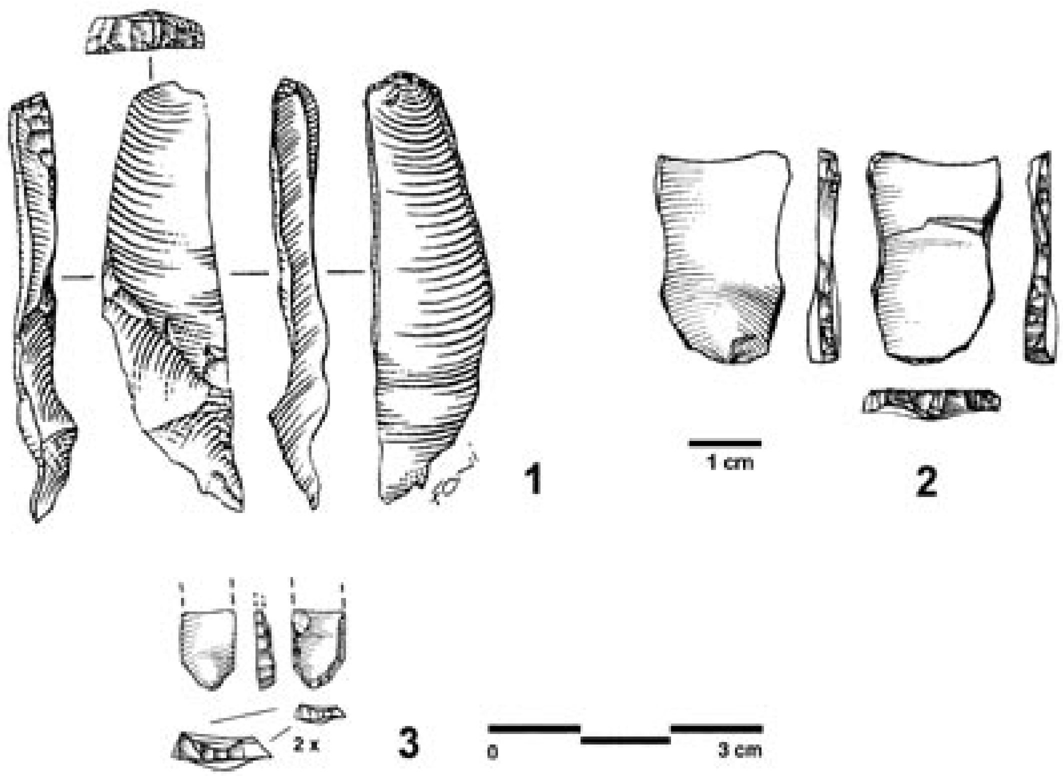

FIG. 10 – Bladelet core tablets (Thèmes type) (platform rejuvenation products from carinated and busked burins): 1. Thèmes (after Le Brun-Ricalens and Brou, 2003); 2. Le Flageolet I, level IX (after Lucas, 2000); 3. Cave XVI, level Abb. Drawings by J.-G. Marcillaud.

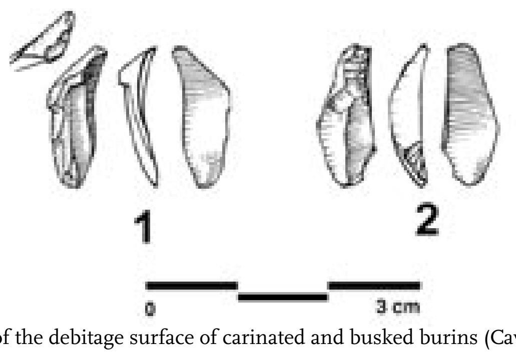

FIG. 11 – Rejuvenation bladelets of the debitage surface of carinated and busked burins (Cave XVI, level Abb) (drawings by J.-G. Marcillaud).

The carinated pieces of the Grotte XVI

The study of the most recent Aurignacian level of the Grotte XVI, layer Abb, (the oldest, Aib, being less abundant and without a date for the moment) will serve as the basis for pursuing the diagnostic problems of the Aurignacian (Fig. 12).

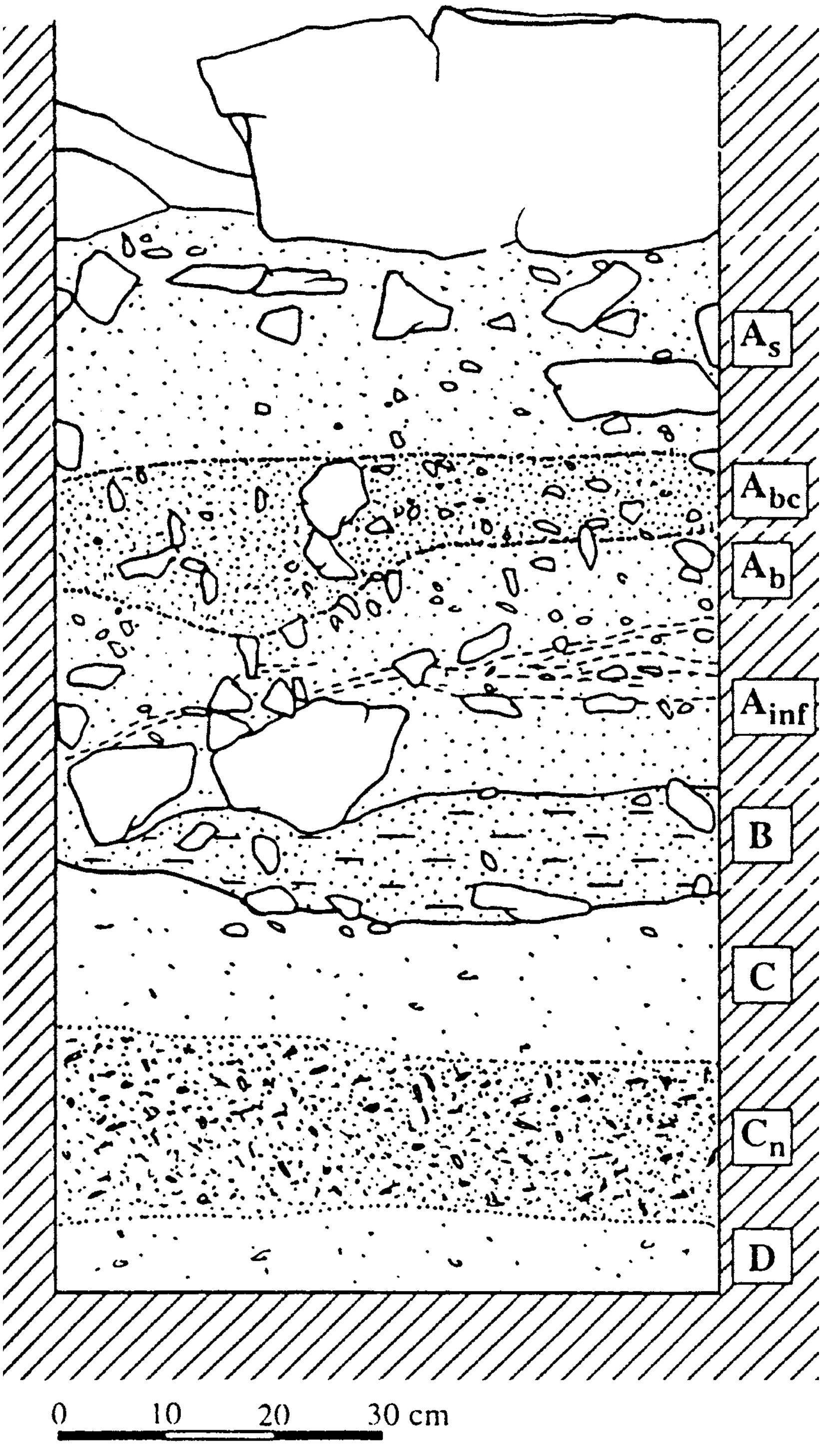

FIG. 12 – Archeostratigraphy of Cave XVI (after Guibert et al., 1999).

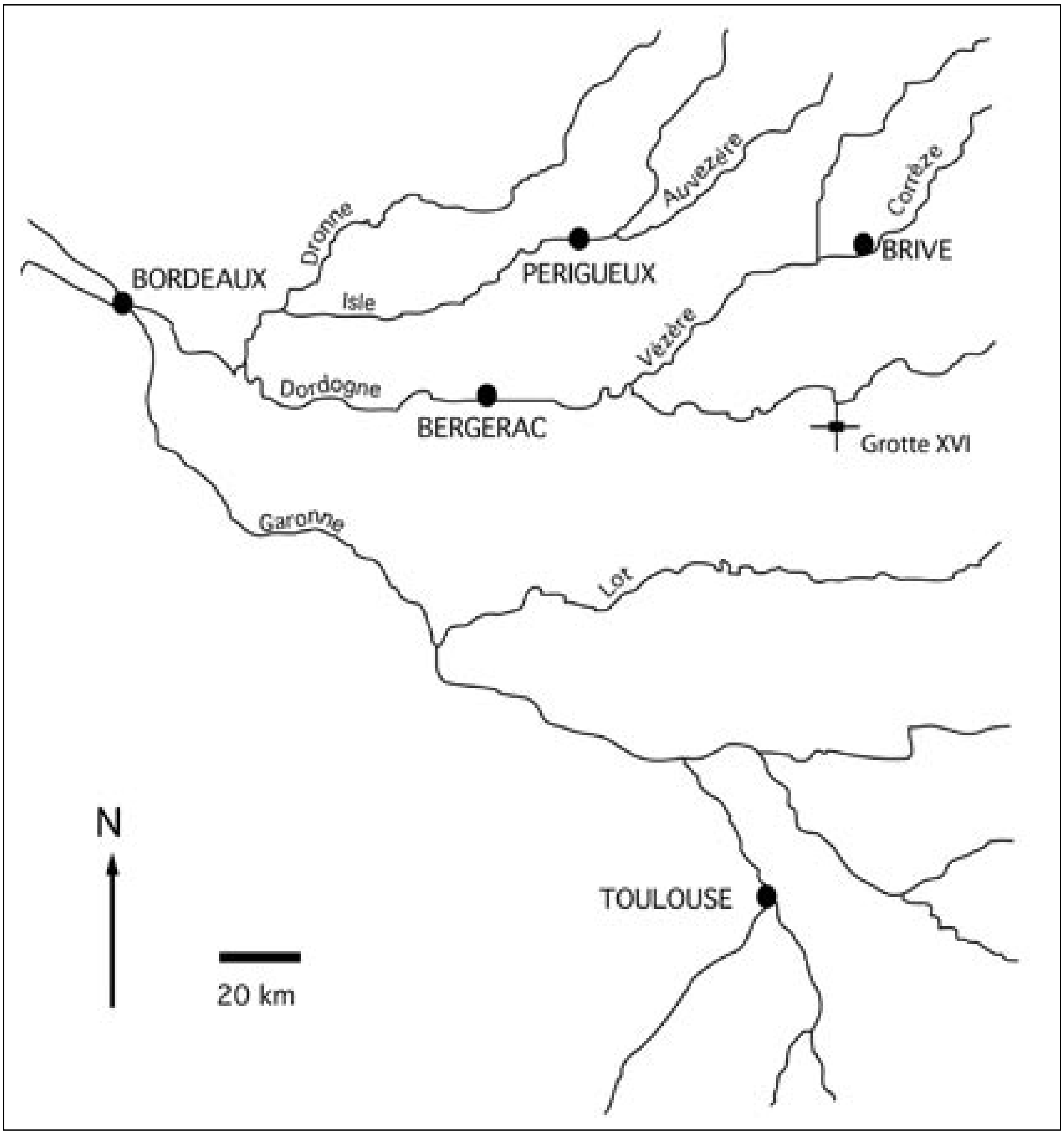

FIG. 13 – Location of Cave XVI.

Situated in the Massif du Conte, at the confluence of the Céou and the Dordogne rivers, south of Sarlat, this cave has a rich cultural sequence. At the base there are Mousterian levels (Fig. 13). The last and the richest level, layer C, is underlain at its top by a polycyclical and polyphased combustion area (Rigaud et al., 1995) containing a Mousterian industry of Acheulian tradition dated by TL to between 62 400±3600 and 57 500±3600 BP (Guibert et al., 1999). Above this deposit, layer B, (sometimes subdivided into Bc and Bf due to a slight change of color) has been identified across almost the entire excavated surface (51 m) with an average thickness of 10 cm. Its industry represents an early Châtelperronian. Several ^{14}C dates between 35 000 and 39 800 BP have been obtained for this layer.

The sequence is continued by two Aurignacian levels — Aib and Abb, the latter dated to 29 740±510 BP (GifA 94201), 29 285±420 BP (AA 6841) and 28 140±405 BP (AA 6840) —a Gravettian layer, Abc, dated to about 26 000 BP, a Solutrean layer, As, dated to about 20 000 BP and a Magdalenian level, Oa, dated to about 12 500 BP (Lucas et al., 2003).

In layer Abb of Grotte XVI, like in other Aurignacian levels in the Dordogne, we have noticed perceptible quantitative variations among the carinated pieces: the number of busked and carinated burins is higher than the number of carinated and nosed scrapers (29 and 2). The explanation may be of a chronological nature, as it has been suggested for the Abri Pataud, where the busked burins are present at the end of the Aurignacian sequence (Brooks, 1995). But in Le Flageolet I, those burins are found in the earliest layer (XI, ca.34 000 BP) (Rigaud, 1982; Lucas, 2000). The link with the laminar index of the level should also be noted: the stronger the laminar index, the more likely it is that the chosen blank is a blade, and that a busked or a carinated burin is exploited as a bladelet core. This is verified for example, at two Aurignacian sites in Portugal: at Vale de Porcos, where the debitage is characterized by blade production and the tools by carinated, busked burins and Vachons burins, and at Gato Preto, where there has been no blade production and where it is the nosed scrapers that dominate the tool assemblage (Zilhão, 1993).

Technological and typological relationships between the different carinated pieces

It seems important to explain the exact relationship that exists between 1) busked and carinated burins vs. carinated and nosed scrapers, 2) busked vs. carinated burins, and 3) carinated scrapers vs. carinated and nosed scrapers.

The common features shared by Aurignacian burins and scrapers result from the application of similar debitage principles to different blanks (thick flakes for the scrapers where the striking platform is the lower face of the blank; blades for the burins where the striking platform is a burin spall removal). One of the common features found in these two modes of bladelet production is the setting up of a narrow, very arched and carinated surface in order

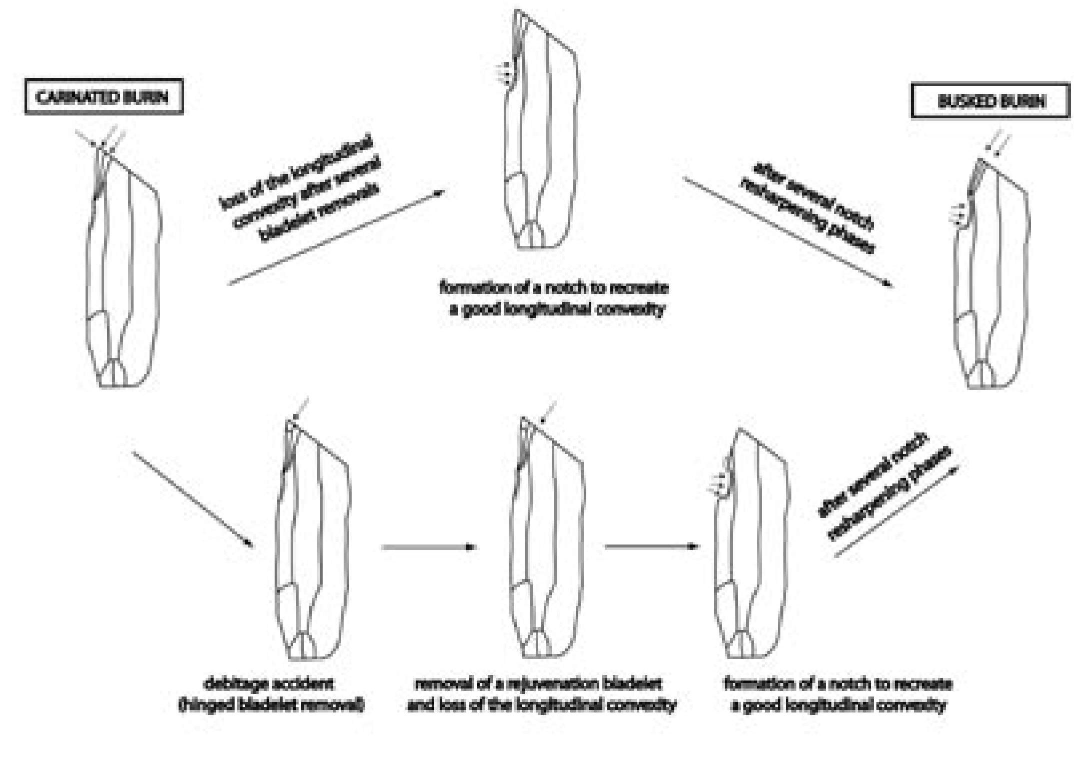

FIG. 14 – Morphological and technological evolution from carinated burin to busked burin.

to obtain curved or twisted bladelets, according to the hammer impact point (Tixier, 1991). It is the existence of that very characteristic debitage surface, described by several authors (Bardon et al., 1906; Bourlon et al., 1912; Pradel, 1962; Demars, 1982; Lucas, 2000) that draws attention to a certain continuum in the group of Aurignacian carinated pieces

The difference between the carinated scrapers, and the carinated and nosed scrapers, essentially rests on the presence of one or two side notches. We have seen that the production of the notches results from shaping or reshaping the debitage surface. Their presence or their absence thus indicates a more or less advanced stage of bladelet production: these two types of objects can then hardly be studied separately, and must be placed together under the same name "carinated scrapers". It is a similar situation for the carinated burins and the busked burins, the latter being only different from the former in the presence of a notch on the edge of the blade, due to the successive reshaping of the longitudinal convexity of the bladelet debitage surface (Fig. 14).

This group of objects, placed together under the name "carinated pieces", represents two types of bladelet cores where exploitation follows similar principles, in particular concerning the morphology of the debitage surface.

Must we then eliminate the carinated pieces from the typological lists, since they are now considered to be cores? The answer may not be as simple as it seems. Indeed, at Le Flageolet I, some of the cores were recycled as endscrapers or burins after an initial use as cores (Hays and Lucas, 2000).

Discussion and conclusion

If we accept that different categories of objects exist which are characteristic of the Aurignacian, do these categories have the same diagnostic value? The question applies, for instance, to:

- objects found in the Aurignacian but also in other cultures (for example, the carinated and nosed scrapers);
- objects found only during a particular period of the Aurignacian (for example, the Aurignacian blades);
- objects found only in the Aurignacian and specific to a geographical area (for example, the Caminade endscrapers of the Dordogne Valley).

The fourth and the last category of objects is that of the objects found throughout the Aurignacian period without distinction in time or space. But do these objects exist? May we classify Dufour bladelets in this precise category? The problem is that when we talk about Dufour bladelets, it is not always the same subtype (Demars and Laurent, 1989). The subtype Roc-de-Combe, issued from the production of the carinated pieces, is found throughout the Aurignacian period in the Périgord. In the same way, the Dufour bladelets of the subtype Dufour (the "large" Dufour) appears at different periods of the European Aurignacian: in Portugal, in Pego do Diabo (28 000 BP; Zilhão, 1993); in Spain, in Arbreda (40 000 BP; Bischoff et al., 1989); and in Italy, in Fumane (40 000 BP; Broglio, 1993).

The two subtypes carry the same type of retouch: could the alternate retouch of the bladelets be a diagnostic element of the Aurignacian? With regard to the busked and carinated burins, they are only found during the Aurignacian period but, even if they do not seem characteristic of one particular period of the Aurignacian, they are not always present within the entire sequence (for example at the Abri Pataud). Their absence does not necessarily predicate a cultural definition distinct from the Aurignacian.

How can we then characterize the Aurignacian in all cases?

1. It seems obvious that it is necessary to use a combination of criteria, the sole presence of a few carinated pieces being insufficient.
2. The criteria are not inevitably typological; the production of bladelets from busked and carinated burins is specific to the Aurignacian, and may be a good criterion when it is found.
3. The identification of regional facies may facilitate the diagnosis of the Aurignacian; these regional facies may have both very specific objects and objects found in the Aurignacian in general (for example, Caminade endscrapers associated to Aurignacian blades).

The definition of the Aurignacian is then complex because it is both geographically and chronologically variable. One element, however, seems to emerge throughout this period: a strong bladelet component.

Acknowledgments

I wish to thank Jean-Philippe Rigaud and Maureen Hays for their corrections, Séverine Percevaud for her translation, and Jean-Georges Marcillaud for the drawings.

REFERENCES

ALMEIDA, F. (2000) - The production of lithic barbs in the context of the core vs tool dichotomy: the Portuguese upper Palaeolithic case. In MCPHERRON, S.; LINDLY, J., eds. - *Tools or cores? The identification and study of alternative core technology in lithic assemblages. Proceedings of Symposium at the Society for American Archaeology Meetings, Philadelphia, April 2000.* Philadelphia: University of Pennsylvania Museum.

AUBRY, T.; DETRAIN, L.; KERVAZO, B. (1995) - Les niveaux intermédiaires entre le Gravettien et le Solutréen de L'Abri Casserole (Les Eyzies de Tayac): mise en évidence d'un mode de production original de microlithes et implications. *Bulletin de la Société Préhistorique Française.* Paris. 92:3, p. 296-301.

BARDON, L.; BOUYSSONIE, J.; BOUYSSONIE, A. (1906) - Grattoir caréné et ses dérivés à la Coumbâ-del-Bouïtou, près Brive (Corrèze). *Revue de l'Ecole d'Anthropologie de Paris.* Paris. 16:11, p. 401-412.

BISCHOFF, J. L.; SOLER, N.; MAROTO, J.; JULIÀ, R. (1989) - Abrupt Mousterian/Aurignacian boundary at ca. 40 ka B.P.: accelerator radiocarbon dates from l'Arbreda Cave (Catalunya, Spain). *Journal of Archaeological Science.* London. 16, p. 563-576.

BON, F. (2000) - *La question de l'unité technique et économique de l'Aurignacien: réflexions sur la variabilité des industries lithiques à partir de l'étude comparée de trois sites des Pyrénées françaises: La Tuto de Camalhot, Régismont-le-Haut et Brassempouy.* Thèse de Doctorat, Université Paris I.

BORDES, F. (1968) - La question périgordienne. In *La Préhistoire, problèmes et tendances.* Paris: CNRS, p. 59-70.

BOURLON, M.; BOUYSSONIE, J.; BOUYSSONIE, A. (1912) - Grattoirs carénés, rabots et grattoirs nucléiformes: essai de classification des grattoirs. *Revue Anthropologique.* 22, p. 473-486.

BROGLIO, A. (1993) - L'Aurignacien au sud des Alpes. In BANESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche Orient. Actes du XII^e Congrès International des Sciences Préhistoriques et Protohistoriques. Bratislava, 1-7 septembre 1991.* Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 193-202.

BROOKS, A. S. (1995) - L'Aurignacien de l'Abri Pataud, niveaux 6 à 14. In BRICKER, ed. - *Le Paléolithique supérieur de l'Abri Pataud (Dordogne): les Fouilles de H.-L. Movius.* Paris: Maison des Sciences de l'Homme, p. 167-222.

CHIOTTI, L. (1999) - *Les industries lithiques des niveaux aurignaciens de l'Abri Pataud, les Eyzies-de-Tayac (Dordogne): étude technologique et typologique*. Paris: Thèse de Doctorat du Muséum d'Histoire Naturelle, Institut de Paléontologie Humaine.

DELPORTE, H. (1968) - L'Abri du Facteur à Tursac. *Gallia Préhistoire*. Paris. 11:1, p. 1-112.

DELPORTE, H. (1984) - L'Aurignacien de La Ferrassie. *Études Quaternaires*. Paris. 7, p. 145-234.

DEMARS, P.-Y. (1982) - Les grattoirs carénés et à museau, les burins busqués et carénés, les pièces nucléiformes dans le Bassin de Brive, approche stylistique. *Bulletin de la Société Préhistorique Française*. Paris. 79:10-12, p. 341-368.

DEMARS, P.-Y.; LAURENT, P. (1989) - *Types d'outils lithiques au Paléolithique supérieur en Europe*. Paris: CNRS.

GUIBERT, P.; BECHTEL, F.; SCHOERER, M.; RIGAUD, J.-Ph.; SIMEK, J. K. (1999) - Datation par thermoluminescence de sédiments chauffés provenant d'une aire de combustion moustérienne (Grotte XVI, Cénac-et-Saint-Julien, Dordogne, France). *Revue d'Archéométrie*. Bordeaux. 23, p. 163-175.

HAYS, M. A.; LUCAS, G. (2000) - A technological and functional analysis of carinates. *Journal of Field Archaeology*. Boston, MA. 27:4, p. 1-11.

KOZŁOWSKI, J. K. (1993) - L'Aurignacien en Europe et au Proche-Orient. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche-Orient. Actes du XIIème Congrès International des Sciences Préhistoriques et Protohistoriques, Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 283-291.

LE BRUN-RICALENS, F.; BROU, L. (2003) - Burins carénés-nucleus à lamelles: identification d'une chaîne opératoire particulière à Thèmes (Yonne) et implications. *Bulletin de la Société Préhistorique Française*. Paris. 100:1, p. 67-83.

LENOIR, M. (1988) - Le Magdalénien ancien en Gironde, conditions de gisement, variabilité typologique et technique. In DIBBLE, H. L.; MONTET-WHITE, A., eds. - *Upper Pleistocene Prehistory of Western Eurasia*. Philadelphia, PA: University Museum, p. 397-410.

LENOIR, M.; MARMIE, F.; TRECOLLE, G. (1995) - Le gisement paléolithique de Saint-Germain-La-Rivière (Gironde). *Bulletin de la Société d'Anthropologie du Sud-ouest*. Bordeaux. 25, p. 139-153.

LUCAS, G. (1997) - Les lamelles Dufour du Flageolet I (Bézenac, Dordogne) dans le contexte aurignacien. *Paléo*. Les Eyzies--de-Tayac. 9, p. 191-219.

LUCAS, G. (1999) - Production expérimentale de lamelles torses: approche préliminaire. *Bulletin de la Société Préhistorique Française*. Paris. 96:2, p. 145-151.

LUCAS, G. (2000) - *Les industries lithiques du Flageolet I (Dordogne), approche économique, technologique, fonctionnelle et analyse spatiale*. Thèse de Doctorat. Université Bordeaux I. 2 vols.

LUCAS, G.; RIGAUD, J.-Ph.; SIMEK, J.; SORESSI, M. (2003) - The Châtelperronian of Grotte XVI, Cénac-et-Saint-Julien (Dordogne, France). In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 289-298.

MELLARS, P. A.; TIXIER, J. (1989) - Radiocarbon-Accelerator Dating of Ksar 'Aqil (Lebanon) and the Chronology of the Upper Paleolithic Sequence in the Middle East. *Antiquity*. Cambridge. 63:241, p. 761-768.

PRADEL, L. (1962) - Du burin busqué au burin nucléiforme, formes de passage. *Bulletin de la Société Préhistorique Française*. Paris. 59:9-10, p. 684-692.

RIGAUD, J.-Ph. (1982) - *Le Paléolithique en Périgord: les données du sud-ouest sarladais et leurs implications*. Thèse de Doctorat es Sciences, Université de Bordeaux I. 2 vols.

RIGAUD, J.-Ph. (1993) - L'Aurignacien dans le sud-ouest de la France: bilan et perspectives. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche-Orient. Actes du XIIème Congrès International des Sciences Préhistoriques et Protohistoriques, Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 181-186.

RIGAUD, J.-Ph.; SIMEK, J. F.; GE, T. (1995) - Mousterian fires from Grotte XVI (Dordogne, France). *Antiquity*. Cambridge. 69:266, p. 902-912.

SCHMIDER, B.; PERPÈRE, M. (1995) - Production et utilisation des lamelles dans l'Aurignacien de la Grotte du Renne, à Arcy-sur-Cure. In PAUTRAT, Y.; THÉVENIN, A., eds. - *Paléolithique supérieur et Epipaléolithique dans le Nord-Est de la France. Actes de la table ronde de Dijon, 7.10. - 8.10.1995*. Dijon: Direction Régionale des Affaires Culturelles (Cahiers Archéologiques de Bourgogne; 6), p. 4-10.

SINITSYN, A. (1993) - Les niveaux aurignaciens de Kostienki I. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche-Orient. Actes du XIIème Congrès International des Sciences Préhistoriques et Protohistoriques, Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 242-259.

SONNEVILLE-BORDES, D. de (1963) - Aurignacien et Périgordien entre Loire et Garonne. *Bulletin de la Société Méridionale de Spéléologie et de Préhistoire*. Toulouse. 6-9, p. 51-62.

TIXIER, J. (1991) - Champ-Parel, Corbiac-Vignoble 2 (CV2), Paléolithique supérieur, Aurignacien. *Gallia Informations Aquitaine*. Paris: CNRS, p. 8-10.

TIXIER, J.; INIZAN, M.-L. (1981) - Ksar 'Aqil, stratigraphie et ensembles lithiques dans le Paléolithique Supérieur: fouilles 1971-1975. In CAUVIN, J.; SANLAVILLE, P., eds. - *Préhistoire du Levant: chronologie et organisation de l'espace depuis les origines jusqu'au VI^e millénaire. Colloques Internationaux du CNRS, 10-14 juin Lyon, Maison de l'Orient*. Paris: Centre National de la Recherche Scientifique, p. 353-367.

ZILHÃO, J. (1993) - Aurignacien et Gravettien au Portugal. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche-Orient. Actes du XII^ème Congrès International des Sciences Préhistoriques et Protohistoriques, Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 154-162.

ZILHÃO, J. (1995) - *O Paleolítico Superior da Estremadura Portuguesa*. Dissertação de Doutoramento em Pré-História e Arqueologia. Universidade de Lisboa, Faculdade de Letras.

Ten small sites: the diversity of the Italian Aurignacian

MARGHERITA MUSSI ▮ PATRIZIA GIOIA ▮ FABIO NEGRINO

ABSTRACT A minimum of 30 Aurignacian sites are known to exist in Italy, either as stratified cave sites, or as open air settlements, often disturbed by farming activity. Uncalibrated ^{14}C dates range approximately 38 to 30 kyr BP, but most sites are undated. Human groups settled into very different environments, both in peninsular Italy and in Sicily, from sea-level to 1400m asl and more in the Alps and Apennines, and the type of animals exploited (red deer, ibex, equids) varied following these diverse habitats. Flint and other suitable raw-material vary in quantity, quality and size, even within relatively short distances. Accordingly, different reduction sequences were used for the production of blades, bladelets and other blanks. The archeological evidence points to a sparse population, with human groups meeting during seasonal movements, and/or linked by a well-organized network of raw-material exchange.

Introduction

The Aurignacian in Italy is represented by a minimum of 30 sites located in stratified cave deposits or open air surface scatters (Mussi, 2001). A few, as Riparo Mochi and Riparo di Fumane, are major sites which have been long known in the international scientific literature. Most, however, are either recent discoveries, smaller occurrences, or have been published years ago, sometimes only in local journals. To discuss the variability and diversity of the Italian Aurignacian, we will illustrate and briefly describe Barma Grande and Riparo Bombrini, both at the Balzi Rossi in Liguria; Lemignano in the Po valley; Grotta Salomone and the Cinquemiglia open air sites in Abruzzo; Sugherone, Grotta del Fossellone and Grotta Barbara in coastal Latium; Grotta del Cavallo in Apulia and Fontana Nuova di Ragusa in Sicily. Reference to more will be made in the discussion and conclusions.

Radiocarbon chronology is not available at most sites and only a few Aurignacian deposits have been dated at all (Table 1). Given the fluctuation of atmospheric radiocarbon concentration between 40 and 30 kyr BP (Beck et al., 2001; Voelker et al., 2000), the Aurignacian can just be loosely bracketed between 38 and 30 kyr BP.

Depending on habitat, red deer, equids and to some extent ibex, were all frequently hunted (Table 2). Other ungulates found in the archeological deposits are *Sus scrofa*, *Capreolus capreolus*, *Dama dama*, *Megaloceros* cf. *giganteus*, *Bos primigenius*, *Bison priscus*, *Rupicapra* sp. (Alhaique et al., 1998; Boscato, 1994; Cassoli and Tagliacozzo, 1991; Masini and Abbazzi, 1997; see also Mussi, 2001, for references). The carnivores include *Vulpes vulpes*, *Canis lupus*, *Gulo gulo*, *Ursus spelaeus*, *Ursus arctos*, *Crocuta crocuta*, *Felis sylvestris*, *Lynx lynx*, *Panthera (Leo)* sp., *Panthera pardus*. *Alopex lagopus*, the polar fox, is possibly present at Riparo di Fumane.

Information on local vegetation is available at some sites, where palynological or anthracological analysis was done (Riparo Mochi, Riparo Bombrini, Riparo di Fumane, Grotta La Cala, Grotta di Castelcivita). However, palynological sequences for establishing a regional framework are only available in the Latium region of west-central Italy, at low elevation. Over time, there is a trend from an open woodland to a woodland-steppe, eventually followed by the development of a steppe, with *Artemisia* generally dominant. Weak tree expansions occur at ca.38-36 kyr, at 32 kyr, and again at 30 kyr BP (Follieri et al., 1998).

TABLE 1

Radiocarbon dates of the Aurignacian sites in Italy. Italics: conventional ^{14}C dates made before 1980. Please note that at Grotta di Paina there is just a small amount of archaeological material, from the top of the dated level.

Site and level	*Result*
Mochi level G	32 280±580 BP (OxA-3588)
Mochi level G	33 400±750 BP (OxA-3589)
Mochi level G	34 680±760 BP (OxA-3590)
Mochi level G	35 700±850 BP (OxA-3591)
Mochi level G	34 870±880 BP (OxA-3592)
Fumane D3b	31 700/+1200/-1100 (UtC-1775)
Fumane D3b	32 300±400 (UtC-2045)
Fumane D6	32 300±500 BP (UtC-2046)
Fumane A1	31 900±500 BP (UtC-2049)
Fumane A2 (porch)	32 100±500 (UtC-2047)
Fumane A2 (porch)	31 600±400 (UtC-2044)
Fumane A2 (porch)	32 800±400 (UtC-2051)
Fumane A2 (porch)	40 000/+4000/-3000 (UtC-1774)
Fumane A2 (cave)	36 500±600 (UtC-2048)
Fumane A2 (cave)	36 800/+1200/-1400 (Utc-2688)
Fumane A2 (cave)	35 400/+1100/-1300 (Utc-2689)
Fumane A2 (cave)	34 200/+900/-1000 (UtC-2690)
Grotta di Paina level 9	38 600/+1400/-1800 BP (Utc-2695)
Grotta di Paina level 9	37 900±800 BP (Utc-2042)
Serino	*31 200±650 BP (F-108)*
Grotta di Castelcivita tg 6	32 390±490 BP (CAMS-4622)
Grotta di Castelcivita tg 8	*31 950±650 BP (F-105)*
Grotta di Castelcivita tg 9	*32 930±720 BP (F-72)*
Grotta La Cala	*29 800±870 BP (F-70)*
Grotta Paglicci level 24	29 300±600 (Utrecht)
Grotta Paglicci level 24	34 300±800 (Utrecht)

TABLE 2

Dominant ungulates, with NISP percentages.

	Cervus elaphus NISP%	*Equus caballus* NISP%	*Equus hydruntinus* NISP%	*Capra ibex* NISP%
Riparo di Fumane				47
Grotta del Fossellone	36		53	
Grotta di Castelcivita		40		
Grotta La Cala levels 10-13	57			
Grotta Paglicci level 24			46	
Riparo di Fontana Nuova	93			

Sources: *Grotta La Cala*: Benini et al., 1997. *Grotta di Castelcivita*: Gambassini, 1997. *Riparo di Fontana Nuova*: Chilardi et al., 1996. *Grotta del Fossellone*: Alhaique et al., 1998. *Riparo di Fumane*: Cassoli and Tagliacozzo, 1991. *Grotta Paglicci*: Boscato, 1994.

Aurignacian sites

Barma Grande

Barma Grande (the "Great Cave" in the local dialect) is one of several caves and rockshelters opening on the Mediterranean shore, next to the modern political boundary with France (Fig. 1). It was by far the richest Upper Paleolithic site of the Balzi Rossi cliff. Reference to more than 50 000 lithic implements just from this cave can be found in the literature (Bolduc et al., 1996). This is only a fraction of the finds, as the excavations were performed in the 19th century, well before the age of scientific archeology. Then, approximately half of the Barma Grande was blown-up during quarrying activity (Fig. 2).

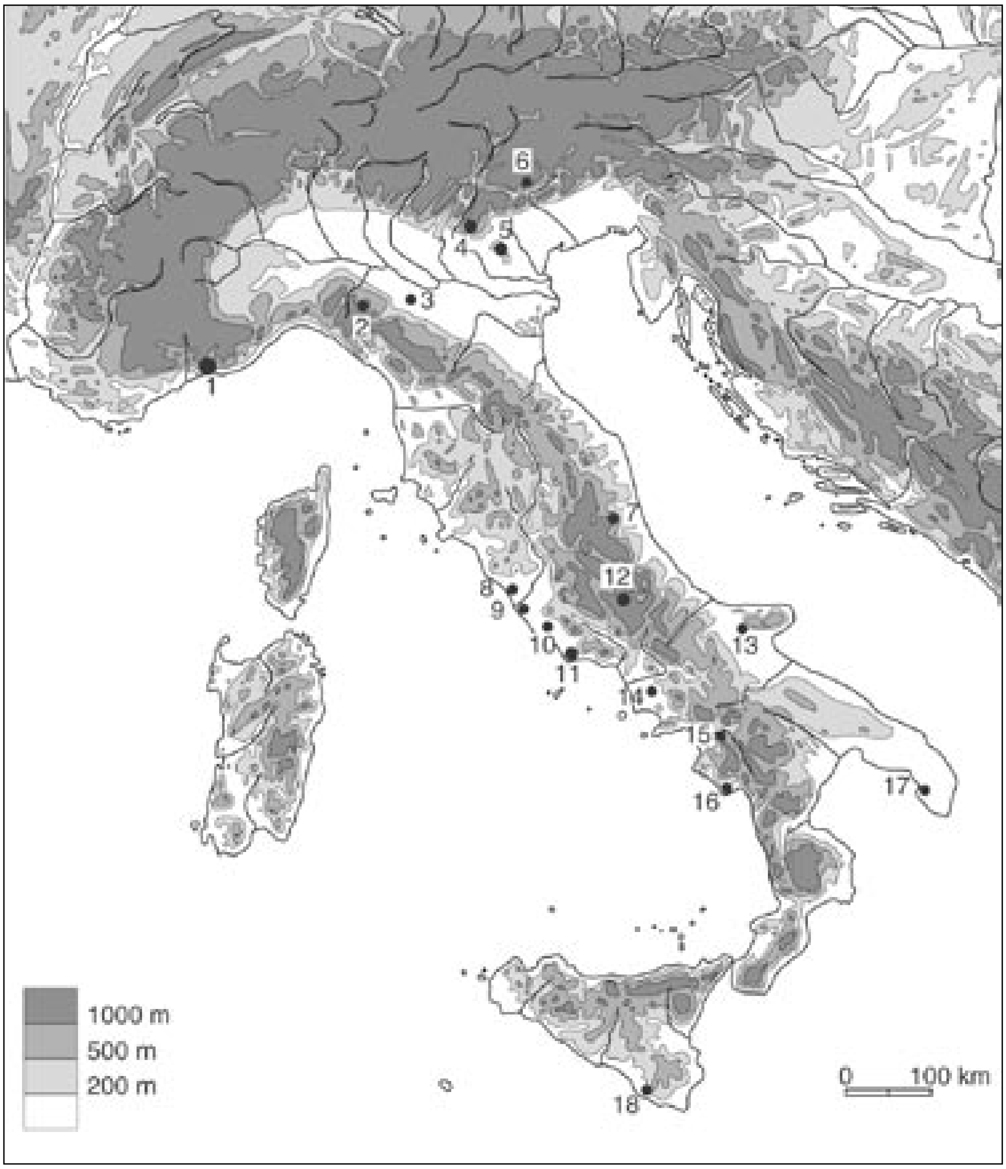

FIG. 1 – Location of Aurignacian sites described or mentioned in the text. 1. Grimaldi or Balzi Rossi sites (Grotta dei Fanciulli, Grotta del Caviglione, Riparo Mochi, Riparo Bombrini, Barma Grande, Baousso da Torre); 2. Ronco del Gatto; 3. Lemignano; 4. Riparo di Fumane; 5. Grotta di Paina; 6. Monte Avena; 7. Grotta Salomone; 8. Maccarese; 9. Sugherone; 10. Canale delle Acque Alte; 11. Grotta del Fossellone, Grotta Barbara; 12. Fonte Chiarano, Pantanello, Le Macerete; 13. Grotta Paglicci; 14. Serino; 15. Grotta di Castelcivita; 16. Grotta La Cala; 17. Grotta del Cavallo, Grotta M. Bernardini, Grotta di Uluzzo, Grotta di Uluzzo C, Grotta di Serra Cicora; 18. Fontana Nuova di Ragusa.

FIG. 2 – Barma Grande and part of the Balzi Rossi cliff. On the left of the extant cave, the lighter coloured rock wall, on which the arrow is superimposed, was produced by 19th century quarrying activity. Other caves and shelters open behind the quarry site and cannot be seen in this picture. In the foreground, the town of Menton, in French territory (photo M. Mussi).

Some evidence can be gained from the study of ca.300 lithic implements excavated by L. A. Jullien[1] in 1883-1884; and of 260 more tools unearthed by Abbo, a quarry-man, in subsequent years[2].

Part of the Jullien collection can be safely attributed to the Aurignacian on a typo-technological basis, including some carinated endscrapers, and endscrapers on an Aurignacian blade, all with a rather glossy patina (Bolduc et al., 1996) (Fig. 3). More Aurignacian blades and endscrapers were illustrated by Cardini (1930), together with two[3] split-based bone points (Fig. 4).

The Aurignacian was originally found nearly everywhere at the Balzi Rossi, above Mousterian layers. The rather mixed deposit of "foyer" K at Grotta dei Fanciulli ("Grotte des Enfants" in the French literature), excavated by the team of Prince Albert I of Monaco, included a couple of bone points with a split base (De Villeneuve et al., 1906-1919), and a few more were previously discovered by E. Rivière at Grotta del Caviglione and at Baousso da Torre (Rivière, 1887) (Fig. 5). Riparo Mochi and Riparo Bombrini, also at the Balzi Rossi, are all that is left to modern archeologists of what must have been a once vast Aurignacian complex.

Riparo Bombrini

Riparo Bombrini is one of the last discovered Upper Paleolithic sites at the Balzi Rossi, as L. Cardini noticed archeological material at this spot in 1938. By then, the rockshelter had already been badly damaged by railway construction. G. Vicino did salvage excavation in 1976, and new research, currently under way, started in 2002 (Vicino, 1984; Holt et al., 2003).

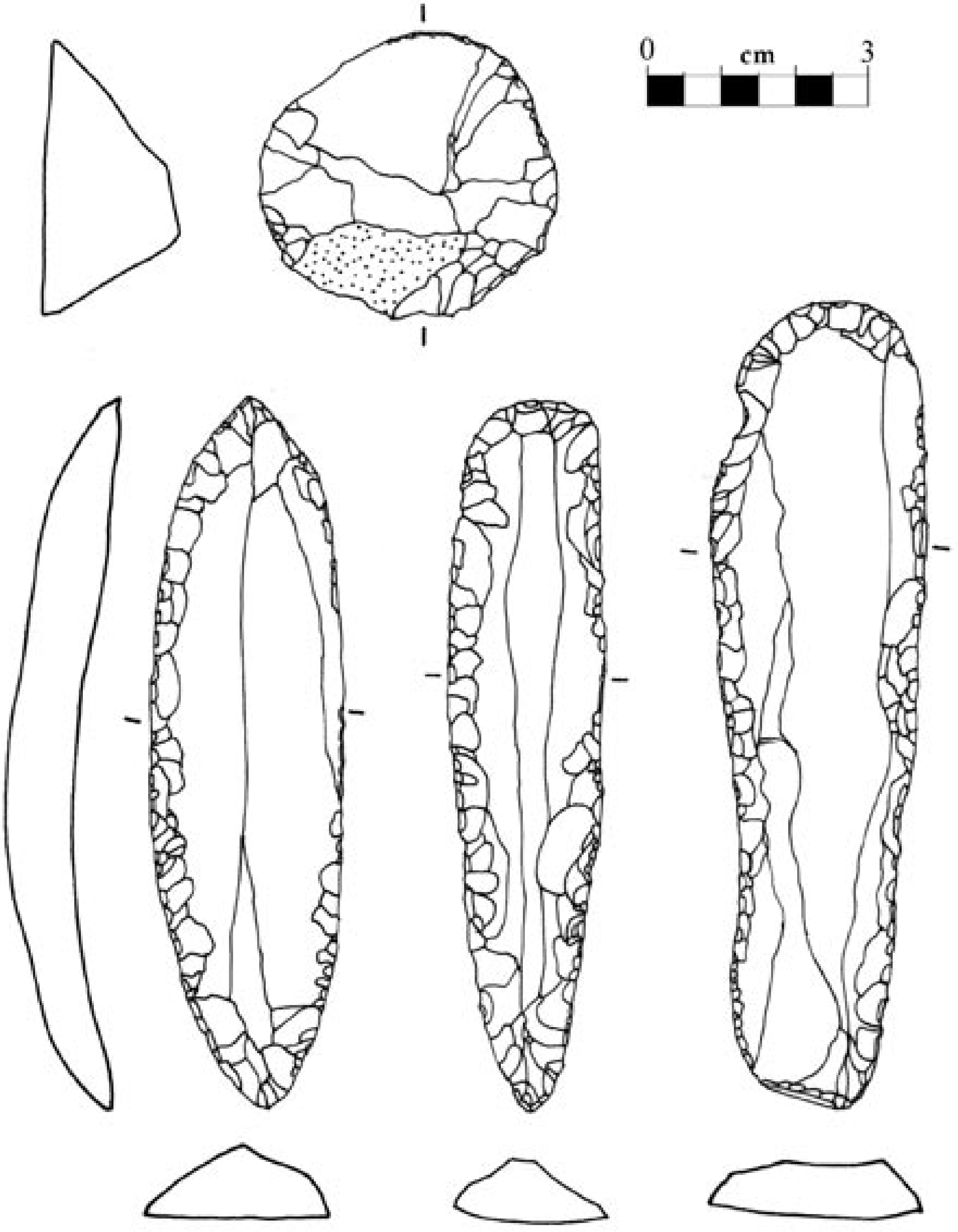

FIG. 3 – Aurignacian lithic industry from Barma Grande (drawings M. Mussi).

FIG. 4 – Bone points from Barma Grande, including two split-based specimens (photo F. Negrino).

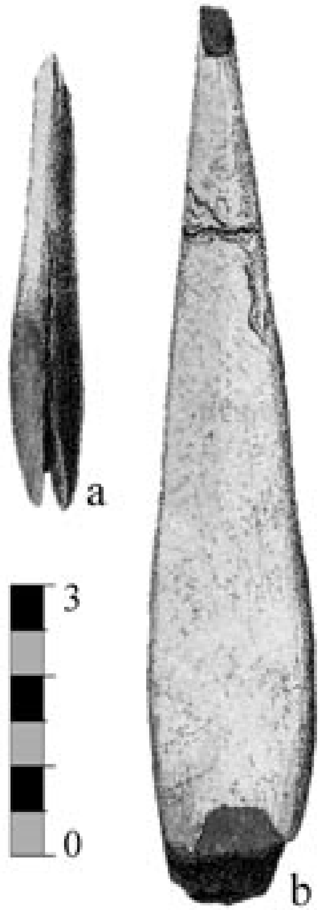

FIG. 5 – Split-based bone points from: a) Grotta del Caviglione; b) Baousso da Torre (after Rivière 1887, with modifications).

A rich Aurignacian deposit, with two hearths, was discovered where the innermost part of the shelter once stood. Mousterian layers were also found, but there is evidence of an erosion phase between the Middle and the Upper Paleolithic.

The lithic assemblage is made mostly by debitage: flakes and bladelets, a few prismatic cores, and some pyramidal cores. There are several Dufour bladelets, some splintered pieces, but only a few formal tools such as endscrapers, burins, and scrapers. Local raw-material was mostly used, but exotic flint was also imported from Vaucluse and Provence, together with ryolithic rocks from the Estérel massif. Some jasper originated from eastern Liguria and from over the Apennines near Parma (Fig. 16) and some tiny bladelets of very characteristic flint (brown to reddish in color) apparently originated from the Scaglia formation of the Marche region, on the Adriatic side of the Italian peninsula, and 350 km away (Negrino and Starnini, 2003).

Bone points (not with a split base), perforated marine shells, a steatite fragment, red ocher, and three tiny incised bird bones (Fig. 6) were also found. Deer and horse remains have been so far identified. A deciduous human lower central incisor was also discovered.

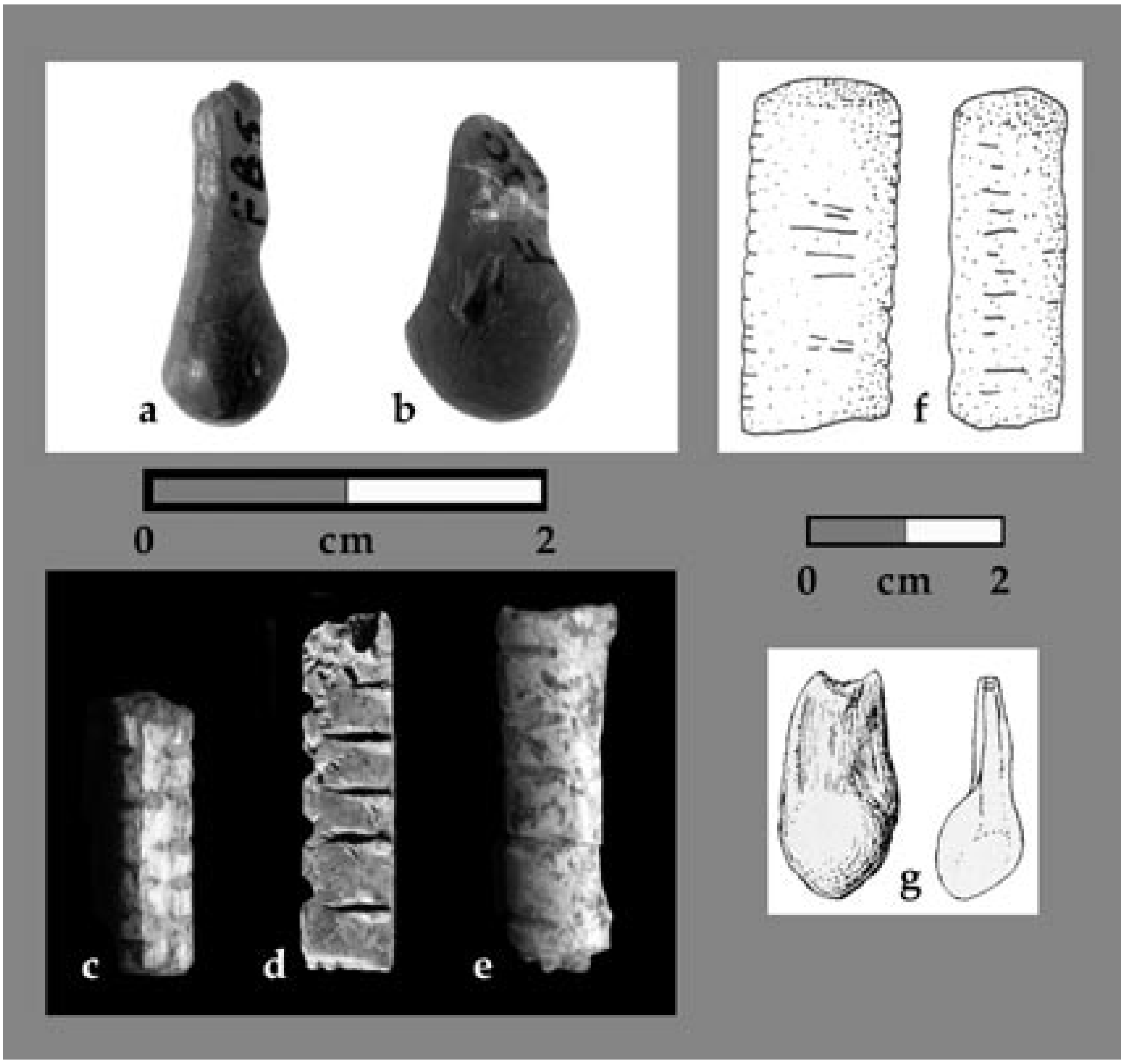

FIG. 6 – Ornaments and decorated items from Aurignacian sites at different scales: a-b. steatite pendants, Grotta del Fossellone; c-e. incised bird bones, Riparo Bombrini; f. incised limestone element, Riparo di Fontana Nuova; g. perforated deer canine, Grotta del Fossellone.

Lemignano

Lemignano is an open air site on the Po plain, near Parma, where lithic implements were collected in great numbers after farming activity: about 3800 over an area of ca.13 000 m^2 (Ghiretti et al., 1991). The archeological remains were apparently covered by a thin deposit of loess, and were disturbed by plowing. Good quality jasper was available nearby as rather large river pebbles of 10-30 cm and more in length, and was knapped on the spot (87,25%), as evidenced by large numbers of flakes, very often with cortical surface. Some flint (2,35%) also originated from the Scaglia Formation (see above), which from Lemignano outcrops at a distance of some 180 km away. There are just a few blades, including crested ones, and over 50 cores, mostly prismatic and pyramidal. These were reduced to produce elongated flakes and blades.

The retouched tools, 100 in all, were classified as follows: mostly endscrapers, including keeled and nosed forms (Fig. 7); some notches and scrapers; and burins, which are also cari-

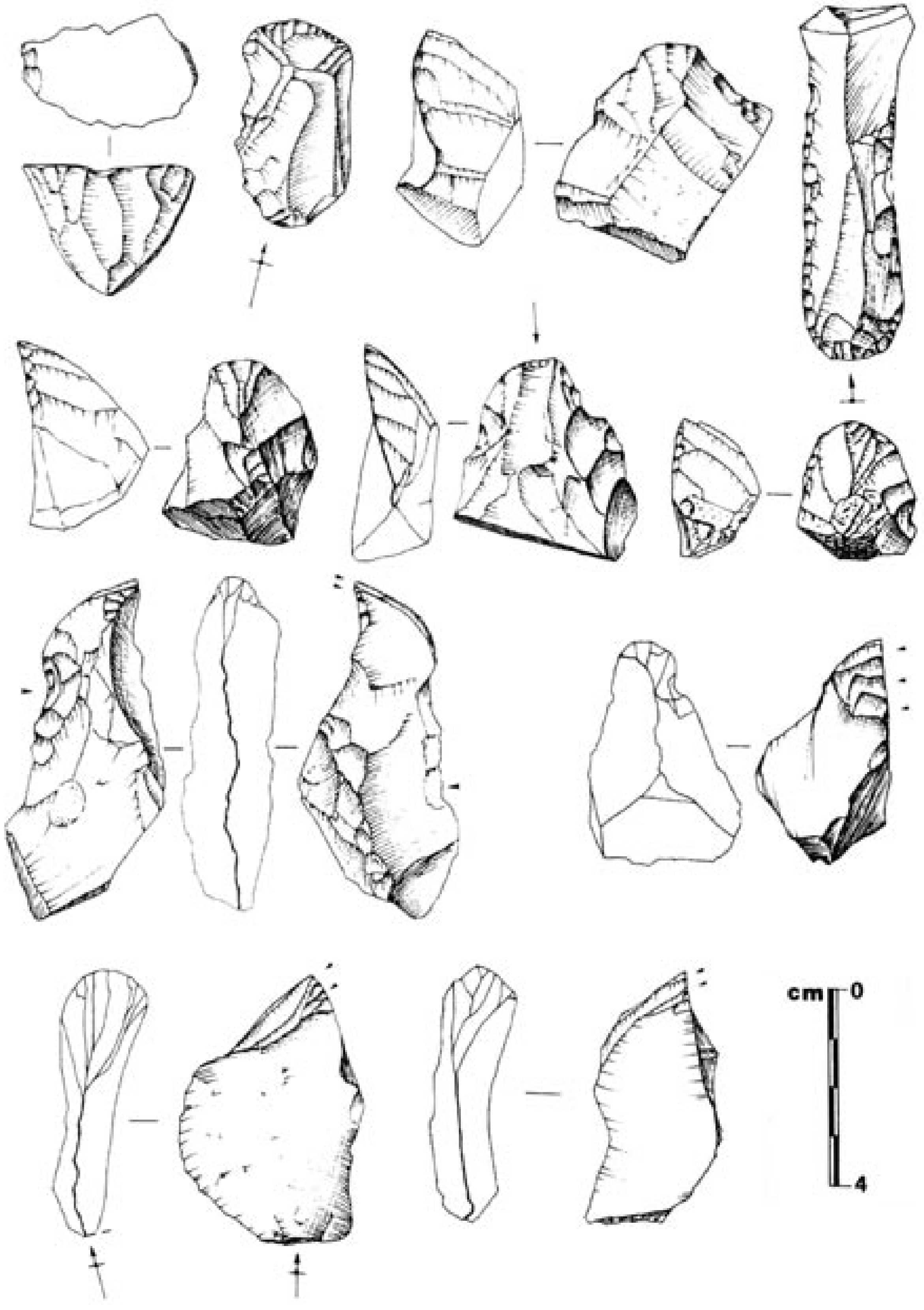

FIG. 7 – Aurignacian lithic industry from Lemignano (drawings F. Negrino).

nated and better interpreted as microblade cores (Le Brun-Ricalens and Brou, 2003). Lithic types such as Vachons burins and busked burins, rarely found in Italy, were also recognized at Lemignano.

Grotta Salomone

Grotta Salomone is a cave on the eastern side of the Apennines, at 590 m asl, not far from the Adriatic shore. The ceiling collapsed in the 16th century, so that the reworked archeological deposit of Grotta Sant'Angelo, which opens just above it, ended in the lower cave. This rather disturbed site was excavated in the sixties of last century by A. M. Radmilli, who eventually published a sketch of the stratigraphy (Radmilli, 1977).

The cave apparently was a cave bear den, and only a handful of implements were reportedly found: some blades and endscrapers, a crested blade and a nearly complete bone point with a split base (117 x 18 x 6 mm) (Fig. 8).

FIG. 8 – Split-based bone point from Grotta Salomone (photo M. Mussi).

The Cinquemiglia open air sites of Abruzzo

Aurignacian lithic implements can be found much higher in the mountains of Abruzzo, and most notably in the Cinquemiglia area, a region of plateaus and rolling mountains at 1000 to 2000 m asl[4]. So far, tools and debitage have been either collected, or retrieved when excavating open air sites which were highly disturbed by diagenic activity. The sites, at an elevation between 1300 and 1600 m asl, include Fonte Chiarano, not far from a flint outcrop, with blades and bladelets generally lacking cortex; Pantanello, next to a marshy area which most probably was a small lake in the final Pleistocene; and Le Macerete, with evidence of quarrying activity and flint exploitation (Fig. 9).

Overall, there is evidence of blade and bladelet production by direct percussion. Hard hammer technique was positively in use during the first steps of core reduction.

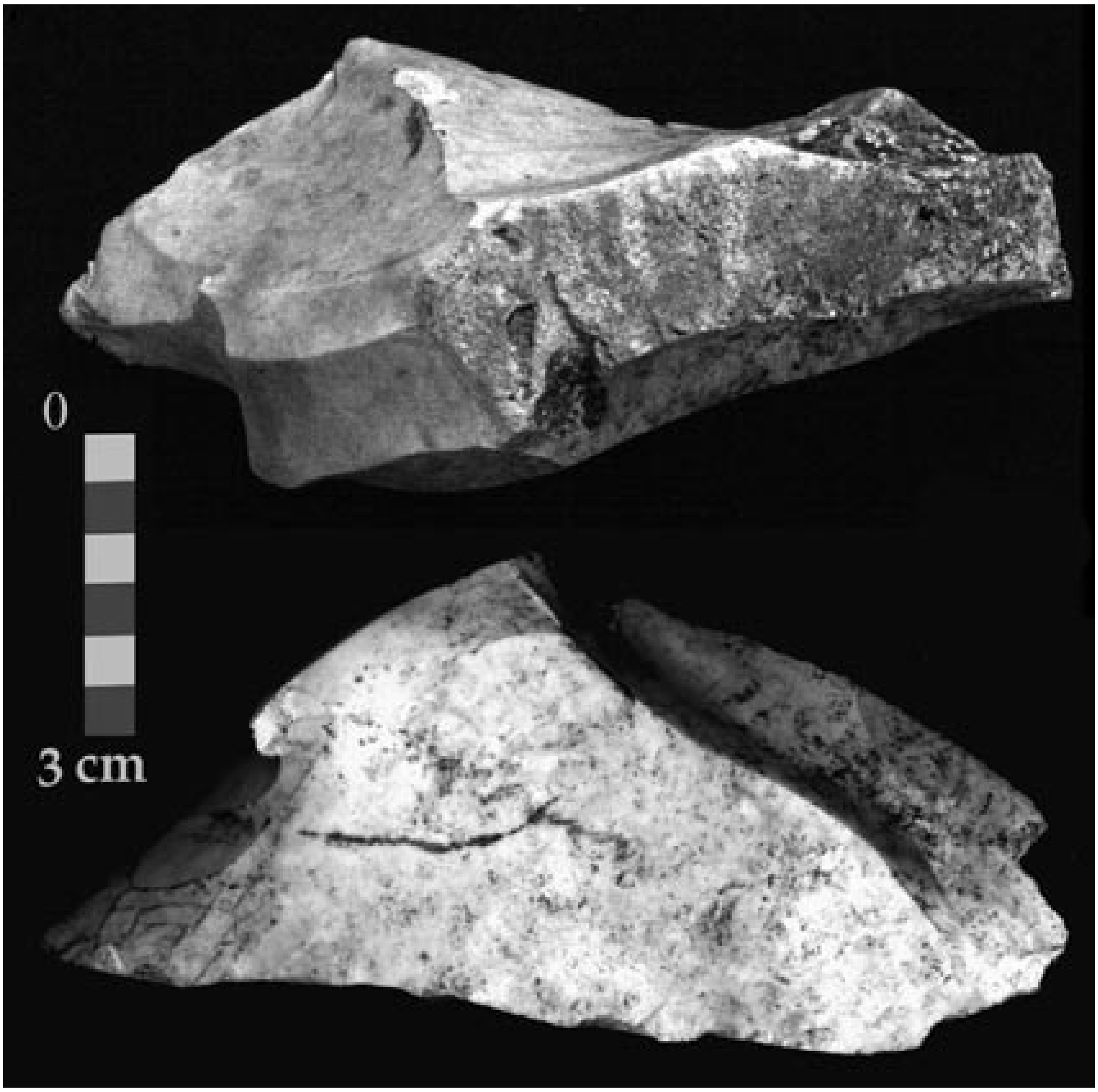

FIG. 9 – Carinated burin or bladelet core from Le Macerete (photo M. Mussi).

Sugherone

In-between Rome and the modern sea shore stands Sugherone, an open air site on an Upper Pleistocene marine terrace at 50-60 m asl. Systematic and repeated surface collections were made a decade ago, and stratigraphic trenches were dug[5] (Arnoldus-Huyzendveld et al., 1996). Over an area of ca.3000 m^2, approximately 2000 artifacts were collected, which can be safely labeled as Aurignacian on typological and technological grounds (Fig. 10). The local stratigraphic sequence included thick deposits of OIS 5, which had been affected by erosional processes (OIS 4?), and eventually capped by sands. The lithic industry, when found *in situ*, was laying at the base of the sands, as well as within the lowermost sand deposit.

Preliminary information is available on a sample of 800 implements. As at most sites of coastal Latium (see below), flint pebbles were knapped, of moderate size. A bipolar flaking technique was often used. Most of the formal tools are endscrapers, which include carinated and nosed types. Burins are few, retouched blades include Aurignacian blades, and notches outnumber denticulates.

Aurignacian artifacts are found in similar stratigraphic situations all over coastal Latium. At Maccarese, where no subsequent sand deposition occurred, the archeological deposit is a palimpsest dating from OIS 5 to OIS 2 (Arnoldus-Huyzendveld et al., 1993). At Canale delle Acque Alte, there is a sequence starting with a Tyrrhenian beach, and covered by sands, which was reported by A. C. A. Blanc (1937a; see also Mussi and Zampetti, 1984-1987).

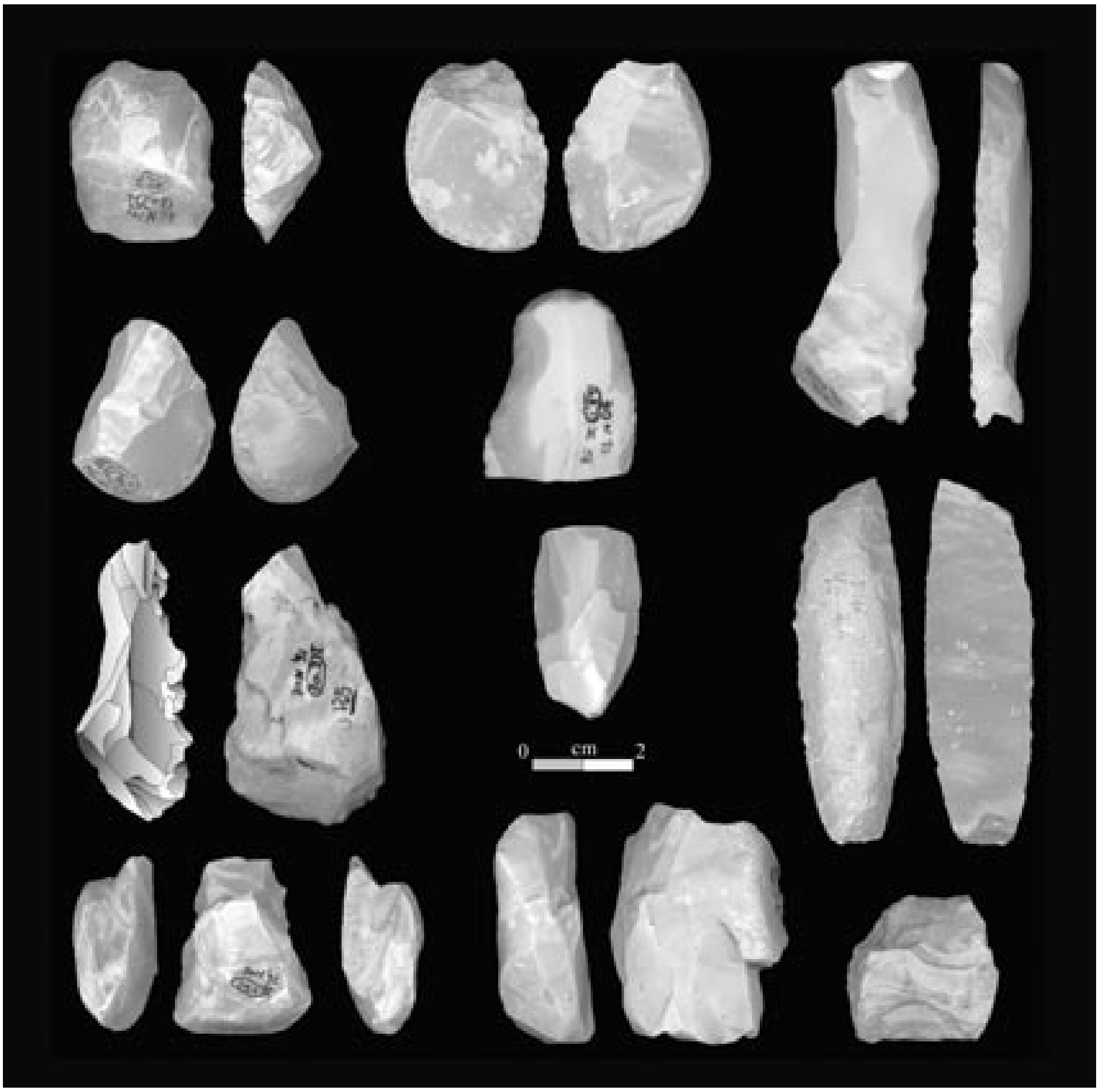

FIG. 10 – Aurignacian lithic industry from Sugherone (photo P. Gioia).

Grotta Barbara

Grotta Barbara is a small cave 12 m long and 4 m wide, opening on the southern cliffs of Monte Circeo, 100 km south of Rome, not far from Grotta del Fossellone (see below). The archeological deposit stands at ca.8 m asl and is currently eroded by stormy waves. Aurignacian layers, which originally accumulated over 50 cm or more, are found as residual deposits in protected parts of the cave, directly on top of Mousterian levels (Mussi and Zampetti, 1995). Remains discovered consist of *Equus hydruntinus*, *Equus caballus*, *Dama dama*, *Cervus elaphus*, *Bos primigenius*/*Bison*, *Capra ibex*, *Vulpes vulpes*, *Lepus*/*Oryctolagus*[6].

As at other sites in coastal Latium, most of the flint derived from small pebbles. Those locally available were of good quality, but hardly more than 60 mm in maximum length, and usually between 20 and 40 mm. Most of the 100 or so formal tools are endscrapers (nosed, shouldered, on an Aurignacian blade), but a few burins, as well as notches, denticulates, borers, truncations, and retouched blades, are all part of the typological inventory. Blades are rare, and quite reduced in size, while carinated endscrapers, which could be the result of bladelet production, are simply not found (Fig. 11). Flaking was very often bipolar, and several reduction sequences have been described, which allowed for the production of bladelets, either plain or with a trihedral section (D'Angelo and Mussi, 2005) (Fig. 12). Other trihedral

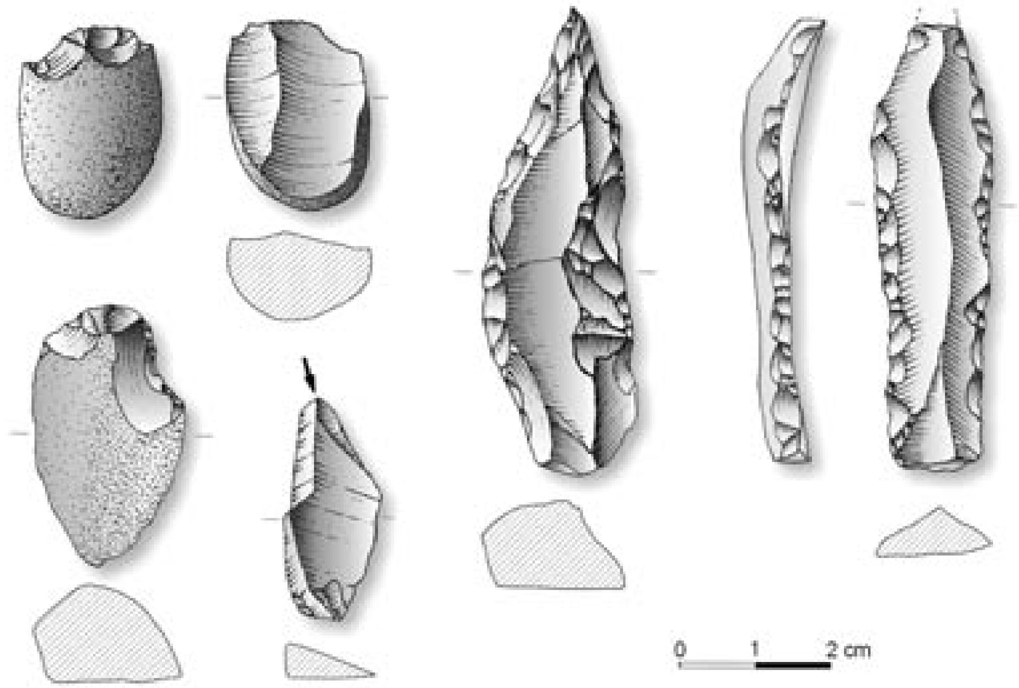

FIG. 11 – Aurignacian lithic industry from Grotta Barbara (drawings P. Gioia).

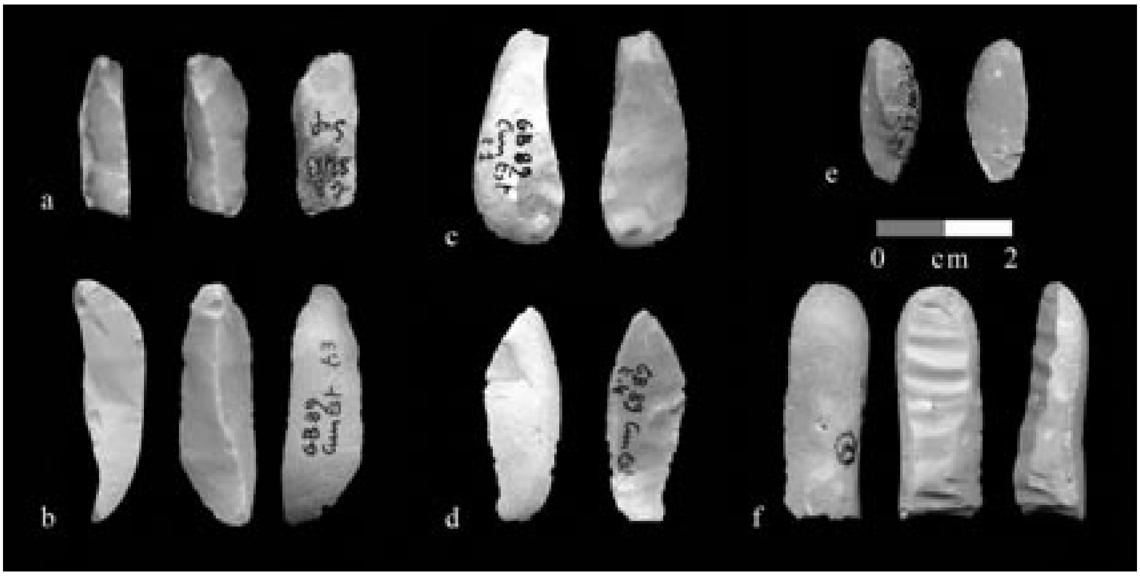

FIG. 12 – Bladelet production at Grotta Barbara, related to bipolar percussion technique: a-b. retouched dihedral bladelets; c-d. corticated bladelets with *en épi* bulb; e. retouched bladelet with distal esquilles; f. exhausted bladelet core (after D'Angelo and Mussi, 2005).

products, larger in width, were sometimes used instead of flakes, and retouched accordingly. Splintered pieces are further evidence of the widespread use of a bipolar flaking technique, which is better explained by the reduced size of the pebbles.

Grotta del Fossellone

Grotta del Fossellone at Monte Circeo, on the coast of Latium, was the first Aurignacian site to be excavated in peninsular Italy, after the pioneering phase at the Balzi Rossi. In 1937, A. C. A. Blanc recognized that there was a layer with Upper Paleolithic implements and "*pointes d'Aurignac*"[7] (Blanc, 1937b), and he dug there over several seasons. Later, Blanc emphasized that the Aurignacian was far richer at Grotta del Fossellone than at Riparo Mochi, that he also excavated (Blanc and Segre, 1953). A long sequence of Mousterian layers is also documented at Grotta del Fossellone, below level 21, which is the Aurignacian one.

Only preliminary reports are available, however. Of the ca.1400 retouched tools of level 21 reported by Laplace[8] (1966), 900 or so are "endscrapers", most of them carinated. Blanc (in Blanc and Segre, 1953) mentions thousands of bladelets, that he describes as byproducts of the "endscrapers", further stating that none are retouched (Fig. 13). There are some 30 burins, probably well over 100 Aurignacian blades, some of them quite large, and also points, scrapers, denticulates, and splintered pieces. The bipolar flaking technique was also fre-

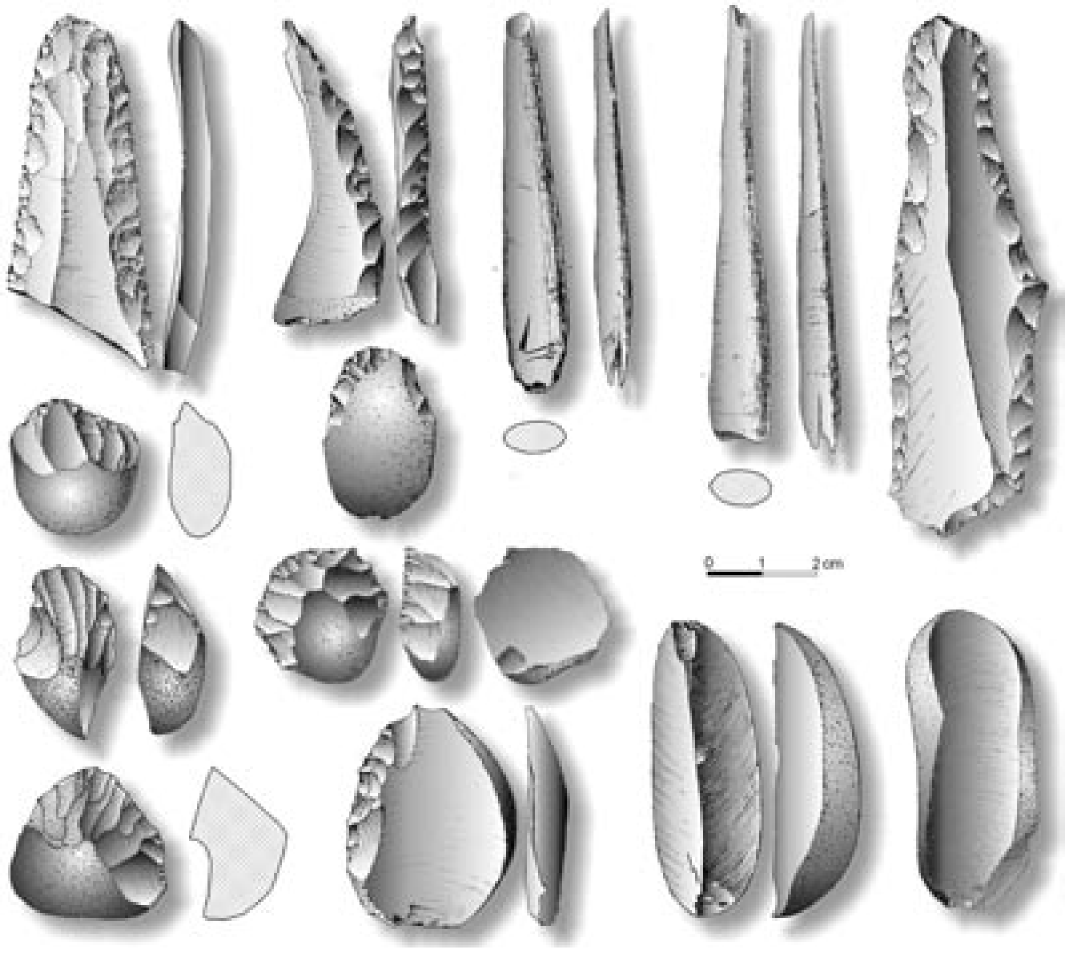

FIG. 13 – Lithic and bone industry from Grotta del Fossellone, level 21 (drawings P. Gioia, after Blanc and Segre, 1953).

quently used (Fig. 13). Most of the lithic implements were produced using flint pebbles, apparently somewhat larger than at Grotta Barbara.

The bone industry is unusually abundant for an Italian site, and includes a number of split-based points (Fig. 13), the southernmost such occurrence. There are also ornaments, represented by perforated deer canines, and two steatite copies of deer canines (Fig. 6). Preliminary observations suggest that perforation was not fully mastered, since a technique *par refouillage* was used. The perforated end was in one instance broken.

The rich fauna is currently under review, but a preliminary study by Alhaique et al. (1998) is available. Red deer and hydruntine horses are predominant (Table 2), with smaller amounts of *Sus scrofa*, *Dama dama*, *Capreolus capreolus*, *Bos primigenius*, *Capra ibex*, *Rupicapra rupicapra*, *Equus caballus*, as well as many birds. The site was occupied between fall and spring, with a peak in *E. hydruntinus* kills in winter.

Grotta del Cavallo

The stratigraphic sequence of Grotta del Cavallo, on the Ionian coast of southern Apulia, is a long and complex one, starting with an interglacial marine level (Palma di Cesnola, 1965, 1966). The latter is capped by some 7 m of Mousterian, Uluzzian and Aurignacian deposits, and by later prehistoric levels as well. We will deal below only with the Aurignacian, which was found in a much disturbed layer, level D, originally interpreted by Palma di Cesnola as Uluzzian. In level D, both Uluzzian and Aurignacian implements are actually mixed by

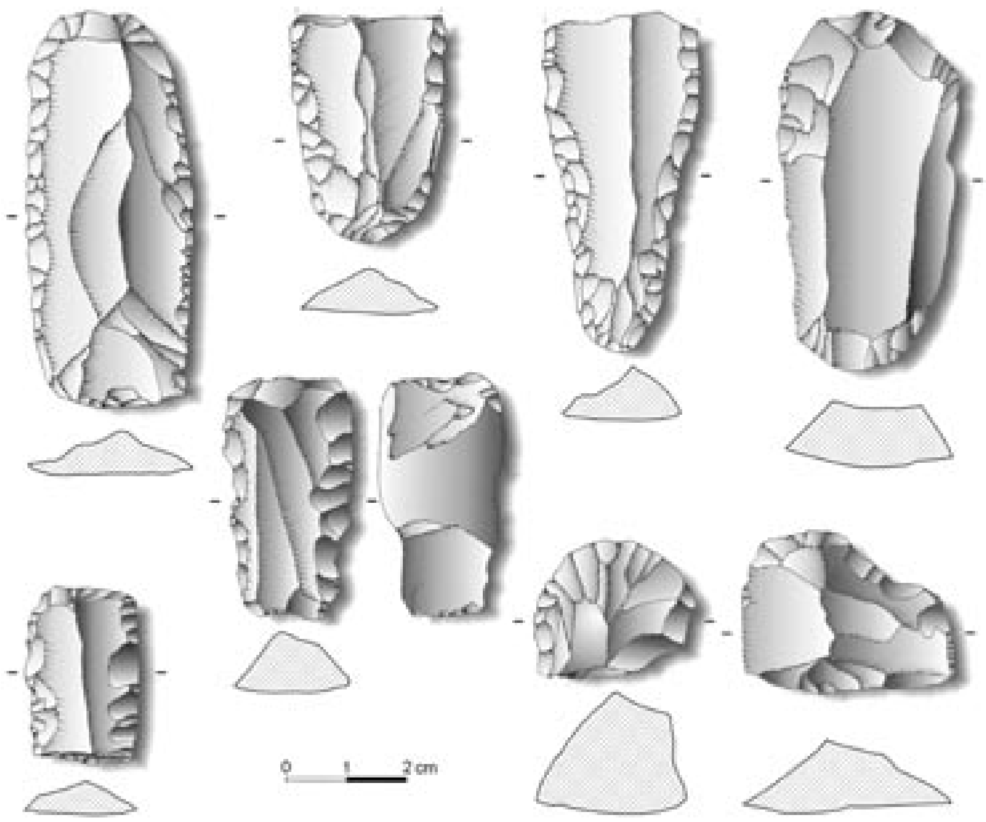

Fig. 14 - Aurignacian lithic industry from Grotta del Cavallo (drawings P. Gioia).

anthropic and biotic activity, but it can be safely hypothesized that a thin Aurignacian layer was originally deposited on top of the Uluzzian one (Gioia, 1990).

Exotic flint was used, instead of the local one, which is of poor quality. The lithic inventory consists of carinated and nosed endscrapers, endscrapers on Aurignacian blades and retouched blades (including a strangled blade), as well as notches and denticulates (Fig. 14). Splintered pieces occur in great numbers. Marine shells, some of them perforated, and segments of *Dentalium*, are abundant in level D, but cannot be easily sorted between Uluzzian and Aurignacian. This is also true of mammal bones, which include many horse remains.

There is also some evidence of Aurignacian in nearby caves, as Grotta di Serra Cicora, and possibly Grotta di Uluzzo, Grotta di Uluzzo C, and Grotta Mario Bernardini.

Fontana Nuova di Ragusa

Fontana Nuova is a small rockshelter of southern Sicily — the southernmost Aurignacian site in Europe, actually. This was hardly noticed, however, when first excavated by a local nobleman, Baron Vincenzo Grimaldi di Calamenzana, before the first World War. He just collected the flint implements, donated them to the local museum, and reburied the faunal remains. The site was investigated again after the second World War by L. Bernabò Brea, who found it nearly empty, and the collections were systematically studied only a few years ago (Chilardi et al., 1996).

The rockshelter opens at 145 m asl, in a commanding position 80 m above the coastal plain, at some 3 km from the modern sea shore. The extant lithic collection of 224 imple-

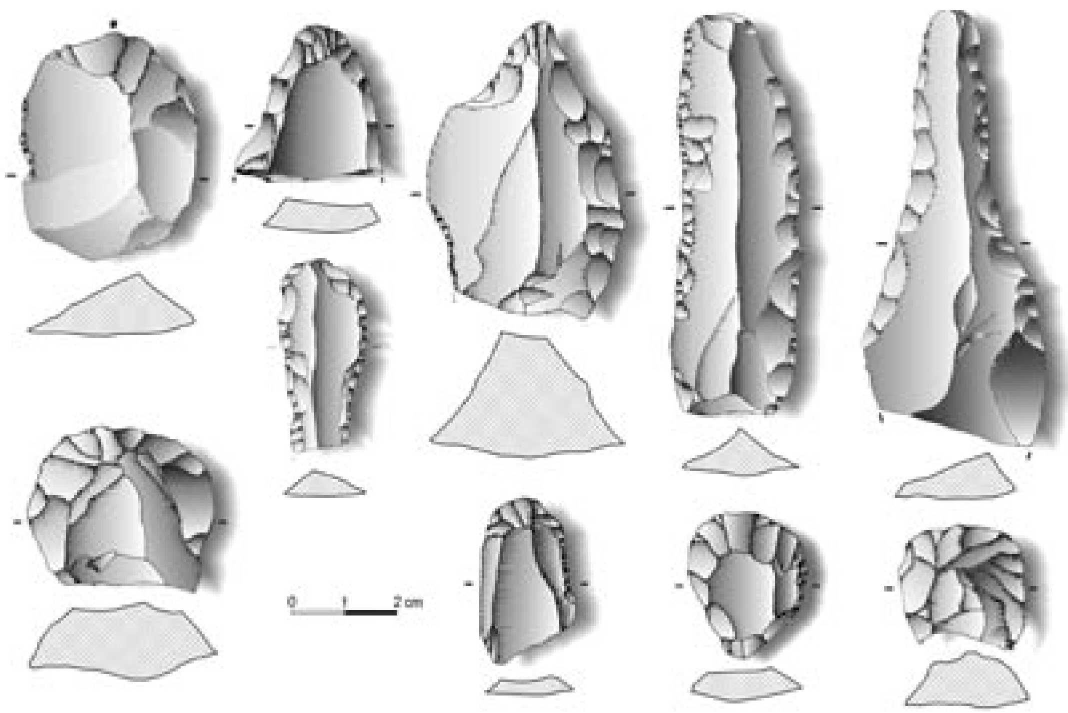

Fig. 15 - Aurignacian lithic industry from Fontana Nuova di Ragusa (drawings P. Gioia).

ments includes a fair percentage of endscrapers (nosed, carinated, on a retouched blade, etc.), as well as many retouched and unretouched blades (Fig. 15). The local Amerillo flint, and the exotic Monte Iudica flint, which outcrops at a distance of some 100 km, were both used to a comparable extent. The Monte Iudica flint, however, was chosen predominantly to make blades, which were apparently produced off-site. Bladelets are not preserved. A limestone element, naturally shaped as a cylinder, was decorated with a row of incisions (Fig. 6).

L. Bernabò Brea located the reburied faunal remains. Of these, red deer bones vastly outnumber any other animal remains (Table 2). This likely reflects the limited number of species able to cross the treacherous Messina Strait and to colonize the island.

Discussion

Raw-material and technological diversity

A variety of reduction sequences are represented, including an emphasis on bipolar percussion at some sites, as in the open air sites of coastal Latium, and in Grotta Barbara and Grotta del Fossellone at Monte Circeo. The technique was also in use at Riparo Bombrini, and is well-suited to take advantage of small pebbles. Different bipolar reduction sequences for the production of bladelets alone have been identified at Grotta Barbara, suggesting unsuspected complexity in this rather unconventional method. The many carinated endscrapers/bladelet cores on small pebbles, also found at Grotta del Fossellone, Sugherone and elsewhere, are evidence of another technological approach to the challenge of local materials. At Lemignano, the busked burins are indicative of yet another *chaîne opératoire*, suited to the exploitation of much larger pebbles.

Raw-material constraints were also evidenced at the Balzi Rossi, and most notably at Riparo Bombrini and Riparo Mochi. Here, bladelets and microbladelets were produced locally, but most blades were imported from France, eastern Liguria and Emilia, where jasper and good-quality flint outcrops were found (Negrino and Starnini, 2003). Finally, the search for suitable micro-crystalline rocks led to establishing seasonal quarry sites in high mountains, as at Monte Avena and at other sites of the Apennine.

Seasonal circulation

Both the geographic distribution of sites and raw-material procurement are indicative of long distance circulation. "Long distance", however, should be related to the morphology and geographic constraints of Italy, which limited traveled distances in an east-west direction.

Aurignacian sites have been located both at high altitude, and in an island environment, i.e. in Sicily. Monte Avena is a quarry site at 1450 m asl in the pre-Alps (Lanzinger and Cremaschi, 1988), Ronco del Gatto is another large quarry site, at 1200 m asl in the northern Apennine[9], while the Cinquemiglia sites mentioned above cluster between 1300 and 1600 m asl in the central Apennine. They are all open air sites without any faunal preservation. However, even assuming that mountain colonization happened during a mild oscillation of OIS 3, there is little doubt that they refer to seasonal exploitation Spring to Fall. The cold part of the year would have been spent at lower elevations, in the range of at least 50 to 100 km away. Grotta del Fossellone, at Monte Circeo on the Tyrrhenian coast, which was occupied from Fall to Spring, is a good example of wintering at sea level. Jasper from Ronco del Gatto, positively recognized in the Balzi Rossi collections, is possibly further evidence of seasonal circuits linking the coast with distant mountains areas.

Fontana Nuova, the Sicilian site, is also suggestive of substantial movement. The Messina Strait is presently some 3 km wide, but is well-known since Antiquity for its treacherous currents[10]. Notwithstanding its modern depth of 72 m, this active tectonic area was open sea for the entire last glacial, and was not traversed without risk and difficulty, by humans just as by animals (Chilardi et al., 1996). The Strait seems unlikely to have been crossed back and forth again and again, and Aurignacian groups settling in Sicily are, by themselves, evidence of movement over substantial distance.

Flint and other inorganic resources give further detail of circulation — either direct movement, or hand-to-hand exchange. In northwestern Italy, flint and other rocks were transported over 100 to 200 km, from both east and west of the Balzi Rossi (Fig. 16) — not to mention the Scaglia rossa flint, from well over 300 km afar. All over peninsular Italy, movements are usually shorter, given the narrow shape of the country. A minimum of 50 km traveled from the western coast can be inferred after finding inland the nosed endscrapers on small pebbles[11] that are well documented at Monte Circeo and in the coastal plain. At Grotte del Cavallo, there is possible evidence of a limited use of flint from Monte Gargano, 250 km north-west of the cave. The Monte Iudica flint of Fontana Nuova outcropped at a distance of 100 km. At the inland site of Grotta di Fumane, again in the north, high numbers of marine shells were discovered (Bartolomei et al., 1992). If during final OIS 3 the sea level was at least at around –20 m (Alessio et al., 1994), some 150 km would have been traveled, just to reach the Adriatic shore.

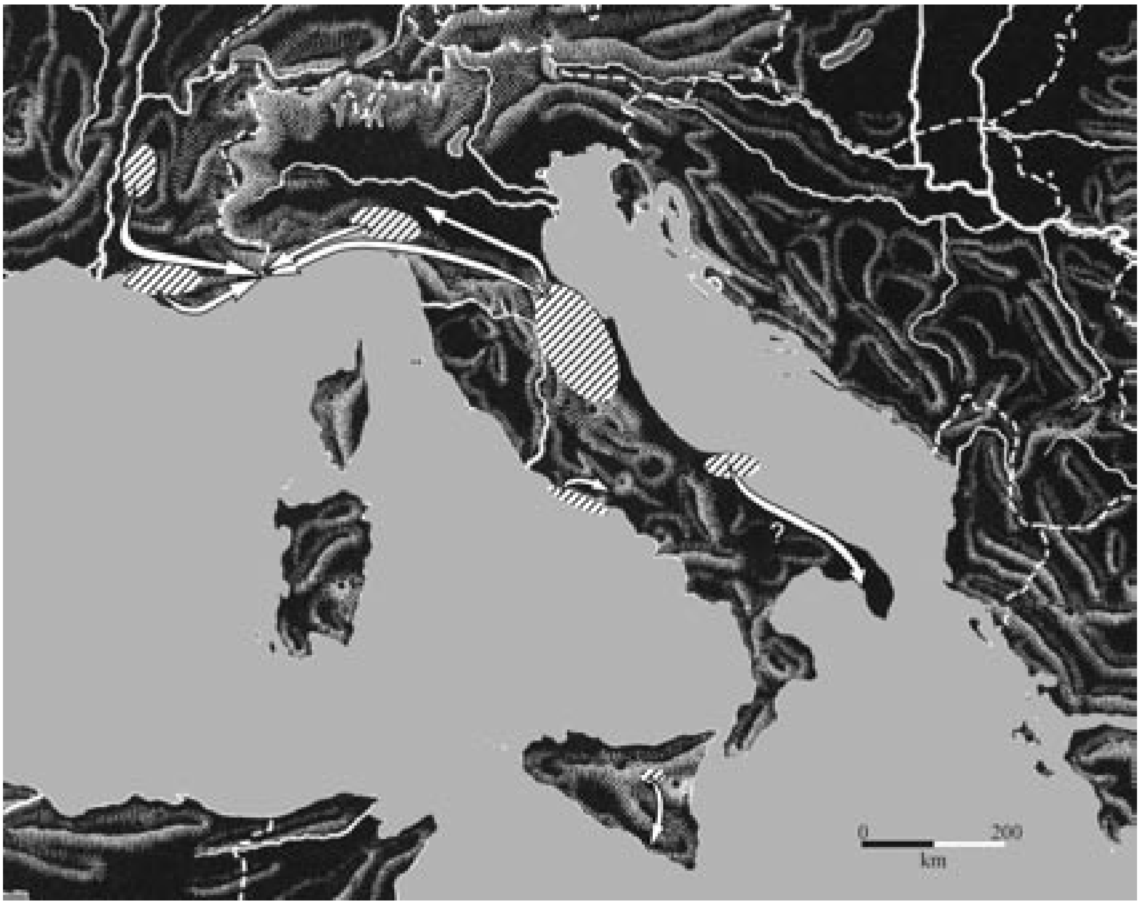

Fig. 16 - The circulation of lithic raw-material, after the evidence of selected Aurignacian sites.

Conclusions

Approximate as it is, the radiocarbon chronology summarized in Table 1 suggests that Italy was inhabited during 5000-10 000 years by human groups producing Aurignacian tools. If new people entered the country, they had to adapt to a different environment: most probably to a milder climate, possibly to a slightly more wooded landscape, and certainly to a more limited variety of animal species (Table 2). Flint resources, often found above 1000 m in the mountain ranges, were unevenly distributed, and at lower elevation sometimes occurred as small-sized pebbles only. Innovative reduction sequences had to be elaborated, while the lack of any split-based bone point south of Monte Circeo is puzzling.

The success of the Aurignacian can only be sketchily estimated by the number of known sites. We assume that many are currently under the sea, a major loss of information in a country, like Italy, where coasts are thousands of kilometers long. More disappeared under expanding glaciers at the LGM, as Monte Avena testifies, which was exceptionally spared, because of the favorable local morphology. Most of the largest Italian plain of the time, which includes the present Po valley, is also beyond investigation, because of extremely marked subsidence rates and thick alluvial deposits inland, and because of rising sea levels further downstream, as the plain extends into the northern Adriatic.

Taking into account preservation problems, we can cautiously compare site density in Italy with the repertoire established by Bocquet-Appel and Demars (2000) for the Aurignacian north of the Alps. The 30 to 40 caves and open air sites in our sample (Mussi, 2001), compare reasonably well with the total of 60 in their "Zone B". The latter is France outside northern Aquitaine, i.e. an area nearly double Italy. Bocquet-Appel and Demars eventually estimated a population of 5400 in northwestern Europe, an area of more than 1 400 000 km, with half the evidence concentrating in the refuge of Aquitaine.

If the density calculated for northwestern Europe is extended to Italy, we get an estimated population of approximately 1000 inhabitants[12]. This, however, is possibly an overestimate, as the general density north of the Alps includes Aquitaine. Not taking into account this refuge, and recalculating accordingly the population of Italy, we rather get some 500 inhabitants.

We emphasize again that these are rough estimates, which are flawed by a number of only partially understood variables. Approximate as they are, however, the numbers calculated above point to a demographic pattern just compatible with a viable and stable population (Wobst, 1974). Some Aurignacian sites exist, in Italy, as thick archeological deposits, with abundant lithic and organic remains, suggestive of human groups returning to favored spots over a long time period. Besides, there are site clusters, as at the Balzi Rossi or at Monte Circeo. But elsewhere, as at Grotta Salomone or Fontana Nuova, there is just a scatter of implements, and evidence of short and occasional stays. Moreover, mountains were presumably visited during the warmer season only. High mobility is suggested by other sites which are scattered and short-lived, while long distance relationships are inferred from shell and raw-material circulation. Evidence exists for regular contacts between lowland and mountains, and between east and west, inside and outside a vast territory, which, for sure, was to no means split into "Italy" and "France". We assume that this was the result of a well-organized network of exchanges, aimed at keeping in contact with each other groups living at exceedingly low demographic density.

Acknowledgments

Margherita Mussi examined Barma Grande, Grotta Salomone, the Cinquemiglia sites and Grotta Barbara; Patrizia Gioia analyzed Sugherone, Grotta del Cavallo and Fontana Nuova; Fabio Negrino studied Riparo Bombrini and Lemignano. We thank L. Narisi and F. Scarpelli, Laboratorio di Paletnologia, Università di Roma "La Sapienza", for elaborating the figures in an electronic format. D. W. Frayer most kindly corrected the English text.

NOTES

1 Now at the Peabody Museum of Harvard University, and studied by M.M.
2 Now in Florence and at the Balzi Rossi, and studied by L. Cardini (1930).
3 Cardini identified a third point with a split base, which rather seems a lozenge one, with a natural fracture.
4 Ongoing research directed by Margehrita Mussi.
5 This was part of a project by the Sovraintendenza Comunale di Rome and the Soprintendenza Archeologica di Ostia in 1990-1993, which included systematic investigations ahead of real estate development and of large scale building activity.
6 Preliminary determination by L. Caloi.
7 It was termed "Middle Aurignacian", after the then accepted taxonomy of Abbé Breuil, who was invited to the site by Blanc and personally participated to the research.
8 While débitage is not taken into account, Laplace splits multiple tools in two or three. Any re-examination of his inventories only allows for an approximation of the actual number of implements.
9 Ongoing research by F.N., Angelo Ghiretti and C.Tozzi.
10 The mythological Scylla and Charybdis were notorious for drowning the sailors who passed through the Strait, which was negotiated with great difficulty by Ulysses.
11 Discussion based on implements originally published by Biddittu and Segre (1976-1977).
12 No attempt is made here to correct the effect of lowered sea-level, and of glacial expansion, which probably tend to balance each other. The 24 000 km^2 of Sardinia, however, are subtracted to the 301 000 km^2 of modern Italy.

REFERENCES

ALESSIO, M.; ALLEGRI, L.; ANTONIOLI, F.; BELLUOMINI, G; IMPROTA, S.; MANFRA, L.; PREITE MARTINEZ, L.; PREITE MARTINEZ, M. (1994) - La curva di risalita del mare Tirreno negli ultimi 43 ka ricavata da datazioni su speleotemi sommersi e dati archeologici. *Memoria Descrittiva della Carta Geologica d'Italia*. 52, p. 261-276.

ALHAIQUE, F.; BIONDI, Sh.; CASSOLI, P. F.; RECCHI, A.; TAGLIACOZZO, A. (1998) - Modifications in the exploitation of animal resources between the Middle Paleolithic and the Aurignacian at Grotta del Fossellone (Monte Circeo, Italy). In GRIFONI CREMONESI, R.; TOZZI, C.; VIGLIARDI, A.; PERETTO, C., eds. - *Proceedings of the XIII Congress U.I.S.P.P.* Forlì: Abaco, 3, p. 571-576.

ARNOLDUS-HUYZENDVELD, A.; GIOIA, P.; MINEO, M.; PASCUCCI, P. (1993) - Preliminary results of the Malafede Survey: 1990-1992. In *Settlement and economy in Italy 1500 BC to AD 1550*. Papers of the V Conference of Italian Archaeology, p. 47-65.

ARNOLDUS-HUYZENDVELD, A.; GIOIA, P.; MUSSI, M.; TONIUTTI, P.; ZAMPETTI, D.; ZARLENGA, F. (1996) - Paleosuperficie esposta, concentrazione di industria litica e stratigrafia nella piana costiera di Maccarese (Roma). *Il Quaternario*. Verona. 6:2, p. 213-226.

BARTOLOMEI, G.; BROGLIO, A.; CASSOLI, P. F.; CASTELLETTI, L.; CATTANI, L.; CREMASCHI, M.; GIACOBINI, G.; MALERBA, G.; MASPERO, A.; PERESANI, M.; SARTORELLI, A.; TAGLIACOZZO, A. (1992) - La Grotte de Fumane: un site aurignacien au pied des Alpes. *Preistoria Alpina*. Trento. 28:1, p. 131-179.

BECK, J. W.; RICHARDS, D. A.; EDWARDS, R. L.; SILVERMAN, B. W.; SMART, P. L.; DONAHUE, D. J.; HERRERA--OSTERHELD, S.; BURR, G. S.; CALSOYAS, L.; JULL, A. J. T.; BIDDULPH, D. (2001) - Extremely large variations of atmospheric ^{14}C concentration during the Last Glacial Period. *Science*. Washington, DC. 292, p. 2453-2458.

BENINI, A.; BOSCATO, P.; GAMBASSINI, P. (1997) - Grotta della Cala (Salerno): industrie litiche e faune uluzziane ed aurignaziane. *Rivista di Scienze Preistoriche*. Firenze. 48, p. 37-95.

BIDDITTU, I.; SEGRE, A. G. (1976-1977) - Giacimenti preistorici e quaternario della provincia di Frosinone. *Bollettino dell'Istituto di Storia e di Arte del Lazio Meridionale*. Anagni. 9, p. 21-44.

BLANC, A. C. (1937a) - On Pleistocene low levels of the Mediterranean Sea during the Pleistocene glaciations. *Quaternary Journal*. London. 93, p. 621-665.

BLANC, A. C. (1937b) - Fauna a Ippopotamo ed industrie paleolitiche nel riempimento delle grotte littoranee del Monte Circeo. I: La Grotta delle Capre. II: La Grotta del Fossellone. *Rendiconti dell'Accademia Nazionale dei Lincei*. Roma. Serie 6. 25, p. 88-93.

BLANC, A. C.; SEGRE, A. G. (1953) - *Excursion au Mont Circé*. INQUA, IV Congrès International. Roma-Pisa.

BOCQUET-APPEL, J.-P.; DEMARS, P.-Y. (2000) - Population kinetics in the Upper Palaeolithic in Western Europe. *Journal of Archaeological Science*. London. 27, p. 551-570.

BOLDUC, P.; CINQ-MARS, J.; MUSSI, M. (1996) - Les figurines des Balzi Rossi (Italie): une collection perdue et retrouvée. *Bulletin de la Société Préhistorique de l'Ariège*. Foix. 51, p. 15-53.

BOSCATO, P. (1994) - Grotta Paglicci: la fauna a grandi mammiferi degli strati 22-24 (Gravettiano antico-Aurignaziano). *Rivista di Scienze Preistoriche*. Firenze. 46, p. 145-176.

CARDINI, L. (1930) - Il "Paleolitico Superiore" della Barma Grande ai Balzi Rossi. *Archivio per l'Antropologia e l'Etnologia*. Firenze. 60-61, p. 461-476.

CASSOLI, P.; TAGLIACOZZO, A. (1991) - Considerazioni paleontologiche, paleoecologiche e archeozoologiche sui macromammiferi e gli uccelli dei livelli del Pleistocene superiore del Riparo di Fumane (VR) (Scavi 1988-91). *Bollettino del Museo Civico di Soria Naturale di Verona*. Verona. 18, p. 349-445.

CHILARDI, S.; FRAYER, D. W.; GIOIA, P.; MACCHIARELLI, M.; MUSSI, M. (1996) - Fontana Nuova di Ragusa (Sicily, Italy): southernmost Aurignacian site in Europe. *Antiquity*. Cambridge. 70, p. 553-563.

D'ANGELO, E., MUSSI, M. (2005) - Galets et lamelles de l'Aurignacien du Latium (Italie centrale): le cas de Grotta Barbara. In LEBRUN-RICALENS, F., BORDES, J.-G.; BON, F., eds. - *Productions lamellaires attribuées à l'Aurignacien: chaînes opératoires et perspectives techno-culturelles*. Luxembourg: Musée National d'Histoire et d'Art, p. 313-322.

DE VILLENEUVE, L.; BOULE, M.; VERNEAU, R.; CARTAILHAC, E. (1906-1919) - *Les grottes de Grimaldi*. Monaco: Imprimerie de Monaco.

FOLLIERI, M.; GIARDINI, M.; MAGRI, D.; SADORI, L. (1998) - Palynostratigraphy of the last glacial period in the volcanic region of Central Italy. *Quaternary International*. Oxford. 47-48, p. 3-20.

GAMBASSINI, P., ed. (1997) - *Il Paleolitico di Castelcivita: cultura e ambiente*. Napoli: Electa.

GHIRETTI, A.; LANZINGHER, M.; NEGRINO, F. (1991) - I ritrovamenti aurignaziani di Lemignano nella pianura parmense: notizie preliminari. *Preistoria Alpina*. Trento. 25, p. 231-234.

GIOIA, P. (1990) - An aspect of the transition between Middle and Upper Palaeolithic in Italy: the Uluzzian. In FARIZY, C., ed. - *Paléolithique moyen récent et Paléolithique supérieur ancien en Europe. Ruptures et transitions: examen critique des documents archéologiques*. Nemours: APRAIF (Actes du Colloque International de Nemours, 1988. Mémoires du Musée de Préhistoire d'Ile-de-France; 3), p. 241-250.

HOLT, B. M.; CHURCHILL, S. E.; NEGRINO, F.; FORMICOLA, V.; VICINO, G.; PETTIT, P.; DEL LUCCHESE, A. (2003) - New evidence of the Middle-Upper Paleolithic transition from Riparo Bombrini (Grimaldi, Italy). *Abstracts, Annual Meeting of the Paleoanthropology Society, Tempe (Arizona, U.S.A.), 22-23 April 2003*.

LANZINGER, M.; CREMASCHI, M. (1988) - Flint exploitation and production at Monte Avena in the Dolomitic region of Italian East Alps. In DIBBLE, H. L.; MONTET-WHITE, A., eds. - *Upper Pleistocene Prehistory of Western Eurasia*. Philadelphia, PA: University Museum, p. 125-139.

LAPLACE, G. (1966) - Recherches sur l'origine et l'évolution des complexes leptolithiques. *Mélanges d'Archéologie et d'Histoire de l'Ecole Française de Rome, Suppléments* 4. Paris: De Boccard.

LE BRUN-RICALENS, F.; BROU, L. (2003) - Burins carénés-nucleus à lamelles: identification d'une chaîne opératoire particulière à Thèmes (Yonne) et implications. *Bulletin de la Société Préhistorique Française*. Paris. 100:1, p. 67-83.

MASINI, F.; ABBAZZI, L. (1997) - L'associazione di mammiferi della Grotta di Castelcivita. In GAMBASSINI, P., ed. - *Il Paleolitico di Castelcivita: culture e ambiente*. Napoli: Electa, p. 33-59.

MUSSI, M. (2001) - *Earliest Italy: an overview of the Italian Paleolithic and Mesolithic*. New York, NY: Kluwer Academic-Plenum Publishers.

MUSSI, M.; ZAMPETTI, D. (1984-1987) - La presenza umana nella pianura pontina durante il Paleolitico medio e superiore. *Origini*. Roma. 13, p. 7-26.

MUSSI, M.; ZAMPETTI, D. (1995) - Grotta Barbara (S. Felice Circeo, Latina). In BIETTI, A.; GRIFONI CREMONESI, R., eds. - *Lazio e Abruzzo. XIII Congresso U.I.S.P.P., Guide archeologiche*, 10, p. 106-113.

NEGRINO, F.; STARNINI, E. (2003) - Patterns of lithic raw material exploitation in Liguria from the Palaeolithic to the Copper Age. *Préhistoire du Sud-Ouest. Nouvelles Etudes*. Cressensac. Supplément 5, p. 235-243.

PALMA DI CESNOLA, A. (1965) - Il Paleolitico superiore arcaico (facies Uluzziana) della Grotta del Cavallo, Lecce (continuazione). *Rivista di Scienze Preistoriche*. Firenze. 20, p. 3-59.

PALMA DI CESNOLA, A. (1966) - Il Paleolitico superiore arcaico (facies Uluzziana) della Grotta del Cavallo, Lecce. *Rivista di Scienze Preistoriche*. Firenze. 21, p. 33-62.

RADMILLI, A. M. (1977) - *Storia dell'Abruzzo dalle origini all'età del Bronzo*. Pisa: Giardini.

RIVIÈRE, E. (1887) - *De l'antiquité de l'homme dans les Alpes-Maritimes*. Paris: Ballière.

VICINO, G. (1984) - Lo scavo paleolitico al Riparo Bombrini (Balzi Rossi di Grimaldi, Ventimiglia). *Rivista Ingauna Intemelia*. Bordighera. 39:3-4, p. 1-10.

VOELKER, A. H. L.; GROOTES, P. M.; NADEAU, M.-J.; SARNTHEIN, M. (2000) - Radiocarbon levels in the Iceland Sea from 25-53 kyr and their link to the earth's magnetic field intensity. *Radiocarbon*. Tucson, AZ. 42, p. 437-452.

WOBST, H. M. (1974) - Boundary conditions for Paleolithic social systems: a simulation approach. *American Antiquity*. Washington, DC. 39, p. 147-178.

The Swabian Aurignacian and its place in European Prehistory

NICHOLAS J. CONARD ▮ MICHAEL BOLUS

ABSTRACT Research on Swabian Paleolithic has a 140 year history. The sites from the region, and particularly the caves of the Lone and Ach valleys, preserve rich Aurignacian deposits. Recent excavations at Geißenklösterle and Hohle Fels in the Ach Valley provide large assemblages with high quality documentation. The fieldwork and dating programs at these sites have done much to clarify the place of the Swabian Aurignacian within the early Upper Paleolithic of Europe. In keeping with the goals of the Lisbon meeting, this paper presents the Aurignacian assemblages from the region. The early dates from Swabia and the many innovations that characterize the Aurignacian of the region point to the Upper Danube Valley as a key center of cultural and technological innovation during the early Upper Paleolithic. The Danube Corridor hypothesis argues that modern humans migrated into central Europe via the Danube Valley. This would help to explain the early dates for the Swabian Aurignacian. Excavations in the caves of Swabia have yet to provide any indications of contact between the makers of the Aurignacian and late Middle Paleolithic assemblages. Thus we argue, in keeping with the Population Vacuum Model, that modern humans arrived in a depopulated region during or immediately following an unfavorable climatic phase, most likely during the continental European equivalent of Heinrich Event 4 or the following interstadial 8, roughly 40 000 years ago. The Aurignacian represents a radical break in the cultural sequence of the region, and the *Kulturpumpe* hypothesis points to inter-taxa competition, climatic stress and largely internal social-cultural and demographic factors as probable causes of the local innovations of the Swabian Aurignacian.

Introduction and history of research

While systematic paleolithic research in the region began in the 1860s, the Aurignacian of the Swabian Jura was first documented by the excavations of Ludwig Bürger (Plate 1, no. 1) at Bocksteinhöhle (Bockstein Cave) in the Lone Valley in 1883/84 (Fig. 1). Here Bürger recovered and published a number of classic Aurignacian artifacts including lithic and organic tools, as well as ornaments (Fig. 16). The significance of this work and the importance of the Swabian Aurignacian became clear in the following century as more data became available.

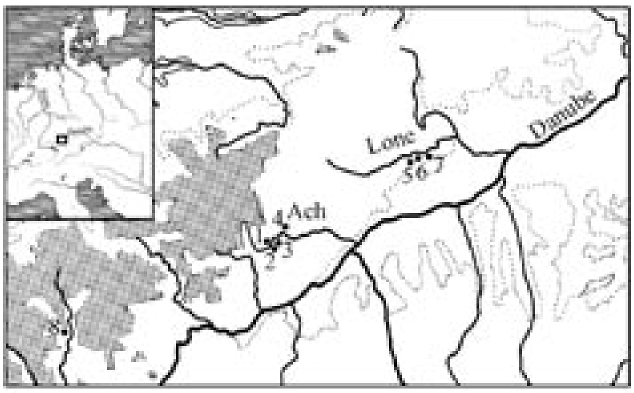

FIG. 1 – Map of southwestern Germany with the principal Aurignacian sites mentioned in the text. Ach Valley: 1. Sirgenstein; 2. Hohle Fels; 3. Geißenklösterle; 4. Brillenhöhle. Lone Valley: 5. Bocksteinhöhle and Bockstein-Törle; 6. Hohlenstein-Stadel and Hohlenstein-Bärenhöhle; 7. Vogelherd. Lauchert Valley: 8. Göpfelsteinhöhle.

A key phase of research was initiated by Robert Rudolf Schmidt (Plate 1, no. 2), whose fieldwork, especially the 1906 excavation at Sirgenstein in the Ach Valley (Fig. 8-10), elevated the

PLATE 1 – Key researchers of the German Aurignacian. 1. Ludwig Bürger (01.04.1844-23.02.1898); 2. Robert Rudolf Schmidt (26.05.1882-14.03.1950) in 1921; 3. Eduard Peters (09.04.1869-22.05.1948) in 1910; 4. Gustav Riek (23.05.1900-01.11.1976) in front of Vogelherd in 1931; 5. Robert Wetzel (30.09.1898-03.04.1962) working in front of Hohlenstein-Bärenhöhle, ca. 1960; 6. Joachim Hahn (12.08.1942-27.04.1997) in the early 1990s.

standards of research. Schmidt, who later founded the Research Institute for Prehistory in Tübingen — the forerunner of the current Institute of Pre- and Protohistory and Medieval Archeology — was also the first to publish a detailed summary of the information available on the German Paleolithic in the form of his monograph *Die diluviale Vorzeit Deutschlands* from 1912. Schmidt's work emphasized the connections between what would be later known as the Aurignacian and the Gravettian. He also demonstrated discontinuity between the Middle Paleolithic and the Aurignacian, which he referred to as the "*gravettoides Aurignac*". He based this conclusion on the presence of an archeologically sterile deposit with arctic microfauna at the base of the Upper Paleolithic sequence at Sirgenstein (Schmidt, 1912, p. 30-31).

The 1930s saw a number of key excavations of Aurignacian deposits including most notably the work of Gustav Riek (Plate 1, no. 4) at Vogelherd Cave (Fig. 12-13), Robert Wetzel (Plate 1, no. 5) at Hohlenstein-Stadel (Fig. 14) in the Lone Valley, and excavations by Eduard Peters (Plate 1, no. 3) at Göpfelsteinhöhle (Göpfelstein Cave; Fig. 18) in the Lauchert Valley. All of these digs, and especially the results from Vogelherd, played a prominent role in establishing the Swabian caves and the Upper Danube region as a whole as an area of central

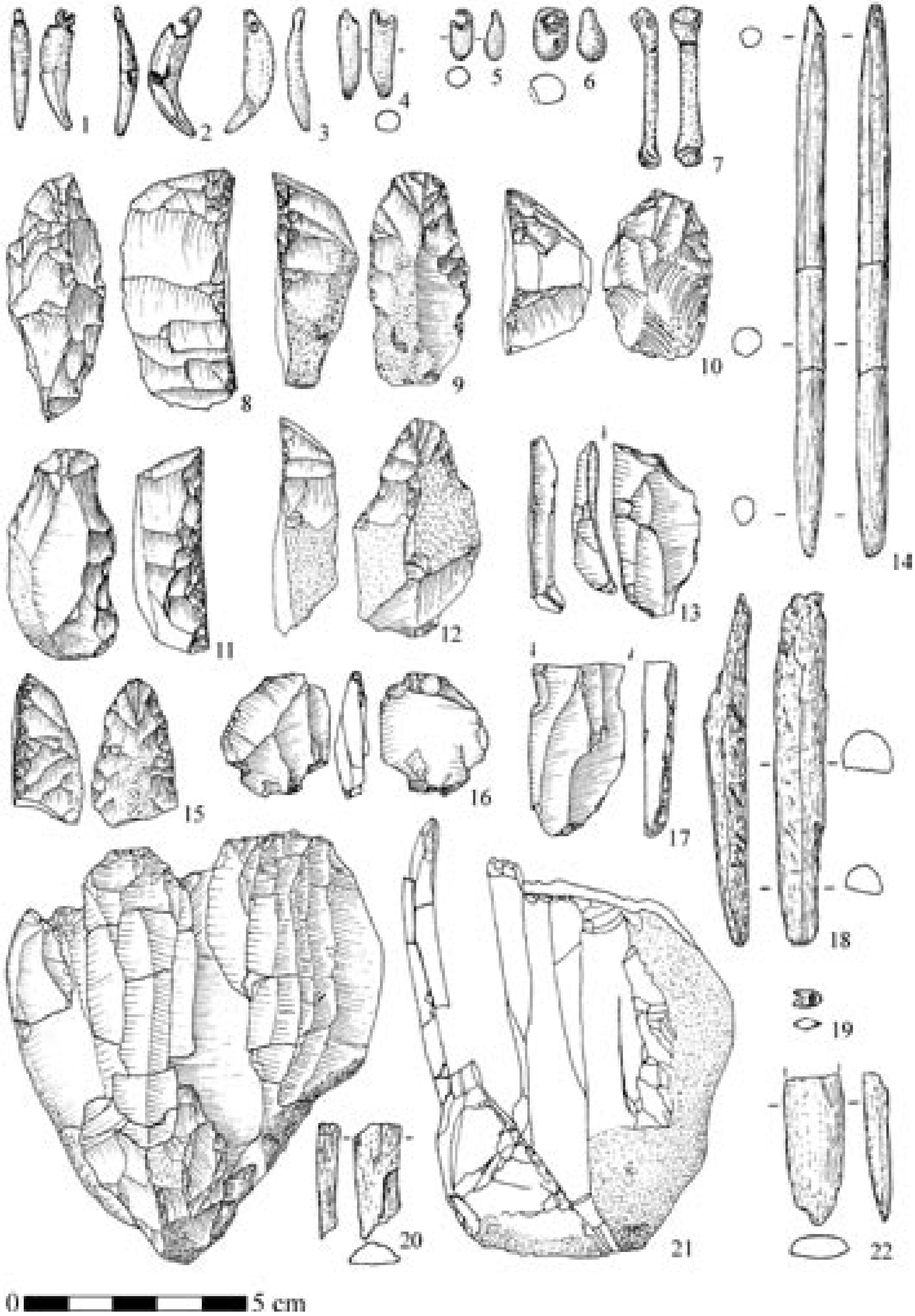

FIG. 2 – Aurignacian of Geißenklösterle, Archeological Horizon III: 1-3. perforated fox canines; 4-5. ivory pendants; 6. basket shaped ivory bead; 7. grooved bone; 8-10. carinated endscrapers; 11-12. nosed endscrapers; 13. burin on truncation; 14, 22. ivory points; 15. endscraper; 16. splintered piece; 17. burin on a break; 18. ivory rod (projectile point?); 19. double perforated ivory bead; 20. worked ivory splinter; 21. unidirectional blade core with refitted blades. After Hahn, 1988 (1-2, 4-5, 7-18, 20-22) and Hahn, 1989 (3, 6).

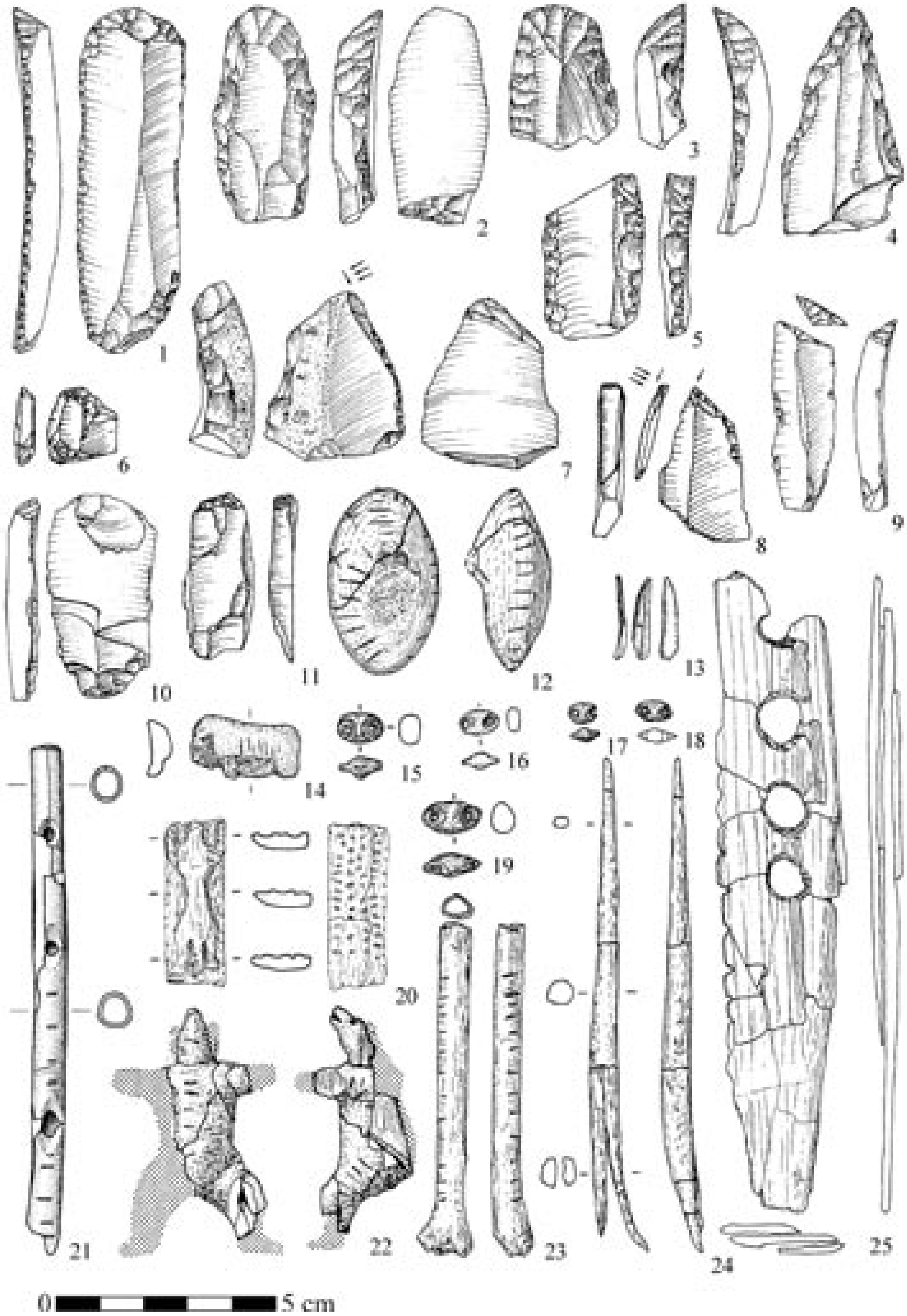

FIG. 3 – Aurignacian of Geißenklösterle, Archeological Horizon II: 1-3. endscrapers; 4. pointed blade (Spitzklinge); 5. laterally retouched blade; 6, 10-11. splintered pieces; 7. busked burin; 8. burin on truncation; 9. truncated blade; 12. antler pendant; 13. Dufour bladelet; 14, 20, 22. ivory figurines; 15-19. double perforated ivory beads; 21. bone flute; 23. decorated bone; 24. antler point with split base; 25. *bâton percé* made of ivory. After Hahn, 1986 (14, 20, 22) and Hahn, 1988 (1-13, 15-19, 23-25).

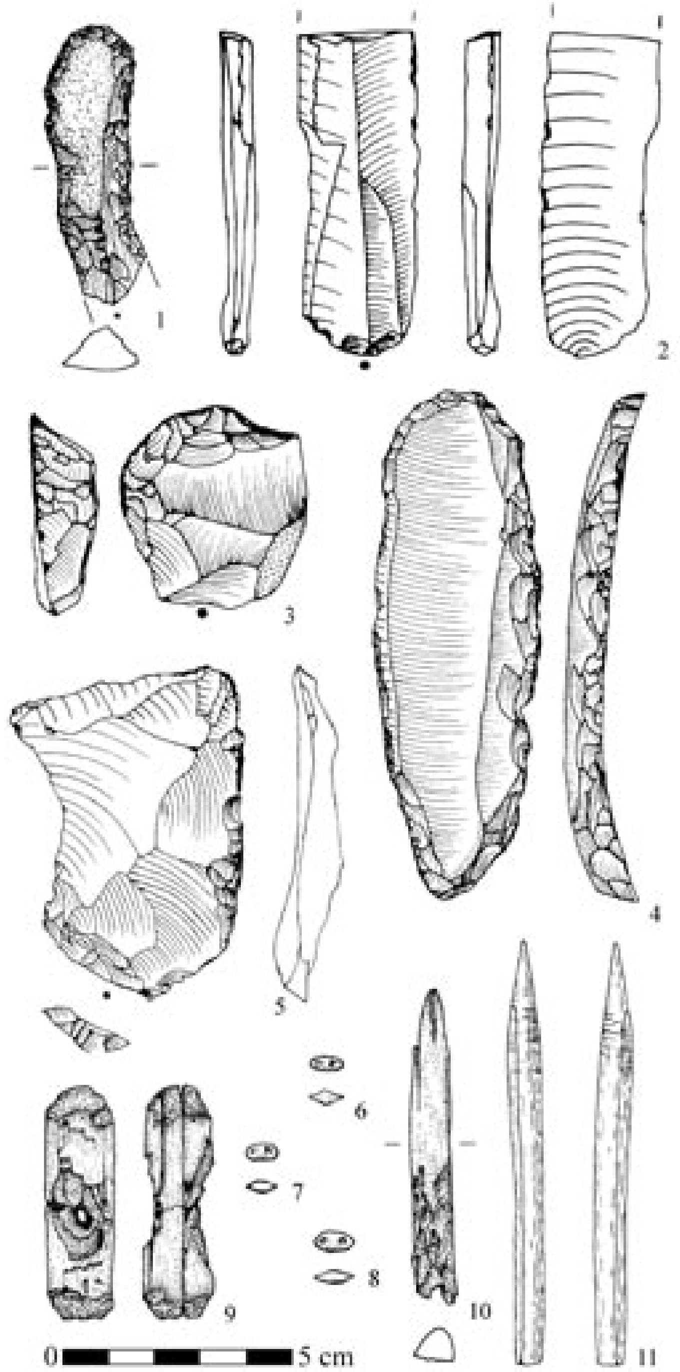

FIG. 4 – Aurignacian of Hohle Fels, Archeological Horizon V: 1. laterally retouched endscraper; 2. blade fragment; 3. nosed endscraper; 4. endscraper combined with pointed blade; 5. sidescraper; 6-8. double perforated ivory beads; 9. perforated ivory object; 10-11. ivory points. After Conard et al., 2002 (3-4) and Conard et al., 2003b (5, 11).

importance for the study of the Aurignacian. The discovery of multiple examples of figurative art in the form of small depictions in mammoth ivory added to the interest in the region.

Joachim Hahn (Plate 1, no. 6), like the earlier Tübingen researchers, Schmidt, Riek and Wetzel, focused his research on the Swabian Paleolithic. His work gained notability, when he and students from Tübingen discovered the famed statue of the *Löwenmensch* (lion-man; Fig. 14, no. 20), while taking an inventory of Wetzel's collections from Hohlenstein-Stadel in 1969 (Hahn, 1970; Schmid, 1989). Following upon earlier work by Eberhard Wagner in 1973, Hahn began long-term systematic excavations at the site of Geißenklösterle in the Ach Valley (Fig. 2-3) in 1974 (Hahn, 1988). The results from Geißenklösterle provided the first fine-grained data from the Swabian Aurignacian and helped set standards for modern excavations. To gain a second stratigraphic sequence documented with modern methods, Hahn began work at the nearby site of Hohle Fels, where Oscar Fraas and Gustav Riek had dug generations earlier. Hahn's work at these sites played a key role in establishing the importance of the Swabian caves within the cultural developments of the European Upper Paleolithic (Hahn, 1986, 1988).

Following Hahn's death in 1997, work on the Swabian Aurignacian has continued under Nicholas Conard's direction and in collaboration with Michael Bolus, Susanne Münzel, and many other colleagues and students (see acknowledgements). This work has focused on comparative studies and new excavations at Geißenklösterle and Hohle Fels (Fig. 4-7) that provide the key data for this overview of the region and its significance (Conard, 2002a; Conard and Bolus, 2003; Bolus, 2003). Recently, we have also begun re-excavation of the backdirt from Riek's excavation at Vogelherd in 1931 (Conard and Malina, in press).

Aurignacian assemblages

In keeping with the objectives of the meeting in Lisbon, the main goal of this paper is to provide an empirical description of the Aurignacian assemblages from Swabia. More detailed discussions of organic and lithic technology, the context of the finds, the chronostratigraphy, cultural affiliations, and interpretations of figurative art and musical instruments from the Swabian Aurignacian can be found in many recent publications (Liolios, 1999; Richter et al., 2000; Bolus and Conard, 2001; Münzel, 2001; Bolus, 2003, 2004; Conard and Bolus, 2003; Conard et al., 2003a, 2003c, 2004c; Teyssandier, 2003; Münzel and Conard, 2004; Niven, 2006; Conard, 2005a, 2005b).

Here we consider the stratified Aurignacian assemblages known from Swabia. It is noteworthy that all of the 17 assemblages presented here (Fig. 2-18; Table 1-2) come from the excavations at the caves mentioned in the introduction to this paper. This emphasis on caves should not be construed as meaning that the Aurignacian inhabitants of the region lived primarily in caves. The bias toward cave sites is clearly affected by the history of research, which has long focused on caves and the well preserved deposits they contain. Unfortunately, while we are convinced that the region contains many open-air sites, this conclusion is based to a high degree on speculation. This speculation, however, fits with several observations. First, Münzel's (1997) studies of seasonality based on faunal analyses clearly point to the use of caves in the colder times of the year. This result is not entirely surprising, since we would expect the caves to be used in seasons when the weather outside the caves was worse than the cool, dark and at times damp conditions within the caves. Another less developed source of information on this question is the apparent presence of open-air Aurignacian sites in the region, such as the unpublished site of Königsbach-Stein (Floss, personal communication 2004). It is probably the geological setting in Swabia in which open-air sites are either deeply buried or eroded that provides the misleading impression that Aurignacian people lived primarily in caves.

TABLE 1

Synthesis of key lithic artifacts from the Swabian Aurignacian.

	GK III (Fig. 2)	GK II (Fig. 3)	HF V (Fig. 4)	HF IV (Fig. 5)	HF III (Fig. 6)	HF IId/e (Fig. 7)	SI VI (Fig. 8)	SI V (Fig. 9)	SI IV (Fig. 10)	BrH XIV (Fig. 11)	VG V (Fig. 12)	VG IV (Fig. 13)	HS (Fig. 14)	HB (Fig. 15)	BT VII (Fig. 17)	BoH (Fig. 16)	GÖ (Fig. 18)
cores																	
blade/ bladelet core	●	◐		○	◐	◐			○		●	○	●		◐		◐
flake core	●	◐		○	○	◐	○		●		●	●	○		◐		○
discoidal core	○					○			○		○	○					
carinated artifacts																	
carinated endscraper	●			○	○	○		○	○		○	◐	◐	○			◐
nosed endscraper	●	◐	○	◐	◐	○		◐	○		○	◐	○	○			○
carinated burin	○			◐	◐	○					○	○	○	◐	●	●	
busked burin		○		○	●	○			○		○		○		●	◐	
other tools																	
endscraper	●	●	○	●	◐	◐	●	●	●		●	●	●	○	●	○	●
burin on truncation	●	◐		●	◐	◐	○	◐	●		●	●	●	○	◐	○	○
dihedral burin		○		○			○	○	●		○	○	○	○	◐	○	
burin on a break	◐	◐		○	○	○	○		◐		◐	●	○	○			
Spitzklinge (pointed blade)	○	●	○	●				◐			●	◐	○	○		○	
truncated blade	◐	◐		●	◐	○	●	◐	◐		◐	●	◐		○		
borer/ zinken	○	○		○	○	○		◐	◐		○	○	◐		○		○
Dufour bladelet		○															
splintered piece	◐	●		●	◐	○		◐	○		◐	◐	○	○	○		
sidescraper			○		○		◐	◐	○		○	○	◐	◐	◐		

GK: Geißenklösterle, HF: Hohle Fels; SI: Sirgenstein; BrH: Brillenhöhle; VG: Vogelherd; HS: Hohlenstein-Stadel; HB: Hohlenstein-Bärenhöhle; BT: Bockstein-Törle; BoH: Bocksteinhöhle; GÖ: Göpfelsteinhöhle. The Roman numerals refer to the Archeological Horizons or layers as mentioned in the figure captions. Bold symbols - abundant; secondary bold symbols - frequent; light symbols - rare. The data for Sirgenstein, Vogelherd, Hohlenstein-Stadel, Hohlenstein-Bärenhöhle, Bockstein-Törle, Bocksteinhöhle, and Göpfelsteinhöhle are based mainly on Hahn (1977), supplemented from own analyses; the data for Geißenklösterle are based on Hahn (1988) and own analyses, supplemented from Teyssandier (2003) and Teyssandier and Liolios (2003); all data for Hohle Fels are based on own analyses.

Constraints of space and time prohibit a detailed numerical approach to the assemblages. The ongoing research at Hohle Fels and Geißenklösterle, and the new excavations in the backdirt at Vogelherd, make it impossible at present to provide final counts of artifact classes or final statistical assessments of the assemblages. Since all of the sites fall within the same technological systems for working organic and lithic materials (Hahn, 1977, 1988; Liolios, 1999; Bolus, 2003; Conard and Bolus 2003; Teyssandier, 2003), we will focus this presentation on a semi-quantitative approach to address the content and variation within the assemblages (see Tables 1-2).

TABLE 2

Synthesis of key organic artifacts, ornaments, and art from the Swabian Aurignacian.

	GK III (Fig. 2)	GK II (Fig. 3)	HF V (Fig. 4)	HF IV (Fig. 5)	HF III (Fig. 6)	HF IId/e (Fig. 7)	SI VI (Fig. 8)	SI V (Fig. 9)	SI IV (Fig. 10)	BrH XIV (Fig. 11)	VG V (Fig. 12)	VG IV (Fig. 13)	HS (Fig. 14)	HB (Fig. 15)	BT VII (Fig. 17)	BoH (Fig. 16)	GÖ (Fig. 18)
tools																	
split base point		●								○	●	○				○	
bone/antler point	○	◐		◐		○		○	○	○	●	○	◐		◐	○	○
ivory point/rod	◐	●	◐	●		○	◐	◐	○		●	◐			◐	◐	
bâton percé		○									○	○					
burnisher		○			○				○		●	●	●	○		○	
bone awl	○	○			○		○	○	○		◐	◐	○		○	○	◐
retoucher bone/antler	○	●									●	●	◐				
retoucher tooth				○							○	○					
antler percussor	○	○															
personal ornaments																	
double perforated bead	○	●	◐	●	●	○			○		○						
basket shaped bead	○				○	○											
fox canine pendant	●			◐									◐				
horse tooth pendant						◐								○			
bear canine pendant											○					○	
other tooth pendant				◐	○	○									○		
other personal ornament	●	●	○	●	●	○						○	○				
art and music																	
decorated object		◐		○		○			○		●	◐	○				○
figurative art		●		◐		○					●	●	○				
painting		○															
flutes		●															

GK: Geißenklösterle; HF: Hohle Fels; SI: Sirgenstein; BrH: Brillenhöhle; VG: Vogelherd; HS: Hohlenstein-Stadel; HB: Hohlenstein-Bärenhöhle; BT: Bockstein-Törle; BoH: Bocksteinhöhle; GÖ: Göpfelsteinhöhle. The Roman numerals refer to the Archeological Horizons or layers as mentioned in the figure captions. Bold symbols - abundant; secondary bold symbols - frequent; light symbols - rare. The data for Sirgenstein, Brillenhöhle, Vogelherd, Hohlenstein-Stadel, Hohlenstein-Bärenhöhle, Bockstein-Törle, Bocksteinhöhle, and Göpfelsteinhöhle are based mainly on Hahn (1977), supplemented from own analyses; the data for Geißenklösterle are based on Hahn (1988) and own analyses, supplemented from Teyssandier (2003) and Teyssandier and Liolios (2003); all data for Hohle Fels are based on own analyses.

Here we cannot present the stratigraphic background to the sites individually, but the published radiocarbon dates for the sites are presented in Tables 3 and 4 with the relevant references (for the TL dates see Richter et al., 2000). Similarly, where the data for the compilations reflected in Tables 1 and 2 are not based on our ongoing excavations and analyses, the sources of the data are provided. Prior to this summary, the best available data stem from Joachim Hahn's (1977) monograph on the Aurignacian of central Europe. We base many of the results presented here on Hahn's work and the primary publications cited in the table and figure captions.

Although the quality of excavation in Swabia was generally very good, it will come as no surprise that the modern excavations at Geißenklösterle and Hohle Fels provide the most diverse assemblages of smaller finds. This being said, the re-excavation of the backdirt at Vogelherd (Conard and Malina, in press) confirms our expectations that many of the smaller artifacts and much debris from ivory and bone working and stone knapping were not recovered in the original excavation under Riek's direction in 1931 (Riek, 1934). Nonetheless, the results of the work from earlier generations of researchers point to the overall technological, typological and chronological unity of these assemblages.

Cultural and chronostratigraphy

Bolus (2003) has recently addressed the question of variation in the Swabian Aurignacian assemblages. In keeping with Hahn's (1977, 1981) and Bolus' (2003) results, we argue that the region shows relatively little well-documented chrono-cultural variation. Some forms, such as perforated horse incisors, tend to appear late in the assemblages, as has been demonstrated at Hohle Fels (Conard, 2003a), but most classes of artifacts are not strictly limited to lower, middle or upper horizons within the Aurignacian sequence. Identifying fine-grained cultural-stratigraphic organization within the Aurignacian is further complicated by the variable quality of the data. Only Geißenklösterle and Hohle Fels provide the large and well-documented assemblages needed to approach these questions.

While mixing and poor recovery are particularly problematic for the older excavations, we do not think that major taphonomic mixing has destroyed the integrity of the key assemblages from recent excavations. Contrary to earlier claims by Zilhão and d'Errico (1999, 2003a, 2003b), refitting and micromorphological studies, in combination with arguments based on the composition of the assemblages, indicate that taphonomic mixing is not a central factor shaping the assemblages from the key sites of Geißenklösterle and Hohle Fels (Conard and Bolus, 2003; Conard et al., 2003a). This being said, we must assume that geological, biological and cultural processes do reduce the coherence of the find horizons. As Hahn and we have discussed, excavation error is also a non-trivial factor when assessing the integrity of the assemblages (Hahn, 1988; Conard and Bolus, 2003).

Despite the abundance of radiometric dates from the Swabian sites and especially from the new excavations, major problems in dating the sites still persist (Conard, 2002b; Conard and Bolus, 2003). These problems are primarily related to the highly variable production of atmospheric radionuclids during the Aurignacian (Voelker et al., 2001; Beck et al., 2001; Hughen et al., 2004). These irregularities in radiocarbon production can easily explain the fluctuation of dates from similar stratigraphic positions by several thousand years or more. In some settings, these production spikes can lead to younger dates stratigraphically underlying older dates from secure contexts.

Radiometric dates indicate that the Swabian Aurignacian dates to roughly 30-40 kyr BP. The thermoluminescence dates by Richter et al. (2000) confirm the great antiquity of the Aurignacian with dates of ca.40 kyr BP for archeological horizon (AH) III and ca.37 kyr BP for AH II at Geißenklösterle. At each site where data are available, a stratigraphic break and an occupational hiatus separates the Aurignacian from the underlying and usually much less intensively occupied Middle Paleolithic strata. Geißenklösterle, Hohle Fels, Sirgenstein, and Vogelherd all provide a consistent picture of this key transition. Contrary to our own expectations, very little data exist to suggest that the makers of the Middle Paleolithic and the Aurignacian encountered each other in Swabia (Conard and Bolus, 2003; Münzel and Conard, 2004; Bolus, 2005; Conard, 2005b). Since the Swabian Aurignacian appears suddenly in a highly developed form containing numerous regionally unique signatures, this material culture must have developed quickly with the makers of the Aurignacian rapidly establishing a sustainable breeding population. The Swabian Aurignacian must have its roots locally, since many of its most prominent characteristics, including figurative artworks, many forms of ornaments, and tools are unknown in neighboring areas. Since the resolution of radiometric dates in this period is poor, we must use multiple lines of evidence to address these questions. Zilhão and d'Errico's (2003a) remarks about the high speed of cultural and demographic dynamics versus the low resolution of our dating methods must be taken seriously. We envision a degree of polycentric innovations in the Aurignacian, but stress the unique innovations that are well documented in the Swabian record (cf. Teyssandier et al., this volume).

The uncalibrated radiocarbon dates (Tables 3-4) range between 29 and 40 kyr BP, and, as we and Zilhão and d'Errico have repeatedly pointed out, these dates tend to fall in the later part of this range. The radiocarbon dates typically underestimate the true ages of the archeological strata by several thousand years (Conard and Bolus, 2003; Hughen et al., 2004). Due to the rapid fluctuations in atmospheric radiocarbon there is at present no reliable way of calibrating these dates. Thus we are not confident that we can currently produce a high resolution chronological correlation of the strata from the different sites. Our approach at present is to base the cultural chronology on sites with multiple Aurignacian strata and high resolution piece-plotted provenience data like Geißenklösterle and Hohle Fels.

Following this approach we see what mainly looks like functional variation between find horizons and few indications for a finely structured cultural chronology within the Aurignacian. Suggestions that characteristics including figurative art and abundant ornaments and organic tools appear late in the sequence must at present be regarded with caution. For example, at Geißenklösterle AH III figurative art and musical instruments are lacking, but ivory working debris is more common than in the overlying AH II, which has produced four figurative representations and an ivory flute. Also, many of the tools and some of the ornaments, such as the double perforated ivory beads, present in AH II, have now been recovered from AH III as well (Fig. 2, no. 19).

The results from Hohle Fels also suggest that we should, for the moment, exercise caution before suggesting the existence of fine-grained cultural stratigraphic indicators. Here we note the presence of one large, retouched Levallois flake from the basal Aurignacian of AH V (Fig. 4, no. 5), but such observations are based on such few pieces that they must be viewed cautiously. The same applies for a single, pencil-shaped ivory point from the same layer (Fig. 4, no. 11). As Tables 1 and 2 and the new results from sites including Vogelherd demonstrate, the Swabian Aurignacian is characterized by a relatively high degree of technological and typological homogeneity. Even highly unusual artifacts, including ivory figurines, point to a strong regional coherence. Increasingly, we are gaining the impression that intense ivory working and ivory figurines are more the norm than the exception at sites with much occupational debris. It is particularly striking that even the system of believes shows an archeologically visible signal in the form of therianthropic *Löwenmenschen* figures made of mammoth ivory from both Hohlenstein-Stadel in the Lone Valley and Hohle Fels in the Ach Valley (Conard, 2003b, 2005a). The therianthropic relief from Geißenklösterle (Fig. 3, no. 20) also seems to reflect this system of believes.

TABLE 3

Radiocarbon dates with 1σ uncertainties for the Ach Valley sites. The dates from Bern (B), Heidelberg (H), and Pretoria (Pta) are conventional radiocarbon dates, those from Kiel (KIA), Oxford (OxA), and Zurich (ETH) are AMS dates.

Lab. Number	*Arch. Hor.*	*Material*	*Modification*	*Date*	*Cultural Group*	*First Publication*
ACH VALLEY						
Geißenklösterle						
OxA-5157	Ip	hare pelvis		24 360±380	Gravettian	Housley et al., 1997
OxA-4855	Ir	reindeer phalange		27 000±550	Gravettian	Housley et al., 1997
OxA-4857	Ir	horse rib	cutmarks	27 500±550	Gravettian	Housley et al., 1997
OxA-4856	Ir	horse radius		30 950±800	Gravettian	Housley et al., 1997
OxA-5227	Is	horse femur		28 050±550	Gravettian	Housley et al., 1997
OxA-5226	It	reindeer tibia	impact	26 540±460	Gravettian	Housley et al., 1997
OxA-5229	It	mammoth rib	cutmarks	27 950±550	Gravettian	Housley et al., 1997
OxA-5228	It	mammoth rib		28 500±550	Gravettian	Housley et al., 1997
OxA-4592	It	reindeer phalange		29 200±460	Gravettian	Hahn, 1995
OxA-4593	It	bone		29 200±500	Gravettian	Hahn, 1995
OxA-5706	Ia	red deer antler		29 220±500	Gravettian	Richter et al., 2000
OxA-5161	Ic	reindeer metacarpal	impact	30 300±750	Gravettian	Housley et al., 1997
H 4147-3346	IIa	mixed bone sample		30 625±796	Upper Aurignacian	Hahn, 1983
H 4279-3534	IIa	mixed bone sample		31 525±770	Upper Aurignacian	Hahn, 1983
OxA-5707	IIa	horse scapula	impact + cutmarks	33 200±800	Upper Aurignacian	Richter et al., 2000
OxA-5160	IIa	hare tibia		33 700±1100	Upper Aurignacian	Hahn, 1988
OxA-4594	IIa	reindeer? humerus		36 800±1000	Upper Aurignacian	Hahn, 1995
KIA 8960	IIb	mammoth rib	impact	29 800±240	Upper Aurignacian	Conard and Bolus, 2003
Pta-2361	IIb	charred bone		31 070±750	Upper Aurignacian	Hahn, 1983
KIA 8958	IIb	horse humerus		31 870+260/-250	Upper Aurignacian	Conard and Bolus, 2003
Pta-2270	IIb	charred bone		31 870±1000	Upper Aurignacian	Hahn, 1983
OxA-5708	IIb	mammoth cranium		32 300±700	Upper Aurignacian	Richter et al., 2000
PtA-2116	IIb	charred bone		32 680±470	Upper Aurignacian	Hahn, 1983
OxA-5162	IIb	hare pelvis		33 200±1100	Upper Aurignacian	Housley et al., 1997
H 4751-4404	IIb	mixed bone sample		33 700±825	Upper Aurignacian	Hahn, 1983
OxA-6256	III	reindeer tibia	impact	30 100±550	Lower Aurignacian	Conard and Bolus, 2003
KIA 8963	III	long bone	impact	31 180+270/-260	Lower Aurignacian	Conard and Bolus, 2003
H 5118-4600	III	mixed bone sample		34 140±1000	Lower Aurignacian	Hahn, 1983
H 5316-4909	III	mixed bone sample		36 540±1570	Lower Aurignacian	Hahn, 1983
OxA-5163	III	ibex mandible		37 300±1800	Lower Aurignacian	Housley et al., 1997
OxA-4595	III	horse femur		40 200±1600	Lower Aurignacian	Hahn, 1995
OxA-6629	IIIa	reindeer metatarsal		30 300±550	Lower Aurignacian	Conard and Bolus, 2003
OxA-6628	IIIa	reindeer metatarsal		30 450±550	Lower Aurignacian	Conard and Bolus, 2003
ETH-8268	IIIa	bone		33 100±680	Lower Aurignacian	Hahn, 1995
OxA-5705	IIIa	reindeer metatarsal		33 150±1000	Lower Aurignacian	Conard and Bolus, 2003
ETH-8269	IIIa	bone		33 500±640	Lower Aurignacian	Hahn, 1995
OxA-6255	IIIa	rhino humerus		32 900±850	Lower Aurignacian	Conard and Bolus, 2003
KIA 13075	IIIa	reindeer tibia	impact	34 330+310/-300	Lower Aurignacian	Conard and Bolus, 2003
KIA 13074	IIIa	reindeer tibia	impact	34 800+290/-280	Lower Aurignacian	Conard and Bolus, 2003
ETH-8267	IIIa	bone		37 800±1050	Lower Aurignacian	Hahn, 1995
KIA 8962	IIIb	rib	impact	28 640+380/-360	Lower Aurignacian	Conard and Bolus, 2003
KIA 8961	IIIb	reindeer humerus		33 210+300/-290	Lower Aurignacian	Conard and Bolus, 2003
KIA 13076	IIIb	reindeer tibia	impact + cutmarks	34 080+300/-290	Lower Aurignacian	Conard and Bolus, 2003
KIA 8959	IIIb	femur		34 220+310/-300	Lower Aurignacian	Conard and Bolus, 2003
KIA 16032	IIIb	roe deer metacarpal	impact	36 560+410/-390	Lower Aurignacian	Conard and Bolus, 2003

TABLE 3 [cont.]

Lab. Number	*Arch. Hor.*	*Material*	*Modification*	*Date*	*Cultural Group*	*First Publication*
OxA-6077	GH 17	ibex tibia		32 050±600	sterile	Conard and Bolus,2003
OxA-6076	IV	red deer tibia		33 600±1900	Middle Paleolithic	Conard and Bolus, 2003
Hohle Fels						
OxA-4599	IIc	reindeer antler	tool (decor. adze)	28 920±400	Gravettian	Hahn, 1995
OxA-5007	IIc	reindeer antler	tool (decor. adze)	29 550±650	Gravettian	Housley et al., 1997
KIA 3503	IIcf	bone		27 030+250/-240	Gravettian	Conard 2003b
KIA 17742	IIcf	horse tibia	impact + cutmarks	27 690±140	Gravettian	Conard 2003b
KIA 17743	IIcf	cave bear vertebra	with flint point	27 830+150/-140	Gravettian	Conard 2003b
KIA 17744	IIcf	rib rhino-mammoth	point	27 780±150	Gravettian	Conard 2003b
KIA 17741	IIcf	reindeer antler		27 970±140	Gravettien	Conard 2003b
KIA 8964	IId (base)	rib rhino-mammoth		29 560+240/-230	Aurignacian	Conard and Bolus, 2003
KIA 8965	IId (base)	reindeer antler		30 010±220	Aurignacian	Conard and Bolus, 2003
KIA 16040	IIe	horse pelvis	impact + cutmarks	30 640±190	Aurignacian	Conard and Bolus, 2003
OxA-4979	III	*Salix* charcoal		27 600±800	Aurignacian	Housley et al., 1997
KIA 18878	III	*Pinus* charcoal		29 780+330/-310	Aurignacian	Conard 2003b
KIA 16038	III	reindeer femur	Impact + cutmarks	29 840±210	Aurignacian	Conard and Bolus, 2003
KIA 18877	III	*Pinus* charcoal		30 170+250/-240	Aurignacian	Conard 2003b
OxA-4601	III	bone		30 550±550	Aurignacian	Hahn, 1995
KIA 18876	III	*Pinus* charcoal		31 010+600/-560	Aurignacian	Conard 2003b
KIA 16039	III	ungulate femur	impact	31 140+250/-240	Aurignacian	Conard and Bolus, 2003
OxA-4980	IV	*Salix+Betula* charc.		28 750±750	Aurignacian	Housley et al., 1997
OxA-4600	IV	reindeer metapodial		31 100±600	Aurignacian	Hahn, 1995
KIA 18879	IV	unidentif. charcoal		31 160+1530/-1280	Aurignacian	Conard 2003b
KIA 16036	IV	horse femur	tool (retoucher)	33 090+260/-250	Aurignacian	Conard and Bolus, 2003
KIA 16035	V	horse bone	impact	33 290±270	Aurignacian	Conard 2003b
KIA 18880	V	*Pinus* charcoal		34 190+340/-330	Aurignacian	Conard 2003b
KIA 16034	V	ungulate humerus	impact + cutmarks	35 710+360/-340	Aurignacian	Conard 2003b
Sirgenstein						
KIA 13079	II	bone	tool (point)	27 250+180/-170	Gravettian	Conard and Bolus, 2003
KIA 13080	III	bone	tool (burnisher)	30 210±220	Aurig./Grav.	Conard and Bolus, 2003
KIA 13081	IV	mammoth rib	tool (burnisher)	28 400±200	Aurignacian	Conard and Bolus, 2003
KIA 13082	V	bone (antler?)	tool (point)	26 730+170/-160	Aurignacian	Conard and Bolus, 2003
KIA 13083	VI	bone	tool (awl)	30 360+230/-220	Aurignacian	Conard and Bolus, 2003
Brillenhöhle						
B-492	VII	charred bone		>25 000	Gravettian	Riek, 1973
B-491	VIII	charred bone		>29 000	?	Riek, 1973

TABLE 4

Radiocarbon dates with 1σ uncertainties for the Lone Valley sites. The dates from Groningen (GrN) and Heidelberg (H) are conventional radiocarbon dates, those from Kiel (KIA), Oxford (OxA), Purdue (PL), and Zurich (ETH) are AMS dates.

Lab. Number	*Arch. Hor.*	*Material*	*Modification*	*Date*	*Cultural Group*	*First Publication*
LONE VALLEY						
Bockstein-Törle						
H 4058-3355	VI	mixed bone sample		20 400±220	Aurig./Grav.	Hahn, 1977
KIA 8956	VI	bone		20 990 +120/-110	Aurig./Grav.	Conard and Bolus, 2003
H 4058-3526	VI	mixed bone sample		23 440±290	Aurig./Grav.	Hahn, 1983
KIA 8953	VI	reindeer radius-ulna	fresh break	31 530±230	Aurig./Grav.	Conard and Bolus, 2003
H 4049-3356	VII	mixed bone sample		26 133±376	Aurignacian	Hahn, 1977
KIA 8952	VII	reindeer metatarsal	fresh break	30 130 +260/-250	Aurignacian	Conard and Bolus, 2003
H 4059-3527	VII	mixed bone sample		31 965±790	Aurignacian	Hahn, 1983
KIA 8954	VII	reindeer femur?	fresh break	44 390+990/-880	Aurignacian/MP ?	Conard and Bolus, 2003
KIA 8955	VII	horse metapodial	fresh break	46 380+1360/-1170	Aurignacian/MP?	Conard and Bolus, 2003
Hohlenstein-Bärenhöhle						
KIA 8967	brown loam	bone	fresh break	26 080+140/-130	Aurignacian?	Conard and Bolus, 2003
Hohlenstein-Stadel						
KIA 8951	19m, spit 6	reindeer humerus	impact	31 440±250	Aurignacian	Conard and Bolus, 2003
H 3800-3025	20m, spit 6	mixed bone sample		31 750+1150/-650	Aurignacian	Hahn, 1977
ETH-2877	20m, spit 6	reind. ulna+wolf astrag.		32 000±550	Aurignacian	Schmid, 1989
KIA 13077	20m, spit 6	reindeer radius	fresh break	32 270+270/-260	Aurignacian	Conard and Bolus, 2003
KIA 8949	19m, spit 7	reindeer? longbone	fresh break	33 920+310/-300	Aurignacian	Conard and Bolus, 2003
KIA 8950	19m, spit 7	elk metatarsal	fresh break	36 910+490/-460	Aurignacian	Conard and Bolus, 2003
KIA 8948	19m, spit 8	horse? longbone	impact	41 710+570/-530	Aurignacian?	Conard and Bolus, 2003
KIA 8947	19m, spit 9	horse longbone	fresh break	42 410+670/-620	Aurignacian?	Conard and Bolus, 2003
KIA 8946	19m, spit 10	reindeer metapodial	fresh break	39 970+490/-460	Aurignacian?	Conard and Bolus, 2003
KIA 8945	19m, spit 11	longbone	fresh break	40 220+550/-510	Aurignacian?	Conard and Bolus, 2003
Vogelherd						
KIA 19542	?	brown bear canine	incised	29 620±210	Aurignacian	Conard, et al., 2003c
OxA-10196	III	mammoth tooth dentin		25 780±250	?	Conard et al., 2003c
OxA-10198	III	giant deer dentin		26 110±310	?	Conardet al., 2003c
OxA-10195	III	mammoth tooth dentin		31 680±310	Aurignacian	Conard et al., 2003c
OxA-10197	III	rhino, tooth dentin		39 700±650	?	Conard et al., 2003c
KIA 19537	IV (top)	human cranium (Stetten 2)		3 980±35	Neolithic	Conard et al., 2004a
KIA 8966	IV	bovid/horse femur	cutmarks	13 015±55	Magdalenian	Conard et al., 2003c
KIA 8957	IV	longbone	cutmarks	26 160±150	?	Conard and Bolus, 2003
H 4053-3211	IV	mixed bone sample		30 730±750	Aurignacian	Hahn, 1977
PL0001340A	IV/V	reindeer metatarsal	cutmarks	13 630±410	Magdalenian	Conard et al., 2003c

TABLE 4 [cont.]

Lab. Number	*Arch. Hor.*	*Material*	*Modification*	*Date*	*Cultural Group*	*First Publication*
GrN-6583	IV/V	mixed bone sample		23 860±190	?	Hahn, 1977
GrN-6662	IV/V	charred bone		27 630±830	?	Hahn, 1977
PL0001339A	IV/V	horse tibia	cutmarks	32 180±960	Aurignacian	Conard and Bolus, 2003
PL0001342A	IV/V	bovid-horse rib	cutmarks	34 100±1100	Aurignacian	Conard and Bolus, 2003
KIA 19538	V (base)	human mandible (Stetten 1)		4 715±35	Neolithic	Conard et al. 2004a
KIA 19539	V (base)	human vertebra (Stetten 4)		4 735±30	Neolithic	Conard et al. 2004a
KIA 20967	V (base)	human cranium (Stetten 1)		4 910±25	Neolithic	Conard et al. 2004a
KIA 20969	V (base)	human mandible (Stetten 1; 2nd sample)		4 985±30	Neolithic	Conard et al. 2004a
KIA 19540	V (base)	human humerus (Stetten 3)		4 995±35	Neolithic	Conard et al. 2004a
H 4035-3209	V	mixed bone sample		23 020±400	?	Hahn, 1977
H 8498-8950	V	mixed bone sample		25 900±260	?	Hahn, 1993
H 8497-8930	V	mixed bone sample		27 200±400	?	Hahn, 1993
H 4054-3210	V	mixed bone sample		30 162±1340	Aurignacian	Hahn, 1977
H 8500-8992	V	mixed bone sample		30 600±1700	Aurignacian	Hahn, 1993
GrN-6661	V	charred bone		30 650±560	Aurignacian	Hahn, 1977
H 8499-8991	V	mixed bone sample		31 350±1120	Aurignacian	Hahn, 1993
KIA 8968	V	artiodactyl tibia	impact	31 790±240	Aurignacian	Conard and Bolus, 2003
H 4056-3208	V	mixed bone sample		31 900±1100	Aurignacian	Hahn, 1977
PL0001338A	V	horse tibia	cutmarks	32 400±1700	Aurignacian	Conard and Bolus, 2003
KIA 8969	V	reindeer longbone	impact	32 500+260/-250	Aurignacian	Conard and Bolus, 2003
KIA 8970	V	horse longbone	impact	33 080+320/-310	Aurignacian	Conard and Bolus, 2003
PL0001337A	V	bovid-horse longbone	cutmarks	35 810±710	Aurignacian	Conard and Bolus, 2003

Discussion and conclusions

In this paper we have presented a summary of the Aurignacian assemblages from Swabia. Nowhere in Europe is there clear evidence for earlier manifestations of the Aurignacian. Based on the work of Bon (2002), Teyssandier (2003), and Broglio's team at Fumane (Broglio et al., 2002; Broglio and Gurioli, 2004; Broglio and Dalmeri, 2005), it is becoming increasingly clear, that the many early assemblages that have been described as Proto-Aurignacian are radically different from the early Swabian Aurignacian and the *Aurignacien ancien* of southwestern France. While the technological and typological links between southwestern France and Swabia are clear, the Mediterranean Proto-Aurignacian, which can be seen as far north as Krems-Hundsteig in the central Danube region, represents a distinctive technocomplex (cf. Teyssandier et al., this volume).

We recommend abandoning the term 'Proto-Aurignacian' to avoid unnecessary confusion. A term such as 'Fumanian' would be a more appropriate name for assemblages of the Fumane and Krems-Hundssteig type, while another term could perhaps be used to refer to assemblages of the Riparo Mochi type (Kuhn and Stiner, 1998), which are characterized by few backed and pointed forms and less diverse organic artifact assemblages than the 'Fumanian'. The detailed data from Fumane provide a clear and highly contrasting signal to the Swabian Aurignacian and *Aurignacien ancien* in southwestern France. The long, narrow laminar debitage and finely retouched and backed tools from the 'Fumanian' are entirely absent in the Swabian Aurignacian. Similarly, abundant evidence contrasts the art, ornaments and organic tools of the two regions. Given the strong similarities between the Swabian and southwestern French assemblages from the early Aurignacian, this term should be used for assemblages with similarities to those from these well-researched areas, while, of course, allowing room for the presence of local signatures, as are well-documented, especially in the ornaments and art of these regions (Hahn, 1986, 1988; Leroi-Gourhan, 1995; White, 1993, 2001; Conard 2003a, 2005a). Vanhaeren and d'Errico's (in press) work on personal ornaments from the Aurignacian also points to links between the Swabian and southwestern French Aurignacian, as well as to the Belgian Aurignacian. Based on a number of technological and stylistic characteristics, these groups of sites are more closely related than those of other regions.

Recent fieldwork and dating programs in Swabia have done much to clarify the place of the region's Aurignacian within the early Upper Paleolithic of Europe. The early dates from Swabia and the many innovations that characterize the Aurignacian of the region point to the Upper Danube Valley as a key center of cultural development during the early Upper Paleolithic. The Danube Corridor hypothesis argues that modern humans migrated into central Europe via the Danube Valley (Conard and Bolus, 2003, but see also Conard et al., 2004a). This would help to explain the early dates for the Swabian Aurignacian. Excavations in the caves of Swabia have yet to provide any indications of contact between the makers of the Aurignacian and late Middle Paleolithic assemblages. Thus we argue, in keeping with the Population Vacuum Model (Conard et al., 2003b; Conard, 2003b), that modern humans arrived in a depopulated region during or immediately following an unfavorable climatic phase, most likely during continental European equivalent of Heinrich Event 4 or the following interstadial 8, roughly 40 000 years ago. The Aurignacian represents a radical break in the cultural sequence of the region, and the *Kulturpumpe* hypothesis points to inter-taxa competition, climatic stress and largely internal social-cultural and demographic factors as probable causes of the local innovations of the Swabian Aurignacian. Based on our most recent data and the lack of evidence demonstrating interaction between modern humans and Neanderthals in Swabia, the local innovations of the Aurignacian more likely reflect a combination of climatic and social-culturally embedded phenomena.

Placing the Swabian data in a broader context, we argue that Eurasia showed great behavioral variation in the middle of the Late Pleistocene. A dynamic equilibrium existed between regions and populations at various scales (Conard, 2005c). About 40 kyr BP, anatomically modern humans entered Europe via the Danube Corridor and the Mediterranean coast (Bar-Yosef, 1998; Conard and Bolus, 2003; Bolus, 2005). There was give and take between populations as is documented in distinctive regional records. In Swabia, contact between archaic and modern populations was minimal. In most regions modern humans reproduced at higher rates and relied on new technologies, more intensive caloric extraction and higher impact behavioral strategies, compared to the low impact strategies followed over tens of millennia by Neanderthals (Münzel and Conard, 2004; Conard, 2005b). Many lines of evidence from Swabia point to higher human population densities during the Aurignacian than during the preceeding Middle Paleolithic. In the context of Darwinian competition and in the face of radical climatic change, modern humans produced innovations of the Aurignacian that archeologists view as hallmarks of what is often referred to as behavioral or cultural modernity (Mellars, 1996, 2004; d'Errico, 2003).

While competition and climate are key variables, the causes of the innovations of the Swabian Aurignacian lie in social-cultural and demographic spheres. We are currently working to develop more explicitly formulated and testable variants of the *Kulturpumpe* hypothesis. We need testable hypotheses reflecting multiple scales of analysis and more data, if we are successfully to reconstruct the prehistory of the cultural dynamics of the early Upper Paleolithic.

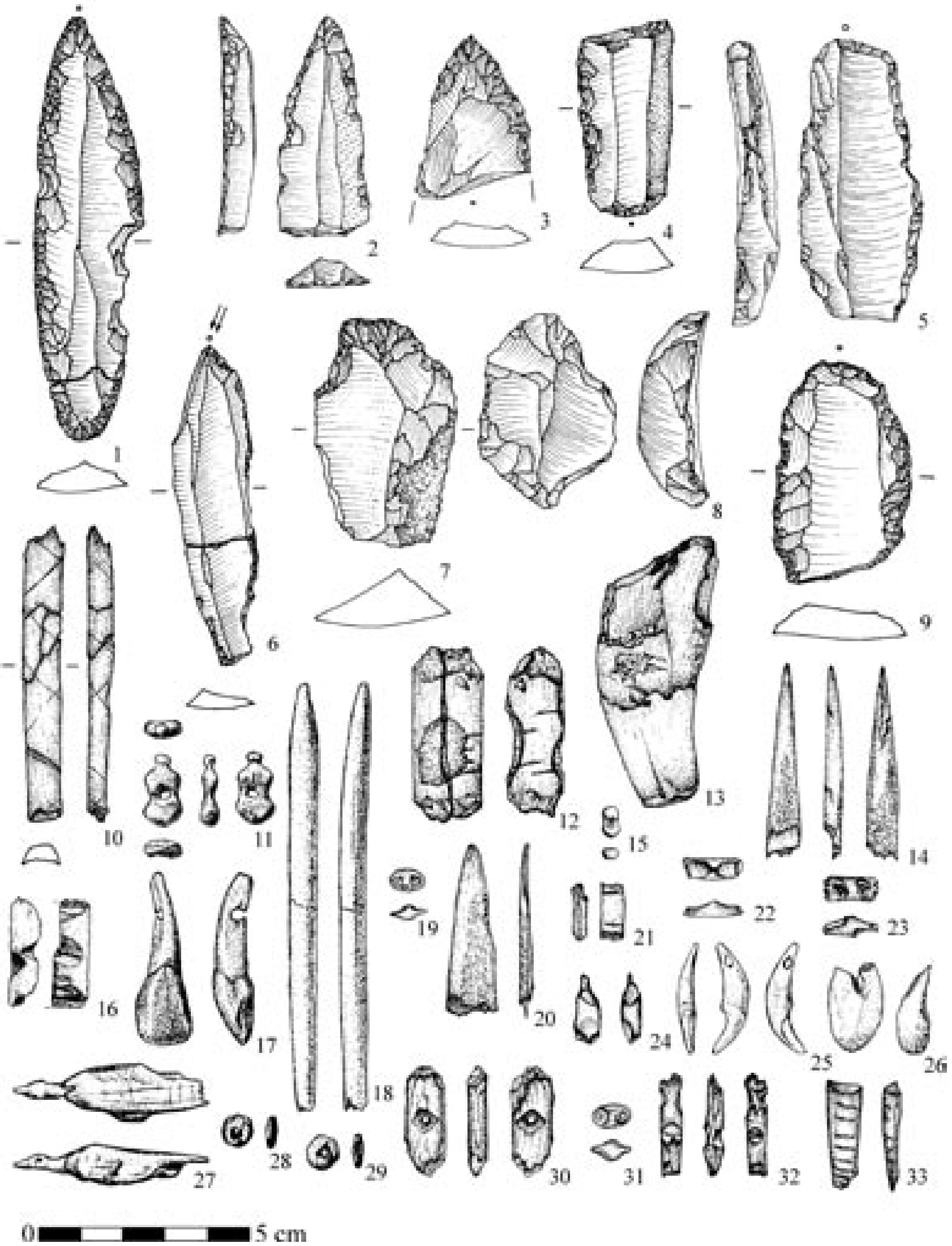

FIG. 5 – Aurignacian of Hohle Fels, Archeological Horizon IV: 1-3. pointed blades (Spitzklingen); 4. blade with double truncation; 5-6. burins on truncation; 7-8. nosed endscrapers; 9. laterally retouched end scraper; 10. decorated ivory rod; 11. violin shaped ivory bead; 12. roughout for a perforated ivory object; 13. bear canine retoucher; 14, 20. antler points; 15. ivory bead; 16, 21-22. roughouts for double perforated ivory beads; 17. perforated tooth; 18. ivory point; 19, 23, 31. double perforated ivory beads; 24. ivory ornament; 25. perforated fox canine; 26. perforated upper canine from red deer; 27. ivory figurine; 28-29. disc shaped ivory beads; 30. perforated ivory object; 32. roughout for an ivory object; 33. double beveled antler point. After Conard et al., 2002 (2, 8, 16, 26, 28-29), Conard and Bolus, 2003 (3), Conard, 2003a (15, 25) and Conard et al., 2004b (1, 14, 20, 22-23, 30).

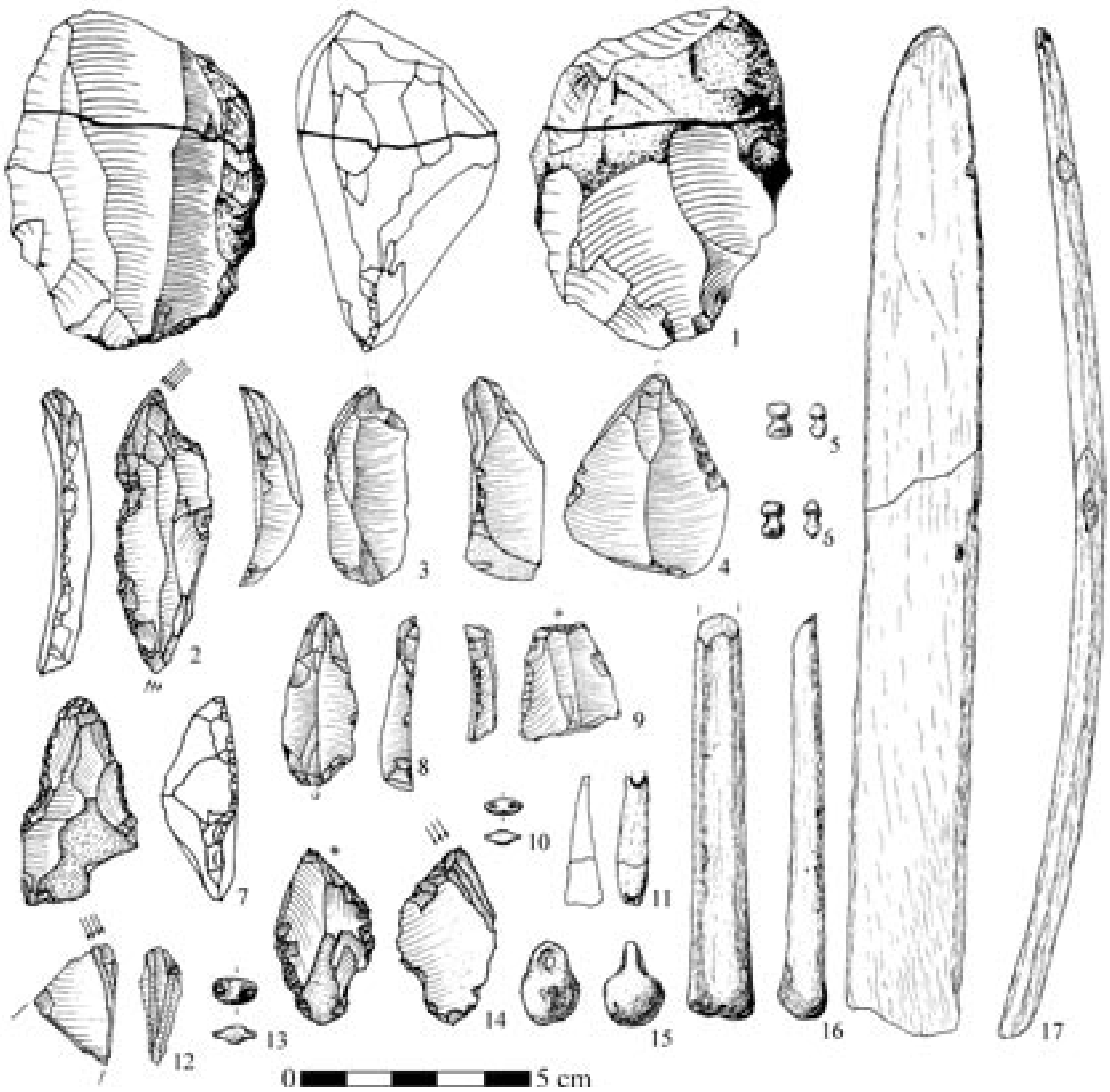

FIG. 6 – Aurignacian of Hohle Fels, Archeological Horizon III: 1. unidirectional blade core; 2-3. busked burins; 4. carinated burin; 5-6. toggle shaped ivory objects; 7. nosed endscraper; 8. pointed blade combined with endscraper; 9. truncated blade; 10, 13. double perforated ivory beads; 11. perforated bear incisor; 12, 14. carinated burins; 15. basket shaped ivory bead; 16. bone awl with intense polishing; 17. burnisher made of a mammoth rib. After Conard et al., 2002 (11), Conard, 2003a (10, 13), Conard and Bolus, 2003 (4, 9, 16-17) and Conard et al., 2004b (12).

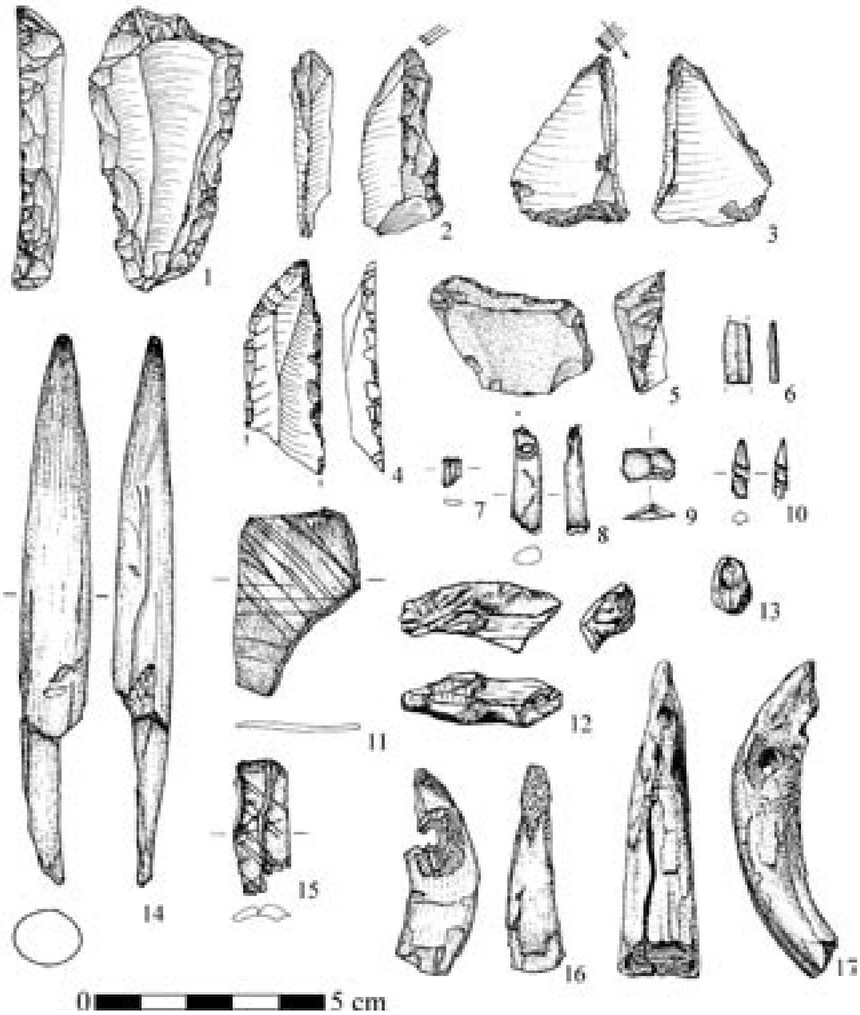

FIG. 7 – Aurignacian of Hohle Fels, Archeological Horizon IId/e: 1. nosed endscraper; 2-3. carinated burins; 4. point; 5. retouched flake; 6. bladelet with slight lateral retouch; 7. ivory object of unknown function; 8. perforated tooth; 9. roughout for a double perforated ivory bead; 10. notched ivory object; 11, 15. decorated bones; 12. ivory figurine; 13. basket shaped ivory bead; 14. ivory point; 16-17. perforated horse incisors. After Conard, 2003a (13, 17), Conard et al., 2004b (2, 8-11, 15) and Conard and Malina, 2005 (16).

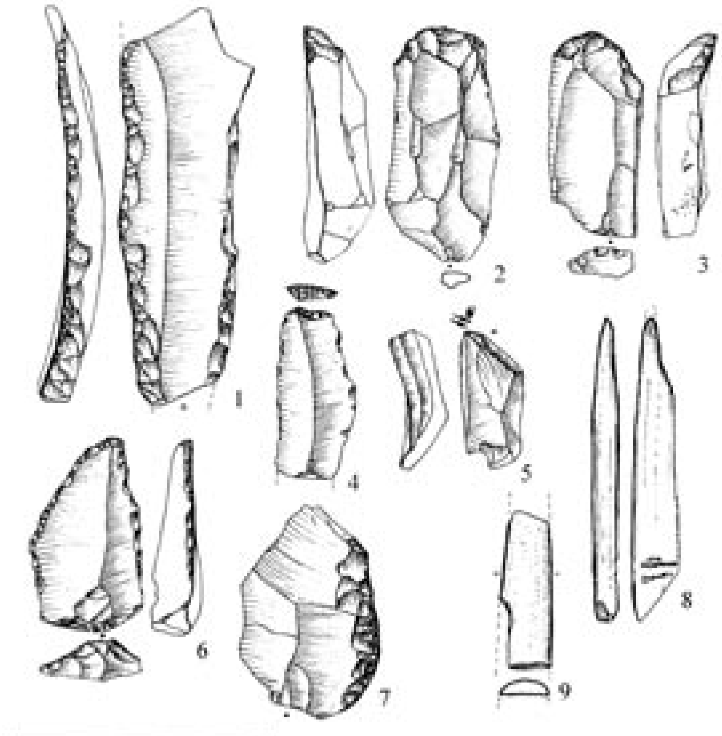

FIG. 8 – Aurignacian of Sirgenstein, Archeological Horizon VI: 1. laterally retouched blade; 2-3. endscrapers; 4. truncated blade; 5. dihedral burin; 6. point; 7. sidescraper; 8. bone awl; 9. fragment of an ivory rod (projectile point?). After Hahn, 1977.

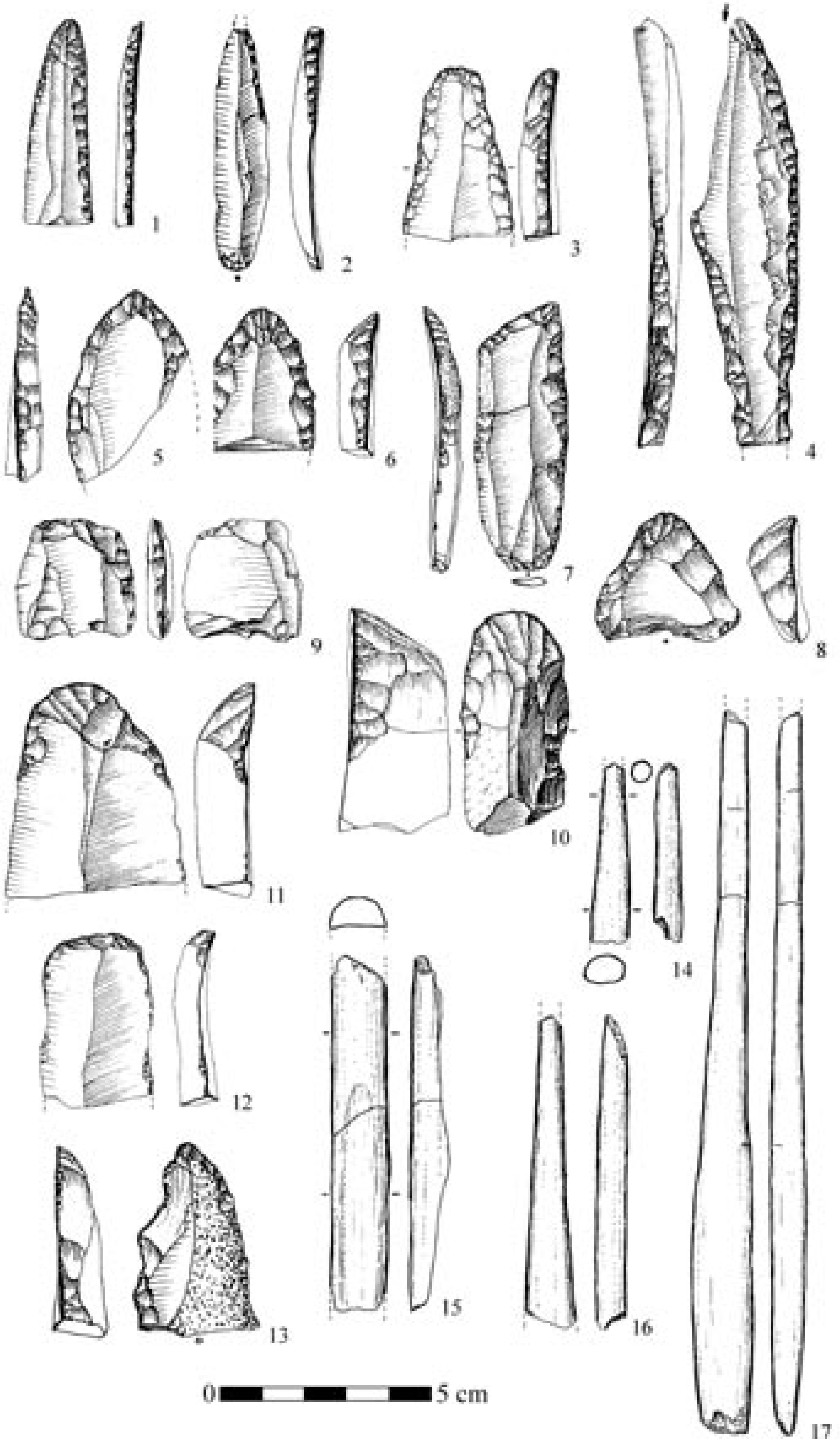

FIG. 9 – Aurignacian of Sirgenstein, Archeological Horizon V: 1, 5. pointed blades (Spitzklingen); 2. laterally retouched blade; 3, 6, 12. endscrapers; 4. burin on truncation; 7. truncated blade; 8, 11. nosed endscrapers; 9. splintered piece; 10. carinated endscraper; 13. borer; 14. bone awl; 15. fragment of an ivory rod (projectile point?); 16-17. bone points. After Hahn, 1977.

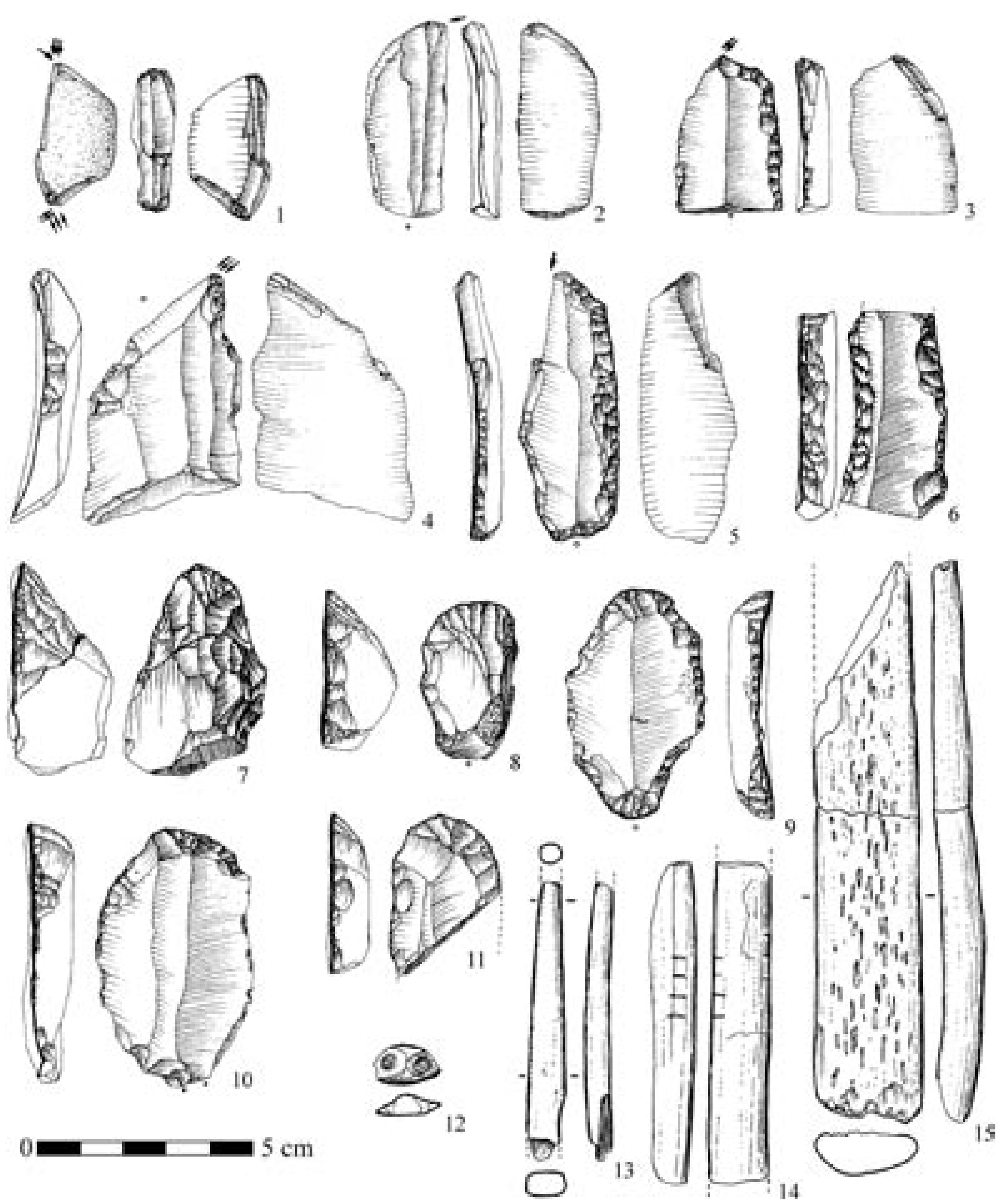

FIG. 10 – Aurignacian of Sirgenstein, Archeological Horizon IV: 1. dihedral burin; 2. transverse burin; 3. burin on truncation; 4. carinated burin; 5. burin on truncation combined with endscraper; 6. laterally retouched blade; 7-8. carinated endscrapers; 9. double nosed endscraper; 10-11; endscrapers; 12. double perforated ivory bead; 13. bone point; 14. ivory rod with incisions (projectile point?); 15. burnisher. After Hahn, 1977.

FIG. 11 – Aurignacian of Brillenhöhle, layer XIV: 1. bone point; 2. bone point with split base. After Hahn, 1977.

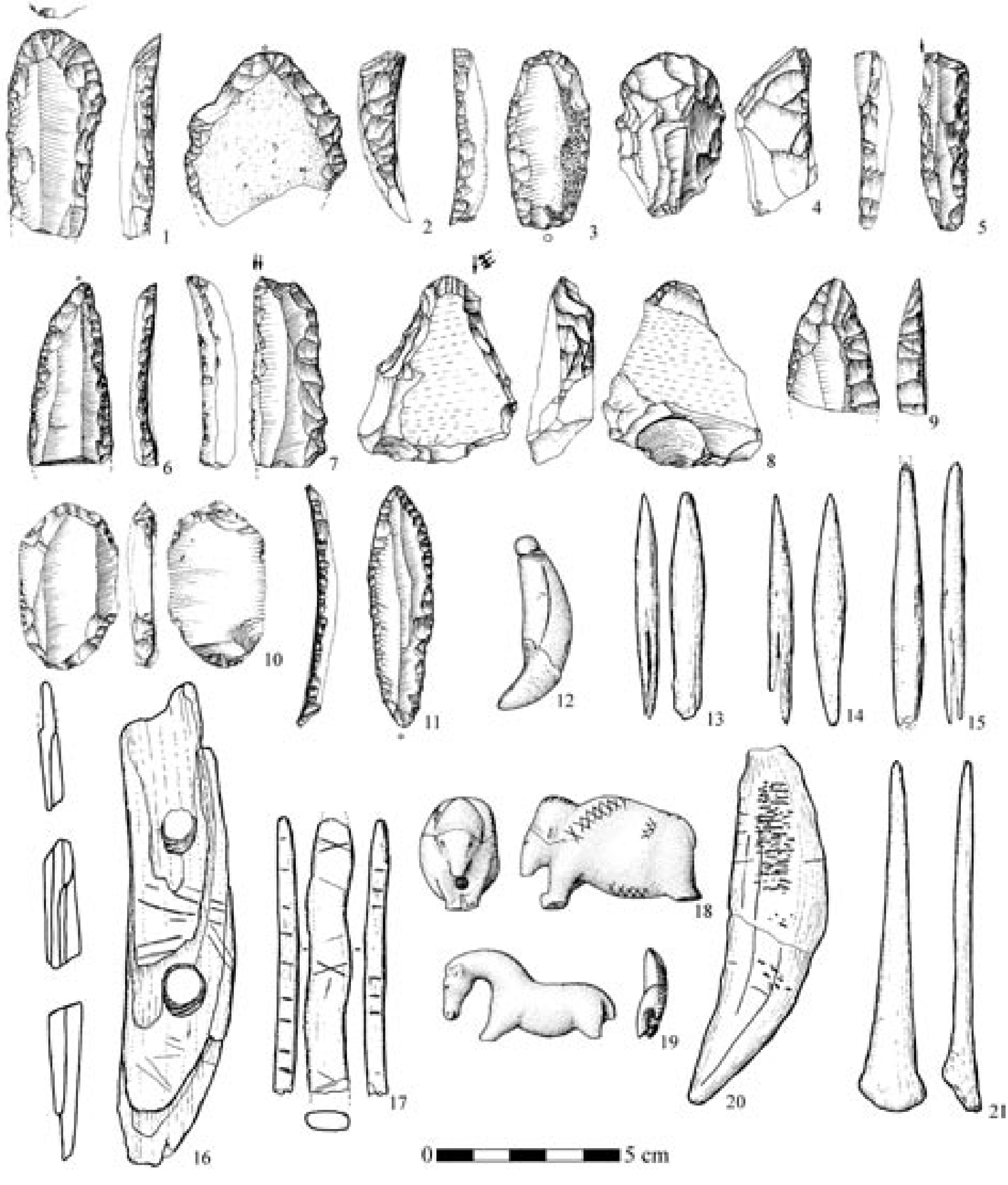

FIG. 12 – Aurignacian of Vogelherd, Archeological Horizon V: 1, 3. endscrapers; 2. nosed endscraper; 4. carinated endscraper; 5, 7. burins on truncation; 6, 9, 11. pointed blades (Spitzklingen); 8. busked burin; 10. splintered piece; 12. canine with a groove at the tip of the root; 13-15. bone points with split bases; 16. *bâton percé* made of ivory; 17. decorated antler rod; 18-19. ivory figurines; 20. retoucher made of a cave bear canine; 21. bone awl. After Hahn, 1977 (1-11, 13-17, 20-21), Conard 2003a, (12) and Conard and Bolus, 2003 (18-19).

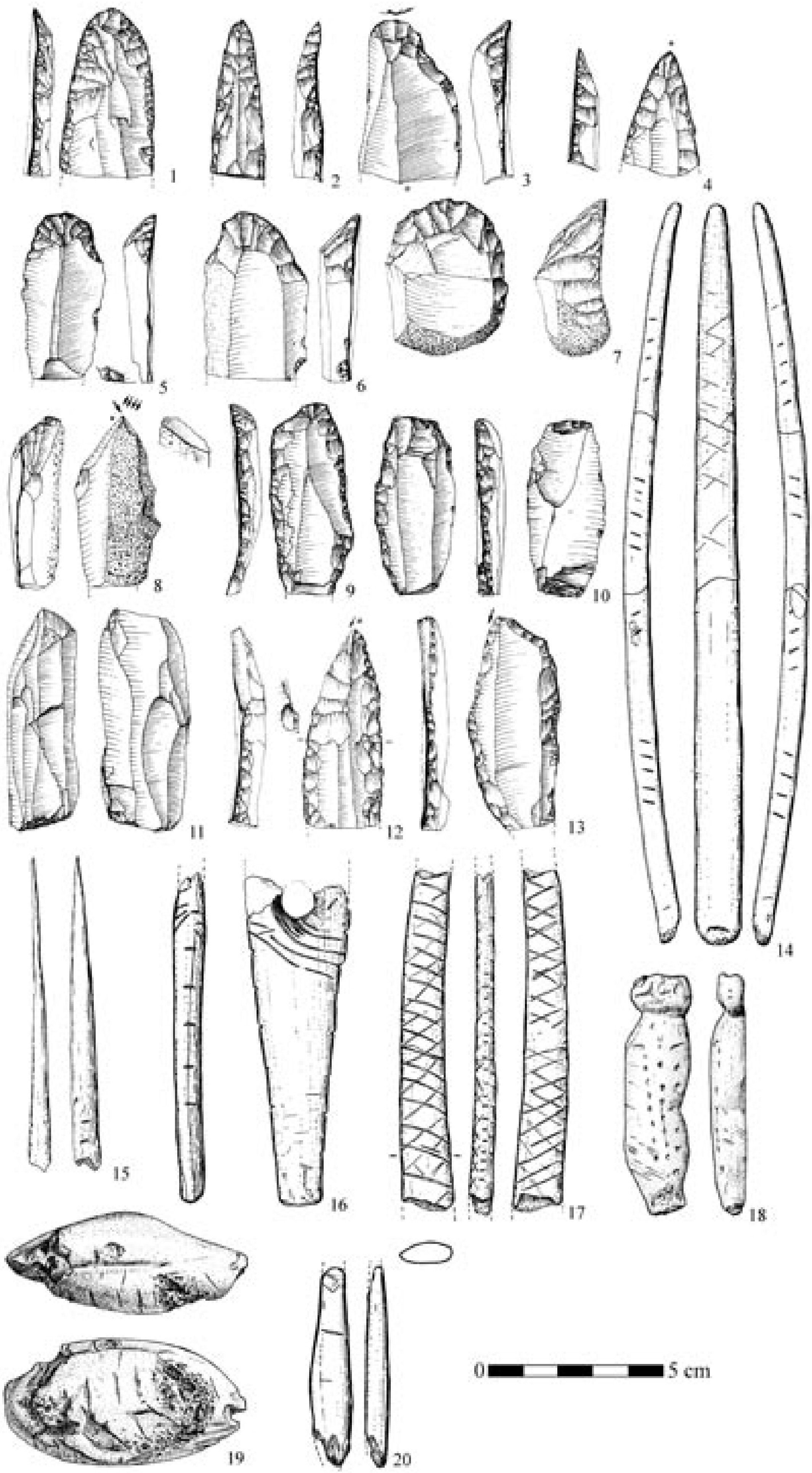
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
0
5 cm

FIG. 14 – Aurignacian of Hohlenstein-Stadel (1-17, 19-20, maximum depth 120 cm; 18, depth 160-180 cm): 1-5. perforated fox canines; 6, 8, 12. carinated endscrapers; 7. ivory bead; 9-10, 13. burins on truncation; 11, 17. laterally retouched blades; 14. bone retoucher; 15. burnisher; 16, 19. bone points; 18. blade core; 20. ivory figurine. After Hahn, 1977 (1-7, 9, 13-17, 19), Hahn in Schmid, 1989 (8, 10-12), Conard and Bolus, 2003 (18) and Schmid, 1989 (20).

◄ FIG. 13 – Aurignacian of Vogelherd, Archeological Horizon IV: 1. endscraper; 2, 4. pointed blades (Spitzklingen); 3, 5-6, 9. nosed endscrapers; 7. carinated endscraper; 8. carinated burin; 10. splintered piece; 11. prismatic blade core; 12-13. burins on truncation; 14. decorated antler point; 15. bone awl; 16. decorated *bâton percé* made of ivory; 17. bone decorated on both sides; 18. ivory figurine; 19. retoucher-pendant made of bone with half relief of a mammoth; 20. bone point. After Hahn, 1977 (1-17, 20).

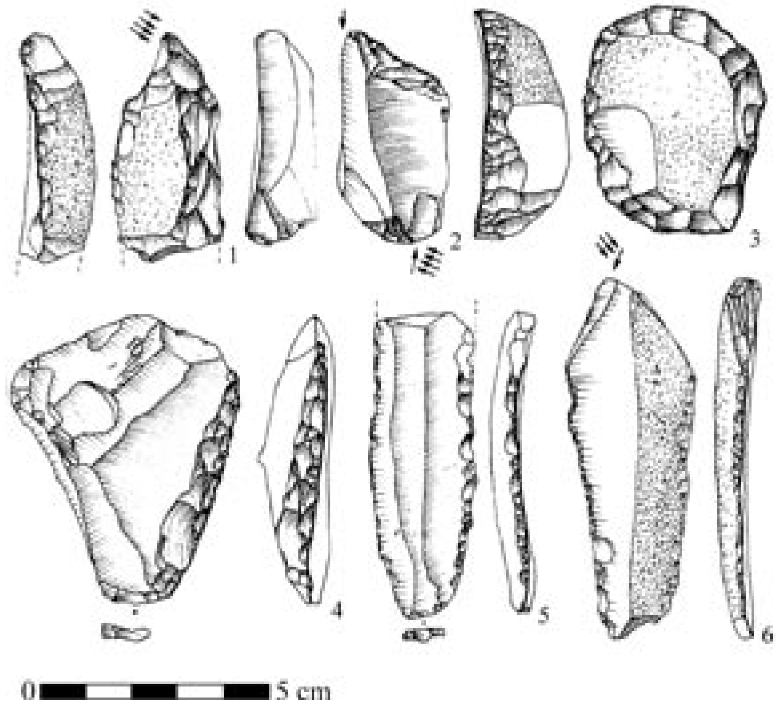

FIG. 15 – Aurignacian of Hohlenstein-Bärenhöhle: 1, 6. carinated burins; 2. burin on truncation combined with a dihedral burin; 3. double endscraper; 4. sidescraper; 5. retouched blade. After Hahn, 1977.

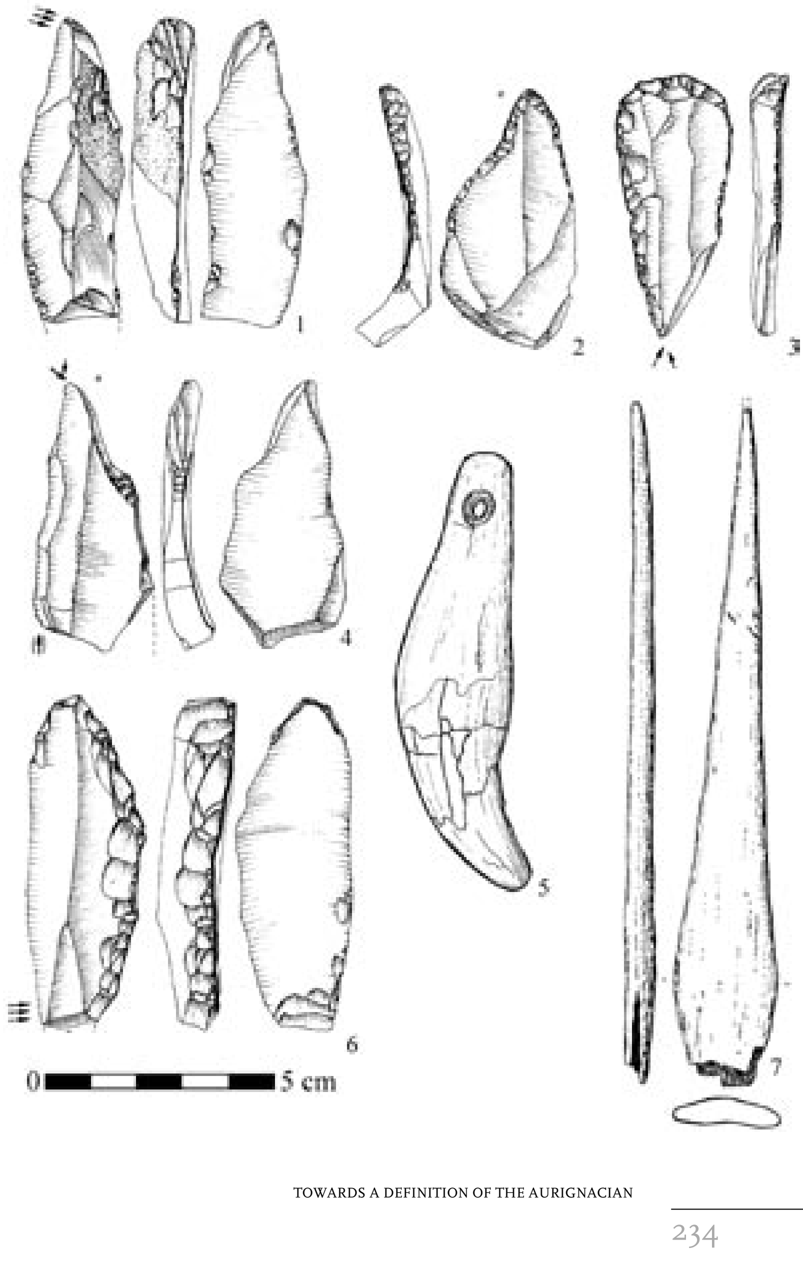

FIG. 16 – Aurignacian of Bocksteinhöhle: 1, 4. busked burins; 2. point; 3, 6. endscrapers combined with burins; 5. perforated cave bear canine; 7. bone point with split base. After Hahn, 1977.

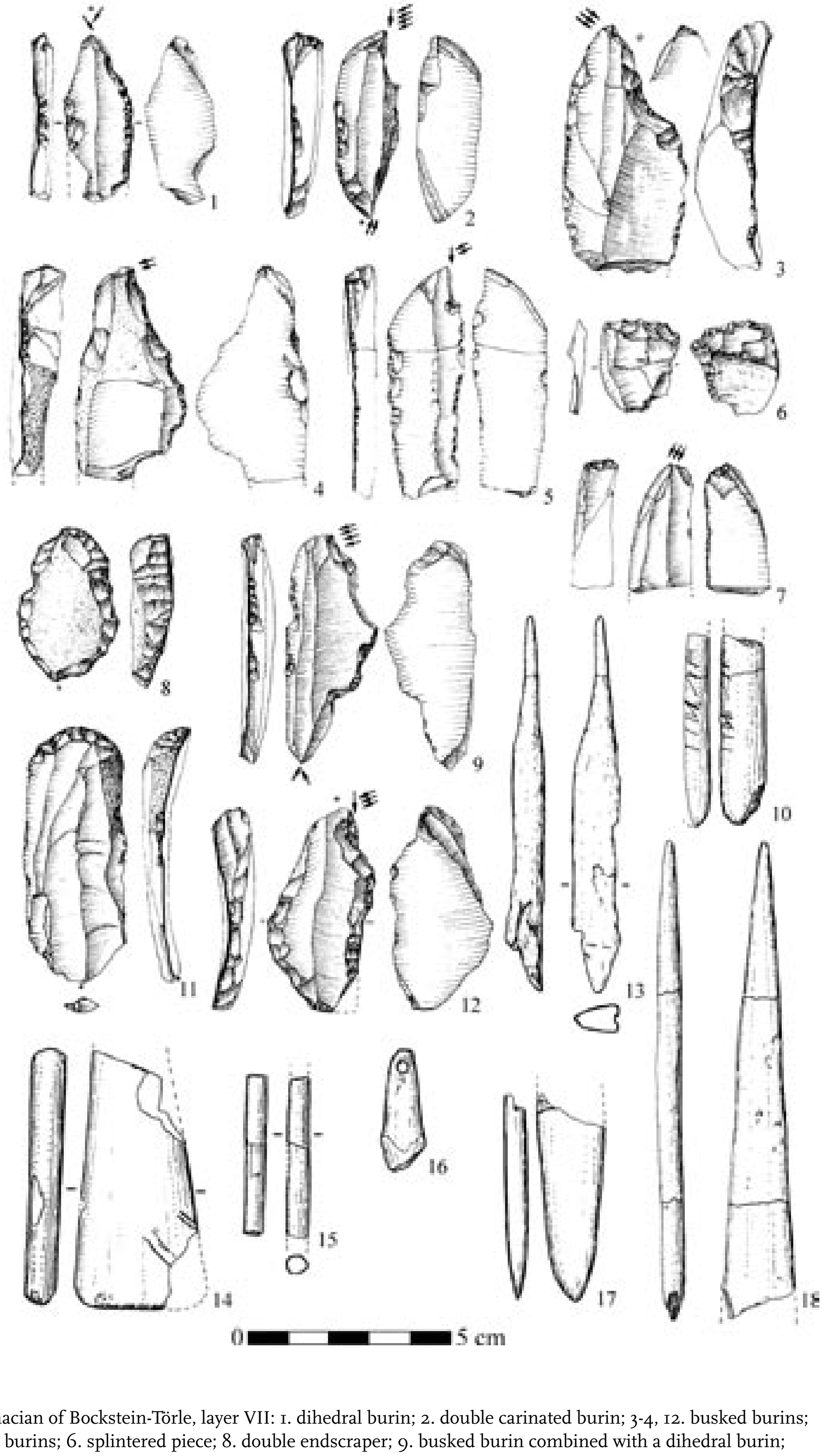

FIG. 17 – Aurignacian of Bockstein-Törle, layer VII: 1. dihedral burin; 2. double carinated burin; 3-4, 12. busked burins; 5, 7. carinated burins; 6. splintered piece; 8. double endscraper; 9. busked burin combined with a dihedral burin; 10
After Hahn, 1977.

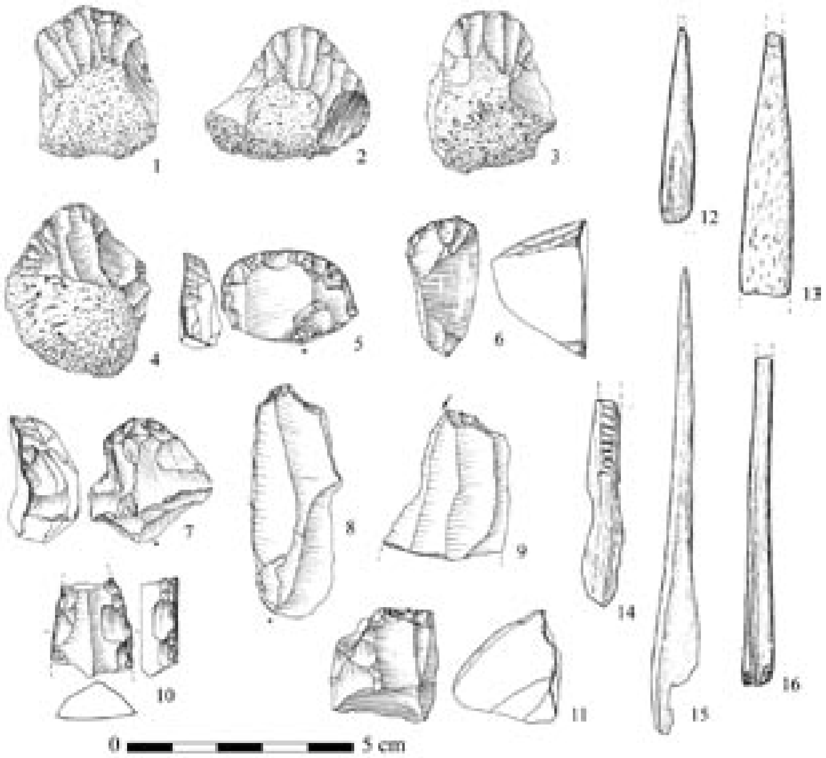

FIG. 18 – Aurignacian of Göpfelsteinhöhle: 1-4, 6. carinated endscrapers; 5. endscraper; 7. nosed endscraper; 8. borer (?); 9. burin on truncation; 10. laterally retouched blade (fragment of a pointed blade?); 11. bladelet core; 12, 15-16. bone awls; 13. antler point; 14. decorated bone fragment. After Hahn, 1977.

Acknowledgments

Many thanks are due our collaborators in the research in Swabia including Martina Barth, Susanne Feine, Harald Floss, Paul Goldberg, Piet Grootes, Michael Hofreiter, Petra Kieselbach, Luc Moreau, Susanne Münzel, Fred Smith, Solveig Schiegl, Nicolas Teyssandier, and Hans-Peter Uerpmann. Many students and the staff of the Department of Early Prehistory and Quaternary Ecology, especially Kurt Langguth and Maria Malina, have made major contributions to the excavations at Hohle Fels and Geißenklösterle. This work has been funded through the generous support of the Deutsche Forschungsgemeinschaft, the Landesdenkmalamt Baden-Württemberg, the Gesellschaft für Urgeschichte, the Museumsgesellschaft Schelklingen, and the Heidelberger Cement Company. Thanks are due to Maria Malina and Susanne Feine for producing many of the figures and illustrations. We are indebted to many colleagues including Alberto Broglio, Francesco d'Errico, James O'Connell, and Teresa Steele for helpful discussions. Finally, we thank João Zilhão and Ofer Bar-Yosef for the opportunity to participate in the Aurignacian meeting in Lisbon in June 2002 and for their generous hospitality.

REFERENCES

BAR-YOSEF, O. (1998) - On the nature of transitions: the Middle to Upper Palaeolithic and the Neolithic revolution. *Cambridge Archaeological Journal*. Cambridge. 8:2, p. 141-163.

BECK, J. W.; RICHARDS, D. A.; EDWARDS, R. L.; SILVERMAN, B. W.; SMART, P. L.; DONAHUE, D. J.; HERRERA--OSTERHELD, S.; BURR, G. S.; CALSOYAS, L.; JULL, A. J. T.; BIDDULPH, D. (2001) - Extremely large variations of atmospheric ^{14}C concentration during the Last Glacial Period. *Science*. Washington, DC. 292, p. 2453-2458.

BOLUS, M. (2003) - The cultural context of the Aurignacian of the Swabian Jura. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 153-163.

BOLUS, M. (2004) - Der Übergang vom Mittel- zum Jungpaläolithikum in Europa. Eine Bestandsaufnahme unter besonderer Berücksichtigung Mitteleuropas. *Germania*. Frankfurt am Main. 82, p. 1-54.

BOLUS, M. (2005) - Brachten es moderne Menschen mit? Die Anfänge des Jungpaläolithikums in Europa. In CONARD, N. J.; KÖLBL, S.; SCHÜRLE, W., eds. - *Vom Neandertaler zum modernen Menschen*. Ostfildern: Jan Thorbecke, p. 71-98.

BOLUS, M.; CONARD, N. J. (2001) - The late Middle Paleolithic and earliest Upper Paleolithic in Central Europe and their relevance for the Out of Africa hypothesis. *Quaternary International*. Oxford. 75, p. 29-40.

BON, F. (2002) - *L'Aurignacien entre mer et océan: réflexion sur l'unité des phases anciennes de l'Aurignacien dans le sud de la France*. Paris: Société Préhistorique Française.

BROGLIO, A.; BERTOLA, S.; DE STEFANI, M.; MARINI, D. (2002) - L'Aurignaziano della Grotta di Fumane. In ASPES, A., ed. - *Preistoria veronese. Contributi e aggiornamenti*. Memorie del Museo Civico di Storia Naturale di Verona - 2^A Serie. Sezione Scienze dell'Uomo 5. Verona: Museo Civico di Storia Naturale di Verona - Museo Tridentino di Scienze Naturali, p. 29-36.

BROGLIO, A; DALMERI, G., eds. (2005) - *Pitture paleolitiche nelle Prealpi Venete. Grotta di Fumane e Riparo Dalmeri, Verona*. Verona: Museo Civico di Storia Naturale di Verona; Trento: Museo Tridentino di Scienze Naturali (Memorie del Museo di Storia Naturale di Verona - 2. Serie, Sezione Scienze dell'Uomo; 9; *Preistoria Alpina*. Trento. Nr. Speciale).

BROGLIO, A.; GURIOLI, F. (2004) - The symbolic behaviour of the first modern humans: the Fumane cave evidence (Venetian Pre-Alps). In OTTE, M., ed. - *La spiritualité. Actes du Colloque International de Liège (10-12 décembre 2003)*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 106), p. 97-102.

CONARD, N. J. (2002a) - Der Stand der altsteinzeitlichen Forschung im Achtal der Schwäbischen Alb. *Mitteilungen der Gesellschaft für Urgeschichte*. Blaubeuren. 11, p. 65-77.

CONARD, N. J. (2002b) - The Timing of Cultural Innovations and the Dispersal of Modern Humans in Europe. In BRAUER, A.; NEGENDANK, J. F. W.; BOHM, M., eds. Proceedings of the DEUQUA-Meeting August 26-28, 2002 Potsdam, Germany. *Terra Nova*. Oxford. 2002/6, p. 82-94.

CONARD, N. J. (2003a) - Eiszeitlicher Schmuck auf der Schwäbischen Alb. In KÖLBL, S.; CONARD, N. J., eds. - *Eiszeitschmuck - Status und Schönheit*. Blaubeuren: Urgeschichtliches Museum (Museumsheft; 6), p. 15-49.

CONARD, N. J. (2003b) - Palaeolithic ivory sculptures from southwestern Germany and the origins of figurative art. *Nature*. London. 426, p. 830-832.

CONARD, N. J. (2005a) - Aurignacian art in Swabia and the beginnings of figurative representations in Europe. In BROGLIO, A; DALMERI, G., eds. - *Pitture paleolitiche nelle Prealpi Venete. Grotta di Fumane e Riparo Dalmeri*. Memorie del Museo di Storia Naturale di Verona - 2.ª Serie, Sezione Scienze dell'Uomo 9. Preistoria Alpina, Nr. Speciale. Verona: Museo Civico di Storia Naturale di Verona - Museo Tridentino di Scienze Naturali, p. 82-88.

CONARD, N. J. (2005b) - Sind sich Neandertaler und moderne Menschen auf der Schwäbischen Alb begegnet? In CONARD, N. J.; KÖLBL, S.; SCHÜRLE, W., eds. - *Vom Neandertaler zum modernen Menschen*. Ostfildern: Jan Thorbecke, p. 131-152.

CONARD, N. J. (2005c) - An overview of the patterns of behavioural change in Africa and Eurasia during the Middle and Late Pleistocene. In D'ERRICO, F.; BACKWELL, L., eds. - *From tools to symbols. From early hominids to modern humans*. Johannesburg: Witwatersrand University Press, p. 294-332.

CONARD, N. J.; BOLUS, M. (2003) - Radiocarbon dating the appearance of modern humans and timing of cultural innovations in Europe: new results and new challenges. *Journal of Human Evolution*. London. 44, p. 331-371.

CONARD, N. J.; DIPPON, G.; GOLDBERG, P. (2003a) - Chronostratigraphy and archeological context of the Aurignacian deposits at Geißenklösterle. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 165-176.

CONARD, N. J.; GROOTES, P. M.; SMITH, F. H. (2004a) - Unexpectedly recent dates for human remains from Vogelherd. *Nature*. London. 430, p. 198-201.

CONARD, N. J.; LANGGUTH, K.; UERPMANN, H.-P. (2002) - Neue Aurignacien-Fundschichten im Hohle Fels bei Schelklingen, Alb-Donau-Kreis. *Archäologische Ausgrabungen in Baden-Württemberg 2001*. Stuttgart. p. 21-26.

CONARD, N. J.; LANGGUTH, K.; UERPMANN, H.-P. (2003b) - Einmalige Funde aus dem Aurignacien und erste Belege für ein Mittelpaläolithikum im Hohle Fels bei Schelklingen, Alb-Donau-Kreis. *Archäologische Ausgrabungen in Baden--Württemberg 2002*. Stuttgart. p. 21-27.

CONARD, N. J.; LANGGUTH, K.; UERPMANN, H.-P. (2004b) - Die Ausgrabungen 2003 in den Gravettien- und Aurignacien-Schichten des Hohle Fels bei Schelklingen, Alb-Donau-Kreis, und die kulturelle Entwicklung im frühen Jungpaläolithikum. *Archäologische Ausgrabungen in Baden-Württemberg 2003*. Stuttgart. p. 17-22.

CONARD, N. J.; MALINA, M. (2005) - Die Ausgrabungen 2004 in den frühen jungpaläolithischen Schichten des Hohle Fels bei Schelklingen, Alb-Donau-Kreis. *Archäologische Ausgrabungen in Baden-Württemberg 2004*. Stuttgart. p. 17-21.

CONARD, N. J.; MALINA, M. (in press) - Schmuck und vielleicht auch Musik am Vogelherd – Erste Ergebnisse der Nachgrabung. *Archäologische Ausgrabungen in Baden-Württemberg 2005*. Stuttgart.

CONARD, N. J.; MALINA, M.; MÜNZEL, S. C.; SEEBERGER, F. (2004c) - Eine Mammutelfenbeinflöte aus dem Aurignacien des Geißenklösterle. Neue Belege für eine musikalische Tradition im frühen Jungpaläolithikum auf der Schwäbischen Alb. *Archäologisches Korrespondenzblatt*. Mainz am Rhein. 34, p. 447-462.

CONARD, N. J.; NIVEN, L. B.; MUELLER, K.; STUART, A. J. (2003c) - The chronostratigraphy of the Upper Paleolithic deposits at Vogelherd. *Mitteilungen der Gesellschaft für Urgeschichte*. Blaubeuren. 12, p. 73-86.

D'ERRICO, F. (2003) - The invisible frontier. A multiple species model for the origin of behavioral modernity. *Evolutionary Anthropology*. New York, NY. 12, p. 188-202.

HAHN, J. (1970) - Die Stellung der männlichen Statuette aus dem Hohlenstein-Stadel in der jungpaläolithischen Kunst. *Germania*. Frankfurt am Main. 48, p. 1-12.

HAHN, J. (1977) - *Aurignacien, das ältere Jungpaläolithikum im Mittel- und Osteuropa*. Köln-Wien: Böhlau (Fundamenta; A 9).

HAHN, J. (1981) - Abfolge und Umwelt der jüngeren Altsteinzeit in Südwestdeutschland. *Fundberichte aus Baden-Württemberg*. Stuttgart. 6, p. 1-27.

HAHN, J. (1983) - Eiszeitliche Jäger zwischen 35 000 und 15 000 Jahren vor heute. In MÜLLER-BECK, H., ed. - *Urgeschichte in Baden-Württemberg*. Stuttgart: Theiss, p. 273-330.

HAHN, J. (1986) - *Kraft und Aggression. Die Botschaft der Eiszeitkunst im Aurignacien Süddeutschlands?*. Tübingen: Verlag Archaeologica Venatoria (Archaeologica Venatoria; 7).

HAHN, J. (1988) - *Die Geißenklösterle-Höhle im Achtal bei Blaubeuren I. Fundhorizontbildung und Besiedlung im Mittelpaläolithikum und im Aurignacien*. Stuttgart: Theiss.

HAHN, J. (1989) - Zur Funktion einer Aurignacien-Feuerstelle aus dem Geißenklösterle bei Blaubeuren. *Fundberichte aus Baden-Württemberg*. Stuttgart. 14, p. 1-22.

HAHN, J. (1993) - Urgeschichtliche Forschung auf der Ostalb. *Karst und Höhle 1993*. München. p. 213-224.

HAHN, J. (1995) - Neue Beschleuniger-^{14}C-Daten zum Jungpaläolithikum in Südwestdeutschland. *Eiszeitalter und Gegenwart*. Hannover. 45, p. 86-92.

HOUSLEY, R. A.; GAMBLE, C. S.; STREET, M.; PETTITT, P. (1997) - Radiocarbon evidence for the Lateglacial Human Recolonisation of Northern Europe. *Proceedings of the Prehistoric Society*. London. 63, p. 25-54.

HUGHEN, K.; LEHMAN, S.; SOUTHON, J.; OVERPECK, J.; MARCHAL, O.; HERRING, C.; TURNBULL, J. (2004) - ^{14}C activity and global carbon cycle changes over the past 50,000 years. *Science*. Washington, DC. 303, p. 202-207.

KUHN, S. L.; STINER, M. C. (1998) - The Earliest Aurignacian of Riparo Mochi (Liguria, Italy). *Current Anthropology*. Chicago, IL. 39 (suppl. 1), p. S175-S189.

LEROI-GOURHAN (1995) - *Préhistoire de l'art occidental*. Nouvelle édition revue et augmentée par B. et G. Delluc. Paris: Éditions d'art Lucien Mazenod.

LIOLIOS, D. (1999) - *Variabilité et caractéristiques du travail des matières osseuses au début de l'Aurignacien: approche technologique et économique*. Ph. D. Thesis. University of Paris X-Nanterre.

MELLARS, P. (1996) - *The Neanderthal legacy. An archaeological perspective from Western Europe*. Princeton, NJ: Princeton University Press.

MELLARS, P. (2004) - Neanderthals and the modern human colonization of Europe. *Nature*. London. 432, p. 461-465.

MÜNZEL, S. (1997) - Seasonal activities of human and Non-human inhabitants of the Geißenklösterle Cave near Blaubeuren, Alb-Danube District. *Anthropozoologica*. Paris. 25-26, p. 355-361.

MÜNZEL, S. C. (2001) - The production of Upper Palaeolithic mammoth bone artefacts from southwestern Germany. In CAVARRETTA, G.; GIOIA, P.; MUSSI, M.; PALOMBO, M. R., eds. - *The world of elephants*. Roma: Consiglio Nazionale delle Ricerche, p. 448-454.

MÜNZEL, S. C.; CONARD, N. J. (2004) - Change and continuity in subsistence during the Middle and Upper Palaeolithic in the Ach Valley of Swabia (South-west Germany). *International Journal of Osteoarchaeology*. London. 14, p. 225-243.

NIVEN, L. (2006) - *The Paleolithic occupation of Vogelherd Cave: implications for the subsistence behavior of late Neanderthals and early modern humans in Southwestern Germany*. Tübingen: Kerns Verlag.

RICHTER, D.; WAIBLINGER, J.; RINK, W. J.; WAGNER, G. A. (2000) - Thermoluminescence, Electron Spin Resonance and ^{14}C-dating of the Late Middle and Early Upper Palaeolithic Site of Geißenklösterle Cave in Southern Germany. *Journal of Archaeological Science*. London. 27, p. 71-89.

RIEK, G. (1934) - *Die Eiszeitjägerstation am Vogelherd im Lonetal I: Die Kulturen*. Tübingen: Akademische Buchhandlung Franz F. Heine.

RIEK, G. (1973) - *Das Paläolithikum der Brillenhöhle bei Blaubeuren (Schwäbische Alb), Teil I*. Stuttgart: Verlag Müller & Gräff.

SCHMID, E. (1989) - Die altsteinzeitliche Elfenbeinstatuette aus der Höhle Stadel im Hohlenstein bei Asselfingen, Alb-Donau-Kreis. With contributions by HAHN, J. and WOLF, U. *Fundberichte aus Baden-Württemberg*. Stuttgart. 14, p. 33-118.

SCHMIDT, R. R. (1912) - *Die diluviale Vorzeit Deutschlands*. With contributions by KOKEN, E.; SCHLIZ, A. 3 vols. Stuttgart: E. Schweizerbartsche Verlagsbuchhandlung.

TEYSSANDIER, N. (2003) - *Les débuts de l'Aurignacien en Europe. Discussion à partir des sites de Geissenklösterle, Willendorf II, Krems-Hundssteig et Bacho Kiro*. Ph. D. Thesis. University of Paris X-Nanterre.

TEYSSANDIER, N.; LIOLIOS, D. (2003) - Defining the earliest Aurignacian in the Swabian Alp: the relevance of the technological study of the Geissenkösterle (Baden-Würtenberg, Germany) lithic and organic productions. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 179-196.

VANHAEREN, M.; D'ERRICO, F. (in press) - *Journal of Archaeological Science*.

VOELKER, A. H. L.; GROOTES, P. M.; NADEAU, M.-J.; SARNTHEIN, M. (2000) - Radiocarbon levels in the Iceland Sea from 25-53 kyr and their link to the earth's magnetic field intensity. *Radiocarbon*. Tucson, AZ. 42, p. 437-452.

WHITE, R. (1993) - Technological and social dimension of "Aurignacian-age" body ornaments across Europe. In KNECHT, H.; PIKE-TAY, A.; WHITE, R., eds. - *Before Lascaux: the complex record of the Early Upper Paleolithic*. Boca Raton, FA: CRC Press, p. 277-299.

WHITE, R. (2001) - Personal ornaments from the Grotte du Renne at Arcy-sur-Cure. *Athena Review*. Westport, CT. 2:4, p. 41-46

ZILHÃO, J.; D'ERRICO, F. (1999) - The chronology and taphonomy of the earliest Aurignacian and its implications for the understanding of Neandertal extinction. *Journal of World Prehistory*. New York, NY. 13, p. 1-68.

ZILHÃO, J.; D'ERRICO, F. (2003a) - The chronology of the Aurignacian and transitional technocomplexes. Where do we stand? In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 313-349.

ZILHÃO, J.; D'ERRICO, F. (2003b) - An Aurignacian "Garden of Eden" in Southern Germany? An alternative interpretation of the Geißenklösterle and a critique of the *Kulturpumpe* model. *Paléo*. Les Eyzies-de-Tayac. 15, p. 69-86.

The Early Aurignacian in central Europe and its place in a European perspective

NICOLAS TEYSSANDIER ▌MICHAEL BOLUS ▌NICHOLAS J. CONARD

ABSTRACT This paper places the current research on the Aurignacian of the Upper and Middle Danube region in a broader European context. Technological and typological studies show that the Swabian Aurignacian, particularly as documented in the well-dated deposits from Geißenklösterle, closely resemble the assemblages of Peyrony's Aurignacian I. We use the term Early Aurignacian in this context to distinguish the well-documented Swabian assemblages including Geißenklösterle, Hohle Fels, and Vogelherd from other early Upper Paleolithic cultural groups including the Proto-Aurignacian of southern Europe. Although the assemblage from Willendorf II, layer 3, is very small, it also appears to belong to the Early Aurignacian. The early phases of the Aurignacian date to about 35 000 radiocarbon years ago and about 40 000 calendar years ago based on TL measurements. These dates indicate a great antiquity of the upper and middle Danubian Early Aurignacian, but similar radiocarbon ages are also known from the Early Aurignacian of the Aquitaine region. Thus, for now, questions about the poly- or monocentric origin of the Aurignacian remain open. The available data, however, do not support the claims for an origin of the Aurignacian in the Balkans or other regions of eastern Europe.

Introduction

Questions related to the first Aurignacian are of critical importance in the debate on the appearance and spread of anatomically modern humans and culturally modern behaviour in Europe. While it is often assumed that the Aurignacian is equivalent to the first dispersion of modern humans in Europe (e.g. Mellars, 1989, 1996a, 1996b, 2004; Otte, 1990, 1996; Kozłowski, 1993; Bar-Yosef, 1998; Zilhão and d'Errico, 1999; Kozłowski and Otte, 2000; Davies, 2001; Conard and Bolus, 2003), no consensus exists regarding the spatial distribution and the archaeological definition of the first Aurignacian. This question is nevertheless crucial in the debate since several scholars view the Aurignacian as a homogeneous, pan-European, cultural event reflecting a migration of modern humans from East to West across western Eurasia (e.g. Djindjian, 1993; Mellars, 1989, 2004; Bocquet-Appel and Demars, 2000; Kozłowski and Otte, 2000). This alleged cultural homogeneity associated with global technical, economic and symbolic signatures has led to the interpretation of the Aurignacian as the cultural and biological European revolution of the Upper Pleistocene (Mellars, 1989, 2004; Bar-Yosef, 1998). More particularly, based especially on assemblages such as Bacho Kiro layer 11 (Kozłowski, 1982, 1999) and Temnata TD-I, layer 4, Bulgaria (Ginter et al., 1996; Drobniewicz et al., 2000), some researchers argue that the European Aurignacian first appears in the Balkans (Kozłowski and Otte, 2000). Through the years, researchers have suggested an east to west movement of the Aurignacian along the Danube Valley as one of the routes followed by modern humans into Europe (Mellars, 1989, 1996a, 1999; Djindjian, 1993; Kozłowski, 1993; Bar-Yosef, 1998). Radiocarbon and TL dates between 40 and 35 kyr BP from German, Austrian and Hungarian Aurignacian strata strongly support this scenario leading to the "Danube corridor hypothesis" raised by the Tübingen research group (Conard, 2002; Conard and Bolus, 2003; Bolus, 2004).

Since central Europe is of major importance for explaining the appearance and spread of the Aurignacian in Europe, it is necessary to test the idea of cultural unity of the Aurignacian through detailed technological studies of material culture. In this paper, we focus our attention on the evidence from central Europe.

The case of Geißenklösterle

The Geißenklösterle sequence has been considered as the most serious candidate for the presence of a very early Aurignacian in central Europe (Hahn, 1988, 1995a; Zilhão and d'Errico, 1999, 2003a, 2003b; Kozłowski and Otte, 2000; Richter et al., 2000; Bolus and Conard, 2001; Conard and Bolus, 2003). Indeed, the lowest layers of the sequence (IIIb, IIIa and III) yielded five radiocarbon dates, both AMS and conventional, falling into the range between about 36.5 and about 40 kyr BP. Moreover, six TL dates obtained by Richter et al. (2000) on burnt flints provide a mean age of 40.2±1.5 kyr BP, while two TL dates on burnt flints for the upper Aurignacian horizon (AH II) yielded ages of ca.37 kyr BP.

Debates on the chronostratigraphy and taphonomic context of the Aurignacian of Geißenklösterle highlight diverse points of view (e.g. Zilhão and d'Errico, 1999; Kozłowski and Otte, 2000; Richter et al., 2000; Conard, 2002; Conard and Bolus, 2003). Disagreements concern notably the stratigraphic context of the several archaeological assemblages, their chronology and their cultural attribution.

Seven Aurignacian archaeological layers (Fig. 1) were originally defined by Hahn (1988) based on geological observations and the vertical and horizontal distribution of artifacts and features. Following extensive refitting of artifacts and taphonomic analyses, Hahn argued for the existence of two major cultural units (AH II and AH III). This

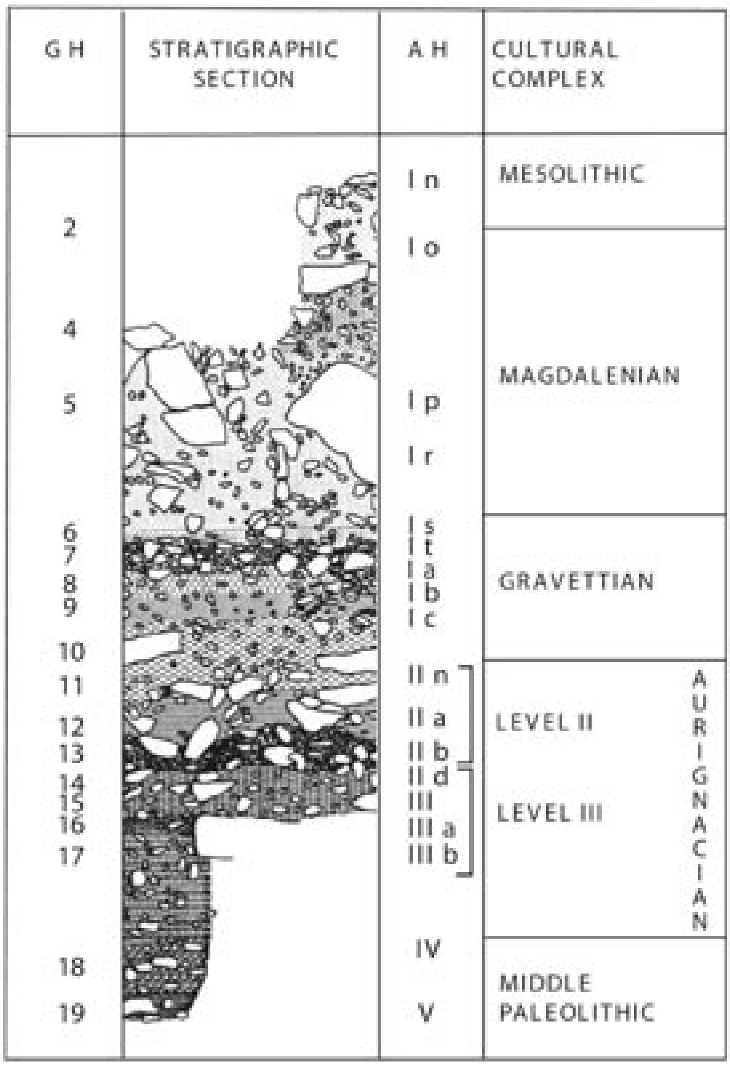

FIG. 1 – Stratigraphic profile of the Geißenklösterle cave (after Hahn, 1988, modified). GH refers to the geological horizons, and AH to the archeological levels.

does not mean that people only came twice to the cave; to the contrary, both Hahn and ourselves argue that the main archaeological horizons II and III reflect several and perhaps many occupations. Spatial analysis suggests that layers IIn and IIa contain artifacts derived from IIb. Similarly, we interpret IId, III, and IIIb as containing secondarily displaced elements of IIIa. Horizon II including IIn, IIa and IIb clearly belongs to the Aurignacian with split-based antler points, mobiliary art, and personal ornaments, while Hahn (1992, 1993) attributed horizon III to the Proto or Pre-Aurignacian. This reconstruction has been contested by Zilhão and d'Errico (1999), who did not accept the integrity and the chrono-cultural attribution of horizon III. Instead, they proposed an alternative hypothesis by which the Aurignacian pieces in horizon III (e.g. carinated pieces, blade technology and personal ornaments) were viewed as the result of contamination from horizon II.

Based on a new taphonomic evaluation of the seven Aurignacian layers of the cave (Teyssandier, 2003), on new refittings (Teyssandier, 2003), on new geoarchaeological and micromorphological analyses (Conard et al., 2003; Dippon, 2003), and on the comparison of lithic and organic productions (Teyssandier and Liolios, 2003), our studies confirm the archeostratigraphic reconstruction by Hahn. We thus attribute AH III to the Early Aurignacian (Teyssandier, 2003), which is directly comparable to similar technical manifestations in the Aquitain basin (e.g. Aurignacian I, Bon, 2002). The Aurignacian pieces such as carinated endscrapers from AH III are not the result of vertical mixing from horizon II. They are clearly concentrated within AH III and originate mainly from archaeological unit IIIa (Fig. 2 and Table 1). The scarcity of vertical mixing from AH II to AH III is confirmed by the stratigraphic position of characteristic organic objects such as split-based antler points or ivory figurines, which always lie within horizon II (Liolios, 1999; Münzel, 1999; Conard et al., 2003; Teyssandier, 2003).

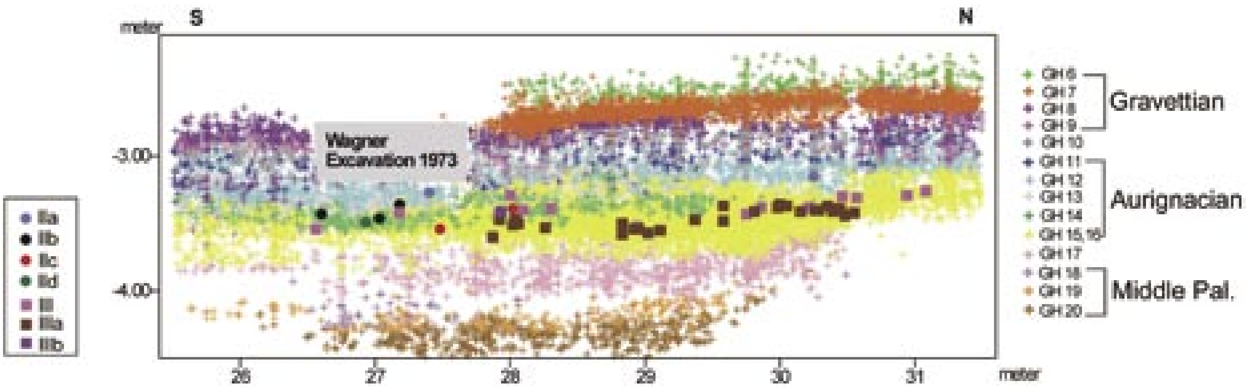

FIG. 2 – Vertical distribution of all the carinated pieces of horizons III and II of Geissenklösterle cave (after Teyssandier, 2003).

TABLE 1

Distribution of all the carinated pieces (including carinated and nosed "endscrapers" and carinated preform cores) in the various levels of the Aurignacian sequence of Geißenklösterle cave (after Teyssandier, 2003).

	IIa	*IIb*	*AH II*	*IId*	*III*	*IIIa*	*IIIb*	*AH III*	*total*
carinated pieces	–	–		1	4	14	–	19	19
nosed pieces	2	2	4	1	8	14	1	24	28
preform	–	1	1	–	–	1		1	2
total	2	3	5	2	12	29	1	44	49

An economic explanation

Our techno-economic work on the lithic (Teyssandier, 2003; Teyssandier and Liolios, 2003) and organic (Liolios, 1999; Teyssandier and Liolios, 2003) productions of the seven Aurignacian subunits casts new light on the debate. AH III is characterized by complete blade reduction sequences, from the first stages of exploitation to the final phases of core discard and tool manufacture. On the other hand, there is scantier evidence of on-site blade production in AH II, since the related reduction sequences are more fragmentary, and cores as well as the initial debitage stages are poorly represented. Additionally, horizon II features a wider range of raw materials than horizon III, a greater use of distant lithic raw materials (Burkert, 1998; Burkert and Floss, 2005), and the introduction of blade blanks and tools produced off-site (Teyssandier, 2003). Both horizons II and III are clearly connected with "evident" and "latent" structures such as an extensive bone and ash lens in IIb and a hearth in IIIa. That is one of the reasons why Hahn (1988) argued that IIb and IIIa were the main occupations of AH II and AH III.

TABLE 2

Distribution of pieces from refitting complex 9 in the various levels of level AH III of Geißenklösterle cave (after Teyssandier, 2003).

A.H.	*number of pieces*
IId	1
III	11
IIIa	16
total	28

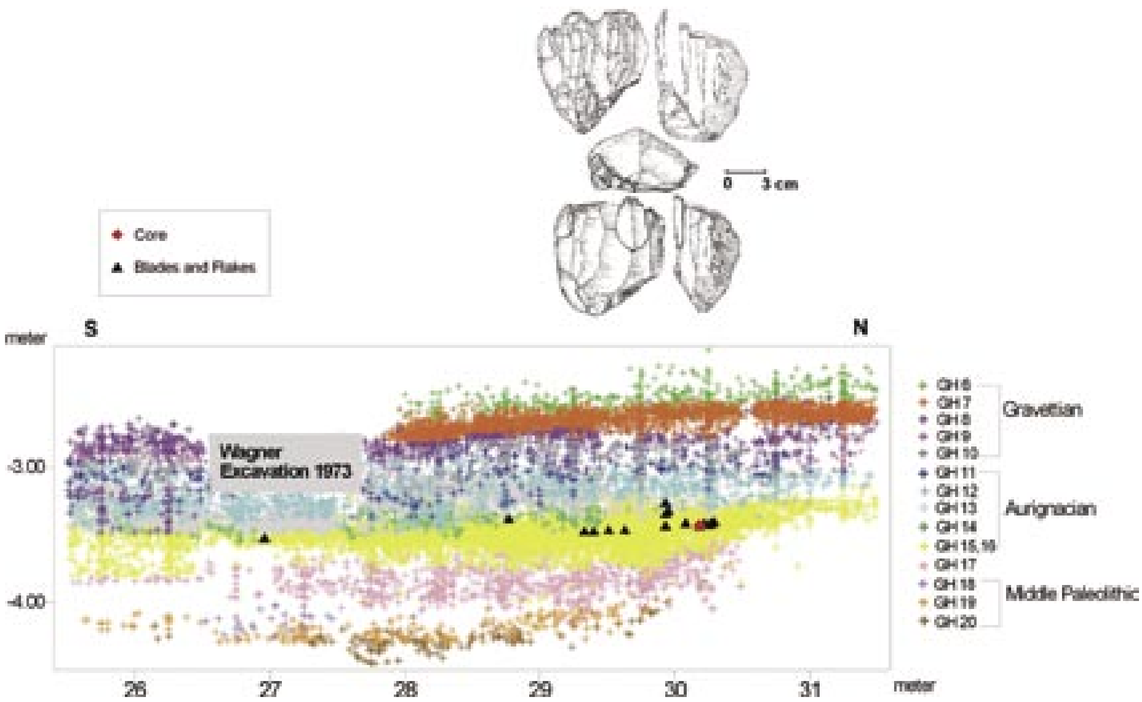

FIG. 3 – Refitting sequence A9 from Geißenklösterle. As indicated in Table 2, most of the refitted pieces were located in IIIa and III (after Conard, 2002).

TABLE 3

Distribution of pieces from refitting complex 11 in the various levels of the Aurignacian sequence of Geißenklösterle cave (after Teyssandier, 2003).

square meter	*number of pieces*
ind.	3
IIb	2
IId	4
III	14
IIIa	44
IIIb	1
total	68

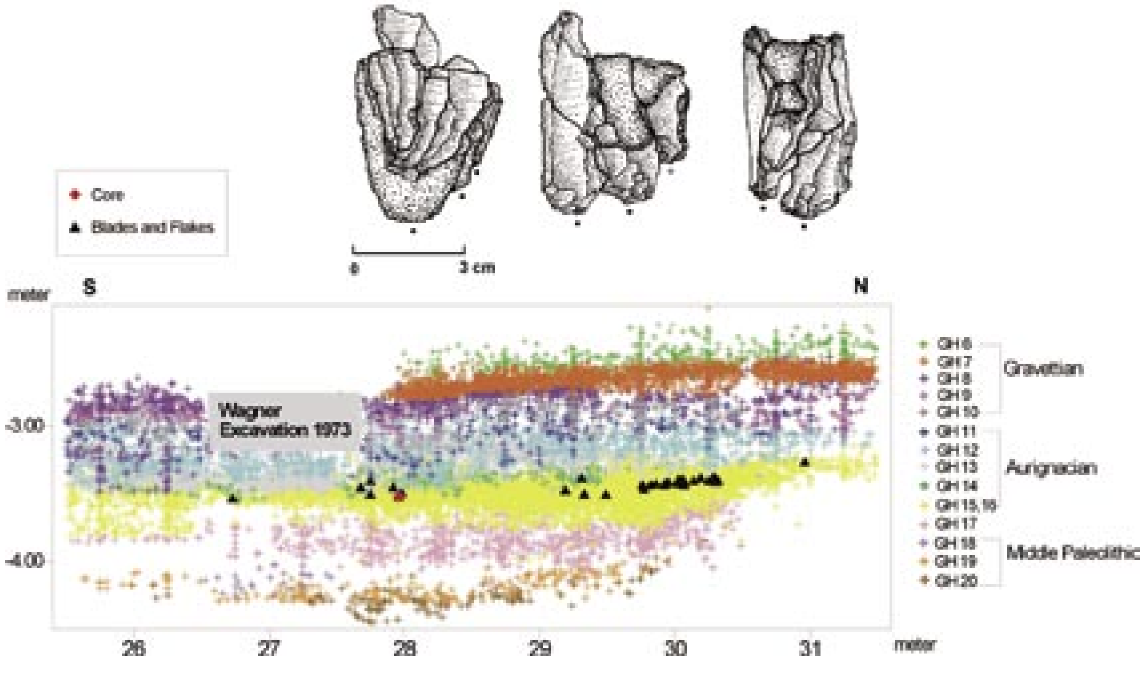

FIG. 4 – Refitting sequence A11 from Geißenklösterle. As indicated in Table 3, most of the reffited pieces were located in IIIa (after Conard, 2002).

This interpretation could be confirmed by the fact that in the area around the hearth, the richest area of AH III, the distribution of refitted artifacts shows a tight spatial patterning in both the horizontal and vertical dimensions. Several blocks were knapped in the area immediately around the hearth as has been demonstrated by lithic refittings (Hahn, 1988; Conard, 2002; Conard and Bolus, 2003; Teyssandier, 2003). Several examples indicate that most of the pieces connected by refittings lie in the area around the hearth. Only a few pieces moved into the overlying layers of horizon II (Figs. 3-4; Tables 2-3). In this case, most of the refitted sequences are clearly related to the hearth of IIIa and give support to the relative integrity of this horizon. Furthermore, the higher proportion of refitting artifacts in horizon III than in horizon II is consistent with the other arguments for the integrity of the deposits. This observation also reflects intensive stone knapping during the formation of AH III. In contrast, due to the economic patterns and the scarcity of on-site primary knapping in AH II, refittings are far less common than in AH III. This being said, the karst dynamic and the related post-depositional processes help to explain the migration of pieces from horizon III to horizon II, especially in the southern area of the cave. These and the other sources of mixing including excavation error do not refute the validity of the two main archaeological horizons described below.

From a technological perspective, both horizons II and III can be attributed to the Early Aurignacian, which is clearly equivalent to the Aurignacian I in the French nomenclature (Teyssandier, 2003). No major technological differences can be established between these two horizons. The affiliation of AH III to the Early Aurignacian is in contradiction with previous attributions to an Aurignacian preceding the Aurignacian I (Hahn, 1988), to the Proto-Aurignacian (Hahn, 1992, 1993) or Pre-Aurignacian (Kozłowski and Otte, 2000), and with the hypothesis of an assemblage originating from the overlying deposit of AH II (Zilhão and d'Errico, 1999).

In the absence of diagnostic objects such as Dufour bladelets or split-based bone points, the core reduction and the general organization of lithic production are of critical importance

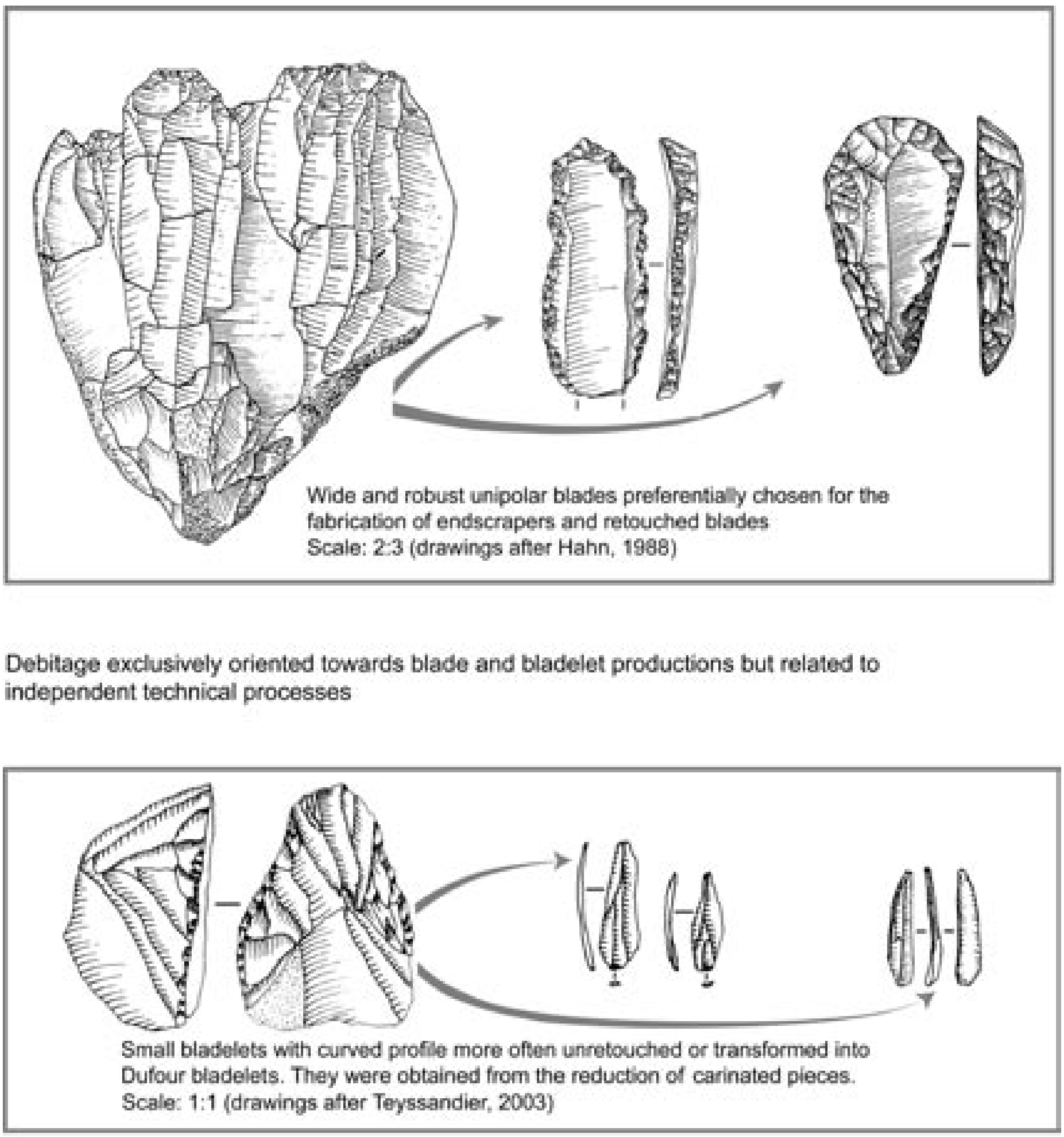

FIG. 5 – Synthetic view on the lithic productions of the Early Aurignacian (AH III and II) of Geißenklösterle cave (after Teyssandier, 2003).

for ascribing AH III to the Early Aurignacian. The lithic production is oriented towards the production of blades and bladelets in using distinct core reduction methods. The blades come from unipolar cores whereas the bladelets are more diversified and obtained predominantly through the exploitation of carinated pieces such as carinated and nosed end-scrapers (Fig. 5). The techniques used for blade and bladelet productions are exactly the same as those recently described in the French Aurignacian I of western Europe (Bon, 2002; Bordes, 2002). The similarity between AH III of Geißenklösterle and the French Aurignacian I is also apparent in the way of obtaining bladelets and in the clear dissociation of blade and bladelet productions.

As a conclusion, horizons II and III are thus culturally similar, but they differ according to economic factors. Such a functional and economic explanation would account for the similarity between the operative concepts identified for the lithic and organic production (Liolios, 1999; Teyssandier, 2003; Teyssandier and Liolios, 2003) in each horizon as well as for the differences in the frequency of tool-types and in the completeness of reduction sequences. In this context, we should recall that in the German research tradition scholars tend to be very cautious in defining cultural sequences. Thus, to date, few attempts have been made to create a fine cultural sequence for the Aurignacian. Analyses by Hahn (1977, 1981) and Bolus (2003) show that there are few if any meaningful cultural subunits within the Aurignacian. Here it is clear that the German tradition emphasizes the role of functional and stochastic variation rather than chrono-stratigraphically defined changes so prevalent in the French Paleolithic tradition.

Geißenklösterle is thus clearly associated with a specific technical tradition now well defined from a techno-economic perspective in southwest France (Bon, 2002) and in the Swabian Jura (Teyssandier, 2003). We may now evaluate, whether or not this tradition exists elsewhere in central Europe.

Willendorf II and its place in the context of the early Upper Paleolithic in central Europe

Willendorf II belongs to a set of Upper Paleolithic sites located on the western bank of the Danube along the Wachau, some 70 km to the west of Vienna. The site was excavated from 1908 to 1927 by Josef Bayer of the Museum of Natural Sciences of Vienna (Felgenhauer, 1956--1959). The excavations revealed the existence of at least nine Paleolithic layers (1 to 9 from the base to the top) in the upper half of loamy deposits about 20 m thick, preserved on the top of a lower terrace of the Danube (Brandtner, 1956-1959; Haesaerts et al., 1996). The lowest cultural layers 1 to 4 are of critical importance in the debate concerning the appearance of Upper Paleolithic industries in central Europe, and they have previously been studied from a typological viewpoint by Felgenhauer (1956-1959), by Broglio and Laplace (1966), and by Hahn (1977).

Cultural layers 1 and 2 are non-diagnostic from a chrono-cultural perspective. The paucity of artifacts and more particularly of diagnostic items make attributions and comparisons extremely difficult (Haesaerts and Teyssandier, 2003; Teyssandier, 2003). Only non-diagnostic tools are found in these assemblages; typical Aurignacian or transitional forms are totally lacking. It is thus impossible to confirm the attribution of layer 2 to the Aurignacian proposed by Broglio and Laplace (1966), or the attribution to the Pre-Aurignacian/Bachokirian proposed by Kozłowski and Otte (2000). The recent hypothesis of Svoboda (2003) to ascribe layer 2 to the Bohunician still remains hypothetical, and it is important to stress that some technical characters recognized in Willendorf II, layer 2, are unknown in the Bohunician tradition (e.g. the use of a soft hammer for blade detachment, Fig. 6, no. 2; Teyssandier, 2003).

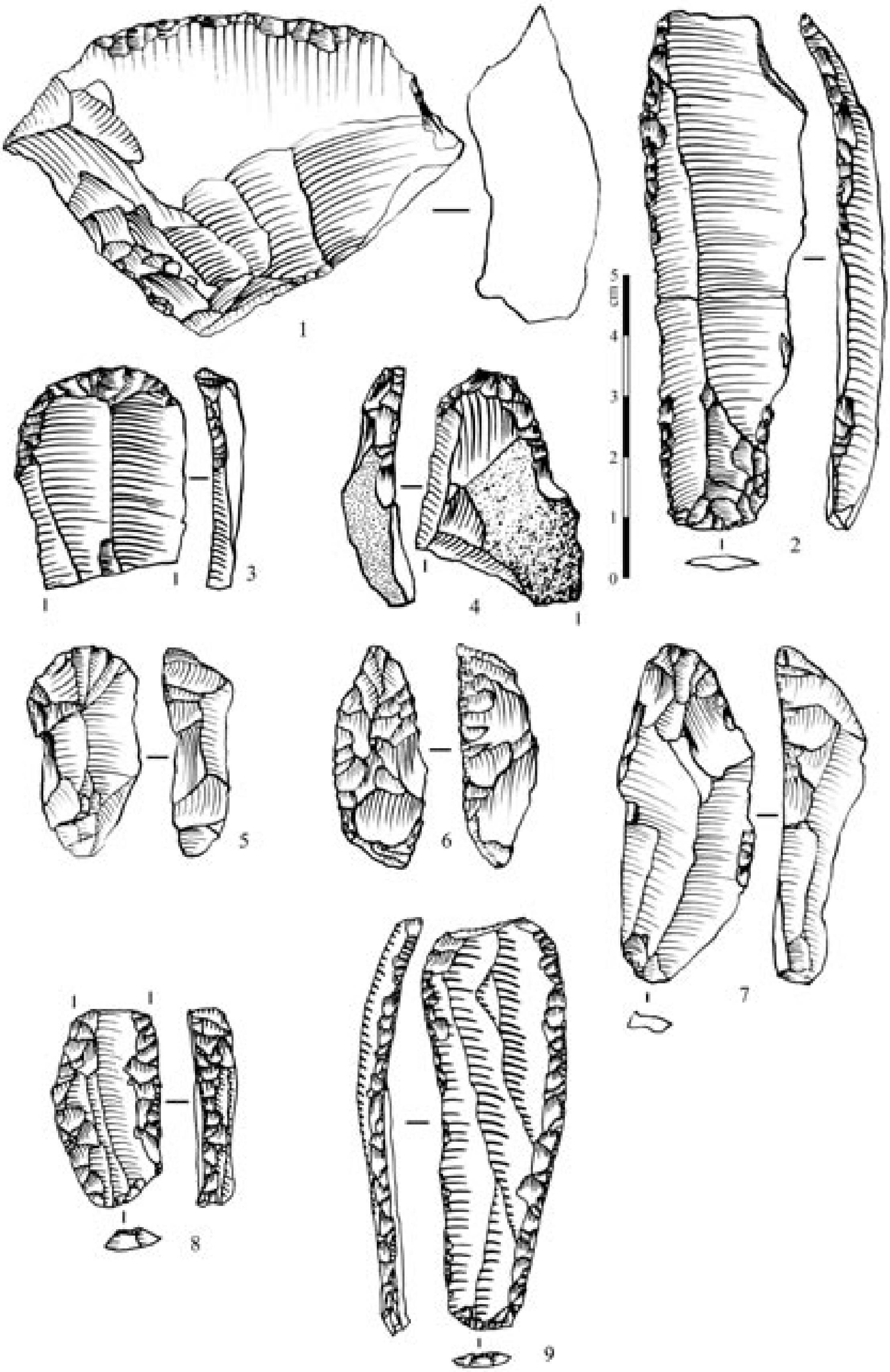

FIG. 6 – Willendorf II, lithic tools from layers 2 (1-4) and 3 (5-9): 1. sidescraper; 2. retouched blade; 3-4. single endscrapers; 5, 7. carinated endscrapers; 6. nosed endscraper; 8-9 retouched blades (after Teyssandier, 2003).

The available lithic assemblage of layer 3 was numerically equivalent to that of layer 2 and consisted of only 38 pieces. However, the morphology of the different tool-types changes: more tools are made on blades, thick endscrapers appear for the first time, and retouched blades are more diversified with two true Aurignacian blades (Fig. 6, nos. 8-9) that are very similar to those usually assigned to the Aurignacian elsewhere. Layer 3 has always been interpreted as Aurignacian (e.g. Felgenhauer, 1956-1959; Broglio and Laplace, 1966; Hahn, 1977, 1993).The chronocultural attribution of Willendorf II, layer 3, depends on the significance attached to some specific tools such as carinated pieces or Aurignacian blades. Concerning the carinated pieces of layer 3 (Fig. 6, nos. 5-7), their aurignacoid character is evident and they are very similar to those documented at Geißenklösterle (Teyssandier, 2003) and in the French Aurignacian I (Bon, 2002). We, however, stress the small number of diagnostic artifacts and the small size of the assemblage, which make comparisons extremely difficult. We need thus to be cautious in using data of layer 3 of Willendorf II in theoretical and global models. Nevertheless, the best points of comparison for layer 3 are found in Early Aurignacian contexts. Recently, several hundred artifacts from layer 3 of Willendorf II have been re-discovered in the cellar of the Department of Prehistory of the Museum of Natural History in Vienna. These artifacts apparently confirm the classification of the Willendorf II, layer 3 assemblage as Aurignacian (Nigst, 2004).

Issues of definition and distribution of Early Aurignacian assemblages in central Europe

When we consider central Europe as a whole, it is necessary to remember the scarcity of well-documented Early Aurignacian stratified assemblages. Here we define the Early Aurignacian not only as a typo-chronological event (e.g. Peyrony's Aurignacian I), but more generally as a specific typo-techno-economic package, which cannot be defined as a pan-European event (Teyssandier, 2003). The Swabian and Austrian data provide some of the best documented evidence of this technological tradition. In moving to a broader spatial scale of analysis, we need to determine the degree to which the social-cultural developments in the Danube Basin are linked to other regions in Europe. This question is of central importance as we work to determine the cultural and demographic processes that occurred at the beginning of the Upper Paleolithic.

If we consider the complexity of technical and socio-symbolic behavior of the inhabitants of sites such as Geißenklösterle, Hohle Fels, Vogelherd or Hohlenstein-Stadel (Bolus, 2003; Conard and Bolus, 2003; Conard et al., 2003) and their temporal affiliation with similar manifestations from the Aquitain Basin, we see both aspects of parallel and contrasting development. The relevant data sets provide to some extent conflicting signatures. On the one hand, organic and inorganic technology documents considerable similarities within Aurignacian assemblages in a wider european context. Here the widespread presence of specific artifacts such as split-based bone points cannot be a matter of independent random discovery. Similarly, patterns of Early Aurignacian lithic reduction and typological variation within lithic assemblages (Hahn, 1977, 1988) also reflect unifying elements between regions. On the other hand, both personal ornaments and diverse forms of figurative art, patterns of decoration and even the evidence for musical traditions, clearly document specific regional signatures (Hahn, 1977, 1986; White, 1993; Vanhaeren, 2002; Conard, 2003; Conard and Bolus, 2003).

Thus, we need to imagine the regions within central Europe, particularly the central Danube and Swabia, as standing in connection with each other and also with neighboring regions, while at the same time developing local traditions. The similarities in technology and typology argue against seeing central Europe as a desolated and depopulated landscape during the Early Aurignacian. The groups occupying different regions must have had occasional contact to each other to maintain these similarities in the material culture, or at a minimum they maintained shared ancestoral forms of material culture and technologically based behavior. It seems that the most unifying elements in the material culture of the Early Aurignacian reside in technologically and functionally constrained forms, such as projectile points and more or less standardized flint knapping techniques and stone tools. But when we turn to less functionally constrained systems, such as artworks or especially ornaments, for which relatively large assemblages are available, we see sharp contrast in the forms that are well documented in specific regions, eg. Aquitaine (White, 1993) and Swabia (Hahn, 1972, 1995; Conard, 2003, 2005). This pattern of development reflects some of the first examples of regionalization in the archaeological record of the Upper Paleolithic.

From a typological point of view, possible early Aurignacian assemblages are reported, from regions cacluding Moravia (Valoch et al., 1985; Oliva, 1989) and Hungary (Vértes, 1955). Major problems, nevertheless, make it difficult to use this kind of evidence in the debate on the first appearance and development of early Aurignacian industries. The assemblages are sometimes poor and atypical as is the case with the lithics in the Hungarian sites such as Peskö and Istállósk (Hahn, 1977; Svoboda and Simán, 1989). Moreover, with new radiocarbon dates ranging between 28 and 33 kyr BP recently published, Istállósk cave no longer seems to be an appropriate candidate for a very early Aurignacian (Adams and Ringer, 2004). Other sites are richer in material, but they are unstratified, without any chronological context, and may show traces of contamination by non-Aurignacian industries. This might be true for a good portion of the Moravian sites. Keilberg-Kirche near Regensburg in Bavaria, with its presumably old Aurignacian (Uthmeier, 1996), also plays a key role in this discussion. The contextual association and taphonomic setting of the Aurignacian assemblage, however, leave some room to doubt whether the published radiocarbon dates of ca.38 kyr BP on charcoal actually date the human occupation of the site (Zilhão and d'Errico, 1999).

Chronological position of the Early Aurignacian

The interpretation of the best documented Early Aurignacian evidence in central Europe may not be as straightforward as it seems. We argue that, if at Geißenklösterle one only considered ^{14}C AMS results of AH III as a whole, their weighted mean ages would give age estimates around 34 000 BP. However, one has to consider the specific stratigraphic context of the dated materials. Layer IIIa is the major subunit of AH III and corresponds most closely to the main occupations reflected in horizon III. It also contains the best defined archaeological features, most notably a well defined hearth and concentrations of burnt materials and debris of ivory working (Hahn 1988, 1989). This being said, there is every reason to assume that AH III reflects multiple occupations, perhaps spanning long periods of time. Furthermore, as Hahn (1988) and the current authors (Conard and Bolus, 2003) have demonstrated, excavation error and taphonomic mixing have made it difficult to develop a generally valid fine stratigraphy for the site. As a result of the problems with the fine statigraphic resolution, Hahn worked mainly with the macro-stratigraphic horizons II and III. Nonetheless it seems appropriate to consider the dates from layer IIIa first and foremost when evaluating the ^{14}C age estimation of AH III (Teyssandier, 2003). ^{14}C AMS measures of layer IIIa are concentrated between 33 and 35.5 kyr BP, and the dates in this range tend to have smaller statistical uncertainties. This chronological framework is consistent with the dates obtained from Geißenklösterle bone samples with anthropogenic features and with recently obtained AMS dates from Vogelherd (between 32 and 36 kyr BP for layer V) in a similar cultural context (Conard et al., 2003). The radiocarbon dates from the lower Aurignacian deposits AH IV and Va at Hohle Fels also correspond to this time range (Conard, 2003). Despite at times polemic discourse that would suggest the opposite, this view is in broad agreement with Zilhão and d'Errico's (2003a, 2003b) arguments on the chronology of the Aurignacian (Teyssandier, 2003).

Given the large variation in levels of atmospheric ^{14}C, there is not necessarily a contradiction between the TL results of ca.40 kyr BP ago published by Richter et al. (2000), and the younger estimation presented here and based on the ^{14}C AMS measures (Conard and Bolus, 2003). The time-range 35.5-33 kyr BP is also coherent with the chronological framework of Aurignacian I sites in western Europe. Indeed, in south-west France, most of the ^{14}C dates of Aurignacian I deposits are concentrated between 34 and 32 kyr BP (Bon, 2002, p. 177-179). Central European evidences such as Geißenklösterle AH III are perhaps slightly older, but this can not be proven with certainty in using the available radiocarbon chronology.

Few other sequences can help us to discuss the chronological framework of the early Aurignacian in central Europe. We have already taken great caution in using Willendorf II layer 3 data in the debate. While Willendorf can unquestionably be used as a benchmark in a chronostratigraphic perspective (Damblon et al., 1996; Haesaerts et al., 1996; Haesaerts and Teyssandier, 2003), the small number of published artifacts in cultural layer 3 make comparisons and clear chronocultural assessments difficult (Haesaerts and Teyssandier, 2003; Teyssandier, 2003). This is a very problematic case, since layer 3 is well dated between 38 880 and 37 930 BP (Haesaerts et al., 1996; Haesaerts and Teyssandier, 2003). These dates are uncontroversial, since they were obtained on the same charcoal concentration well identified both in the old excavations and in the 1993 profile cleaning (Haesaerts et al., 1996; Haesaerts and Teyssandier, 2003). We have nevertheless to take into account, that even if Willendorf II cultural layer 3 is accepted as an early Aurignacian occupation, the ^{14}C dates around 38 000 BP were obtained on charcoal samples, whereas the Geißenklösterle chronology relies almost entirely on bone samples. As recently pointed out by Jöris et al. (2003) and Zilhão and d'Errico (1999, 2003a, 2003b), differences exist between dates obtained on bone and charcoal, the latter often yielding older ages than the former.

Outside Swabia and the Wachau, other early Aurignacian assemblages dated around 36--33 000 BP and clearly documented in a techno-economic perspective are lacking in central Europe. It is noteworthy that the Early Aurignacian chronology in central Europe relies almost entirely on Geißenklösterle, the new excavations at Hohle Fels, and more generally on Swabian evidence from well dated sites including Vogelherd and Hohlenstein-Stadel (Hahn, 1977, 1988; Conard, 2003; Conard and Bolus, 2003). This situation is not sufficient to discuss more globally the chronological context of the beginning of the Upper Paleolithic across all of central Europe.

The radiocarbon dates for the Early Aurignacian deposits at Geißenklösterle and other Swabian sites raise important questions about the timing and geographic distribution of the Aurignacian. The issues at hand relate to the fundamental question of whether the Aurignacian has mono- or polycentric origin, and whether or not it is even possible to identify sources of cultural origins. While we agree with Zilhão and d'Errico's (2003a, p. 344) claim that our chronological resolution is in the range of one to five millennia and that the rate of development and spread of cultural characteristics occurs on the order of decades or generations, we also argue that there is still every reason to work to develop and test models for the demographic and cultural processes of the early Upper Paleolithic.

Recent years have seen such progress in the study of the Aurignacian, that future work should continue to address these questions. Only in the last decade, it has become increasingly clear that the Aurignacian florescence around 40 000 calendar years ago based on TL and around 35 000 radiocarbon years ago saw multiple areas of innovations that produced regional signatures.

Conclusion

This paper raises a number of central questions about the nature of the early Aurignacian. Here we define the Early Aurignacian not only as a chronological stage but more particularly as a technical tradition that includes specific technological patterns, such as lithic core reduction, that is different from roughly contemporaneous traditions such as the Proto-Aurignacian (e.g. Bartolomei et al., 1994; Broglio, 1996, 2000; Kuhn and Stiner, 1998; Bon, 2002). The Early Aurignacian thus includes the classical French Aurignacian I stage characterized by typical organic artifacts such as split-based antler points. Results obtained in central Europe and the Balkans lead to the distinction of at least two distinct "technical" traditions during the early stages of what the scientific community called the Aurignacian (Teyssandier, 2003): the Early Aurignacian described in this paper and the Proto-Aurignacian dominated by large rectilinear bladelets, which are generally transformed into Dufour bladelets. Bon (2002) has already discussed the variability of the early stages of the Aurignacian in southwest France and the western Mediterranean and comes to similar conclusions. He argues for the existence of two "facies": the Archaic Aurignacian (e.g. Proto-Aurignacian) and the Early Aurignacian (e.g. Aurignacien I).

In France, considering the results obtained by Bordes (2002, 2003), the Proto-Aurignacian predates the Early Aurignacian in Le Piage rock-shelter. This could well be the same in the famous site of Isturitz where excavations were recently relaunched (Normand and Turq, in press). The Proto-Aurignacian seems to exist in central Europe, particularly in Krems-Hundssteig, Lower Austria (Broglio and Laplace, 1966; Laplace, 1970; Hahn, 1977), but we have at present little information on its chronological relationship with the Early Aurignacian (Teyssandier, 2003). This is due notably to the absence of well-stratified and recently studied assemblages. Thus, any attempt to develop a taxonomy for the early stages of the Aurignacian is hindered by a lack of reliable data.

The question of the relationships between the Proto- and the Early Aurignacian is far from being resolved. Though they may share certain technical aspects, these two traditions clearly differ in blade and bladelet core reduction (Bon, 2002; Bordes, 2002; Teyssandier, 2003), and in the number and the diversity of their organic tools, ornaments, figurative art, and musical instruments (e.g. Vanhaeren, 2002; Teyssandier, 2003; Liolios, in press; Conard, 2005). In this perspective, the Proto-Aurignacian does not radically deviate from Middle to Upper Paleolithic transitional industries often attributed to the last Neandertals, and its phylogenetic relation with the Early Aurignacian is difficult to define. The term "Aurignacian" in its broader sense thus includes distinct socio-cultural phenomena and is not a pan-European cultural event with a clear single point of origin. For now, both poly- and monogenetic models are plausible. The available data do not clearly demonstrate a unique point of origin for the Aurignacian, perhaps because the speed of the cultural and demographic processes involved is too fast to be isolated with the available data (Teyssandier, 2003; Zilhão and d'Errico, 2003a).

Acknowledgments

We are grateful to Ofer Bar-Yosef and João Zilhão for inviting us to the meeting held in Lisbon in June 2002. This meeting was a wonderful place to discuss the issues related to the Aurignacian. Nicolas Teyssandier thanks the French Ministry of Research and the UMR 7055 of the CNRS for their financial support. We are indebted to O. Bar-Yosef, F. Bon, J. G. Bordes, F. d'Errico, J. M. Geneste, J. K. Kozłowski, L. Meignen, M. Otte, J. Pelegrin, C. Perlès and J. Zilhão for constructive discussions on the early Upper Paleolithic of Europe.

REFERENCES

ADAMS, B.; RINGER, Á. (2004) - New C^{14} dates for the Hungarian Early Upper Palaeolithic. *Current Anthropology*. Chicago, IL. 45, p. 541-551.

BAR-YOSEF, O. (1998) - On the nature of transitions: the Middle to Upper Palaeolithic and the Neolithic Revolution. *Cambridge Archaeological Journal*. Cambridge. 8, p. 141-163.

BARTOLOMEI, G.; BROGLIO, A.; CASSOLI, P. F.; CASTRELLETTI, L.; CATTANI, L.; CREMASCHI, M.; GIACOBINI, G.; MALERBA, G.; MASPERO, A.; PERESANI, M.; SARTORELLI, A.; TAGLIACOZZO, A. (1994) - La grotte de Fumane. Un site aurignacien au pied des Alpes. *Preistoria Alpina*. Trento. 28, p. 131-179.

BOCQUET-APPEL, J.-P.; DEMARS, P. Y. (2000) - Neanderthal contraction and modern human colonization of Europe. *Antiquity*. Cambridge. 74, p. 544-552.

BOLUS, M. (2003) - The Cultural Context of the Aurignacian of the Swabian Jura. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 153-163.

BOLUS, M. (2004) - Der Übergang vom Mittel- zum Jungpaläolithikum in Europa. Eine Bestandsaufnahme unter besonderer Berücksichtigung Mitteleuropas. *Germania*. Frankfurt am Main. 82, p. 1-54.

BOLUS, M.; CONARD, N. J. (2001) - The late Middle Paleolithic and earliest Upper Paleolithic in Central Europe and their relevance for the Out of Africa hypothesis. *Quaternary International*. Oxford. 75, p. 29-40.

BON, F. (2002) - *L'Aurignacien entre mer et océan: réflexion sur l'unité des phases anciennes de l'Aurignacien dans le Sud de la France*. Paris: Société Préhistorique Française.

BORDES, J.-G. (2002) - *Les interstratifications Châtelperronien/Aurignacien du Roc-de-Combe et du Piage (Lot, France). Analyse taphonomique des industries lithiques; implications archéologiques*. Thèse de doctorat, Université de Bordeaux I.

BORDES, J.-G. (2003) - Lithic taphonomy of the Châtelperronian/Aurignacian interstratifications in Roc de Combe and Le Piage (Lot, France). In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 223-244.

BRANDTNER, F. (1956-1959) - Die geologisch-stratigraphische Position der Kulturschichten von Willendorf i. d. Wachau, N. Ö. In FELGENHAUER, F. - *Willendorf in der Wachau. Monographie der Paläolith-Fundstellen I-VII*. Wien: R. M. Rohrer (Mitteilungen der Prähistorischen Kommission der Österreichischen Akademie der Wissenschaften; 8-9), p. 173-198.

BROGLIO, A. (1996) - The appearance of modern humans in Europe: the archaeological evidence from the mediterranean regions. In PIPERNO, M.; BAR-YOSEF, O.; CAVALLI-SFORZA, L. L., eds - *The origin of modern man*. XIII International Congress of Prehistoric and Protohistoric Sciences, Forlí, Coll. X. Forlí: A.B.A.C.O., p. 237-249.

BROGLIO, A. (2000) - Considerations on the Aurignacian industries from Krems-Hundssteig in the Middle Danube basin and Fumane in the Adige basin. In MESTER, Z.; RINGER, Á., eds., - *A la recherche de l'homme préhistorique*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 95), p. 311-320.

BROGLIO, A; LAPLACE, G. (1966) - Études de typologie analytique des complexes leptolithiques de l'Europe centrale I. Les complexes aurignacoïdes de la Basse-Autriche. *Rivista di Scienze Preistoriche*. Firenze. 21, p. 61-121.

BURKERT, W. (1998) - *Lithische Rohmaterialversorgung im Jungpaläolithikum des südöstlichen Baden-Württemberg*. Doctoral Dissertation University of Tübingen.

BURKERT, W.; FLOSS, H. (2005) - Lithic exploitation areas in the Upper Paleolithic of west and southwest Germany: a comparative study. In WEISGERBER, G.; KÖRLIN, G., eds. - *Stone Age – Mining Age. Proceedings of the VIIIth International Flint Symposium Bochum 1999*. Der Ausschnitt. Beiheft 19, p. 35-39.

CONARD, N. J. (2002) - The timing of cultural innovations and the dispersal of modern humans in Europe. In BRAUER, A.; NEGENDANK, J. F. W.; BOHM, M., eds. - *Proceedings of the DEUQUA-Meeting August 26-28, 2002 Potsdam, Germany. Terra Nova*. Oxford. 2002/6, p. 82-94.

CONARD, N. J. (2003) - Palaeolithic ivory sculptures from southwestern Germany and the origins of figurative art. *Nature*. London. 426, p. 830-832.

CONARD, N. J. (2005). - Aurignacian art in Swabia and the beginnings of figurative representations in Europe. In BROGLIO, A; DALMERI, G., eds. - *Pitture Paleolitiche nelle Prealpi Venete. Grotta di Fumane e Riparo Dalmeri*. Memorie del Museo di Storia Naturale di Verona - 2.ª Serie, Sezione Scienze dell'Uomo 9. Preistoria Alpina, Nr. Speciale. Verona: Museo Civico di Storia Naturale di Verona - Museo Tridentino di Scienze Naturali, p. 82-88.

CONARD, N. J.; BOLUS, M. (2003) - Radiocarbon dating the appearance of modern humans and timing of cultural innovations in Europe: new results and new challenges. *Journal of Human Evolution*. London. 44, p. 331-371.

CONARD, N. J.; DIPPON, G.; GOLDBERG, P. (2003) - Chronostratigraphy and archeological context of the Aurignacian deposits at Geißenklösterle. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 165-176.

CONARD, N. J.; NIVEN, L. B.; MUELLER, K.; STUART, A. J. (2003) - The Chronostratigraphy of the Upper Paleolithic deposits at Vogelherd. *Mitteilungen der Gesellschaft für Urgeschichte*. Blaubeuren. 12, p. 73-86.

DAMBLON, F.; HAESAERTS, P.; VAN DER PLICHT, J. (1996) - New datings and considerations on the chronology of Upper Palaeolithic sites in the Great Eurasiatic Plain. *Préhistoire Européenne*. Liège. 9, p. 177-231.

DAVIES, W. (2001) - A very model of a modern human industry: new perspectives on the origins and spread of the Aurignacian in Europe. *Proceedings of the Prehistoric Society*. London. 67, p. 195-217.

DIPPON, G. (2003) - *Die Taphonomie der Aurignacienhorizonte der Geißenklösterle-Höhle bei Blaubeuren*. MA Thesis, University of Tübingen.

DJINDJIAN, F. (1993) - Les origines du peuplement aurignacien en Europe. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche Orient. Actes du XIIᵉ Congrès International des Sciences Préhistoriques et Protohistoriques. Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 136-154.

DROBNIEWICZ, B.; GINTER, B.; KAZIOR, B.; KOZŁOWSKI, J. K. (2000) - Early Upper Palaeolithic assemblages from layer 4, trench TD-I. In GINTER, B.; KOZŁOWSKI, J. K.; GUADELLI, J.-L.; LAVILLE, H. - *Temnata Cave. Excavations in Karlukovo Karst Area, Bulgaria*, vol. 2, part 1. Kraków: Uniwersytet Jagielloński, p. 333-418.

FELGENHAUER, F. (1956-1959) - *Willendorf in der Wachau. Monographie der Paläolith-Fundstellen I-VII*. 3 vols., with contributions by F. Brandtner; A. Papp; E. Thenius; E. Zirkl.. Wien: R. M. Rohrer (Mitteilungen der Prähistorischen Kommission der Österreichischen Akademie der Wissenschaften; 8-9).

GINTER, B.; KOZŁOWSKI, J. K.; LAVILLE, H.; SIRAKOV, N.; HEDGES, R. E. M. (1996) - Transition in the Balkans: news from the Temnata Cave, Bulgaria. In CARBONELL, E.; VAQUERO, M., eds. - *The last Neandertals, the first anatomically modern humans: a tale about the human diversity. Cultural change and human evolution: the crisis at 40 ka BP*. Tarragona: Universitat Rovira i Virgili, p. 169-200.

HAESAERTS, P.; DAMBLON, F.; BACHNER, M.; TRNKA, G. (1996) - Revised stratigraphy and chronology of the Willendorf II sequence, Lower Austria. *Archaeologia Austriaca*. Wien. 80, p. 25-42.

HAESAERTS, P.; TEYSSANDIER, N. (2003) - The early Upper Paleolithic occupations of Willendorf II (Lower Austria): a contribution to the chronostratigraphic and cultural context of the beginning of the Upper Paleolithic in Central Europe. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 133-151.

HAHN, J. (1972) - Aurignacian signs, pendants and art objects in Central and Eastern Europe. *World Archaeology*. London. 3, p. 252-266.

HAHN, J. (1977) - *Aurignacien, das ältere Jungpaläolithikum in Mittel- und Osteuropa*. Köln-Wien: Böhlau (Fundamenta; A 9).

HAHN, J. (1981) - Abfolge und Umwelt der jüngeren Altsteinzeit in Südwestdeutschland. *Fundberichte aus Baden-Württemberg*. Stuttgart. 6, p. 1-27.

HAHN, J. (1986) - *Kraft und Aggression. Die Botschaft der Eiszeitkunst im Aurignacien Süddeutschlands?*. Tübingen: Verlag Archaeologica Venatoria (Archaeologica Venatoria; 7).

HAHN, J. (1988) - *Die Geißenklösterle-Höhle im Achtal bei Blaubeuren I. Fundhorizontbildung und Besiedlung im Mittelpaläolithikum und im Aurignacien*. Stuttgart: Theiss.

HAHN, J. (1989) - Zur Funktion einer Aurignacien-Feuerstelle aus dem Geißenklösterle bei Blaubeuren. *Fundberichte aus Baden-Württemberg*. Stuttgart. 14, p. 1-22.

HAHN, J. (1992) - Die Ausgrabungen 1991 im Geißenklösterle bei Blaubeuren, Alb-Donau-Kreis. *Archäologische Ausgrabungen in Baden-Württemberg 1991*. Stuttgart. p. 19-21.

HAHN, J. (1993) - L'origine du Paléolithique supérieur en Europe Centrale: Les datations C^{14}. In CABRERA VALDÉS, V., ed. - *El origen del hombre moderno en el Suroeste de Europa*. Madrid: Universidad Nacional de Educación a Distancia, p. 61-80.

HAHN, J. (1995a) - Neue Beschleuniger ^{14}C-Daten zum Jungpaläolithikum in Südwestdeutschland. *Eiszeitalter und Gegenwart*. Hannover. 45, p. 86-92.

HAHN, J. (1995b) - Les ivoires en Allemagne: débitage, façonnage et utilisation au Paléolithique supérieur. In HAHN. J.; MENU, M.; TABORIN, Y.; WALTER, P.; WIDEMANMN, F., eds. - *Le travail et l'usage de l'ivoire au Paléolithique supérieur*. Ravello: Istituto Poligrafico e Zecca dello Stato, Libreria dello Stato, p. 115-135.

JÖRIS, O.; ÁLVAREZ FERNÁNDEZ, E.; WENINGER, B. (2003) - Radiocarbon evidence of the Middle to Upper Palaeolithic transition in Southwestern Europe. *Trabajos de Prehistoria*. Madrid. 60:2, p. 15-38.

KOZŁOWSKI, J. K., ed. (1982) - *Excavation in the Bacho Kiro Cave (Bulgaria): final report*. Warszawa: Państwowe Wydawnictwo Naukowe.

KOZŁOWSKI, J. K. (1993) - L'Aurignacien en Europe et au Proche-Orient. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche-Orient. Actes du XIIème Congrès International des Sciences Préhistoriques et Protohistoriques, Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 283-291.

KOZŁOWSKI, J. K. (1999) - The evolution of the Balkan Aurignacian. In DAVIES, W.; CHARLES, R., eds. - *Dorothy Garrod and the progress of the Palaeolithic: studies in the Prehistoric Archaeology of the Near East and Europe*. Oxford: Oxbow, p. 97-117.

KOZŁOWSKI, J. K.; OTTE, M. (2000) - The formation of the Aurignacian in Europe. *Journal of Anthropological Research*. Albuquerque, NM. 56, p. 513-534.

KUHN, S. L.; STINER, M. C. (1998) - The Earliest Aurignacian of Riparo Mochi (Liguria, Italy). *Current Anthropology*. Chicago, IL. 39 (suppl. 1), p. S175-S189.

LAPLACE, G. (1970) - *L'industrie de Krems-Hundssteig et le problème de l'origine des complexes aurignaciens*. In GRIPP, K.; SCHÖTRUMPF, R.; SCHWABEDISSEN, H., eds - *Frühe Menscheit und Umwelt*. Teil I: Archäologische Beiträge. Köln--Wien: Böhlau (Fundamenta; A2), p. 242-288.

LIOLIOS, D. (1999) - *Variabilité et caractéristiques du travail des matières osseuses au début de l'aurignacien: approche technologique et économique*. Thèse de doctorat de l'Université Paris X-Nanterre.

LIOLIOS, D. (in press) - Les productions osseuses de l'Aurignacien ancien pyrénéen. *Annales de la Fondation Fyssen*. Paris.

MELLARS, P. A. (1989) - Major issues in the emergence of modern humans. *Current Anthropology*. Chicago, IL. 30, p. 349-385.

MELLARS, P. A. (1996a) - Models for the dispersal of anatomically modern populations across Europe: theoretical and archaeological perspectives. In PIPPERNO, M.; BAR-YOSEF, O.; CAVALLI-SFORZA, L. L., eds. - *The origin of modern man. Colloquium X, XIII International Congress of U.I.S.P.P., Forlí*. Forlí: A.B.A.C.O., p. 225-235.

MELLARS, P. A. (1996b) - *The Neanderthal legacy. An archaeological perspective from Western Europe*. Princeton, NJ: Princeton University Press.

MELLARS, P. A. (2004) - Neanderthals and the modern human colonization of Europe. *Nature*. London. 432, p. 461-465.

MÜNZEL, S. (1999) - *DFG-Abschlußbericht zur Großsäugerfauna aus dem Geißenklösterle*. Tübingen: unpublished manuscript.

NIGST, P. R. (2004) - *The first modern humans in the Middle Danube Area: new evidence from Eastern Austria*. Poster presented at the round table 'Neanderthals and Modern Humans Meet?' in Blaubeuren, July 2004.

NORMAND, Ch.; TURQ, A. (in press) - L'Aurignacien de la grotte d'Isturitz (France): la production lamellaire dans la séquence de la salle Saint-Martin. In LE BRUN-RICALENS, F., ed. - *Productions lamellaires attribuées à l'Aurignacien: chaînes opératoires et perspectives techno-culturelles*. Liège: Symposium 6-7, XVe Congrès de l'UISPP, 2-8 Septembre 2001. Université de Liège.

OLIVA, M. (1989) - The early Aurignacian industry from Vedrovice II (Southern Moravia) and the question of the Aurignacian origins. *Anthropologie*. Paris. 27, p. 251-264.

OTTE, M. (1990) - From the Middle to the Upper Paleolithic: the nature of the transition. In MELLARS, P. A., ed. - *The emergence of modern humans: an archaeological perspective*. Edinburgh: Edinburgh University Press, p. 438-456.

OTTE, M. (1996) - Le bouleversement de l'humanité en Eurasie vers 40.000 ans. In CARBONELL, E.; VAQUERO, M., eds. - *The last Neandertals, the first anatomically modern humans: a tale about the human diversity. Cultural change and human evolution: the crisis at 40 ka BP*. Tarragona: Universitat Rovira i Virgili, p. 95-106.

RICHTER, D.; WAIBLINGER, J.; RINK, W. J.; WAGNER, G. A. (2000) - Thermoluminescence, Electron Spin Resonance and ^{14}C-dating of the Late Middle and Early Upper Palaeolithic Site of Geißenklösterle Cave in Southern Germany. *Journal of Archaeological Science*. London. 27, p. 71-89.

SVOBODA, J. (2003) - The Bohunician and the Aurignacian. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the A*
of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001). Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 123-131.

SVOBODA, J.; SIMÁN, K. (1989) - The Middle-Upper Paleolithic transition in Southeastern Central Europe (Czechoslovakia and Hungary). *Journal of World Prehistory*. New York, NY. 3, p. 283-322.

TEYSSANDIER, N. (2003) - *Les débuts de l'Aurignacien en Europe. Discussion à partir des sites de Geissenklösterle, Willendorf II, Krems-Hundssteig et Bacho Kiro*. Thèse de doctorat, Université de Paris X-Nanterre.

TEYSSANDIER, N.; LIOLIOS, D. (2003) - Defining the earliest Aurignacian in the Swabian Alp: the relevance of the technological study of the Geissenkösterle (Baden-Würtenberg, Germany) lithic and organic productions. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 179-196.

UTHMEIER, T. (1996) - Ein bemerkenswert frühes Inventar des Aurignacien von der Freilandfundstelle „Keilberg-Kirche" bei Regensburg. *Archäologisches Korrespondenzblatt*. Mainz am Rhein. 26, p. 233-248.

VALOCH, K.; OLIVA, M.; HAVLÍČEK, P.; KARÁSEK, J.; PELÍŠEK, J.; SMOLÍKOVÁ, L. (1985). - Das Frühaurignacien von Vedrovice II und Kupa ovice I in Südmähren. *Anthropozoikum*. Praha. 16, p. 107-203.

VANHAEREN, M. (2002) - *Les fonctions de la parure au Paléolithique supérieur; de l'individu à l'unité culturelle*. Thèse de doctorat, Université de Bordeaux I.

VÉRTÈS, L. (1955) - Neue Ausgrabungen und paläolithische Funde in der Höhle von Istállóskö. *Acta Archaeologica Academiae Scientiarium Hungaricae*. Budapest. 5, p. 111-131.

WHITE, R. (1993) - Technological and social dimension of "Aurignacian-age" body ornaments across Europe. In KNECHT, H.; PIKE-TAY, A.; WHITE, R., eds. - *Before Lascaux: the complex record of the Early Upper Paleolithic*. Boca Raton, FA: CRC Press, p. 277-299.

ZILHÃO, J.; D'ERRICO, F. (1999) - The chronology and taphonomy of the earliest Aurignacian and its implications for the understanding of Neandertal extinction. *Journal of World Prehistory*. New York, NY. 13:1, p. 1-68.

ZILHÃO, J.; D'ERRICO, F. (2003a) - The chronology of the Aurignacian and transitional technocomplexes. Where do we stand? In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 313-349.

ZILHÃO, J.; D'ERRICO, F. (2003b) - An Aurignacian "Garden of Eden" in Southern Germany? An alternative interpretation of the Geißenklösterle and a critique of the *Kulturpumpe* model. *Paléo*. Les Eyzies-de-Tayac. 15, p. 69-86.

The Aurignacian and after: chronology, geography and cultural taxonomy in the Middle Danube region

JIŘÍ A. SVOBODA

ABSTRACT The specific technological and typological features of the Aurignacian of the Middle Danube region are reviewed in the context of available chronostratigraphic data and anthropological associations. Sites of the Early Aurignacian are rare and following the Danube valley, but the number of sites increases rapidly over the landscape in the period ca.34-29 kyr BP, when Evolved (typical) Aurignacian occurrences are of unambiguous technological and typological definition, and are most likely manufactured by modern humans. Assemblages often associated with the Aurignacian label, such as the "Late Aurignacian" of ca.26-21 kyr BP, the "Morava-river" or "Míškovice" type Aurignacian, and the Kašovian of ca.18-15 kyr BP, however, either share many cultural traits with the Gravettian, possibly relate to mechanical admixture, or represent altogether different traditions with "aurignacoid" elements (the Streletskian).

From a European perspective, the Aurignacian clearly appears as the first of the transcontinental entities of the Upper Paleolithic, and (despite a recent discussion) as a result of adaptation of anatomically modern humans to the northern latitudes. Such a simple statement, naturally, does not imply a completely "monolithic" unity all over the continent. Focusing on the individual regions, the techno/typological comparative studies of artifacts reveal a pattern of structuration and local differences.

One of the aims of this paper is to discuss how far such differences are real, or result from local research traditions and misunderstandings in artifact taxonomy. In the Middle Danube region, some of the uncertainties are rooted in the complex research history. Until the 1950s of the 20th century, when the Gravettian was recognized in this part of the continent, all Upper Paleolithic industries of Pre-Magdalenian age were usually labeled "Preaurignacian" and "Aurignacian". Since that time, important work has been realized in defining more clearly what the Aurignacian *sensu stricto* is (Klíma, 1959; Valoch, 1976, 1996; Bánesz, 1976; Hahn, 1977; Oliva, 1987; Neugebauer-Maresch, 1999; Svoboda et al., 1996), but a variety of "non-Aurignacian" industries are still being included into this group.

Although the Middle Danube region provided one of the richest Aurignacian concentrations in Europe, the majority of assemblages are just surface collections, or material from early excavations or from other unsecure archaeological contexts. Actually, modern research in Austria (Stratzing, Krems) and Moravia (Stránská skála, Milovice) correlates the Aurignacian development with the loess-and-paleosols stratigraphy of central Europe and with the ^{14}C chronology (Haesaerts et al., 1996; Neugebauer-Maresch, 1999; Svoboda and Bar-Yosef, 2003; Figs. 1-2). The "coarse-grained" stratigraphy, as reflected in the levels of pedogenesis visible at most loess sections in the region, may be subdivided into a finer sequence of climatic events in the key stratigraphic section of Willendorf II, and these, in turn, correlated with the global climatic development during OIS 3-OIS2 (Haesaerts et al., 1996, 2004). Even if the stratigraphic sequence and the correlations between individual sites show a sequence of the basic archaeological horizons of the Initial, Early, and Middle Upper Paleolithic, the record also suggests partial overlaps between archaeological entities, as between the Late Bohunician and Early Aurignacian, or the Late Aurignacian and the Gravettian.

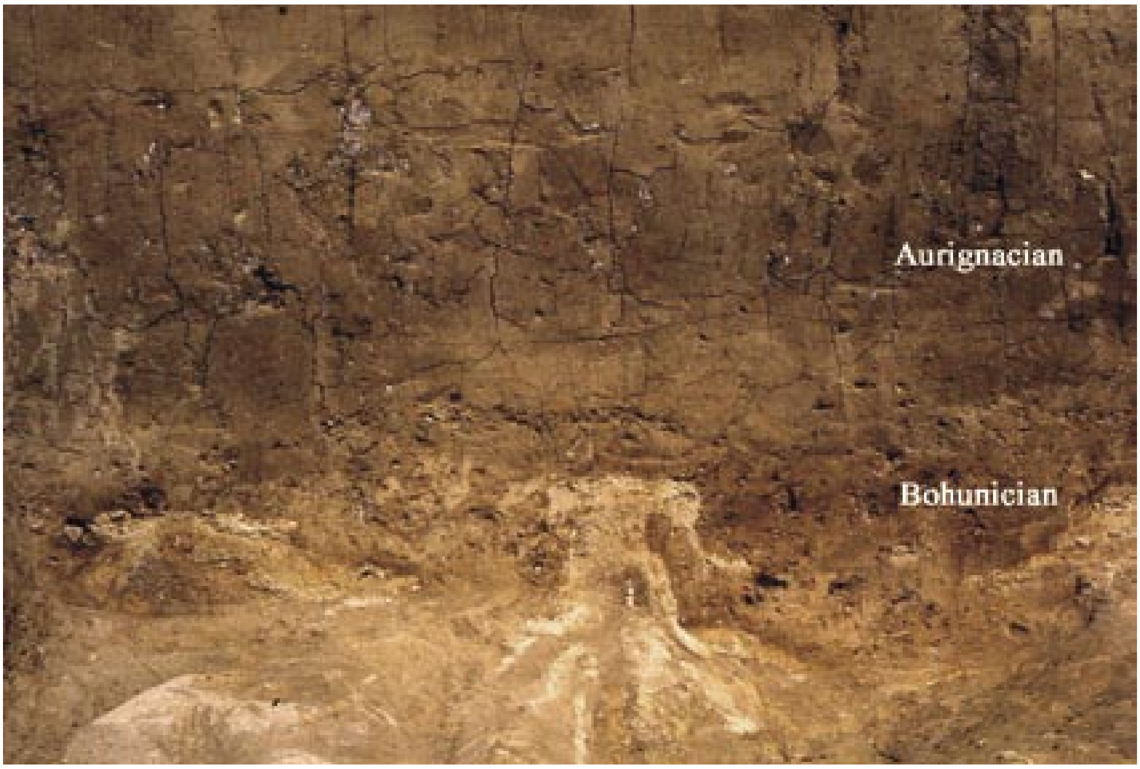

FIG. 1 – Stránská skála, site IIIa. Superposition of the two paleosols, showing a sterile loess interlayer in between. The lower paleosol includes the Bohunician (layer 4), the upper one the Aurignacian (layer 3). The effect of cryoturbation is seen visible in the lower paleosol. The Bohunician is dated to 41 300/+3100/-2200 BP (GrN-12606) (on displaced charcoal) and the Aurignacian to 30 980±360 BP GrN-12605 (regular hearth H3).

FIG. 2 – Stránská skála, site IIIb. Section showing the upper loess at the top, and the superposition of the two paleosols (with Aurignacian in the upper one, Bohunician in the lower one, and a complex of stripped soliflucted layers at the base; charcoal from the Aurignacian layer was dated to 32 600/+1700/-1400 BP, GrN-16918).

The majority of radiocarbon dates from secure Aurignacian contexts cluster between 34-29 kyr BP, the "Aurignacian Golden Age". Discussions are held about the preceding Early Aurignacian on the one hand (Zilhão and d'Errico, 1999; Teyssandier, 2005), and about the Late Aurignacian or "Epi-Aurignacian" and other possible manifestations of an Aurignacian tradition on the other hand (Terberger and Street, 2002; Verpoorte, 2004; Svoboda and Novák, 2004).

Finally, and under the influence of the new Vogelherd dates (Conard et al., 2004), recent discussion questioned the previously accepted modern human authorship of the Aurignacian technology as well as Aurignacian art. After the complex revision and dating of Mladeč and after examining the Aurignacian anthropomorphic art of central Europe (which evokes modern rather than Neandertal anatomy), it seems that the paradigm of a relationship between modern humans and the Aurignacian will remain valid.

Anthropological context

The earliest modern human fossil find in Europe, Peştera cu Oase in Romania (34-36 kyr BP), originates from a cave bear site and lacks a typologically determinable archaeological context (Trinkaus et al., 2003a, 2003b). Two more ^{14}C dates were obtained from other human remains in Romania found during earlier excavations, also without reliable archaeological associations (Peştera Muierilor, 30 kyr BP; Cioclovina, 29 kyr BP) (Beldiman, 2004). Therefore, the key site in the Middle Danube region is the cave system of Mladeč I-II, Moravia, excavated since 1881 and providing more than 100 human fossils belonging to several individuals, together with bone-and-antler projectiles with oval section (the Mladeč-type points) and items of personal decoration (Szombathy, 1925). On the basis of the points, the Aurignacian classification was advocated already by Bayer (1922) and confirmed by later research (Hahn, 1977). Even if actual revision of the cave suggests that the deposition and redeposition of human and faunal remains together with the artifacts inside this deep underground system may have been a complex and long-term process (Svoboda, 2001), the ^{14}C dates from site I, be it from the associated calcite deposits (34-35 kyr BP; Svoboda et al., 2002) or directly from the human fossils Mladeč 1-2, 8-9a, and 25c, confirm the Aurignacian classification (Wild et al., 2005). The first two finds of Szombathy, 1-2, are dated to over 31 kyr BP, while the others, 8-9a, do not exceed the time-span of sever millennia around 30 kyr BP; only Mladeč 25c dates as late as 26.3 kyr BP, which may either be due to contamination, or reflect a longer time-interval of body deposition at this place. A monographic publication of the Mladeč sites from the viewpoints of physical anthropology, paleontology, ^{14}C dating, and archeological context is in preparation.

In the case of all the other cave sites of central Europe where Aurignacian age was suspected for human fossils, the recent ^{14}C dating proves a later age (Koněprusy - Zlatý Kůň, 12.9 kyr BP; Saint Prokop's cave, 5 kyr BP; Vogelherd, 5-4 kyr BP; Velika Pečina, 5 kyr BP).

The Aurignacian landscape

Early Aurignacian sites are too scarce to provide a clear picture of settlement patterns. We may only note the association of the Willendorf II site to the Danube River as the major axis of communication in this part of Europe.

During the Evolved Aurignacian, the settlement formed a dense network of sites extended from the Austrian Danube valley through the Moravian corridor to south Poland (Fig. 3). Surprisingly, Aurignacian is rarely encountered in directly adjacent Bohemia, West Slovakia and Hungary — the next more important site cluster is recorded only as far as eastern Slovakia. Mapping of the Aurignacian sites on the Middle Danube shows that the “Aurignacian landscape” covered mainly the marginal areas between highlands and lowlands, 250-400 m above sea level, especially along the margins of the Bohemian Massif, beginning with the Austrian Danube valley in the south and going as far as southern Poland in the north, penetrating along valleys deeper into the Massif, or occupying marginal highlands of the Carpathians. Thus, the Aurignacian landscape is preferable for the exploitation of two types of environment, the highlands and lowlands, with their specific vegetation cover, and offering control over the movements of game in the lowland. With the exception of the Danube valley in Austria (Willendorf), most of the sites are situated at a distance from the large rivers. On the other hand, some of these microregions offered local sources of good-quality chert (Krumlovský Les, Stránská skála) or flint (southern Poland). Faunal materials are rarely preserved at these sites, and if so (e.g. at Stratzing), they suggest a variable composition of the last glacial fauna rather than tendencies for a specialization.

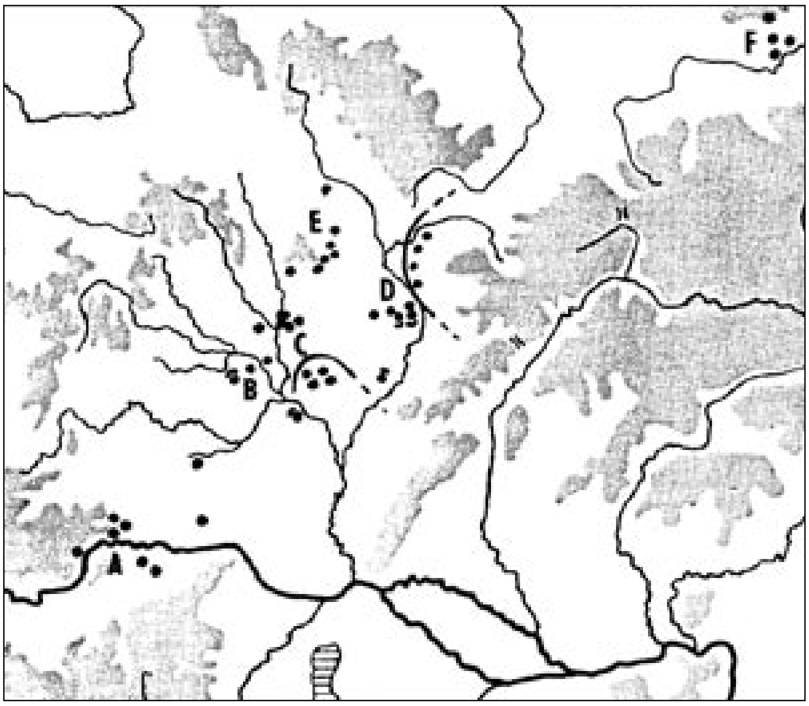

FIG. 3 – Aurignacian sites on the Middle Danube (Lower Austria, Moravia, south Poland).
The letters refer to important site clusters: A. Wachau Gate (Willendorf, etc.); B. Krumlov Forest (Vedrovice); C. Brno Basin (Stránská skála); D. Kroměříž area; E. Prostějov area; F. Kraków area. The solid line separates the “Morava-river type” industries, probably penetrating from the east.

The cave of Potočka zijalka in Slovenia evidently played a special role in the Aurignacian landscape: its location in mountainous landscape at 1700 m above sea level, and the quantity of polished bone points hitherto recovered (more than 130 items), predominantly in the deep inner part of the cavity, out of daylight, make it, possibly, a place of symbolic significance.

In the following, we shall discuss the question of the “Morava-river Aurignacian” on the basis of typology (separated by the solid line of Fig. 3). Taken from the geographic viewpoint, the tendency of this strange cultural unit to follow a river is in contrast with the Aurignacian habits. However, along the rivers of eastern Europe (Prut and Don), typologically similar industries show similar tendencies.

After the Aurignacian, the “Kašovian” (previously labeled as “Epigravettian” or “Epiaurignacian”) constitutes a more regular network over the Carpathian Basin (Fig. 4). In Moravia, the same type of landscape was still settled but we documented a shift from exposed elevations to sheltered valleys or slopes. In the faunal material, we observed more pronounced tendencies to specialization on horse (e.g. the horse-hunting site at Stránská skála IV) and reindeer (West, 1997). This change may be related with climatic deterioration during the Upper Pleniglacial.

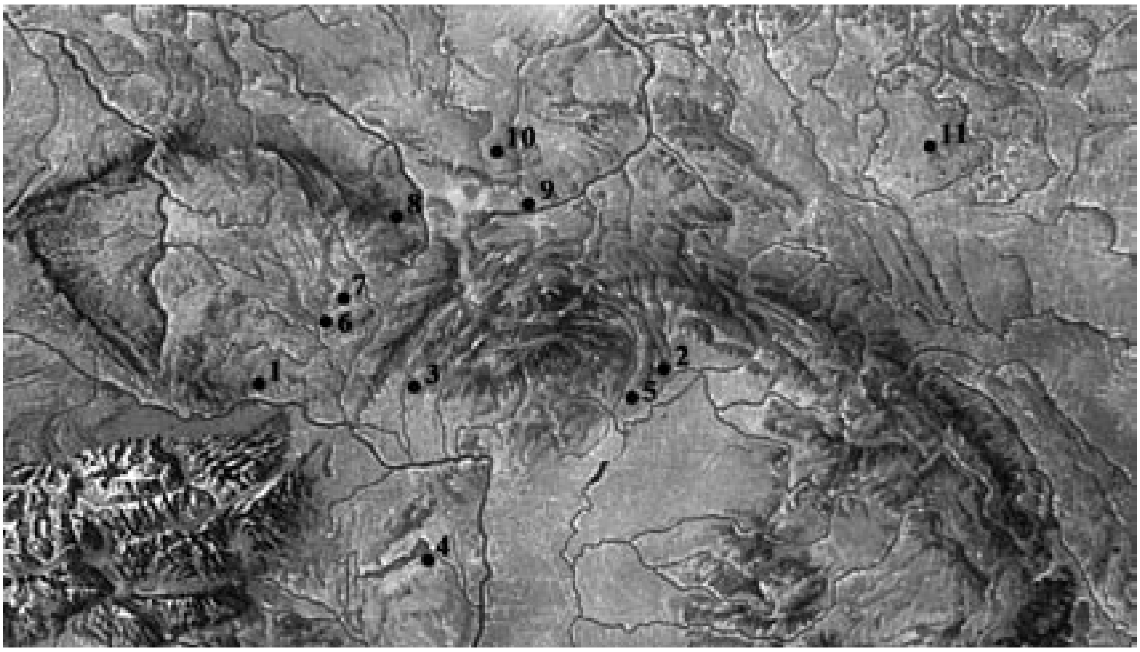

FIG. 4 – The Kašovian of eastern Central Europe, with sites mentioned in the text. 1. Grubgraben (A); 2. Kašov (SK); 3. Moravany-B
10. Deszczowa cave (PL); 11. Lipa (UA).

Aurignacian typology

In our region, the Aurignacian has been defined especially on the basis of lithic style, dominated by thick and polyhedric endscrapers and burins, the other major typological groups being retouched blades, sidescrapers, notches and denticulates (Klíma, 1959; Bánesz, 1976; Hahn, 1977; Svoboda et al., 1996). Following the comparative typological tables and indices offered in these publications, the quantitative proportion between the two most important tool-types, endscrapers and burins, displays a remarkable inter-site variability. This observation has been explained either in terms of chronology (Valoch, 1976) or cultural facies (Oliva, 1987). The more sites and dates we have, however, the more difficult it is to demonstrate statistically any regular trends that would be meaningful from chronological or spatial viewpoints.

Even if microblades logically resulted from the technological process of both the polyhedric endscraper and burin production (so that some of these specimens may, in fact, be understood as cores), the percentage of microliths is surprisingly low in most of the assemblages. This bias has sometimes been explained by the imprecise collecting and excavation methods used in the past, and by the lack of sieving and floatation, but not even the recently excavated sites provide higher percentages of these elements; on the contrary, the highest frequencies of Dufour bladelets and other microliths were found at the early excavated site of Krems-Hundsteig (Neugebauer-Maresch, 1999, p. 62). Even if microblades as one of the important indicators of Aurignacian patterning over Europe deserve a special attention, the Middle Danube region will hardly contribute in an essential manner to this problem. Except

Krems-Hundsteig, it seems that microblades were not frequent before the Late Aurignacian (as at Alberndorf), and even there, this feature is sometimes explained as an influence from the contemporaneous, and strictly microlithic Gravettian (Pavlovian).

As a result of unfavorable conditions for bone preservation at most of the open air sites in Danubian Europe, the typical bone-and-antler industry of the Aurignacian is preserved mainly from caves. A few cave sites, especially Potočka zijalka in Slovenia (Brodar and Brodar, 1983), suggest an association of the bone projectiles with the Aurignacian lithic implements. In other cave sites, the bone-and-antler projectiles may appear in other Initial and Early Upper Paleolithic contexts as well, and one may dispute to what extent this is a matter of mechanical mixture or of a broader, cross-cultural importance of these projectiles (Svoboda, 2001).

Because bone-and-antler projectiles of two types, with oval-shaped section (Mladeč-type) and with split base, are recorded in association with leaf-points and other Szeletian elements in several cave sites of the region, we suppose their cross-cultural distribution during the Initial and Early Upper Paleolithic. This suggestion is also of importance in the case of the presumed "earliest Aurignacian" from the lower stratigraphic complex of Istállos-Kö cave (dates of 44-40 kyr BP) where the cultural determination was exclusively based on the bone implements.

In addition, "aurignacoid", i.e., massive types of endscrapers and burins appear in our region in the IUP (Bohunician, Szeletian), in parallel non-Aurignacian industries (Morava river-type industries), and as late as after the Last Glacial Maximum (18-15 kyr BP). In this case, however, it should be underlined that the endscrapers, even if short, massive and broad in form, rarely display the typical carinated shapes and the *canelure* made by long and parallel microremovals.

There is also a reverse side of the question, i.e. the typologically foreign elements recorded in Aurignacian assemblages, discussed and interpreted by K. Valoch (1976). Since that time, it seems that the question may find simple and realistic answers. Some of these elements may be explained as misunderstandings (the "large" and "coarse" tools in the lithic exploitation areas being reinterpreted as functional, i.e., not chronological markers; Svoboda, 1983), wrong classification (the leaf-points in the "Morava-river type" industries, which should be excluded from the Aurignacian), mechanical mixture (the Levallois elements at Hradsko and Podstránská), or by a cross-cultural significance of certain tool types (the backed microblades in Late Aurignacian sites).

In the light of this, and after redefining the "earliest" sites with bone-and-antler points as Initial Upper Paleolithic in general, and the "latest" sites with Aurignacoid endscrapers and burins as Kašovian, we arrive to a more realistic chronology of the Aurignacian *sensu stricto*, placing it, maximally, and in terms of uncalibrated ^{14}C chronology, to a very broad interval between 38-21 kyr BP. It should be stressed, however, that the majority of the sites, and the most typical ones, belong to the middle stage, dated into the five millennia between 34-29 kyr BP.

The Early Aurignacian: before 35 kyr BP

As a part of the axis of Early Aurignacian sites spreading along the lower Danube (Temnata Cave, Bulgaria), upper Danube (Geißenklösterle, South Germany), and continuing as far as northern Iberia, the Middle Danubian site of Willendorf II, layer 3 (Fig. 5), provided uncalibrated ^{14}C dates around 38-34 kyr BP (Haesaerts et al., 1996; Haesaerts and Teyssandier, 2003). Sites attributed to this early period are rare, and located at considerable distances from

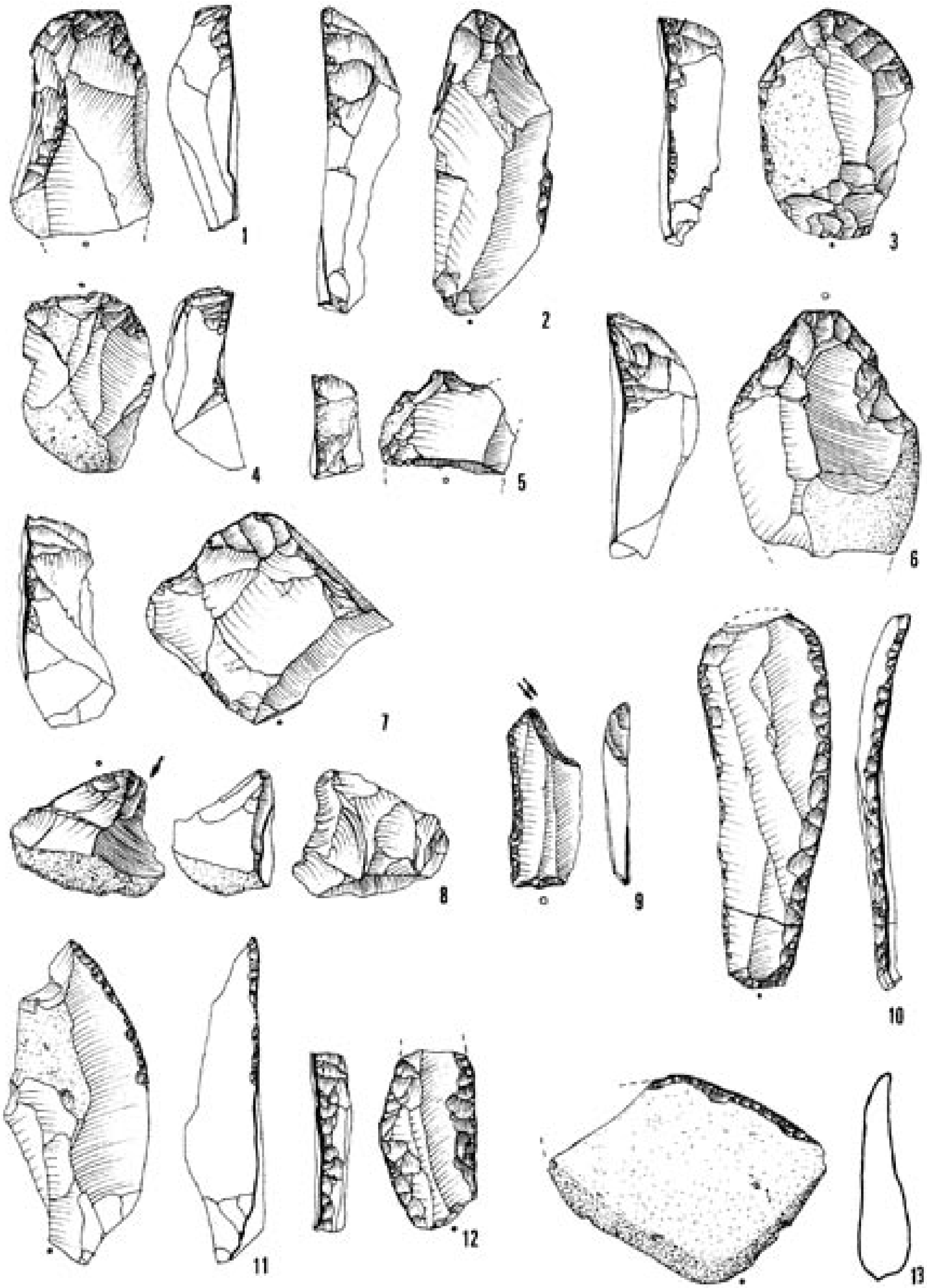

FIG. 5 – The Lower Aurignacian. Willendorf II, layer 3, dated to 38.8, 37.9 and 34.1 kyr BP. After J. Hahn.

each other. Although the sample of Willendorf II, layer 3, is small, the industry is composed of typically Aurignacian, thick and polyhedric endscrapers and burins, whereas microliths are rare and art is absent. A date of 35.5 kyr BP was also obtained from the nearby site of Krems-Hundsteig, also on the Danube, but intensive new research is in course in this area.

It seems that the rarity of early sites is not only an effect of the actual state of research, but reflects an archaeological reality — the demographic growth of a spreading population. It should be added that at this stage of development, the Aurignacian was partly contemporary with the "transitional" or Initial Upper Paleolithic entities of central Europe such as the Szeletian and the Bohunician (Svoboda and Bar-Yosef, 2003).

Evolved (typical) Aurignacian: 34-29 kyr BP

During this time-period we observe a rapid increase in the number of Aurignacian sites, forming a regular network in Lower Austria, Moravia and south Poland, and a parallel center in east Slovakia. This is confirmed by a large series of uncalibrated ^{14}C datings between 34-29 kyr BP (Milovice, Grossweikersdorf, Senftenberg, Willendorf II – layer 4, Barca), some of which are multilayer sequences (Stránská skála – Fig. 6 – Stratzing). We need more published data about the excavations at the important Austrian sites of Senftenberg and Grossweikersdorf (Brandtner, personal communication).

Typically Aurignacian endscrapers and burins continue to form the index fossils of these assemblages. Their proportions are variable even at contemporary sites (cf. endscraper domination at all units from Stránská skála versus burin-domination at most layers at Stratzing). Therefore, these proportions can hardly be used as chronological markers, as was suggested previously. Also, microblades and other microliths are still rare in this stage of development, if we compare our industries to western Europe. Microliths (microblades, Font-Yves points or Krems points) were recorded previously at Krems-Hundsteig, and the industry has therefore been nominated "the Kremsian". As mentioned above, the typology of this site is an exception. Recent excavations in these parts of the city of Krems by Ch. Neugebauer-Maresch and T. Einwägerer should demonstrate whether this composition is not, in fact, due to mixing of the Aurignacian and Gravettian layers during earlier fieldworks.

The largest assemblage of bone points with oval section (the Mladeč-type) from the cave of Potočka zijalka has recently been dated around 30 kyr BP (Pacher, 2001; Horusitzky, 2004). This coincides well with similar points from Mladeč, where the associated human remains were also recently dated to the same age (Wild et al., 2005).

An important event recorded during this time span is the flourishing of mobiliary art production in the adjacent Upper Danube region (animal and human figurines at Geißenklösterle, Hohlenstein, Vogelherd...), with a few objects also from the Middle Danube: a small human figurine carved of stone from Stratzing (Neugebauer-Maresch, 1996), and a series of perforated animal teeth at the funerary cave site of Mladeč (Szombathy, 1925).

Late Aurignacian (Epiaurignacian): 26-21 kyr BP

The situation becomes less clear after ca.26 kyr BP, a period dominated by the Gravettian. Several Aurignacian or Aurignacoid sites in Lower Austria and Moravia are dated to this period: Alberndorf (26-21 kyr BP; Bachner et al., 1996), Langmannersdorf (around 21 kyr BP; Angeli, 1953), Horn-Raabserstrasse (23.2 kyr BP; Neugebauer-Maresch, 1993) and, according

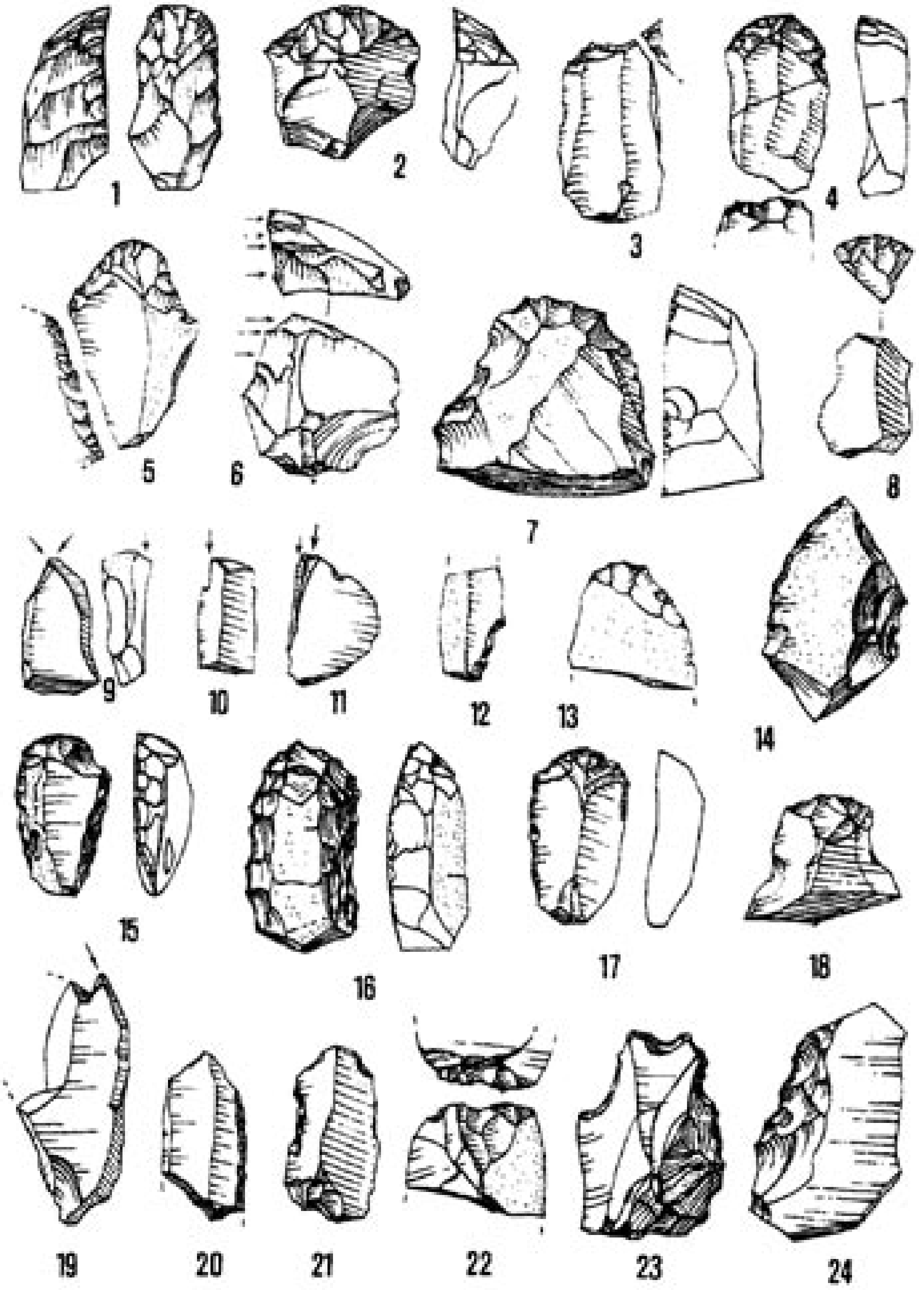

FIG. 6 – The Middle Aurignacian of Stránská skála, dated to 31 kyr BP: 1-14. site IIIa, layer 3; 15-24. site II, layer 4.

to the most recent datings, also Dolní Věstonice II-unit A (23.5 kyr BP; Fig. 7). These sites demonstrate a persistence of typically Aurignacian endscrapers and burins, accompanied, however, by microblades and backed microblades.

At this late Aurignacian stage, a mutual cultural influence and the sharing of technologies with the Gravettian should not be excluded as a possible explanation for these occurrences. This concerns also the industry in organic materials, as represented by the ivory working at Alberndorf, for example, which shows Gravettian parallels. Naturally, and especially in case of the surface assemblages such as Boršice, the coexistence of Aurignacian and Gravettian features may also be interpreted as mechanical mixture. Therefore, the term "Late Aurignacian" as applied in this paper, is provisional and open to discussion.

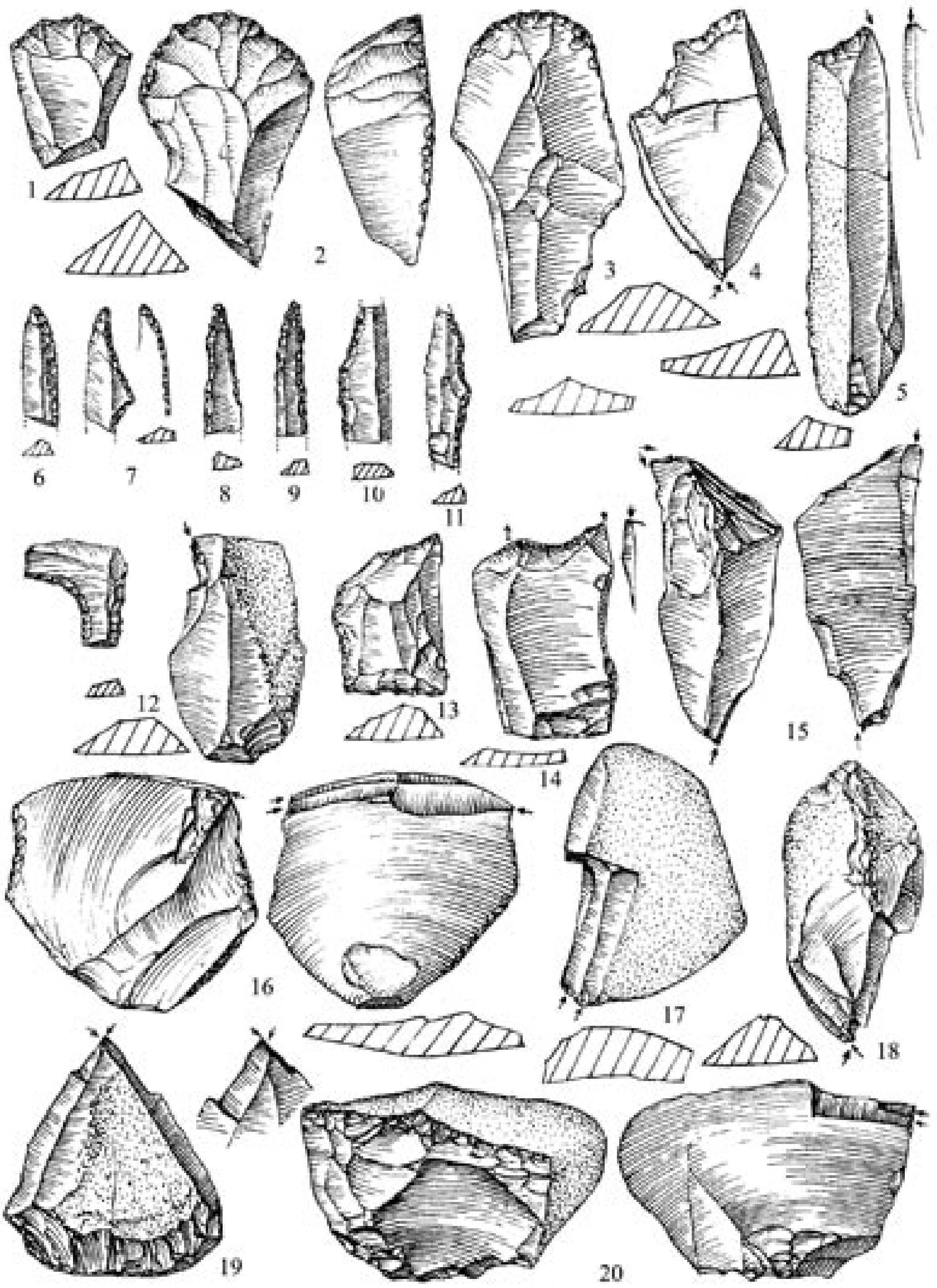

FIG. 7 – The Late Aurignacian. Dolní Věstonice II, northern slope, settlement unit A, dated to 23 540±180 BP (GrA-19498).

The problem of the industries of the "Morava-river type" (Streletskian elements)

Although it is clear that some industries classified previously Aurignacian do not belong to this group, I would like to mention in this context a specific type of industries with bifacial (sometimes triangular) leaf-points, short and broad endscrapers, and splintered pieces, found especially along the valley of the Morava river and its tributaries (Fig. 8). Until now, they have been alternatively labeled “Aurignacian of the Morava-river type” (Klíma, 1978) and “Míškovice--type” (Oliva, 1990), but they were never found in a more secure context than surface surveys. From a broader European perspective, they can be compared to industries found along the east European rivers of the Váh, Prut and Don, which are labeled Prut-culture (Noiret, 2004), and with the Streletskian still farther to the east. Following Noiret (2004), these industries penetrated from the Don valley to the Prut River around 27-26 kyr BP. In my viewpoint, their occurrence as far as the Morava river valley may suggest a prolongation of this movement westwards. This intervention may be contemporary with the later Aurignacian, but both entities should be strictly separated (Fig. 3).

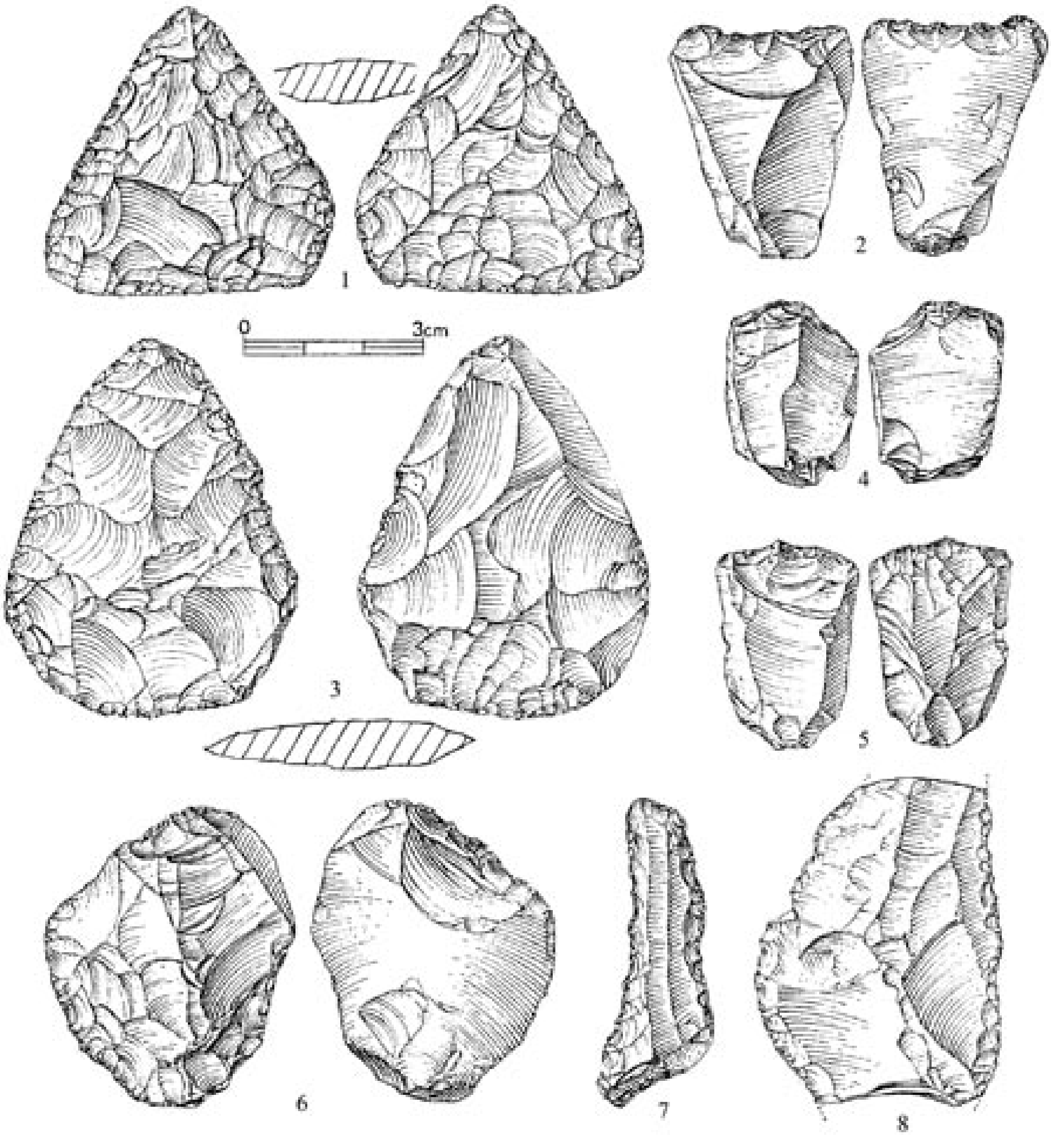

FIG. 8 – Non-Aurignacian industries, previously labeled “Aurignacian of the Morava-river type”. Lhota u Lipníka, surface collection. After B. Klíma.

The Kašovian: 18-15 kyr BP

The Last Glacial Maximum played a more important role in cultural adaptation than was expected previously. During this time period, the western part of central Europe appeared as an area of remarkable demographic decrease. A more regular network of sites are recorded in the eastern part of central Europe, namely in the Carpathian Basin, which seemed to have functioned as one of the European refugia (Terberger and Street, 2002; Verpoorte, 2004; Svoboda and Novák, 2004).

As in the Late Aurignacian, the sites of this period retain certain typological elements of the Aurignacian and Gravettian traditions (Fig. 9). This seemingly justified that the cultural entities of that period were named either “Epigravettian” or “Epiaurignacian” (Kozłowski, 1996; Oliva, 1996; Svoboda et al., 1996; Valoch, 1996; Neugebauer-Maresch, 1999). However, the sites could equally well have been called “Protomagdalenian”, especially on the basis of the bone industry from Grubgraben. Thus, it appears that one should reverse the process, by finding a local site of reference and define the entity as the first step, and looking for its developmental relationships as a second step.

Until recently, this time period was considered typologically extremely variable. However, new datings and the reclassification of certain sites (Moravany-Žakovská to Upper Gravettian — Verpoorte, 2002; Hranice and possibly Brno-Vídeňská to the Magdalenian — Svoboda and Novák, 2004) show that what remains is an entity which was technologically and typologically more homogeneous than expected.

One of the key sites of this period is Grubgraben in Lower Austria, with a series of dates around 18 kyr BP. This industry, accompanied by a relatively rich bone-and-antler industry (including *bâtons de commandement*), shows, however, a surprising typological variability. This is especially visible if one compares the “Epigravettian” typology as presented by A. Montet--White (1990) with the numerous “Aurignacoid” or even “Mousteroid” types recorded by Brandtner (1996). Therefore, this site still requires a detailed correlation of the various aspects of its chronology and typology.

In eastern Slovakia, the site of Kašov, providing a stratigraphy of Upper Gravettian in the lower layer and “Epigravettian” in the upper layer provides a more illustrative case. The site is located at an obsidian outcrop, a raw material which almost completely dominates in the upper layer. Compared to the lower (Upper Gravettian) layer, the upper layer is considerably larger and richer, and only a part of it has been published (Bánesz et al., 1992). Both layers are dated by ^{14}C: the lower one to 20.7 kyr BP, and the upper one to 18.6 ka BP (see Verpoorte, 2002, table 11). On the basis of the relatively clear stratigraphy, datings, amount of material, and central geographic position, we propose Kašov as the reference site of this cultural entity (Fig. 3; Svoboda and Novák, 2004).

A more dense occupation is recorded in the climatically favorable parts of Hungary. At Ságvár, on the basis of systematic excavation by Gábori in 1957, a dwelling structure has been reconstructed. In what concerns raw-material and technology, Tolnai-Dobosi (2001) emphasized the usage of river pebbles to produce short flakes. The industry is dominated by end-scrapers (50-60%, after Kozłowski and Kozłowski, 1975). They are short, marginally retouched, and rarely thick. Burins make about 16-25% and are mainly angular, with several parallel removals. A *bâton de commandament* accompanies the lithic assemblage. Arka, another relevant site on the western margin of the Tokaj-Prešov Mountains, in an area of hydroquartzite outcrops, has been excavated by L. Vértés (1964/65).

Moravia and Silesia provided only one stratified and dated site (a horse hunting station at Stránská skála IV, with two dates around 18 kyr BP), accompanied by a number of unstrat-

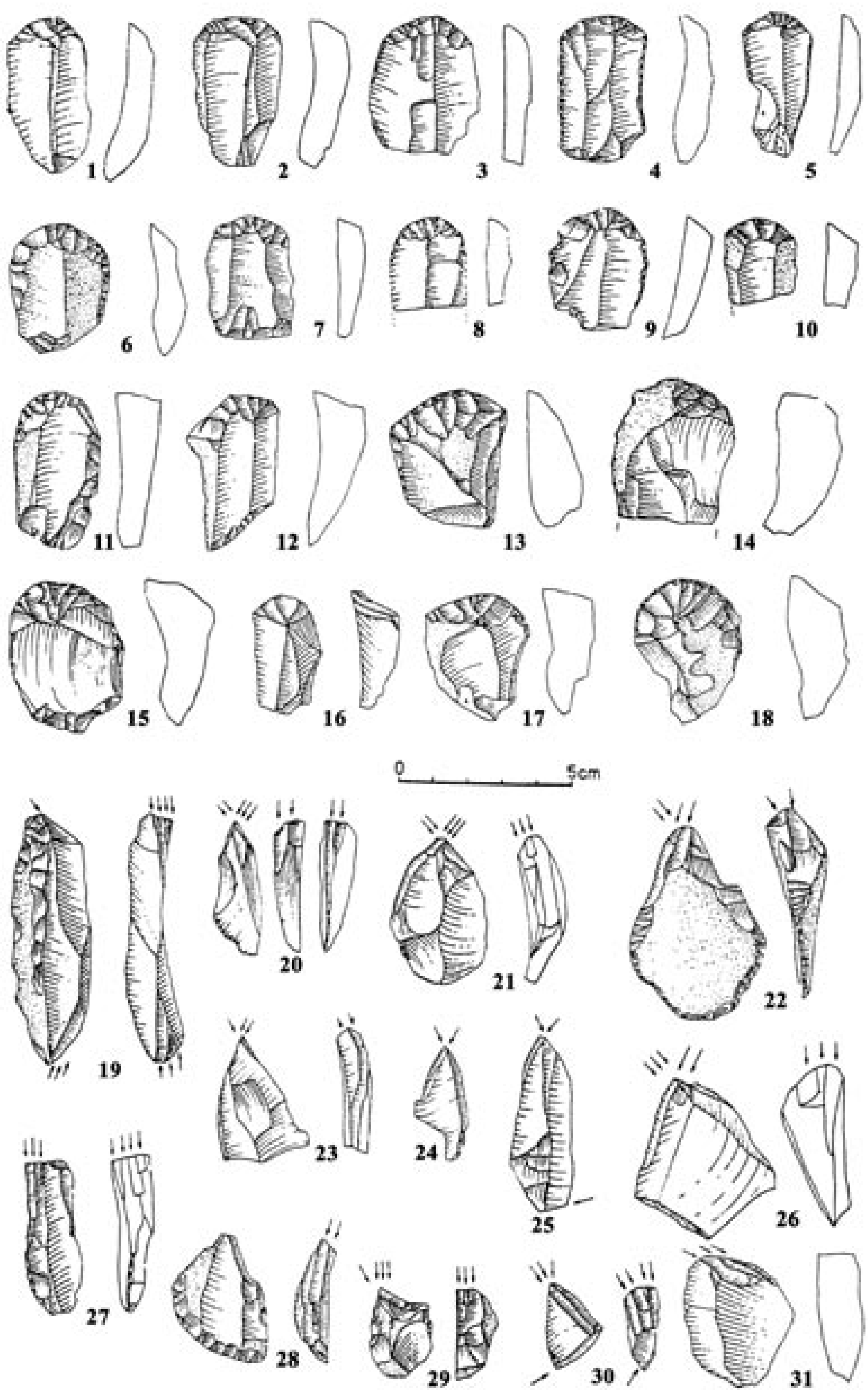

FIG. 9 – The Kašovian. Kašov, upper layer, dated 18 600±390 BP, Gd-6569. After Bánesz et al. (1992).

ified assemblages from living sites such as Pístovice II, in the Vyškov Gate, or Opava, in Czech Silesia.

In southern Poland, within the stratigraphic sequence of the multilayer site Kraków--Spadzista, the most important horizons belong to the later Gravettian (Willendorf-Kostenkian) occupations. However Kozłowski (1990) summarized several later assemblages, with dates of 17.4 kyr BP (site C2, layer II) and between 17-15 kyr BP (site B, workshop in layer 5). The industry includes some burins of various types made on shorter and longer blades, accompanied by a few backed and truncated blades; chisels of the Kostenki type are also present. A new site, dominated by typical broad endscrapers, was recently discovered at Targowisko (J. Wilczyński, personal communication).

In the western Ukraine, the site complex of Lipa, sites I-VI, has been excavated in 1963--1967 by V. P. Savich (1975), who recorded a cultural layer in the lower part of loessic clays, and also suggested a reconstruction of a dwelling structure. The industry is made of local Cretaceous flint, and is accompanied by rare bone-and-antler industry, especially by points with circular section in site VI. The cores are predominantly short (cubical), but also prismatic or discoid, suited for production of blades and flakes. The tool assemblage is dominated by endscrapers and burins. Endscrapers make about 10-20% (Kozłowski and Kozł owski, 1975) and they are short, marginally retouched, although some are thick (aurignacoid). Burins predominate (about 50%) and their forms are simple, on broken blade or truncation, and some are typically polyhedric. The assemblage is completed by pointed blades, retouched blades and microblades, and truncated blades. Some backed elements are equally present.

The Last Glacial Maximum induced complex changes in adaptation and behavior. In terms of raw materials, there is more emphasis on local sources compared to the Gravettian. However, limited amounts of materials were transported over surprisingly long distances. This is the case of obsidian, a raw material originating in the eastern Carpathian basin (also around Kašov), and found at this time as far as south Poland and Moravia. Technologically, the blanks are produced from short, cubical cores as well as from prismatic blade cores, and, specifically, from wedge-shaped microblade cores that strongly recall northern Asian parallels (Svoboda, 1995). Typologically, the groups of short endscrapers and burins predominate, but their quantitative relationship is variable at the individual sites. Both types are usually short. Some of them are thick and polyhedric, thus recalling some "aurignacoid" forms, however their quantity is low, and the morphology is different from the true Aurignacian. Also, backed implements, used as the main argument for a Gravettian tradition, are in fact surprisingly rare. Finally, the bone-and-antler industry, whenever preserved, shows parallels to the Magdalenian (*bâtons de commandament* at Grubgraben and Ságvár, needles at Grubgraben) or to the Gravettian (the circular section points at Lipa VI), but never to the Aurignacian.

REFERENCES

ANGELI, W. (1953) - *Der Mammutjägerhalt von Langmannersdorf an der Perschling*. Wien: Österreichische Akademie der Wissenschaften (Mitteilungen der Prähistorischen Kommission der Österreichischen Akademie der Wissenschaften; 6).

BACHNER, M.; MATEICIUCOVÁ, I.; TRNKA, G. (1996) - Die Spätaurignacien-Station Alberndorf im Pulkautal, NÖ. In SVOBODA, J., ed. - *Paleolithic in the Middle Danube region: anniversary volume to Bohuslav Klíma*. Brno: Archeologický ústav, p. 93-119.

BÁNESZ, L. (1976) - L'Aurignacien en Slovaquie. In *IX[e] congrès de l'UISPP. Colloque XVI, L'Aurignacien en Europe*, Nice, p. 30-50.

BÁNESZ, L.; HROMADA, J.; DESBROSSE, R.; MARGERAND, I.; KOZŁOWSKI, J.K.; SOBCZYK, K.; PAWLIKOWSKI, M. (1992) - Le site de plein air du Paléolithique supérieur de Kašov I en Slovaquie orientale. *Slovenská Archeológia*. Nitra. 40, p. 5-28.

BAYER, J. (1922) - Das Aurignac-Alter des Artefakte und menschlichen Skelettreste aus der Fürst-Johanns-Höhle bei Lautsch in Mähren. *Mitteilungen der Anthropologisch Gesellschaft*. Wien. 52, p. 173-185.

BELDIMAN, C. (2004) - Art mobilier au paléolithique supérieur en Roumanie. In OTTE, M., ed. - *La spiritualité. Actes du Colloque International de Liège (10-12 décembre 2003)*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 106), p. 103-121.

BRANDTNER, F. (1996) - Zur geographischen und kulturellen Zuordnung der Paläolithstation Grubgraben bei Kammern, NÖ. In SVOBODA, J., ed. - *Paleolithic in the Middle Danube region: anniversary volume to Bohuslav Klíma*. Brno: Archeologický ústav, p. 121-146.

BRODAR, S.; BRODAR, M. (1983) - *Potočka zijalka. Visokoalpska postaja aurignacienskih lovcev*. Ljubljana: Slov. Akad. Znanosti in Umetnosti Classis I.

HAESAERTS, P.; DAMBLON, F.; BACHNER, M.; TRNKA, G. (1996) - Revised stratigraphy and cbronology of the Willendorf II sequence, Lower Austria. *Archaeologia Austriaca*. Wien. 80, p. 25-42.

HAESAERTS, P.; BORZIAK, I.; CHIRICA, V.; DAMBLON, F.; KOULAKOVSKA, L. (2004) - Cadre stratigraphique et chronologique du Gravettien en Europe centrale. In SVOBODA, J.; SEDLÁČKOVÁ, L., eds. - The Gravettian along the Danube. Brno: Archeologický ústav (The Dolní Věstonice Studies; 11), p. 33-56.

HAESAERTS, P.; TEYSSANDIER, N. (2003) - The early Upper Paleolithic occupations of Willendorf II (Lower Austria): a contribution to the chronostratigraphic and cultural context of the beginning of the Upper Paleolithic in Central Europe. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 133-151.

HAHN, J. (1977) - *Aurignacien, das ältere Jungpaläolithikum im Mittel- und Osteuropa*. Köln-Wien: Böhlau (Fundamenta; A 9).

HORUSITZKY, F. Z. (2004) - Les artefacts en os et bois de cerf a Bukovac, Lokve (Croatie). Une seconde flute possible? Relations entre les chasseurs de Lokve et les montagnards d'Olcheva au début du Paléolithique supérieur. *Arheološki vestnik*. Ljubljana. 55, p. 9-37.

KLÍMA, B. (1959) - Zur Problematik des Aurignaciens und Gravettiens in Mittel-Europa. *Archaeologia Austriaca*. Wien. 26, p. 35-51.

KLÍMA, B. (1978) - Paleolitická stanice u Přestavlk, okr. Přerov. *Archeologické rozhledy*. Praha. 30, p. 5-13.

KOZŁOWSKI, J. K. (1996) - The latest Aurignacian and "Aurignacoid" elements in the Epigravettian of the Carpathian Basin. UISPP, XIV Congrès, Colloquium XI, Forli, p. 83-98.

KOZŁOWSKI, J. K.; KOZŁOWSKI, S. K. (1975) - Pradzieje Europy od XL do IV tysiaclecia p. n.e. Warszawa: Państwowe Wydawnictwo Naukowe.

MONTET-WHITE, A., ed. (1990) - *The Epigravettian site of Grubgraben, Lower Austria: the 1986 and 1987 excavations*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 40).

NEUGEBAUER-MARESCH, Ch. (1993) - *Altsteinzeit im Osten Österreichs/Christine Neugebauer-Maresch*. St. Pölten [etc.]: Niederösterreichische Pressehaus (Wissenschaftliche Schriftenreihe Niederösterreich; 95/97).

NEUGEBAUER-MARESCH, Ch. (1996) - Zur Stratigraphie und Datierung der Aurignac-Station am Galgenberg von Stratzing/Krems-Rehberg, N.Ö. In SVOBODA, J., ed. - *Paleolithic in the Middle Danube region: anniversary volume to Bohuslav Klíma*. Brno: Archeologický ústav.

NEUGEBAUER-MARESCH, Ch. (1999) - *Le Paléolithique en Autriche*. Grenoble: J. Millon.

NOIRET, P. (2004) - Le Paléolithique supérieur de la Moldavie. *L'Anthropologie*. Paris. 108, p. 425-470.

OLIVA, M. (1987) - *Aurignacien na Moravě*. Kroměříž: Muzea Kroměřížska (Studie Kroměřížska; 87).

OLIVA, M. (1990) - La signification des pointes foliacées dans l'aurignacien morave et dans le type de Míškovice. In KOZŁOWSKI, J. K., ed. - *Feuilles de pierre*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 42), p. 223-232.

OLIVA, M. (1996) - Epiaurignacien en Moravie: le changement économique pendant le deuxième pléniglaciaire würmien. In *UISPP, XIII Congrès, Colloquium XI*, Forli, p. 69-82.

PACHER, M. (2001) - As campañas de excavación en Potocka Zijalka, Eslovenia (Pleistoceno Superior): estado de la investigación. *Cadernos do Laboratorio Xeolóxico de Laxe*. A Coruña. 26, p. 301-310.

SAVICH, V. P. (1975) - *Pizdnopaleolitichne naselennia pivdenno-zakhidnoi Volini*. Kiev: Naukova Dumka.

SVOBODA, J. (1983) - Raw material sources in Early Upper Paleolithic Moravia. The concept of lithic exploitation areas. *Anthropologie*. Brno. 21, p. 147-158.

SVOBODA, J. (1995) - Wedge-shaped microblade cores in Moravia and Silesia. *Archeologické rozhledy*. Praha. 47, p. 651-656.

SVOBODA, J. (2001) - Mladeč and other caves in the Middle Danube region: early modern humans, late Neandertals, and projectiles. In ZILHÃO, J.; AUBRY, T.; CARVALHO, A. F., eds. - *Les premiers hommes modernes de la Péninsule Ibérique. Actes du Colloque de la Commission VIII de l'UISPP. Vila Nova de Foz Côa, 22-24 Octobre 1998*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 17), p. 45-60.

SVOBODA, J., BAR-YOSEF, O., eds. (2003) - *Stránská skála. Origins of the Upper Paleolithic in the Brno Basin, Moravia, Czech Republic*. Cambridge, MA: Harvard University Press.

SVOBODA, J.; LOŽEK, V.; VLČEK, E. (1996) - *Hunters between East and West. The Paleolithic of Moravia*. New York-London: Plenum.

SVOBODA, J. A.; NOVÁK, M. (2004) - Eastern Central Europe after the Upper Pleniglacial: changing points of observation. *Archäologisches Korrespondenzblatt*. Mainz. 34, p. 463-477.

SVOBODA, J. A.; van der PLICHT, J.; KUŽELKA, V. (2002) - Upper Palaeolithic and Mesolithic human fossils from Moravia and Bohemia (Czech Republic): some new C14 dates. *Antiquity*. Cambridge. 76, p. 957-962.

SZOMBATHY, J. (1925) - Die diluvialen Menschenreste aus der Fürst-Johanns-Höhle bei Lautsch in Mähren. *Die Eiszeit*. Wien. 2:1, p. 1-34.

TERBERGER, T.; STREET, M. (2002) - Hiatus or continuity? New results for the question of pleniglacial settlement in Central Europe. *Antiquity*. Cambridge. 76, p. 691-698.

TEYSSANDIER, N. (2005) - Les débuts de l'Aurignacien en Europe. Résumé de Thèse. *Bulletin de la Société Préhistorique Française*. Paris. 102, p. 211-220.

TOLNAI-DOBOSI, V. (2001) - About Ságvárian: chronological-cultural sketch of the Upper Paleolithic in Hungary. In GINTER, B. [et al.], eds. - *Problems of the Stone Age in the Old World*. Kraków: Uniwersytet Jagielloński, p. 195-201.

TRINKAUS, E.; MILOTA, Ş.; RODRIGO, R.; MIRCEA, G.; MOLDOVAN, O. (2003a) - Early modern human cranial remains from the Peştera cu Oase, Romania. *Journal of Human Evolution*. London. 45, p. 245-253.

TRINKAUS, E.; MOLDOVAN, O.; MILOTA, Ş.; BÎLGĂR, A.; SARCINA, L.; ATHREYA, S.; BAILEY, S. E.; RODRIGO, R.; MIRCEA, G.; HIGHAM, T.; BRONK RAMSEY, C.; VAN DER PLICHT, J. (2003b) - An early modern human from the Peştera cu Oase, Romania. *Proceedings of the National Academy of Sciences of the United States of America*. Washington, DC. 100, p. 11231-11236.

VALOCH, K. (1976) - L'aurignacien en Moravie. In OTTE, M., ed. - *Actes des réunions de la X^e Commission "Aurignacien et Gravettien" UISPP*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 13), p. 112-123.

VERPOORTE, A. (2002) - Radiocarbon dating the Upper Palaeolithic of Slovakia: results, problems and prospects. *Archäologisches Korrespondenzblatt*. Mainz am Rhein. 32, p. 311-325.

VERPOORTE, A. (2004) - Eastern Central Europe during the Pleniglacial. *Antiquity*. York. 78, p. 257-266.

VÉRTÉS, L. (1964) - Das Jungpaläolithikum von Arka in Nord-Ungarn. *Quartär*. Bonn. 15/16.

WEST, D. (1997) - *Hunting strategies in Central Europe during the Last Glacial Maximum*. Oxford: British Archaeological Reports IS 672.

WILD, E. M.; TESCHLER-NICOLA, M.; KUTSCHERA, W.; STEIER, P.; TRINKAUS, E.; WANEK, W. - Direct dating of Early Upper Palaeolithic human remains from Mladeč. *Nature*. London. 435, p. 332-335.

ZILHÃO, J.; D'ERRICO, F. (1999) - The chronology and taphonomy of the Earliest Aurignacian and its implications for the understanding of Neandertal extinction. *Journal of World Prehistory*. New York, NY. 13, p. 1-68.

The first Aurignacian technocomplexes in Europe: a revision of the Bachokirian

JEAN-PHILIPPE RIGAUD ▮ GÉRALDINE LUCAS

ABSTRACT The initial stages of the Upper Paleolithic are at the origin of a long debate on the emergence of modern behavior. The acculturation model was founded on evidence which is now questionable. The contemporaneity of Neandertals and *Homo sapiens sapiens* based on interstratifications at Le Piage and Roc-de-Combe is not supported by recent studies. The Bachokirian, one of the oldest Upper Paleolithic culture in the Balkans was for a long time considered as an "Aurignacoid" technocomplex but it doesn't show any typological or technological characteristics of the European Aurignacian assemblages. Elaborating a definition of the Aurignacian culture should start by some rethinking of our methodology and our terminology.

Introduction

In Europe, the appearance of the first Aurignacian technocomplexes is a major event for our understanding of the Middle-to-Upper Paleolithic transition. Indeed, the age of the first Aurignacian industries is determining in a debate where what is at stake is to know whether the Neandertals, authors of the Castelperronian cultures but also of the Uluzzian and a few other so-called transitional industries, have developed their own technology independently by passing from Middle Paleolithic to Upper Paleolithic (Pelegrin, 1995; Rigaud, 1989, 1993, 1996, 2000 (cf. 1998), 2001; D'Errico et al., 1998, 2000) or if they have acquired what could be called a modern behavior under the influence of an acculturating process (Mellars, 1990; Demars, 1991; Demars and Hublin, 1989; Hublin, 1990). To speak of an acculturation necessarily means that Aurignacian populations, which were hurriedly and exclusively assimilated to the *Homo sapiens sapiens* kind (Stringer, 1990; Hublin, 1990) were contemporaneous with Neandertal populations and that they had developed direct or indirect contacts.

Another point of view posits the possibility of a biological continuity, and therefore of a cultural continuity, between Neandertals and modern humans; it has been supported by anthropologists as well as prehistorians (Cabrera and Bernaldo de Quirós, 1990; Valoch, 1990; Wolpoff, 1998). According to these authors, the Upper Paleolithic and more specifically the Aurignacian could be the result of a technological evolution deeply rooted in the local Mousterian. On the basis of the data from Vindija cave (Croatia), a variant of the acculturation model has been proposed by Karavanić and Smith (Karavanić, 1995; Karavanić and Smith, 1998). The association in the G1 level of an Aurignacian bone point and of Neandertal human remains has been interpreted by Karavanić and Smith (1998, 2000) as the indication of a "biocultural" interaction between Neandertals and *Homo sapiens sapiens* populations that would have been contemporaneous over a long time span. Therefore, the authors admit that Neandertals could have produced an Aurignacian industry.

If the fact that late periods of the Aurignacian are associated with anatomically modern humans is usually accepted (Hublin, 1990; Stringer, 1990), we must admit that we do not know of fossils associated with the Archaic Aurignacian (Rigaud, 1986, 1993); thus, the possibility that Neandertals could have been the authors of it cannot be *a priori* removed from further consideration. Yet, such a possibility will have to be established in a much more rigorous way, because the data from Vindija cave are not convincing, given the questionable geological context among other things. But, following Karavanić and Smith's (2000) proposal, these data can be accepted for the debate while waiting for more conclusive arguments. According to Garralda and Vandermeersch (2000), the human teeth remains associated with the first Aurignacian occupations of the El Castillo cave show morphometrical features within the variability limits of Neandertals. Nevertheless, it is not possible to assign these with certainty to Neandertals or *Homo sapiens sapiens*.

Finally, to be the more complete, we must evocate the publication by Trinkaus and Zilhão of the human remains from Lagar Velho, which pose the problem in terms of hybridization, implying contemporaneity of the two populations (Trinkaus et al., 2001).

Whatever model is chosen, the relative chronological position of the last Neandertal productions and of the first Aurignacian technocomplexes becomes of great importance. The chronological frame of reference was initially based on stratigraphic data. By the end of the 1950s, the Castelperronian (= Lower Perigordian) underlying the Aurignacian was considered as earlier on the basis of the stratigraphies of Le Moustier, La Ferrassie and many other sequences of Atlantic Europe. Yet, Bordes and Labrot (1967), on one hand, and Champagne and Espitalié (1967), on the other, based on the Roc-de-Combe and Le Piage, wrote that they had found stratigraphic sequences where Castelperronian and Aurignacian levels were interstratified. Their conclusion was that there was contemporaneity between the Castelperronian and the Aurignacian in southwest France. At the same time, in Spain, González Echegaray signaled that there was a Lower Perigordian (Castelperronian) level over an Aurignacian occupation at the site of El Pendo (González Echegaray, 1982).

Two 1998 symposia, "Gibraltar and the Neandertals", in Gibraltar, and "The first modern humans of the Iberian Peninsula" in Vila Nova de Foz Côa, called the stratigraphic argument in favor of a contemporaneity between Castelperronian and Aurignacian into question (Rigaud 1998, 2000 (cf. 1998)).

At Le Piage, Champagne and Espitalié (1967), as well as Laville (1981), wrote about the difficulties they had met to follow the continuity of some of the deposits. Laville had then mentioned the possibility of disturbances caused by renewed karstic activity. Furthermore, Pelegrin (1995), much as Demars (1990), mentioned Aurignacian contaminations in the Castelperronian assemblages.

At the Roc-de-Combe, the interstratification described by F. Bordes was based on stratigraphic correlations between the porch and the interior of the cave, and mainly based on the identification of a Level 8 (Bordes and Labrot, 1967). Some really detailed arguments developed by one of us (Rigaud, 1998) demonstrated that, on one hand, there was no continuous stratigraphic sequence and, on the other hand, that the identification of a Level 8 by F. Bordes was largely hypothetical. Thus, it was possible to give a different interpretation of the Roc-de-Combe stratigraphy and to call the interstratification of Castelperronian and Aurignacian levels into question again. Recently, J.-G. Bordes undertook a taphonomic analysis of these two sites that led him to confirm our conclusions while bringing new arguments to bear on the issue (Bordes, 2002).

The same thing happened with the El Pendo sequence, where new work conducted by Hoyos and Laville (1982) revealed some geological abnormalities that did not allow it to be considered as an acceptable reference anymore.

We also have showed that radiometric data related to Castelperronian and Archaic Aurignacian confirmed the precedence of the former over the latter in southwest France, as well as the precedence of the Castelperronian of southwest France relative to the Castelperronian of central France (Rigaud, 1998). Thus, we have demonstrated that any contacts between Castelperronian and Aurignacian cultures could have been possible only after the first stages of the Castelperronian.

Yet, in the Balkans, in central Europe, and in Spain, Aurignacian or "Aurignacoid" technocomplexes have been dated back to more than 40 000 years ago (Kozłowski, 1982, 1983; Hahn, 1988, 1995; Cabrera and Bischoff, 1989; Bischoff et al., 1989). A reappraisal of sites from Spain, Belgium, Germany, Austria, Hungary, Ukraine and the Balkans led Zilhão and d'Errico (2000) to conclude that the age of some of these Archaic Aurignacian industries was questionable, and that Aurignacian technocomplexes systematically post-dated the Castelperronian and similar industries from central and eastern Europe. This is closely related to what we had already written about the southwest of France (Rigaud, 1998). So, we had to be sure that industries considered by some as part of the earlier stages of the Aurignacian really belonged to this culture. This we did in 1997 for Level 11 from Bacho Kiro, whose attribution we had been questioning as early as 1998 (Rigaud, 2000).

The industry from Bacho Kiro, Level 11

The industry from Level 11 was first called "Bachokirian" by J. K. Kozłowski and A. Dangnan-Ginter (Kozłowski, 1982) in the monograph dedicated to the publication of the work carried out at Bacho Kiro cave between 1971 and 1975. In more recent publications, they called it "Pre-Aurignacian" (Kozłowski and Otte, 2000). The ^{14}C dating results were >43 000 BP (GrN-7545) (Kozłowski, 1982), 33 750±850 BP (OxA -3184), 34 800±1150 BP (OxA-3212) and 38 500±1700 BP (OxA-3213) (Hedges et al., 1994).

According to the authors, the industry from Level 11 includes endscrapers, some of them "on blades with Aurignacian retouch" (Kozłowski, 1982, p. 125), "carinated and elevated atypical endscrapers" (p. 125), some "not so typical nosed endscrapers", a few "Aurignacian retouched blades" (n = 9), four distal parts of "Font-Yves points", and an object that looked like a "Caminade endscraper". Dufour bladelets were completely missing ("they do not include any classical Dufour type bladelets" (Kozłowski, idem, p.137). According to these typological criteria, Kozłowski and Ginter stated that Level 11 was typologically homogenous, that the (stratigraphic?) subdivisions the level is made of, represented not only the same cultural tradition but also the same development phase, and, finally, that the technological and typological structure of the industry put it in the Aurignacian tradition (Kozłowski, 1982, p. 162).

H. Delporte and F. Djindjian (1979) carried out a comparative study of series of the early western Aurignacian and of this Archaic Aurignacian from the Balkans based on the typological inventory made by Kozłowski and Ginter but without having seen the industry. They came to the conclusion that "the Aurignacian from Bacho Kiro shows typological features close to those of Aurignacian levels 9 to 6 from Cueva Morin..." and that "the presence in these levels of Dufour bladelets (...) reinforces the resemblance". Later, H. Delporte (1998) confirmed the Aurignacian attribution using as arguments new and contrary typological and statistical data published by Kozłowski (1982; Kozłowski and Otte, 2000). Thus, Delporte (1998, p.108) wrote that the industry contained about 41% of blades with Aurignacian retouch and a few Dufour bladelets.

A new study of the industry had to be done, contradictions being too numerous. In 1997, we had the possibility to study the Level 11 collection from Bacho Kiro kept at the Archeological Institute of the Bulgarian Academy of Sciences in Sofia. We were able to do the following preliminary observations:

Raw material

Flint is highly predominant, most often in varieties of a good grade, and colors are very variable (brown, beige, grey). We were not able to check on the field the origin of the different varieties to evaluate distances to the site, but information given to us by N. Sirakov indicated that the sources were at least 10 km away, and that there were no pebbles of the same raw-material in the river bed near the cave.

Volcanic rocks (basalt) as well as quartzite and sandstones are also to be found, but in smaller amounts than in the underlying Mousterian levels (Kozłowski, 1982). The size of flint blocks ranges from 5 to 7, cm and the products are of medium size.

Laminar products

Nearly one third of the flint production is made of laminar products. They are highly fragmented, proximal and medial parts are dominating, the unbroken blades are rather large and thin. Cores most often have only one striking platform.

Lamellar products

The absence of bladelet nucleus and of carinated pieces clearly indicates that lamellar production was rather marginal. The examination of sieving products allowed the identification of 25 bladelets <5 mm wide and with an average thickness of 13 mm. Such low numbers are obviously not the result of intentional bladelet production but rather represent the byproduct of operations of shaping out or retouching thick blanks.

Percussion techniques

The specific shape of the striking platforms and of the bulbs seems to indicate that hard hammer stones were mostly used.

Retouched artifacts

The retouched tool kit found in Level 11 of Bacho Kiro has endscrapers, some times made on crested blades, which lends them a carinated shape, but where no lamellar "retouch" can be seen. There are also a few endscrapers made on flakes, some really rare burins, and many blades retouched on one or both sides. No blades can be called Aurignacian blades, since no scaled or stepped retouch is present. The Font-Yves point fragments described by Kozłowski are actually distal fragments of small retouched blades frequently found in any Upper Paleolithic assemblage.

The diversity of imported raw-materials, the scarcity of cores and of initial markers of the operating sequence, the abundance of re-sharpening and re-use, and the huge number of retouched artifacts, leads us to think that the industry from Level 11 of Bacho Kiro represents an exhaustion facies where siliceous raw-materials were processed to the limit.

Aurignacian retouched blades, carinated pieces (end scrappers or burins) that could be used to produce bladelets, Dufour bladelets, and more generally microlithic tools, are absent. Thus, we reject the possibility that the industry from Level 11 belongs to an early or archaic phase of the Aurignacian, even if we take into account the regional techno-typological peculiarities of this culture as patent in later stages of the same sequences.

It is obvious that, even if the Upper Paleolithic characteristics of this industry were developed, it is in no way within the limits of variability of the Aurignacian. As we had suggested in 1998, it is much closer to some industries linked with the Initial Upper Paleolithic of the Near East. While waiting for a better definition, it should be connected to a polymorphic group of "Initial Upper Paleolithic" industries to which the Beauronnian also belongs (Sackett, 1999; Rigaud, 2001)

Discussion

As it is clearly shown by its title — "Towards a definition of the Aurignacian" — one of the goals of this symposium was to define techno-typological features that could allow assignment of any given assemblage to the Aurignacian culture The goal we want to pursue relates to taxonomy and terminology, as well as to issues of lithic assemblage variability.

About terminology

A few expressions widely used in our community are actually rather vague. Thus, they can generate some dangerous confusion. In order to illustrate this problem, we have chosen the example of the Dufour bladelets. Demars and Laurent (1989) defined two subtypes: the "Dufour" subtype, with a length ranging from 30 to 45 mm and curved profile; and the "Roc-de-Combe" subtype, with a twisted profile and 15 to 20 mm long. These two subtypes not only had different sizes and morphologies, their production modes were also different, as widely described (Lucas, 1997, 1999; Ortega, 1998; Teyssandier, 1998; Bon, 2000; Bordes, 2002). These pieces, whose morphology and technology are different, should be given different names. They can be found together or separated in many Aurignacian industries in Europe, and they have been given the same chronological and/or cultural meaning.

On taxonomy

The goal of this symposium was not really to establish a "stereotype" of the Aurignacian, or to give a "legal definition" of it, which would be immediately contradicted by its own techno-typological variability. Its goal was more to establish the criteria that will help to identify the Aurignacian as a technocomplex. To do so, the rules of taxonomy establish that the characteristics chosen will have to be: 1) defined without any ambiguity but also 2) patent or continuous (their absence being significant) and 3) exclusive to the culture studied.

Respecting of the rules of taxonomy also means that the limits of variability of a cultural assemblage are determined by the presence of the techno-typological criteria used to define the culture.

Conclusion

More than its implications for our knowledge of the Aurignacian peopling of Europe, the reconsideration of Level 11 from Bacho Kiro allowed us to point to the necessity of a methodological rethinking.

Distinguishing Aurignacian assemblages, within their limits of variability, cannot be limited to summing-up a list of techno-typological diagnostic forms. The whole lithic and osseous production (with, for the later, all the reservations needed) must be taken into account. For example, variants in the operating sequence can be cultural markers as good as the finished products resulting from such operating sequences. They have allowed to characterize regional features (Bon, 2000), as much as the Caminade endscrapers characterize the Aurignacian of the Dordogne river valley.

We can also face a few dangers if we try to use a chronological framework to establish cultural attributions. This is frequently done with parietal art, yet it is completely independent from the techno-typological criteria used to define the cultures, and thus it must find in other domains of human activity the necessary diagnostic elements. Some of the contributions in this symposium dealt with bone and ornament technologies; nevertheless, we will have to find the diagnostic criteria especially in the lithic production, because bone conservation can be somewhat problematic. Developing our analytic tools in the various domains of human activity will certainly allow us to isolate numerous facies, be they of a cultural, functional, regional, or chronological nature. Nonetheless, at the end, we still will have to argument as best as we can our hypothesis and our interpretations.

REFERENCES

BON, F. (2002) - *L'Aurignacien entre mer et océan: réflexion sur l'unité des phases anciennes de l'Aurignacien dans le Sud de la France.* Paris: Société Préhistorique Française (Mémoire; 29).

BORDES, F.; LABROT, J. (1967) - La stratigraphie du gisement de Roc de Combe (Lot) et ses implications. *Bulletin de la Société Préhistorique Française.* Paris. 67, p. 105-113.

BORDES, J.-G. (2002) - *Les interstratifications Châtelperronien/Aurignacien du Roc de Combe et du Piage (Lot, France) analyse taphonomique des industries lithiques; implications archéologiques.* Thèse de l'Université Bordeaux 1.

BISCHOFF, J. L.; SOLER, N.; MAROTO, J.; JULIÀ, R. (1989) - Abrupt Mousterian/Aurignacian Boundary at c. 40ka BP: Accelerator 14C dates from l'Arbreda Cave (Catalunya, Spain). *Journal of Archaeological Science.* London. 16:4, p. 563-576.

CABRERA VALDÉS, V.; BERNALDO DE QUIRÓS, F. (1990) - Données sur la transition entre le Paléolithique moyen et le Paléolithique supérieur de la région Cantabrique: révision critique. In FARIZI, C., éd. - *Paléolithique moyen récent et Paléolithique supérieur ancien en Europe.* Nemours: APRAIF (Mémoire; 3), p. 185-188.

CABRERA VALDÉS, V.; BISCHOFF J. L. (1989) - Accelerator C14 dates for Early Upper Paleolithic (Basal Aurignacian) at El Castillo (Spain). *Journal of Archaeological Science.* London. 16, p. 577-584.

CHAMPAGNE, F.; ESPITALIÉ, R. (1967) - La stratigraphie du gisement du Piage: note préliminaire. *Bulletin de la Société Préhistorique Française.* Paris. 64, p. 29-34.

DELPORTE, H. (1998) - *Les Aurignaciens, premiers hommes modernes.* Paris: Editions de la Maison des Roches.

DELPORTE, H.; DJINDJIAN, F. (1979) - Note à propos de l'outillage aurignacien de la couche 11 de Bacho-Kiro. *Zeszyty Naukowe Uniwersytetu Jagiellońskiego. Prace Archeologiczne.* Kraków. 28, p. 101-104.

DEMARS, P.-Y. (1991) - Evolution humaine, évolution culturelle: l'exemple du Paléolithique européen. In HUBLIN, J.-J.; A.-M. TILLIER, A.-M., eds. - *Aux origines d'homo sapiens.* Paris: Presses Universitaires de France.

DEMARS, P.-Y.; HUBLIN J.-J. (1989) - La transition Néandertaliens/hommes de type moderne en Europe occidentale: aspects paléontologiques et culturels. In VANDERMEERSCH, B., ed. - *L'homme de Néandertal. L'extinction.* Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 34), p. 23-37.

DEMARS, P.-Y.; LAURENT, P. (1989) - *Types d'outils lithiques du Paléolithique supérieur en Europe*. Paris: CNRS (Cahiers du Quaternaire; 14).

D'ERRICO, F.; ZILHAO, J.; BAFFIER, D.; JULIEN, M.; PELLEGRIN, J. (1998) - *Neandertals acculturation in western Europe. A critical review of the evidence and its interpretation. Current Anthropology*. Chicago, IL. 39, p. 1-44.

DJINDJIAN, F. (1993) - Les origines du peuplement aurignacien en Europe. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche Orient. Actes du XII[e] Congrès International des Sciences Préhistoriques et Protohistoriques. Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 136-154.

GARALDA, M. D.; VANDERMEERSCH, B.; MAUREILLE, B. (2000) - Les hommes du Moustérien récent et de l'Aurignacien archaïque de la région cantabre (Espagne): nouvelles données et interprétations. *Bulletin de la Société Anthropologique de Paris*. Paris. Nouvelle série. 12:3-4, p. 486.

GONZÁLEZ ECHEGARAY, J. G. (1980) - El yacimiento de la Cueva de El Pendo (excavaciones 1953-57). Madrid: Consejo Superior de Investigaciones Científicas (Bibliotheca Prehistorica Hispana; 17).

HAHN, J. (1988) - *Die Geißenklösterle-Höhle im Achtal bei Blaubeuren I. Fundhorizontbildung und Besiedlung im Mittelpaläolithikum und im Aurignacien*. Stuttgart: Theiss.

HAHN, J. (1995) - Neue Beschleuniger-^{14}C-Daten zum Jungpaläolithikum in Südwestdeutschland. *Eiszeitalter und Gegenwart*. Hannover. 45, p. 86-92.

HAROLD, F. (1989) - Mousterian, Chatelperronian and Early Aurignacian in Western Europe: continuity or discontinuity?. In MELLARS, P. A.; STRINGER, C., eds. - *The human revolution, behavioral and biological perspectives on the origins of modern humans*. Edinburgh: Edinburgh University Press, p. 677-713.

HEEDGES, R. E. M.; HOUSLEY, R.; RAMSEY, C.B.; VAN KLINKEN, G. (1994) - Radiocarbon dates from the Oxford AMS system Archaeometry datelist 18. *Archaeometry*. Oxford. 36, p. 337-374.

HOYOS, M.; LAVILLE, H. (1982) - Nuevas aportaciones sobre la estratigrafía y sedimentología de los depósitos del Paleolítico superior de le Cueva de El Pendo (Santander): sus implicaciones. *Zephyrus*. Salamanca. 34-35, p. 285-293.

HUBLIN, J.-J. (1990) - Les peuplements paléolithiques de l'Europe: un point de vue paléobiogéographique. In FARIZY, C., ed. - *Paléolithique moyen récent et Paléolithique supérieur ancien en Europe. Actes du Colloque international de Nemours 9-11 mai 1988*. Nemours: APRAIF (Mémoire du Musée de Préhistoire d'Ile de France; 3), p 29-37.

KARAVANIĆ, I. (1995) - Upper Palaeolithic occupation levels and late-occuring neandertals at Vindija cave (Croatia) in the context of Central Europe and the Balkans. *Journal of Anthropological Research*. Albuquerque, NM. 51, p. 9-35.

KARAVANIĆ, I.; SMITH, F. H. (1998) - The Middle/Upper Paleolithic interface and the relationship of Neanderthals and early modern humans in the Hrvatsko Zagorje, Croatia. *Journal of Human Evolution*. London. 34, p. 223-248.

KOZŁOWSKI, J. K., ed. (1982) - *Excavation in the Bacho Kiro Cave (Bulgaria): final report*. Warszawa: Państwowe Wydawnictwo Naukowe.

KOZŁOWSKI, J. K. (1993) - L'Aurignacien en Europe et au Proche-Orient. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche-Orient. Actes du XII[ème] Congrès International des Sciences Préhistoriques et Protohistoriques, Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 283-291.

KOZŁOWSKI, J. K.; OTTE, M. (2000) - The formation of the Aurignacian in Europe. *Journal of Anthropological Research*. Albuquerque, NM. 56, p. 513-534.

LAVILLE, H. (1981) - Les dépôts paléolithiques du Piage (Fajoles, Lot: signification climatique et chronologique. CHAMPAGNE, F.; ESPITALIÉ, R. (1981) - *Le Piage, site préhistorique du Lot*. Paris: Société Préhistorique Française (Mémoire de la Société Préhistorique Française; 15).

LUCAS, G. (1997) - Les lamelles Dufour du Flageolet I (Bézenac, Dordogne) dans le contexte aurignacien. *Paléo*. Les Eyzies-de--Tayac. 9, p. 191-219.

LUCAS, G. (1999) - Production expérimentale de lamelles torses: approche préliminaire. *Bulletin de la Société Préhistorique Française*. Paris. 96:2, p. 145-151.

MELLARS, P. A., ed. - *The emergence of modern humans: an archaeological perspective*. Edinburgh: University of Edinburgh Press.

PELEGRIN, J. (1995) - *Technologie lithique: le Châtelperronien de Roc-de-Combe (Lot) et de la Côte (Dordogne)*. Paris: CNRS (Cahiers du Quaternaire; 20).

RIGAUD, J.-Ph. (1989) - Le Paléolithique supérieur ancien en Aquitaine. In MOHEN, J.-P., ed. - *Le temps de la Préhistoire. 23[ème] Congrès préhistorique de France, 3-6 novembre 1989, Paris*. Paris: Société Préhistorique Française; Dijon: Archeologia, 1, p. 269-273.

RIGAUD, J.-Ph. (1993) - Passages et transitions du Paléolithique moyen au Paléolithique supérieur. In CABRERA, V., ed. - *El origen del hombre moderno en el suroeste de Europa*. Madrid: Universidad Nacional de Educación a Distancia, p. 117-126.

RIGAUD, J.-Ph. (1996) - L'émergence du Paléolithique supérieur en Europe occidentale. Le rôle du Castelperronien. In BAR--YOSEF, O.; CAVALLI-SFORZA, L. L.; MARCH, R. J.; PIPERNO, M., eds. - *«The origin of modern human.». Xème Colloque du XIIIème Congrès International des Sciences Préhistoriques et Protohistoriques*. Forlì: ABACO, 5, p. 219-223.

RIGAUD, J.-Ph. (2001) - A propos de la contemporanéité du Châtelperronien et de l'Aurignacien ancien: une révision des données et ses implications. In ZILHÃO, J.; AUBRY, T.; CARVALHO, A. F., eds. - *Les premiers hommes modernes de la Péninsule Ibérique. Actes du Colloque de la Commission VIII de l'UISPP. Vila Nova de Foz Côa, 22-24 octobre 1998*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 17), p. 61-68.

RIGAUD, J.-Ph. (2000) - Late neandertals in the southwest of France and the emergence of the Upper Paleolithic. In STRINGER C.; BARTON R. N. E.; FINLAYSON J. C., eds. - *Neanderthals on the edge: papers from a conference marking the 150th anniversary of the Forbes' Quarry discovery, Gibraltar*. Oxford: Oxbow.

SACKETT, J. (1999) - *The archaeology of Solvieux, an Upper Paleolithic open air site in France*. Los Angeles, CA: UCLA Institute of Archaeology (Monumenta Archaeologica; 19).

STRINGER, C. (1990) - The emergence of modern humans. *Scientific American*. New York, NY. 263, p. 68-74.

TEYSSANDIER, N. (2003) - *Les débuts de l'Aurignacien en Europe. Discussion à partir des sites de Geißenklösterle, Willendorf II, Krems-Hundssteig et Bacho Kiro*. Ph. D. Thesis, University of Paris X-Nanterre, Nanterre.

TRINKAUS, E.; ZILHÃO, J.; DUARTE, C. (2001) - O menino do Lapedo. Lagar Velho 1 and perception of the Neandertals. *Archaeological Dialogues*. Leiden. 8:1, p. 49-69.

VALOCH, K. (1990) - La Moravie il y a 40 000 ans. In FARIZY, C., ed. - *Paléolithique moyen récent et Paléolithique supérieur ancien en Europe*. Nemours: Musée de Préhistoire d'Île de France, p. 115-124.

WOLPOFF, M. H. (1998) - Multiregional evolution and modern human origins. In OMOTO K.; TOBIAS, P. V., eds. - *The origins and past of modern humans: towards reconciliation, Kyoto, Japan, 21-23 March, 1996*. Singapore-London: World Scientific Publishing (Recent Advances in Human Biology; 3), p. 91-105.

ZILHÃO, J.; D'ERRICO, F. (1999) - The chronology and taphonomy of the earliest Aurignacian and its implications for the understanding of Neandertal extinction. *Journal of World Prehistory*. New York, NY. 13:1, p. 1-68.

The Aurignacian of the Caucasus

MARCEL OTTE

ABSTRACT The presence of the Aurignacian in the Caucasus is part of the transition and expansion from the Zagros Mountains toward the Crimea and Eastern Europe.

Importance of the region

The occupations at the many archaeological sites found in this mountainous region, intermediate between Asia and Europe, establish cultural relationships with Anatolia, the Zagros and the Crimea (Fig. 1).

In addition to the abundance of sites, the Paleolithic of the Caucasus has been the subject of excavations since the beginning of the 20th century that contributes to the regional history (Nioradzé and Otte, 2000). Still more recently, new fieldwork has been undertaken by an international team directed by Ofer Bar-Yosef (Tushabramishvili et al., 1999). This research will certainly shed light on the characteristics of the Georgian Paleolithic and the different forms of development which occurred. The prehistory of Europe is thus linked to this terrestrial passage joining the Near East to eastern Europe.

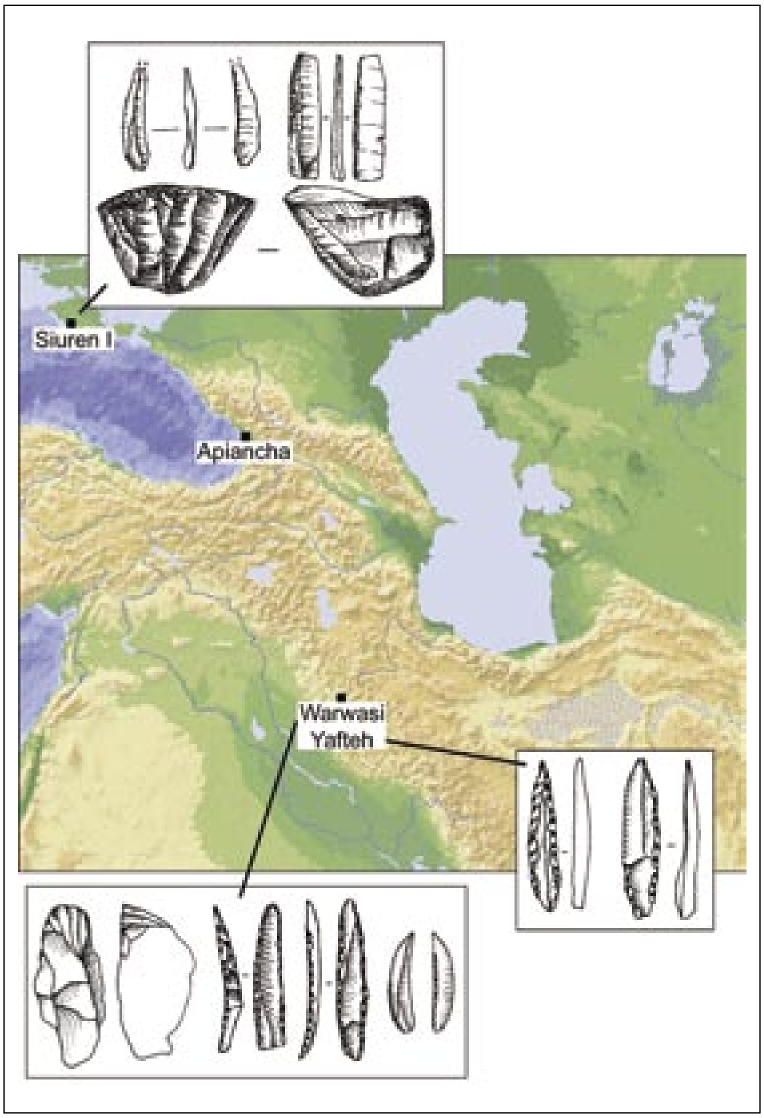

FIG. 1 – Map indicating locations of Siuren I (Crimea), Apiancha (Georgia), Warwasi and Yafteh (Iran) (artifacts of Siuren I after Demidenko et al., 1998; artifacts of Warwasi and Yafteh, drawings by M. Otte).

Situation

The privileged location of this region was further accentuated during glacial periods and the global decrease in sea levels. The Caspian Sea was smaller and the Azov Sea was dry, permitting easy passage from the Caucasus chain to the hills of southern Crimea where Paleolithic sites are also abundant (Demidenko et al., 1998).

From the eastern side, the Caucasian chain follows the large hilly region of eastern Anatolia, then the long Zagros chain, to the confines of Afghanistan. This "nuclear region" has not yet been studied in detail, but pioneer research has demonstrated its inestimable importance for understanding the Eurasian Paleolithic as a whole (Hole and Flannery, 1967; Olzsewski and Dibble, 1994).

Research is aimed at understanding the "marginal" effects at the eastern edge of Europe and the subsequent changes which occurred, for which research in the Caucasian regions gains a crucial importance.

Style

Regardless of the origin of the modern human population in Europe, this population appears to be clearly associated with a group of technological processes corresponding to cultural traditions of the human groups who transported them. It should thus be possible to use stylistic arguments to trace the migration routes back to a region of origin: this is the only method available to the archaeologist and art historian. Not a single lithic artifact in Africa can be attributed to the Aurignacian, which is associated with modern humans in Europe.

Quite logically, therefore, the tool styles should serve to guide us across space in order to reconstruct migration routes, much as one can trace the advance of Roman armies or Germanic peoples by the material evidence.

Certain Paleolithic assemblages in Georgia have obvious associations with the European notion of the Aurignacian, associated at three sites with remains of modern humans (Cro-Magnon, Vogelherd and Mladeč).

Sites

Among the collections that we had the privilege to study, due to the generosity of Medea Nioradzé and David Lordkipanidze, diagnostic characteristics of the Aurignacian can be found.

For example, Samerzchle Klde contains an industry produced on thick blades and flakes with retouch evoking Aurignacian techniques: semi-abrupt retouch on the lateral edges of blades and bladelet retouch on burins and endscrapers (Fig. 2). Further, the bone industry, beginning in Europe with the Aurignacian, is also represented in abundance (Fig. 3). This new relationship between humans and nature breaks radically with Mousterian traditions and is integrated within a new and irreversible behavior. Tools used for hunting are made on the materials that were originally the defenses of the animals themselves, such as cervid antlers. Form, spirit, technique: all invoke the Aurignacian traditions that would eventually extend across all of Europe.

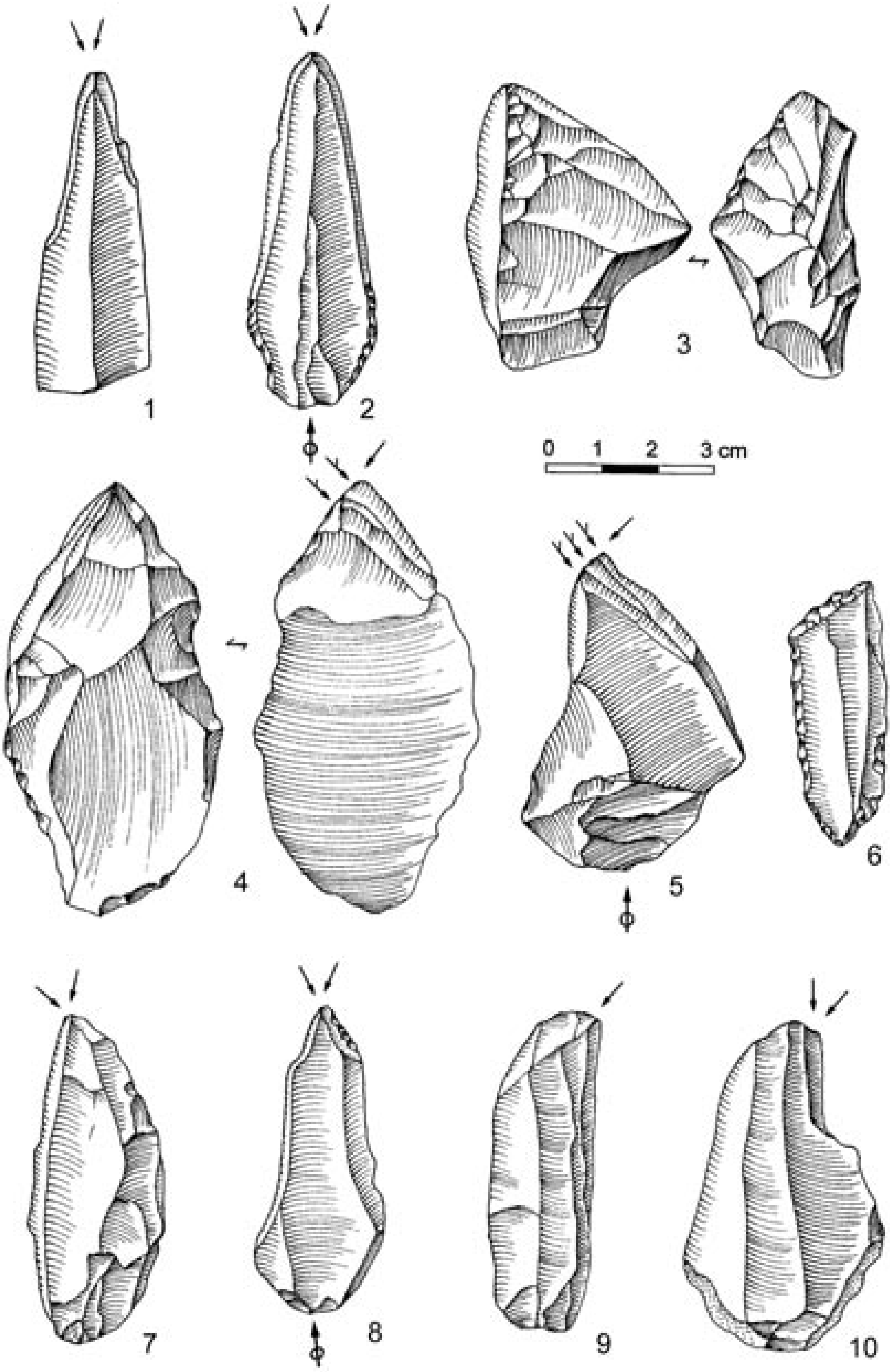

FIG. 2 – Samerzchle Klde. 1-2, 7-10. dihedral burins; 3-5. carinated burins; 6. truncated blade (after Nioradzé and Otte, 2000).

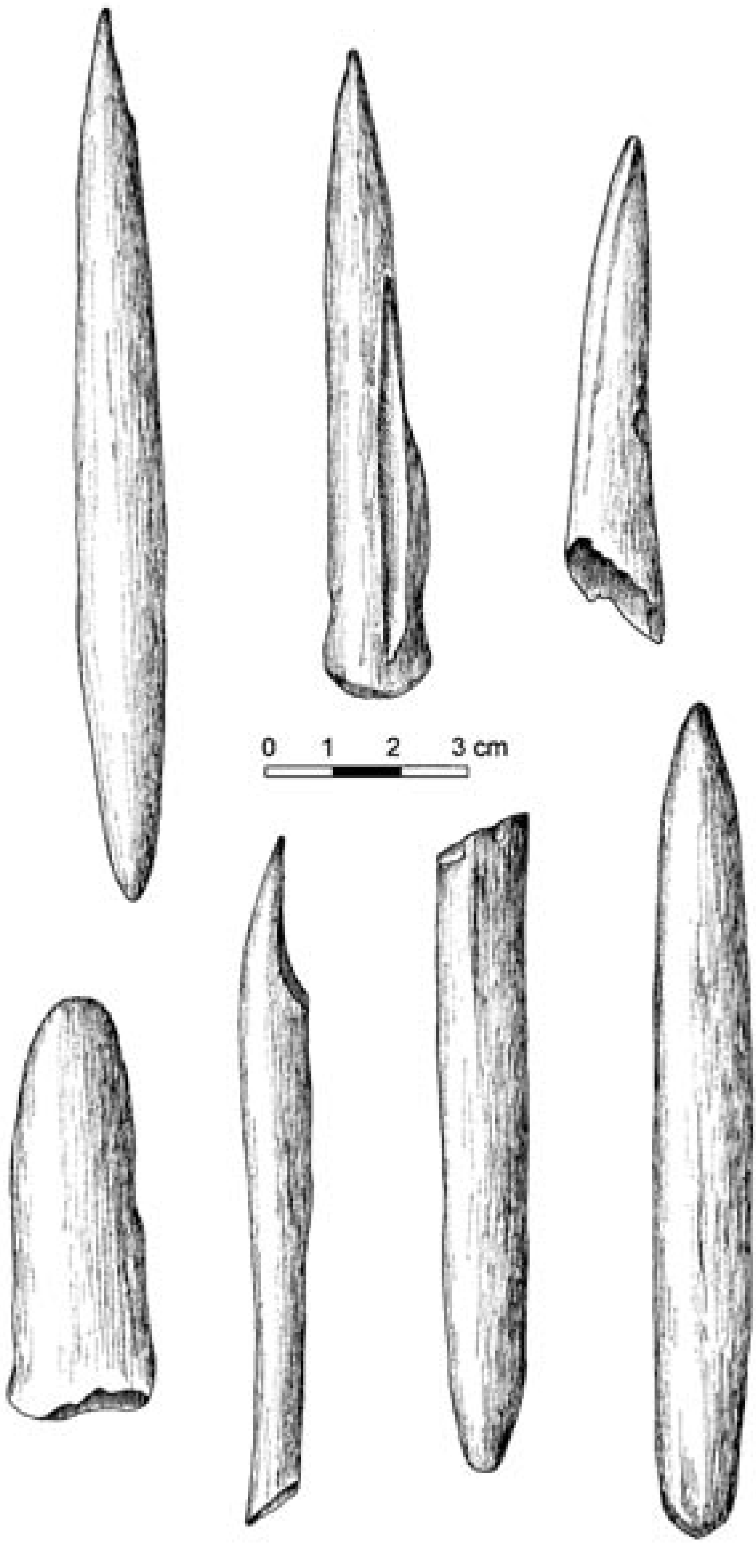

FIG. 3 – Samerzchle Klde. Awls and sagaie points with massive bases (after Nioradzé and Otte, 2000).

Among other evidence (Nioradzé and Otte, 2000), the assemblage of stratum III at Ortvala Klde (Fig. 4) also demonstrates technological and stylistic criteria of the Aurignacian, including carinated burins and a shaped bone point, found in early excavations. Recent excavations have yielded a transitional level, from the Mousterian to the Upper Paleolithic, which could correspond to this facies of the Aurignacian in the Caucasus (Tushabramishvili et al., 1999). It appears that the oldest typical Aurignacian characteristics are found in this mountainous region, from Iran to Georgia. Here also, more fieldwork should be done in order to understand the mechanisms of this transformation.

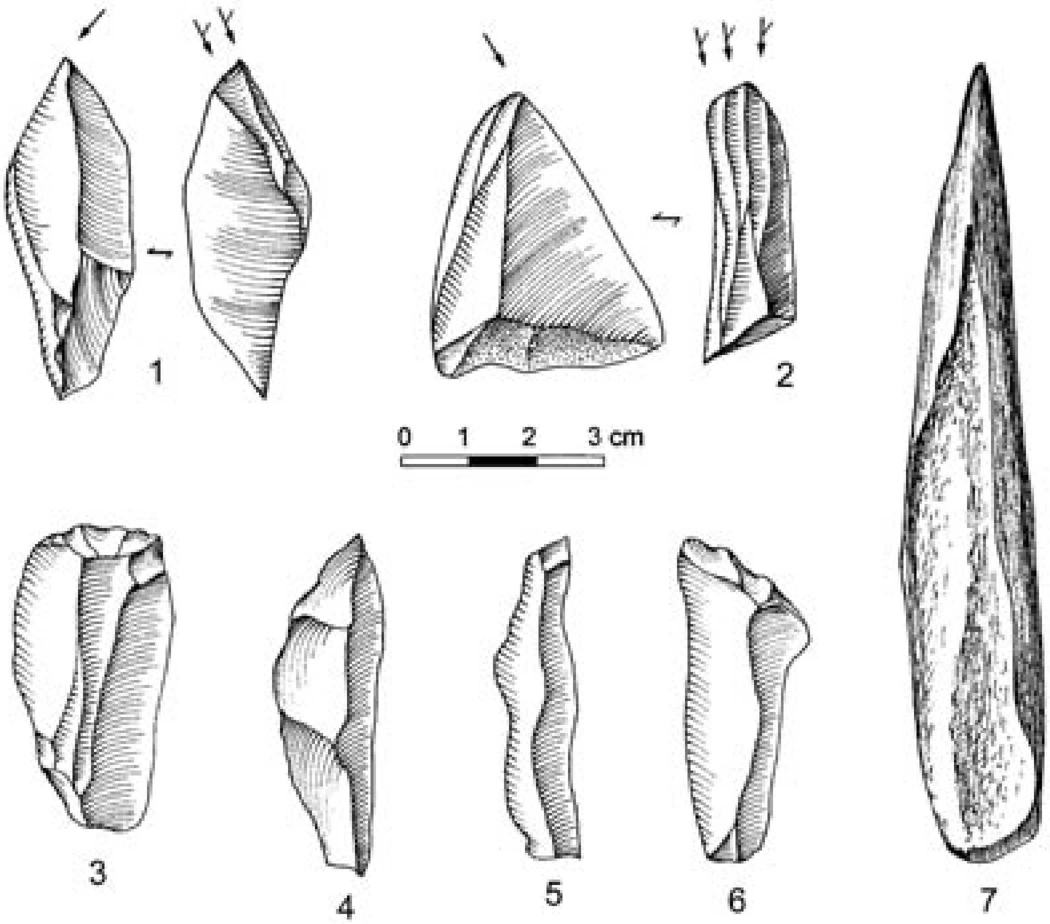

FIG. 4 – Ortvala Klde, stratum III. 1. dihedral burin; 2. carinated burin; 3. endscraper on blade; 4-5. blades; 6. truncated blade; 7. awl (after Niorazdzé and Otte, 2000).

The most substantial documentation, but as yet poorly known, comes from the site of Apiancha in Abkhazia (western Georgia), excavated by Madame Tsereteli (1988). This region has yielded other assemblages in the same style, but remains unknown due to difficulty of access to the collections. We are grateful to Madame Tsereteli to have been able to study the Apiancha material and we reproduce here some drawings from her publications (redrawn by Yvette Paquay, Figs. 5-6). The industry is laminar as well as on thick flakes, there are Mousterian elements, curved lamellar retouch is used on burins and endscrapers, and bone tools and pendants (which often serve to convince the most skeptical...; Fig. 6, no. 6) are present. A radiocarbon date places this assemblage at 32 000 BP, corresponding to the expected chronological range. Additional dates would be useful to confirm this interpretation.

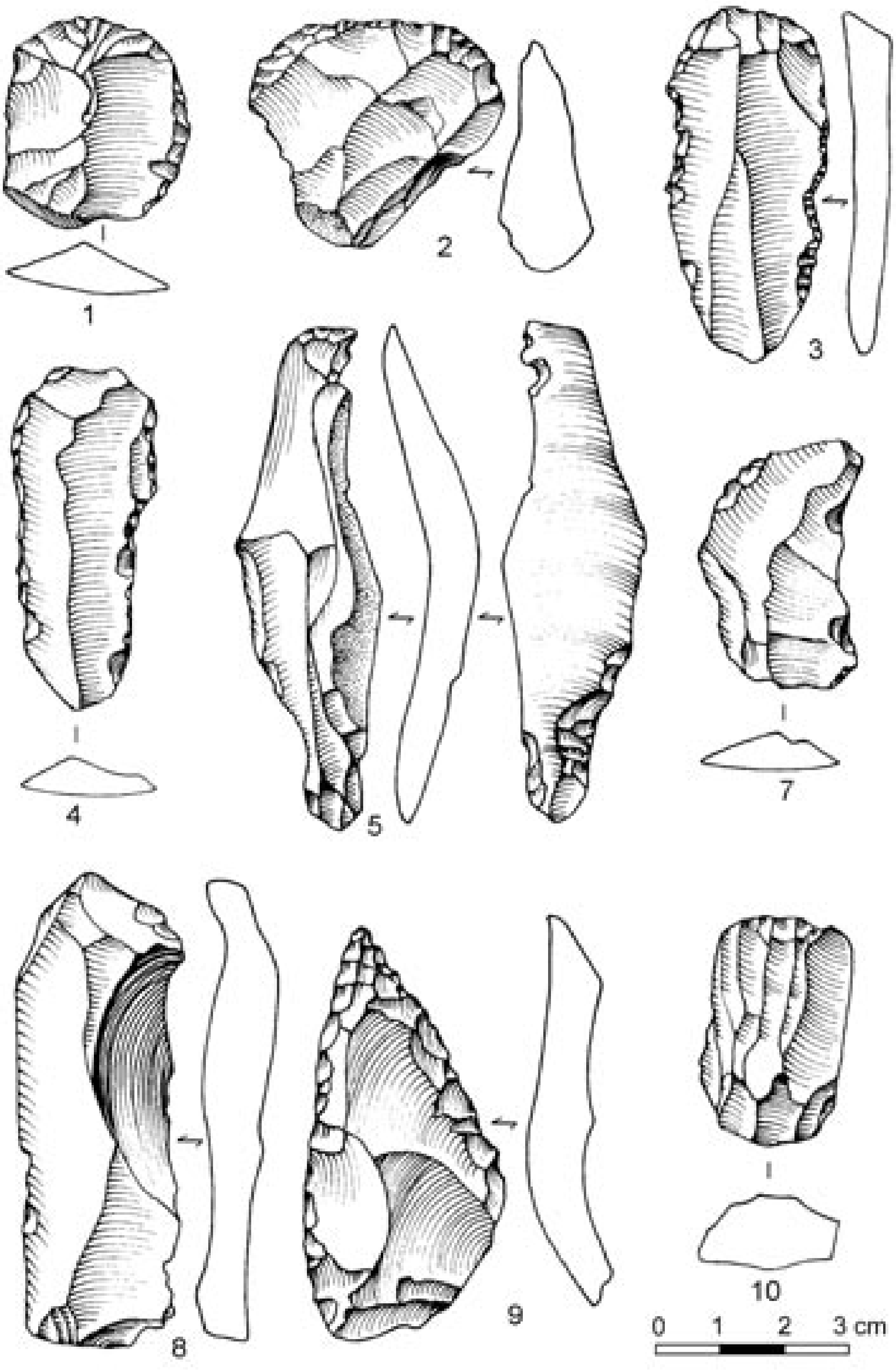

FIG. 5 – Apiancha. Lithic industry (redrawn after Tsereteli, 1988).

Between West and East

Following the northern coast of the Black Sea, Aurignacian sites are known in the Crimea, often established in similar hilly landscapes (Demidenko et al., 1998). In southern Ukraine and Moldavia, technological and typological elements as well as radiometric dates confirm the Aurignacian attribution.

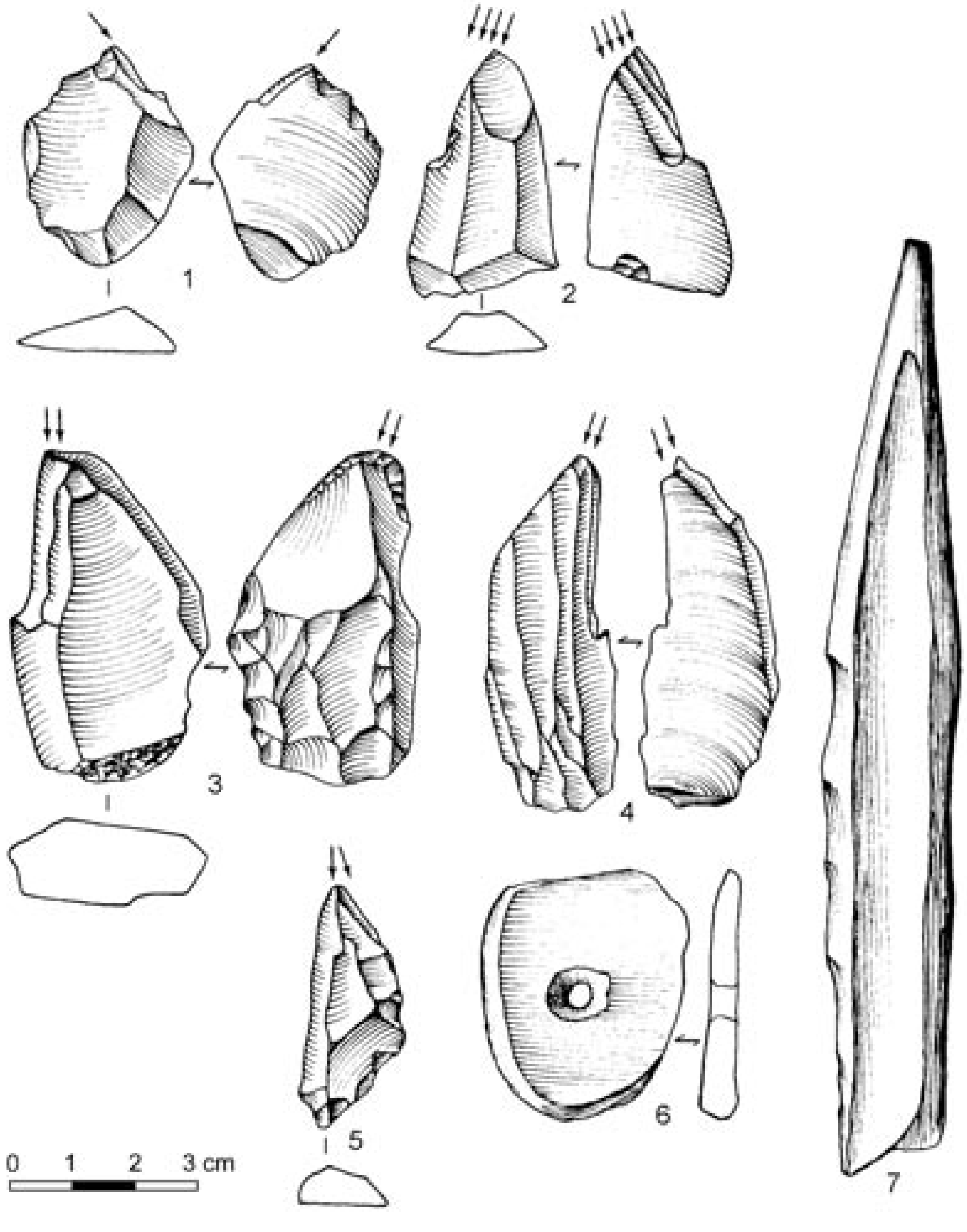

FIG. 6 – Apiancha. Lithic industry (redrawn after Tsereteli, 1988).

The most important center on this axis of diffusion is formed by the Zagros Mountains, the veritable "birthplace" of ethnic and cultural diffusion. A broad concentration of Aurignacian sites can be clearly observed here (Hole and Flannery, 1967; Olszewski and Dibble, 1994) with sometimes quite early radiocarbon dates, such as 40 000 BP at Yafteh. The territory is immense and the sites abundant, but excavations in this region are still limited.

Georgia seems to constitute a natural passage for the Aurignacian, from the Asian center towards eastern Europe (the Crimea, the Ukraine, and Moldavia).

Moreover, due to its favorable geographic position, Anatolia must have also constituted an intermediary territory. Evidence of the Aurignacian is known near Antalya, but the southern coast of the Black Sea would have been a more natural territory for migration. The as yet unexplored caves of the Trebizonde region could thus be part of a relay towards Balkan Aurignacian sites (Greece and Bulgaria). The passage through the Caucasian region could explain the apparently abrupt appearance in eastern Europe of both modern humans and new behaviors associated with the Aurignacian.

REFERENCES

DEMIDENKO, Y. E.; CHABAI, V. P.; OTTE, M.; YEVTUSHENKO, Al. I.; TATARTSEV, S. V. (1998) - Siuren-I, an Aurignacian site in the Crimea (the investigations of the 1994-1996 field seasons). In OTTE, M., ed. - *Préhistoire d'Anatolie. Genèse de deux mondes. Actes du colloque international de Liège, 28 avril-3 mai 1997*. Vol. I, Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 85), p. 367-413.

HOLE, F.; FLANNERY, K. V. (1967) - The prehistory of Southwestern Iran: a preliminary report. *Proceedings of the Prehistoric Society*. London. 38, p. 147-206.

NIORADZÉ, M.; OTTE, M. (2000) - Paléolithique supérieur de Géorgie. *L'Anthropologie*. Paris. 104:2, p. 265-300.

OLZSEWSKI, D. I.; DIBBLE H. L. (1994) - The Zagros Aurignacian. *Current Anthropology*. Chicago, IL. 35, p. 68-75.

TSERETELI, L. D. (1988) - Le peuplement ancien de la vallée de Kodori. In KOZŁOWSKI, J. K., ed. - *L'Homme de Néandertal, vol. 8, La mutation, Actes du colloque international de Liège (4-7 décembre 1986)*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 35), p. 211-224.

TUSHABRAMISHVILI, N.; LORDKIPANIDZE, D.; VEKUA, A.; TVALCHERLIDZE, M.; MUSKHELISHVILI, A.; ADLER, D. (1999) - The Palaeolithic rock-shelter of Ortvale klde, Imereti region, the Georgian Republic. *Préhistoire Européenne*. Liège. 15, p. 65-77.

A hard look at the “Levantine Aurignacian”: how real is the taxon?

NIGEL GORING-MORRIS ANNA BELFER-COHEN

ABSTRACT In the last 30 years the Levantine Upper Paleolithic has undergone a gradual process of decoupling the automatic association of the “Upper Paleolithic” with the “Aurignacian”. Nevertheless, there is still a long way to go in acknowledging the wide range of Upper Paleolithic material culture variability present in the region. Otherwise, the taxon “Aurignacian” will continue to represent a veritable *pot-pourri* receptacle incorporating diverse industries whose only common denominator is the fact that they cannot be called something else from amongst the current, rather limited selection of Upper Paleolithic prehistoric entities.

Introduction

Until some 30 years ago all of the Upper Paleolithic occurrences postdating the Middle to Upper Paleolithic transition and predating the Epipaleolithic in the Levant were related in one way or another to various stages of the “Aurignacian” (e.g., Copeland, 1975). In other words, virtually every assemblage recognized (techno-typologically or chronologically) as belonging to the Upper Paleolithic sequence was considered “Aurignacian” *sensu lato*[1] (Fig. 1).

This approach reflected the pioneering research in western Europe, where the earliest Upper Paleolithic industry had been defined as “Aurignacian”. This Aurignacian “package” supposedly involved a change in human types, together with the appearance of evidence for “modern human behavior” (for a history of European research see Davies, 2001). Since the pioneers of Near Eastern prehistoric research were European-trained scholars, it was only natural that they would interpret their research in the Levant within a general Eurocentric paradigmatic framework. Accordingly, they initially reconstructed the Levantine Upper Paleolithic sequence as a unilinear evolution of Aurignacian variants or their local counterparts, the “Antelian” and the “Atlitian” (Garrod, 1953, 1954, 1957; Garrod and Bate, 1937; Neuville, 1934, 1951; Rust, 1950). The search for the familiar (i.e., European) type fossils in the various assemblages was sometimes accompanied by ignoring “new”, (i.e., absent and hence unknown in Europe) lithic elements or associations. Indeed, one can follow Garrod’s growing unease with the situation: “… the small, sharp Font-Yves point, which is the special feature of Upper Paleolithic III [i.e., the Levantine Aurignacian of today], is **hardly known in the West**”. (Garrod, 1953, p. 25, our emphasis). And, furthermore: “… the Upper Paleolithic III represents the stage at which an incoming Aurignacian group made contact with the natives, adopting and developing the Font-Yves point, which was missing from their original tool-kit, and which in any case rather soon went out of fashion again” (idem, p. 33).

Actually, it is quite obvious that, from the very beginning of systematic research, differences were observed between the local Levantine Upper Paleolithic industries and the Aurignacian of western Europe, i.e. the “classic” French Aurignacian. One can but blame the underlying Eurocentric attitude, and the attendant umbilical cord (i.e., “Aurignacian” = “Upper Paleolithic”)

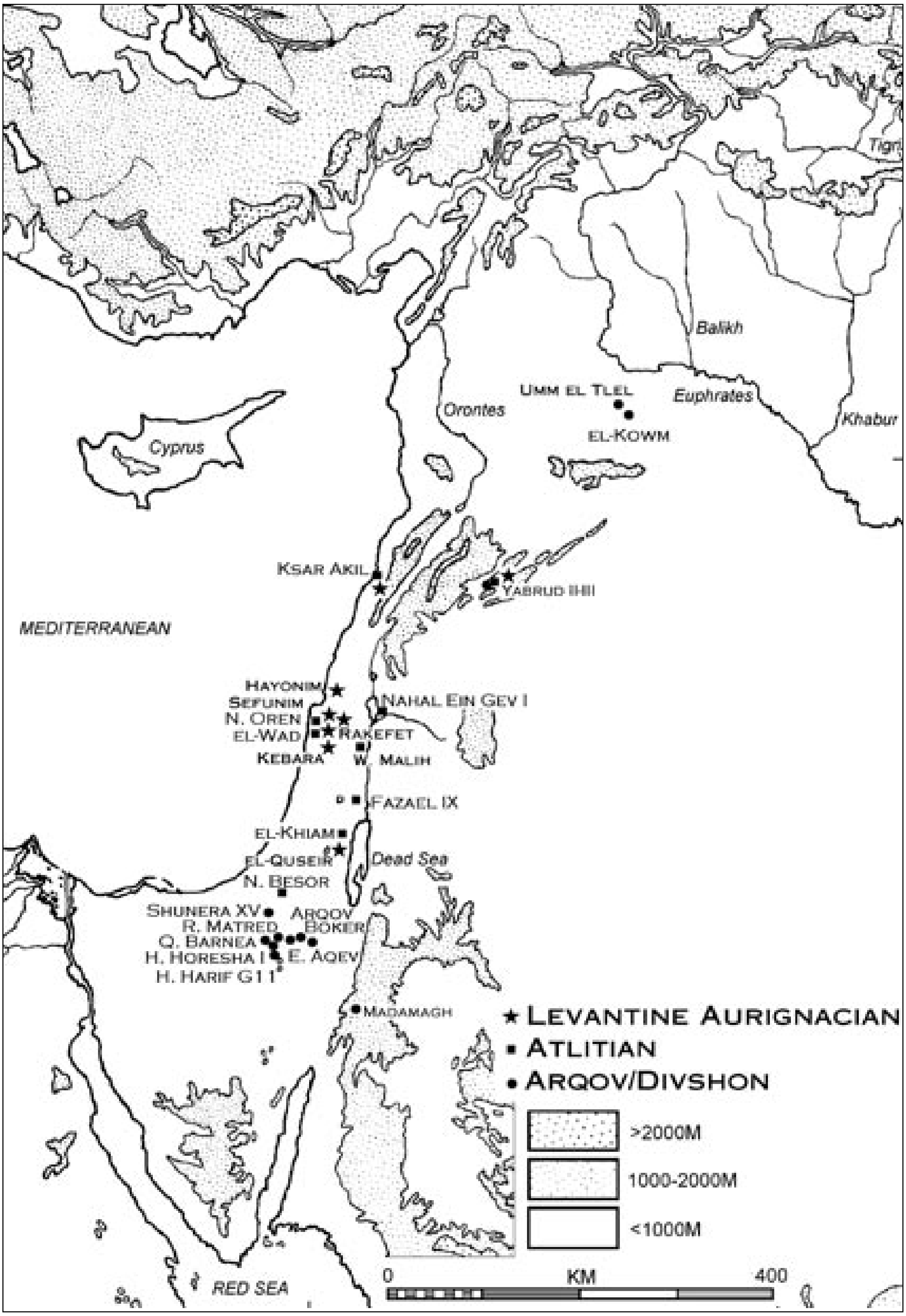

FIG. 1 – Map of the Levant showing the location of Levantine Aurignacian, Atlitian and "Arqov/Divshon" sites.

of Garrod and Neuville that, while seeing the differences, could not resist the attraction of familiar terms — and thus their adherence to the "Aurignacian-of-a-kind". This invoked the implicit "excuses" of Neuville's use of "phases" instead of "named cultures", together with Garrod's later substitution of the terms "Antelian" and "Atlitian" for "Aurignacian".

Some order was brought to bear in 1968, when it was decided to incorporate all pre-Last Glacial Maximum (LGM) Upper Paleolithic variants in the Levant under the term "**Levantine** Aurignacian", enumerating the specifics of its particular characteristics. This enabled Copeland (1975), while describing the Lebanese sequence, to largely revert to Garrod's original terminology (albeit with minor modifications), so that the "Levantine Aurignacian A", "B" and "C" now replaced "Antelian I", "Antelian II" and "Atlitian" (and see discussion below).

Nevertheless, and notwithstanding the subsequent definition of a quite separate and distinct strand (see below), the problem of the automatic association and coupling of the Early Upper Paleolithic with "Aurignacian" still hovers today over much of Europe and the Near East. Recent examples of the latter include, among others, assemblages from Üçağızlı (Turkey) and Umm el Tlel (Syria) (for Üçağızlı, see Minzoni-Deroche, 1992; Minzoni-Deroche et al., 1995; Kuhn et al., 1999, 2003; and for Umm el Tlel, Boëda, personal communication; Boëda and Muhesen, 1993; Ploux, 1998; Ploux and Soriano, 2003).

"Problematic" assemblages that did not conform to this rigid formula of having at least some of the "classic" Aurignacian characteristics simply went unacknowledged, a case in point being the Qafzeh Upper Paleolithic assemblages, which were briefly described (albeit in distinctly neutral terms) some 16 years after the excavations took place (Neuville, 1951). Today, there is no doubt whatsoever that Qafzeh should be assigned to the Early Ahmarian (Bar-Yosef and Belfer-Cohen, 2004; and see also Ronen and Vandermeersch, 1972).

Nonetheless, through time, the model of the Upper Paleolithic sequence in the Levant underwent changes in accordance with new findings and improved dating options (see overview in Belfer-Cohen and Goring-Morris, 2003). Thus intensive research in the 1960s resulted in the separation of the latest Upper Paleolithic phase (VI) of Neuville (1934) into a distinctive time/culture unit, namely the Epipaleolithic Kebaran entity (Perrot, 1968; Bar-Yosef, 1970). Still later it was finally acknowledged that there was at least one other Upper Paleolithic phylum (besides the Aurignacian) present in the Levant (Gilead, 1981; Marks, 1981). This was assigned the name "Ahmarian", and was accepted by all and sundry to be widespread and to postdate the initial stages of the Upper Paleolithic[2] (Fig. 2).

Still, while the later recognition of the "Ahmarian" entity was a progressive stage in the development of a conceptual framework, the means and methodology offered to differentiate between this seemingly "new" entity and the "old" Aurignacian were totally confusing[3]. From 1981 onward the entire Levantine Upper Palaeolithic was divided into two general camps. In consequence the fuzzy, problematic definition of the Levantine Aurignacian led to the taxon being assigned the role of a 'waste basket' of sorts, whereby virtually every Upper Palaeolithic assemblage that did not display obvious and clear-cut 'Ahmarian' characteristics (i.e., an overwhelming blade/let component) was relegated to the 'Aurignacian' (e.g. see Coinman and Henry, 1995). Even hard-core defenders of the bi-partite, contemporaneous traditions (i.e., 'Ahmarian' and 'Levantine Aurignacian') had to acknowledge that the facies and phases observed within the Levantine Aurignacian differ more strongly among themselves than those pertaining to the Ahmarian sensu lato (Gilead, 1991; Marks 2003, and references therein). Indeed recent studies (e.g., Williams, 2003a) of assemblages attributed to the 'Levantine Aurignacian' complex resulted in new insights, including the division of those assemblages into distinct and separate industrial complexes.

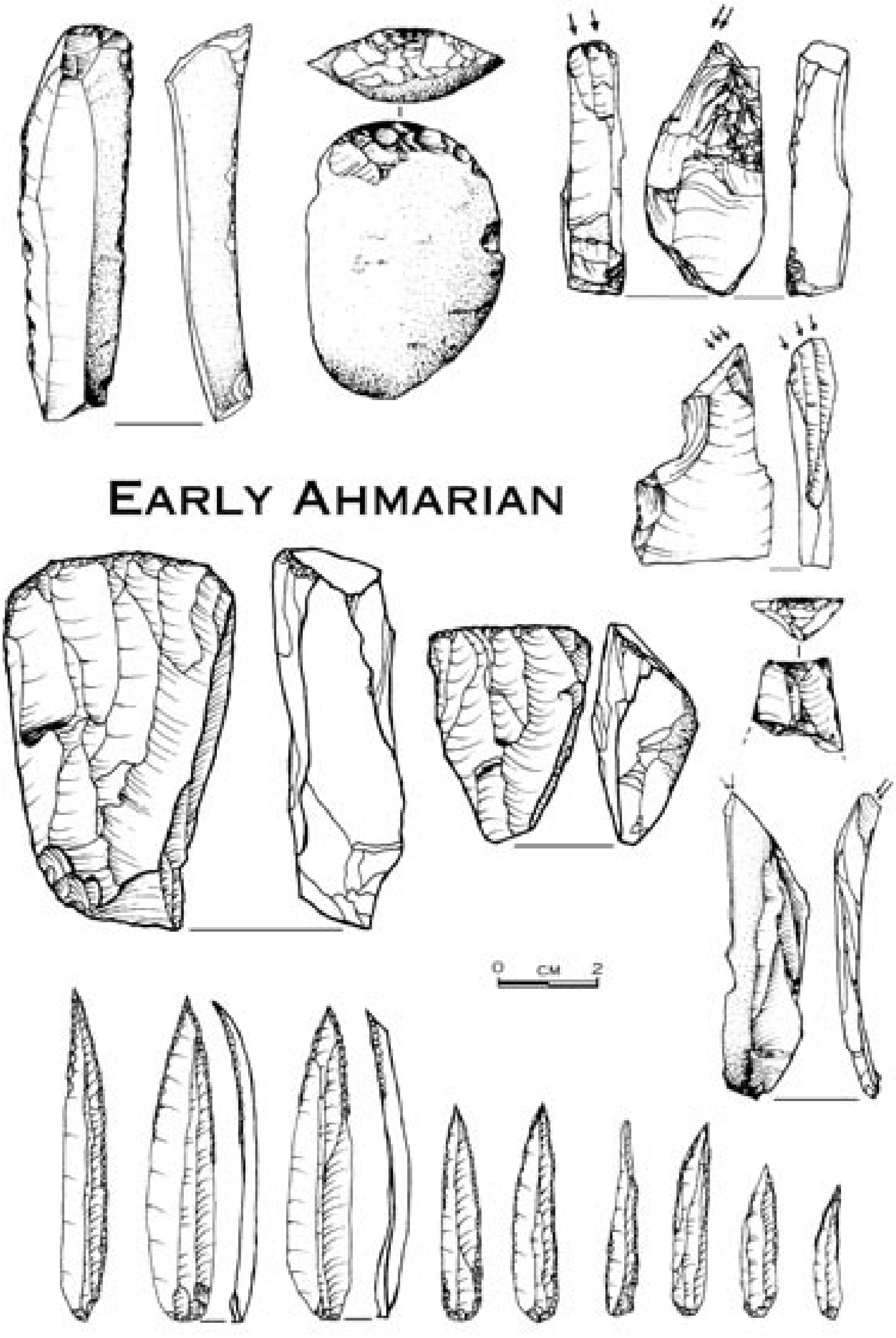

FIG. 2 – A typical Early Ahmarian lithic assemblage. Single platform narrow fronted cores, cortical endscrapers, dihedral burins, truncated blade, el-Wad points, pointed retouched bladelets.

In considering all of the above we shall confine ourselves in the present article to those issues pertaining to the central, main bulk of the pre-LGM Upper Paleolithic sequence in the Levant, namely the Ahmarian/Aurignacian conundrum. Reference will be made to the Middle Paleolithic/Upper Paleolithic transition, the Initial Upper Paleolithic (IUP), or the final stages of the Upper Paleolithic only when the cultural entities pertaining to those time slots are relevant to the main topic of the present discussion.

The Aurignacian/Ahmarian conundrum

The intensive research efforts in the Levant since the beginning of the 1970s have focused primarily upon its arid margins. They have provided a wealth of basic data concerning the Upper Paleolithic (see papers and references in Goring-Morris and Belfer-Cohen, 2003). These studies triggered reconsideration of the previously accepted traditional unilinear developments. In consequence the dichotomy of parallel phyla (or the two-tradition) model was proposed, whereby blade/let-oriented assemblages were defined as "Ahmarian", in contrast to the supposedly flake-oriented "Aurignacian" (and see above)[4]. That model has been widely accepted and adopted by most researchers working throughout the Levant, albeit with various modifications, through to the present (e.g., Boëda and Muhesen, 1993; Coinman, 1990, 1998, 2003; Coinman and Henry, 1995; Kerry, 2000; Ploux, 1998; Ploux and Soriano, 2003).

In its most recent manifestation the relevant terminology has been modified to define the "Leptolithic lineage" that incorporates the Ahmarian, which has currently been downgraded to the status of an industry forming but one of "... at least, four distinct (Upper Paleolithic) industries and one complex of related industries during the Epipaleolithic" (Marks, 2003, p. 253). The duration of the Levantine "Leptolithic lineage" thus stretches from the transitional (MP/UP) Emiran right through to the onset of the Late Epipaleolithic Natufian. This Leptolithic lineage comprises:

1. Emiran;
2. An as yet unnamed industry beginning in Boker Tachtit 4 and passing unto;
3. The Early Ahmarian;
4. The Late Ahmarian or the Masraqan;
5. The Pre-Natufian Epipaleolithic complex.

The Early Ahmarian is actually subdivided into two phases, comprising two geographic facies:

1) "Early Ahmarian southern facies" (Negev, Jordan and Sinai), with early (ca. 37-30 000 BP) and late (ca.27-25 000 BP) "sub-phases".
2) "Early Ahmarian northern facies" (northern Levant — Ksar Akil, Üçağızlı, Umm el Tlel and Qafzeh).

Similarly, the Aurignacian has also been downgraded to become an industry, "... with possibly two phases and two facies" (Marks, 2003, p. 251), which unfortunately are not detailed in that text. Another subdivision of what was previously called Levantine Aurignacian *sensu lato* is offered by Williams (2003a, 2000b) incorporating three distinct entities (or, according to Williams, "cultural groups"). These are:

1) The so-called "Noncarinated Flake-Blade-Scraper" variety, the only one that actually retains the designation as "Levantine Aurignacian" (Williams, personal communication).
2) A "Carinated" variety incorporating most of the assemblages previously assigned to the southern facies of the Levantine Aurignacian (e.g., Gilead, 1991). It is of interest to note that similar assemblages are reported from Umm el Tlel, where they are considered as the "non-classical Aurignacian facies of Umm el Tlel sect - 2" (Ploux and Soriano, 2003).
3) And the "Noncarinated Flake-Burin" (or "Lisanian" [= "Atlitian" in our parlance; see Belfer-Cohen et al., 2004]) entity which comprises assemblages that had previously been incorporated within the last stage of the Levantine Aurignacian (i.e., Levantine Aurignacian C of Copeland, 1975).

It is of interest to note that Marks (2003) does not define most of the phases he recognizes (both within the "Leptolithic" lineage and the "Aurignacian") as "cultures" in the archeological sense, although he does recognize the term. But, by contrast, those who do use the option of facies (= cultures) are Ploux and Soriano (2003) in their recent publication of portions of the Upper Paleolithic sequence at Umm el Tlel.

The chronological span of the Levantine Aurignacian as now defined (i.e., Williams' "Noncarinated Flake-Blade-Scraper") is in consequence now accepted to be considerably shorter than previously suggested — from a maximum duration of ca.36 000 to 17 500 BP, to a shorter range from ca.34 000-27 000 BP at the very most (see Marks, 2003, p. 256).

Levantine Aurignacian, the 2004 version

Indeed it seems that at long last there is a widespread consensus that the term 'Aurignacian' *sensu stricto* is applicable to only a limited number of Levantine assemblages amongst those generally assigned to the non-Ahmarian complex, i.e., the supposedly flake-oriented and, hence, non-blade/let-oriented entities (Marks, 2003; Williams, 2003a, 2003b; and, to a degree, even Gilead, 1991). This was the position argued from the very beginning of this polemic by Ofer Bar-Yosef and ourselves (e.g., Bar-Yosef and Belfer-Cohen, 1996; Belfer-Cohen and Bar-Yosef, 1999; Belfer-Cohen and Goring-Morris, 1986, 2003a, 2003b and references therein). These assemblages are the only ones that exhibit those 'classic' Aurignacian characteristics as defined in the literature (Fig. 3 and see below)[5].

There is still the problem of chronological continuity: the Ahmarian can be seen as a long sequence with geographical and temporal variations, while the flake-oriented industries and the classic "Levantine Aurignacian" assemblages are more difficult to interpret (as to their origins, temporal evolution, interrelationships, etc.). The 15 m thick Upper Paleolithic sequence of Ksar Akil, considered as the most complete record of late and terminal Pleistocene developments is still used as a "benchmark" in every discussion of Levantine Upper Paleolithic evolution (Copeland, 1975; and references in Belfer-Cohen and Goring-Morris, 2003). Yet, when re-checking this sequence, it seems that, instead of a straightforward linear development encompassing a short Aurignacian stage against the backdrop of a broad Ahmarian developmental sequence, we face a series of discrete occupation episodes; some are continuous, but sometimes there are clear indications of discontinuity (see also Bergman, 2003). In consequence, within the Ksar Akil sequence one can distinguish the presence of:

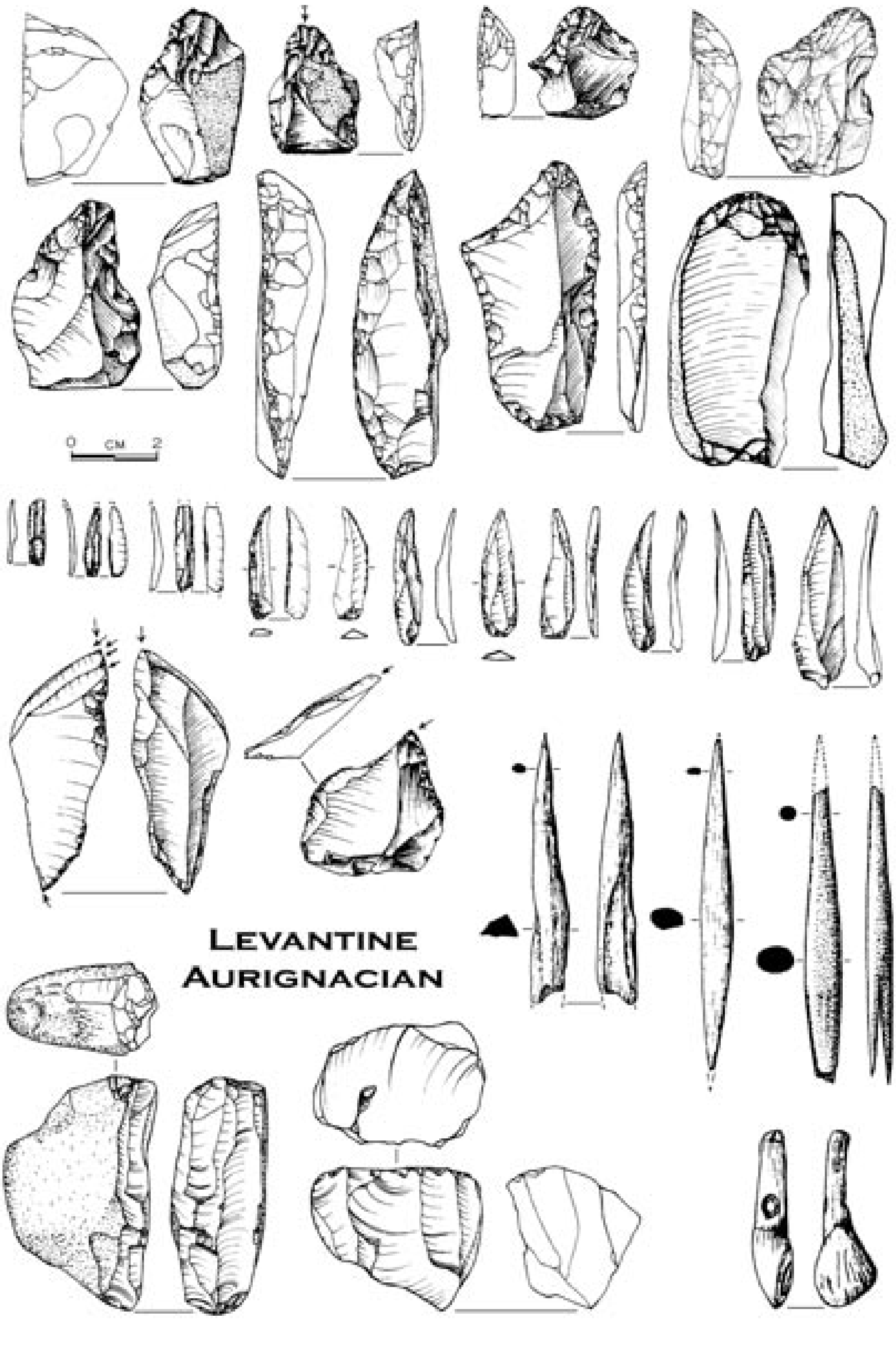

FIG. 3 – A typical Levantine Aurignacian assemblage. Cores (opposed platform blade and single platform varieties), broad shouldered and nosed carinated scrapers, endscrapers, Aurignacian retouched blade, dihedral and truncation burins, Dufour bladelets (some twisted, some incurvate), and (small) el-Wad points. Bone tools include a point/awl, a bipoint (on antler), and a split base point (also on antler), and perforated and polished bovid tooth pendant.

1) A transitional (MP/UP) entity ("Ksar Akil Phase A", XXV-XXI).
2) A heavy duty initial UP blade industry which evolves (at least judging by the incremental nature of the appearance of techno-typological features) into an Early Ahmarian facies ("Ksar Akil Phase B", XXI-XV).
3) Assemblages comprising both Aurignacian and Ahmarian elements, as well as unique characteristics such as twisted blade/bladelets (formerly called "Levantine Aurignacian A", XIII-IX).
4) Classic Aurignacian levels ("Levantine Aurignacian B", VIII-VII).
5) As well as later UP levels predating the (LGM) Early Epipaleolithic ("Levantine Aurignacian C", VI-IV; and more research is underway, see references in Belfer-Cohen and Goring-Morris, 2003a).

It should be pointed out that research in Europe has conclusively demonstrated that, techno-typologically the "Aurignacian" is rich in tools on blade and bladelet blanks as well as blade/bladelet cores (e.g., J.-G. Bordes, present volume). By contrast, in the Levant, the local Aurignacian (past and present definitions) was and widely continues to be considered primarily as a flake-based industry (e.g., Gilead, 1981, 1991). Nevertheless, there **are** considerable numbers of blade/lets in those assemblages assigned by us to the Levantine Aurignacian *sensu stricto* (see note 5 and Bar-Yosef and Belfer-Cohen, 1996), which were fashioned into scrapers, burins, retouched blades and bladelets. Thus the Levantine Aurignacian *sensu stricto* actually does correspond in this respect, amongst others, to the Aurignacian in western Europe (see also Williams, 2003a, 2003b).

Also notable is the presence of elaborate and varied bone (and antler) tools in those particular assemblages, though researchers have tended to ignore this particular characteristic in their speculations, claiming that the presence or absence of organic materials is primarily influenced by taphonomic factors (Marks, 2003). Still, this argument was resolved once it became clear that the presence or absence of worked bone and antler in the arid zone assemblages is of lesser importance, since all those lithic assemblages differ significantly in their techno-typological characteristics from those assigned to the Levantine Aurignacian *sensu stricto* (or, in Williams' [2003a, 2003b] unwieldy parlance, termed as the "Noncarinated Flake--Blade-Scraper industry" to add to the confusion, and see below).

Ultimately, the distinctive lithic characteristics of the Levantine Aurignacian *sensu stricto* comprise a dominance of endscrapers and burins, with the prominent presence of thick varieties of both classes (nosed, shouldered, frontal broad carinated, polyhedral), and Aurignacian retouch (Fig. 3). There is also a high percentage of blades among the tool blanks as compared to their percentage in the debitage, some points (including el-Wad types), as well as a moderate percentage of bladelets (especially the Dufour variety — and see discussion below). The latter purportedly derive from a secondary reduction sequence involving the laminar removals that shaped the thick endscrapers/burins/carinated items. Accordingly (and with the introduction of more meticulous excavation procedures and wet sieving the percentage of bladelets rose sharply), it is now argued that most of the thick endscrapers/burins should be considered as cores for the aforementioned bladelets (Chazan, 2001a, 2001b; Lucas, 1997, 1999; and see also the term *nucléus de type "burin caréné plan"* as used by Ploux and Soriano [2003]), an argument that may be resolved only through use-wear studies, if at all).

Most authorities concur with the characteristics enumerated above. Unfortunately though, there are still contentious issues concerning terminology and the differential use of some definitions. Besides the issue of the point class, most especially the el-Wad varieties, there are also the inter-related questions of "carination" per se, and the "Dufour bladelets," which are presumed to derive from the process of carination. It is important to note that, amongst those assemblages that have been assigned at one time or another to the Levantine Aurignacian *sensu lato*, carination (with no discrete specifications) has frequently been considered as a diagnostic feature, whether referring to the carinated items as either cores or tools (compare Figs. 3-5). At the present stage of research, when there is a growing consensus concerning which assemblages should be called Levantine Aurignacian and which should not, a matter to be resolved concerns the differences between narrow, **lateral** carination and the "classic", i.e. **broad**, carination.

Carination

It seems to us that the issue of 'carination' has been a major bone of contention in discussing Levantine Upper Palaeolithic cultural developments and that much confusion has derived from different understandings of the term. In their original definitions and descriptions of carinated items Sonneville-Bordes and Perrot (1954) emphasized **flat** (i.e., broad) carination, together with shouldered and nosed items[6].

As stated above, these carinated items, together with the presence of "Aurignacian" retouch, were amongst the most distinctive Aurignacian features as defined from a primarily (west) European perspective. Assemblages characterized by similar features have been documented in several Levantine sites, including Ksar Akil VII, Yabrud II/3-4, Hayonim D, Sefunim D/8, Rakefet IV, Kebara I-II, and el-Quseir, (Bar-Yosef et al., 1992, 1996; Belfer-Cohen and Bar-Yosef, 1981; Bergman, 1987; Dortch, 1970; Lengyel, personal communication; Perrot, 1955; Ronen, 1984; Rust, 1950). With the addition of Upper Paleolithic assemblages deriving from the more arid regions of the southern and northern Levant (Fig. 1), it was noted that some were dominated by items (*cum* cores) featuring a distinctive and quite different form of lateral carination (Ploux and Soriano's [2003] *nucléus de type "burin caréné plan"*). Nevertheless, since both forms involved carination, usually on flake blanks, all such assemblages were lumped together and united under the banner of the "Levantine Aurignacian tradition" taxon (Gilead, 1981; and see above).

Our point here is that it is by no means proven that "broad" and "lateral" carination should necessarily be viewed as part of the same phenomenon (i.e., *chaîne opératoire*). Indeed, there is actually a tendency for the lateral carinated varieties to converge with some "Ahmarian tradition" assemblages, in that the systematic setting-up of narrow or "N--fronted" cores for bladelet production often results in pieces that superficially resemble laterally carinated items (and see reduction sequence schemes illustrated in Davidzon and Goring-Morris, 2003; Ploux and Soriano, 2003). Carination is also a distinctive feature of many early Epipaleolithic (LGM) entities (e.g., the Kebaran assemblages from Ein Gev, see Bar-Yosef, 1991). All of the above is not simply a somewhat semantic and barren theoretical discussion — for example, in some recent literature those assemblages rich in nosed and frontal carinated endscrapers are assigned to "non-carinated" entities, since the term "carinated" is reserved only for the **lateral** carinated items (e.g., see Williams, 2003a). Accordingly, for the sake of clarity, we urge scholars to adhere to the traditional, well-worn and accepted terminologies, or else to be very specific about shifting and using the same term for different phenomena.

Dufour bladelets

The issue of the Dufour bladelets has implications far beyond the realm of the Aurignacian, since it also relates to the characteristics of bladelet assemblages in later Levantine Upper Paleolithic and Epipaleolithic industries (Belfer-Cohen and Goring-Morris, 2003; and references therein). Still, we confine ourselves herein primarily to their role within Aurignacian assemblages. The definition of Dufour bladelets as provided by Sonneville-Bordes and Perrot (1954, p. 554; their type 90) was actually very broad[7]. Basically, it included **all** bladelets with complete or partial, inverse or obverse, marginal fine or semi-abrupt retouch. These derived from carinated items, yet the twisted profile, per se, was not a criterion for defining an item as a Dufour bladelet.

In practice, in many assemblages where **broad** carination is prevalent, the resulting bladelets commonly tend to be slightly squat and distally convergent. If somewhat offset and detached from around the side of the removal surface they sometimes also have a tendency to be twisted, although this is not a requirement (or indeed even referred to) in the original definition[8].

Research in the Levant from the 1970s onward has documented a series of assemblages featuring large quantities of finely retouched bladelets deriving from narrow-fronted cores and **laterally** carinated items. Many of these bladelets tend to be delicate and elongate, with blunt distal tips and marginal, fine-abrupt through nibbled retouch. For a variety of historical and other reasons comparisons for these assemblages were drawn primarily with sites in North Africa and the Nile Valley, where somewhat similar features had been included within the 'Ouchtata' category (Tixier, 1963; but see also Tixier and Inizan, 1981)[9].

Following these comparisons there has often been a tendency in the Levant to differentiate between:

1. the shorter, convergent and more twisted comma-shaped 'Dufour' bladelets, which often tend to inverse or semi-abrupt retouch, and
2. the elongated nibbled or 'Ouchtata' retouched and/or backed items (see Marks, 1976; Ferring, 1977; Goring-Morris, 1980).

Still, this issue does not appear to have been systematically discussed to date, and it clearly warrants more detailed treatment. In consequence there are few, if any, broadly accepted criteria to distinguish between those bladelets predominant in the flake-oriented industries, from those recovered from within the "N-fronted" Early Ahmarian (and the later Masraqan, i.e., Late Ahmarian) blade/bladelet contexts.

Perhaps, with regards distinctions between Dufour and Ouchtata bladelets in the Levant, at least, we are facing again a conundrum similar to that concerning the el-Wad point, which was initially considered as a hallmark of the Levantine Aurignacian, but which subsequently was discovered to be far more prevalent (and standardized) within the Ahmarian tradition. These are issues that one should at least be aware of...

So, what about those Dufour bladelets exhibiting flat profiles that have been recovered from every Levantine Aurignacian assemblage, e.g., Hayonim D, and Kebara Units I-II (Belfer-Cohen, 1994)? While it is true that there have been *ad hoc* modifications to the original definitions of the Dufour bladelet, we need to be more explicit in our endeavors, in order to avoid finding ourselves on a terminological "merry-go-round".

Concluding remarks

After more than 30 years of dispute there is finally a modicum of consensus that assemblages defined as "Levantine Aurignacian" from the central parts of the northern Levant (i.e. el-Wad E-D; Sefunim 8; Hayonim D; Ksar-Akil VIII-VII) are **unrelated** to other, non-Ahmarian Upper Paleolithic assemblages reported **mainly** from the southern and northern, arid areas of the Levant (but see also the northern assemblages of Ksar Akil XIII-IX) (Marks, 2003; Williams, 2003a, 2003b). It is thus acknowledged that more than two complexes represent the Levantine Upper Paleolithic and that the designation as "Levantine Aurignacian", if one adheres to the original definitions of an Aurignacian entity, should be retained only for the assemblages enumerated above.

Yet there are still basic misunderstandings among the various researchers concerning the nature of non-Ahmarian Upper Paleolithic industries. Prominent are the issues discussed above, namely the definition criteria, the presence/absence of carinated items, and Dufour bladelets.

Thus a recent study by Williams (2003a, b), while largely contributing to the resolution of the conundrum of "not every/every non-Ahmarian assemblage is Levantine Aurignacian" threatens to raise a new point of confusion by calling the Levantine Aurignacian assemblages enumerated above as the "Noncarinated Flake-Blade-Scraper" industry. By doing this he ignores: a) the presence of bladelets in these assemblages; and b) that the original definition of carination applies (mostly! and see above) to **flat frontal** carination.

Moreover, the other non-Ahmarian Upper Paleolithic complex, which he calls the "carinated" variety (e.g. idem, p. 32) is defined as such through the presence of (laterally) carinated items considered by him to be mostly cores and the high percentages of bladelets deduced, not through the numbers of the **actual** items found, but through the counting of remaining scars preserved on the carinated items. These are rather shaky grounds, since one cannot count the scars on the laterally carinated items and consider their number as indicating the actual number of twisted bladelets so-produced, while ignoring the scars on the nosed and frontal carinated endscrapers in the Levantine Aurignacian assemblages! Indeed, an especially notable feature of the entire Umm el Tlel Upper Paleolithic sequence concerns the absolute predominance of bladelets, whether incurvate, straight or twisted, irrespective of cultural attribution (the "Ahmarian", "Aurignacian" or "Late Upper Paleolithic" as defined by Boëda and Muhesen, 1993; Ploux and Soriano, 2003). It is of interest to note that other elements characteristic of the respective entities elsewhere in the Levant ("Aurignacian" retouch, el-Wad points, etc.) seem to be remarkably rare, if not totally absent at Umm el Tlel.

Some can claim that this adherence to semantics, trying to retain the definition of the Aurignacian as strictly and rigidly as possible is petty, since by now everyone is aware of the great variability which probably existed in the past, and one cannot deny that archeologists are actually creating artificial definitions and boundaries whose validity in the "real" past is rather tenuous… Nevertheless, retention of the restricted definitions focuses the contours of the reconstructed past much more sharply, so that the details are highlighted; otherwise why should we bother defining and creating concrete sets of references?

Indeed by adhering to the original definitions of the Aurignacian in the Levant we can more readily observe the fascinating phenomenon of the appearance of a geographically (and chronologically?) limited cluster of assemblages of the classic Aurignacian variety. These are so similar to assemblages from southwest France at the other end of the Mediterranean, that one is tempted to view them literally as well as figuratively having just disembarked from the boat! They appear, "out-of-the-blue", in the midst of other, endemic, Upper Paleolithic lineages (e.g. the Ahmarian) with few, if any, obvious ties to the preceding and succeeding Levantine industries.

Which brings us onto more philosophical grounds — people are still avoiding the thorny question of how come these Levantine Aurignacian assemblages are so similar to those reported from western Europe and, in particular, from the Périgord, France. Researchers are still reticent to acknowledge the existence of discrete groups bound by social and biological ties. Current explanations for the techno-typological differences among cultural groups, presently defined within the Upper Paleolithic chronological framework, are attuned to ecological/environmental circumstances and tend to ignore social issues. Thus Williams (2003a, 2003b) claims that the flaky, lateral carinated assemblages from the arid zone (previously incorporated within the Levantine Aurignacian taxon; see Gilead, 1981 and Marks, 1981) indicate a mobile existence which is advantageous during periods of harsh conditions. Yet, what of the appearance of lateral carination much earlier, in Levels XIII-IX at Ksar Akil, under different environmental circumstances? While one wants to detach oneself as far as possible from the committing terms of "ethos" and "culture", Williams' deliberations lead to the absurd notion that blady "Ahmarians" become carinated "Aurignacians" when the weather changed.

In the past, as now, cultural changes occurred through combinations of slow or rapid acculturation, total replacement, and intrusions from near or afar in addition, of course, to local *in situ* cultural evolution. There is no need to consider all/every local phenomena as representing a point on a progress line. There was most probably a dominant, local archeological lineage (the Ahmarian best fits the ticket). But it seems that all the other Upper Paleolithic entities of one sort or another ultimately represent influxes, intrusions, and pulses from elsewhere of greater or lesser impact, rather than parallel long-term lineages. There has been a tendency to artificially cluster early and later archeological entities into a single lineage (The Levantine Aurignacian). This "tradition" included, besides the few assemblages that genuinely accord with the original Aurignacian definition, a host of other named and un-named entities removed in time (and sometimes space), such as the Arqov/Divshon, the "Atlitian/Lisanian", etc., simply because they were "non-Ahmarian" in nature (Figs. 4-5).

One should bear in mind that the Levant is an open region and that Upper Paleolithic human groups were mobile, and could have wandered following those environmental conditions they were adapted to, joining or splitting off their respective marriage networks.

Upper Paleolithic populations in the Near East were sparse on the ground, and while some were tethered to specific localities, others may have roamed over considerable distances within the region and even beyond (e.g. how to explain the convergence of chamfered items in the Middle to Upper Paleolithic transition both in Lebanon and Cyrenaica?). Perhaps we should view the routes of such dispersions and movements not only by circum-Mediterranean land bridges but also, potentially, by maritime leapfrogging, as is suggested for the terminal Pleistocene and early Holocene (Runnels and van Andel, 1988; Bar-Yosef, 2002a, 2002b).

Thus, we believe, ends the story of the "Levantine Aurignacian" *sensu lato*. Instead of reflecting a long-term local archeological lineage, contemporaneous and competing (?) with the Ahmarian, rather it appears to comprise a *pot-pourri* of unrelated archeological entities that briefly intruded onto the scene. The few "real" Aurignacian assemblages recognized so far were restricted in both time and space, and either quickly moved on to better pastures, died out, or relatively rapidly assimilated with local Ahmarian populations, soon loosing their distinctive attributes. By the time another intrusion occurred (e.g., The Divshon/Arqov entity), the prior Aurignacian pulse was long past and forgotten.

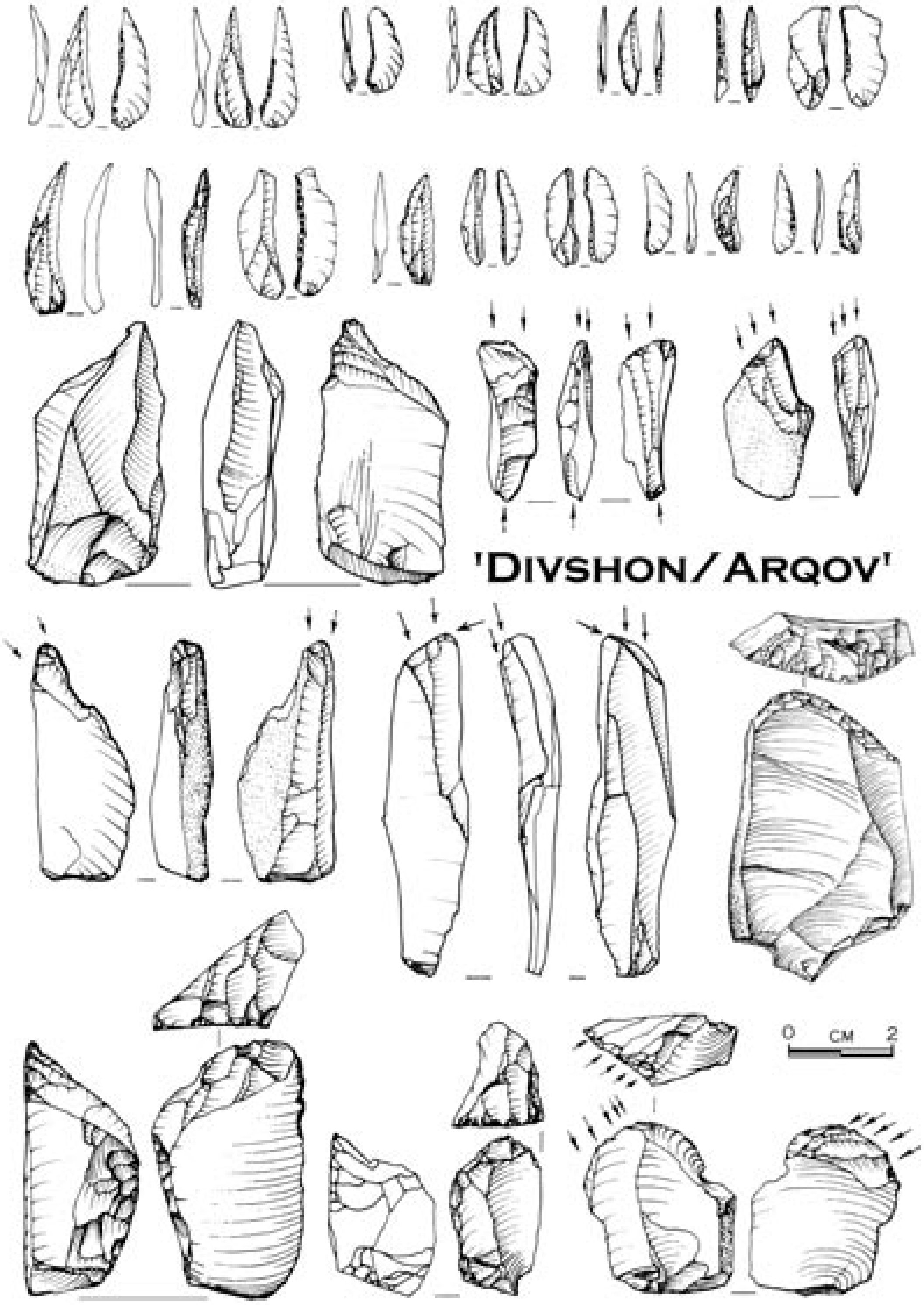

FIG. 4 – A typical “Divshon/Arqov” lithic assemblage. Lateral carinated scraper/burin/cores, endscraper, and Dufour bladelets (most, but not all are twisted).

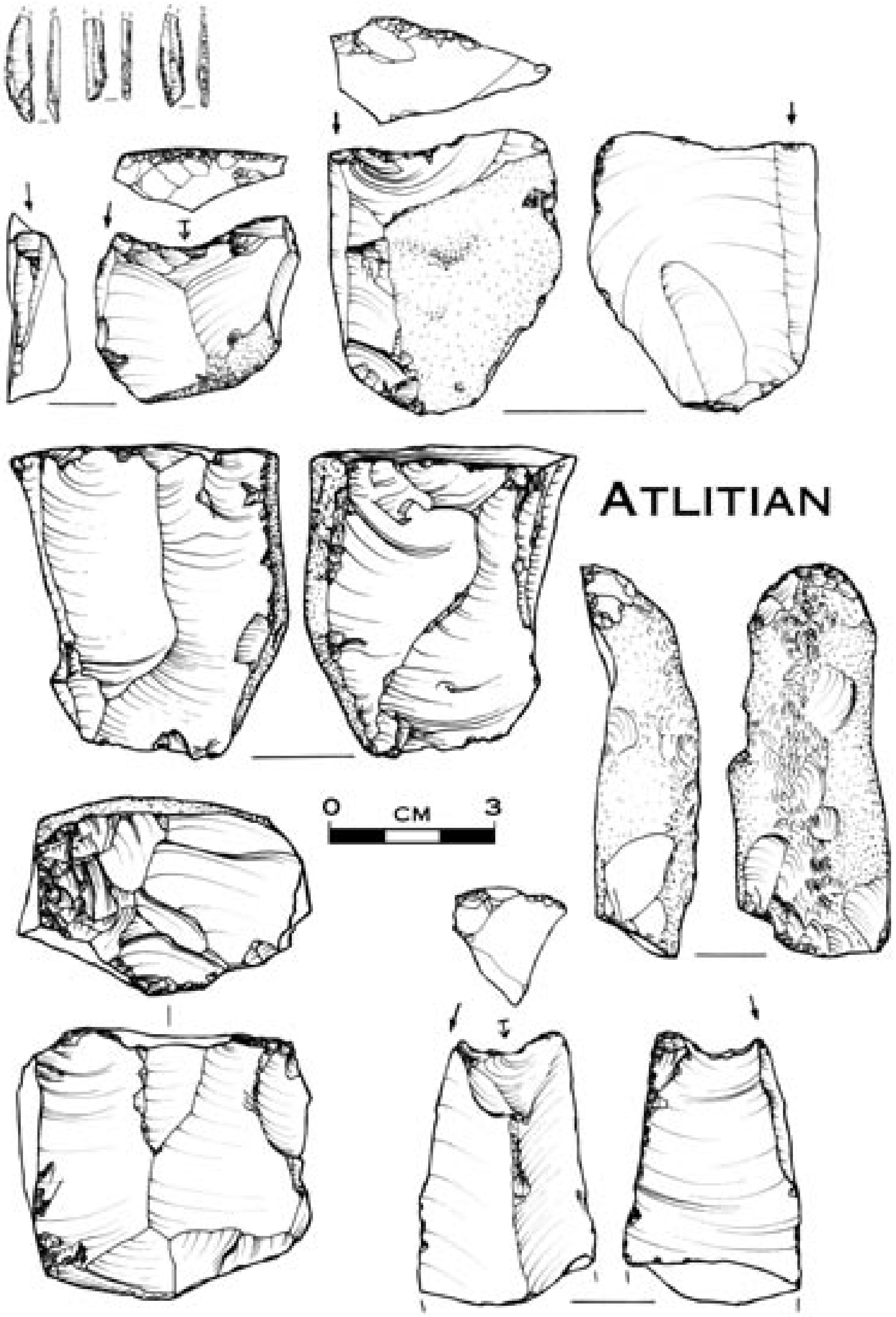

FIG. 5 – A typical “Atlitian” lithic assemblage. Single platform cores for elongated flakes, endscraper (cortical), burins on truncation (often concave Clactonian), backed microliths.

Acknowledgments

We thank Ofer Bar-Yosef and João Zilhão for inviting us to the stimulating symposium in Lisbon in the summer of 2002.

NOTES

1 The observed divergences from the classic European Aurignacian (*e.g.*, a greater emphasis on el-Wad — sic Font Yves — points) were major reasons for using the prefix "Levantine", in much the same manner that modern *Homo sapiens* remains recovered by the early excavations of Mousterian levels in the Mt. Carmel caves were initially described under the rubric *Neanderthalensis palestinensis*. This followed the logic that Middle Palaeolithic industries were produced, by definition, by Neanderthals (see McCown and Keith, 1939).

2 The "Ahmarian tradition" (Gilead, 1981; Marks, 1981), or, in its most recent manifestation, the "Leptolithic lineage" (Marks, 2003) corresponded to Neuville's Erq el-Ahmar layers F-D. These subsequently became the type assemblages of the "Early Ahmarian" (Gilead, 1981).

3 Ronen's (1976) synthesis of the Upper Palaeolithic in the Mediterranean zone of the southern Levant is an excellent example of the confusion then current — all those assemblages that subsequently were assigned to the "Ahmarian" were winnowed-out from the "Aurignacian", but were not given a distinctive title, and even their chrono-stratigraphic position remained open. Indeed, the microlithic blade/let components tended to "pull" in the direction of a later, pre-Epipalaeolithic assignment (and see also Ronen and Vandermeersch, 1972).

4 It should, however, be noted that Gilead (1981) and Marks (1981), employed significantly different methodologies and criteria (i.e., typology as opposed to technology) in the definition of the Ahmarian, which led to some notable divergences (e.g., the assignment of Sde Divshon – D27B).

5 Assemblages that we believe should be included within this rubric comprise: Ksar Akil VII; Yabrud II/1-4; Hayonim D; Sefunim D/8; Rakefet IV; el-Wad D; Kebara D (I-II); and perhaps also el-Quseir.

6 However, one of their illustrated items is **laterally** carinated (Sonneville-Bordes and Perrot, 1954, Fig. 3:10). In the course of time the *grattoir nucléiforme* and *rabot* (their Types 15 and 16) have been widely relegated from the tool categories to the cores.

7 "*Lamelle à profile fréquement incurvé, présentant de fines retouches marginales continues semi-abruptes, soit exclusivement sur l'un des bords de l'une des faces, dorsale ou ventrale, soit sur les deux bords, et, dans ce cas-là, disposées de façon alterne*."

8 The twisting reflects dexterity and is not simply just associated with a particular and distinct *chaîne opératoire*. Indeed the twisting occurs in both blade and flake oriented assemblages (see discussion in Bergman, 2003).

9 In describing the assemblages from his excavations at Ksar Akil, Tixier (1970) dispensed altogether with the terms "Dufour" and "Ouchtata" bladelets, opting instead for the neutral term "retouched bladelets". He does, however, describe very tiny "comma-shaped" twisted retouched bladelets *"... les lamelles retouchées ... dont un type inconnu jusqu'alors: très petit, "en virgule*" (Tixier and Inizan, 1981, p. 360). Bergman (2003) has also related to these short and stubby "comma-shaped" bladelets.

Elsewhere, Tixier (1974, p. 28) has stated that: "Ouchtata retouch... we may define as...direct retouch (very rarely inverse), the removals short or very short, never encroaching deeply into the edge it is worked on, semi-abrupt or slightly abrupt, never forming a back, sometimes a little irregular (but never forming true notches), nearly always well marked on the proximal part of the piece (especially on Ouchtata bladelets, see Tixier, 1963, p. 115), but on some bladelets may be thinly applied, in which case very close examination (even a binocular microscope) may be necessary to confirm its presence. In rare instances this retouch can approximate "*Dufour*" retouch... Since Ouchtata retouch shows fairly wide variability, it might be useful to create sub-types. Any attempt to do this will nevertheless present unquestioned difficulties: in addition to some barely perceptible variations, Ouchtata retouch can vary locally even on one edge of a piece that is continuously retouched."

REFERENCES

BAR-YOSEF, O. (1970) - *The Epi-Palaeolithic cultures of Palestine*. Unpublished Ph.D. Thesis, Hebrew University, Jerusalem.

BAR-YOSEF, O. (1991) - Raw material exploitation in the Levantine Epi-paleolithic. In MONTET-WHITE, A.; HOLEN, S., eds. - *Raw material economies among prehistoric hunter-gatherers*. Lawrence, KA: University of Kansas, p. 235-250.

BAR-YOSEF, O. (2002a) - The Upper Paleolithic Revolution. *Annual Review of Anthropology*. Palo Alto, CA. 31, p. 363-393.

BAR-YOSEF, O. (2002b) - Early Egypt and the agricultural dispersals. In GEBEL, H. G. K.; DAHL HERMANSEN, B.; HOFFMAN JENSEN, C., eds - *Magic practices and ritual in the Near Eastern Neolithic*. Berlin, SENEPSE 8. Ex oriente. p. 49-66.

BAR-YOSEF, O; BELFER-COHEN, A. (1996) Another look at the Levantine Aurignacian. In *XIII International Union of Prehistoric and Protohistoric Sciences: Coloquium XI - The Late Aurignacian*. Forlì: ABACO Edizioni, p. 139-150.

BAR-YOSEF, O; BELFER-COHEN, A. (2004.) - The Qafzeh Upper Paleolithic assemblages: 70 years later. *Eurasian Prehistory*. 2:1, p. 145-180.

BAR-YOSEF, O.; ARNOLD, M.; MERCIER, N.; BELFER-COHEN, A.; GOLDBERG, P.; HOUSLEY, R.; LAVILLE, H.; MEIGNEN, L.; VOGEL, J. C.; VANDERMEERSCH, B. (1996) - The dating of the Upper Palaeolithic layers in Kebara Cave, Mt. Carmel. *Journal of Archaeological Science*. London. 23, p. 297-306.

BAR-YOSEF, O.; VANDERMEERSCH, B.; ARENSBURG, B.; BELFER-COHEN, A.; GOLDBERG, P.; LAVILLE, H.; MEIGNEN, L.; RAK, Y.; SPETH, J. D.; TCHERNOV, E.; TILLIER, A.-M.; WEINER, S. (1992) - The excavations in Kebara Cave, Mt. Carmel. *Current Anthropology*. Chicago, IL. 33, p. 497-550.

BELFER-COHEN, A. (1994) - Problems in defining a prehistoric culture: an example from the southern Levant. In M. OTTE, ed. - *Nature et culture*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 68), p. 247-260.

BELFER-COHEN, A.; BAR-YOSEF, O. (1981) - The Aurignacian in Hayonim Cave. *Paléorient*. Paris. 7, p. 19-42.

BELFER-COHEN, A.; BAR-YOSEF, O. (1999) - The Levantine Aurignacian: 60 years of research. In DAVIES, W.; CHARLES, R., eds. - *Dorothy Garrod and the progress of the Palaeolithic. Studies in the prehistoric archaeology of the Near East and Europe*. Oxford: Oxbow Books, p. 118-134.

BELFER-COHEN, A.; GORING-MORRIS, A. N. (1986) - Har Horesha I: an Upper Palaeolithic site in the central Negev highlands. *Mitekufat Haeven - Journal of the Israel Prehistoric Society*. Jerusalem. 19, p. 43-57.

BELFER-COHEN, A.; GORING-MORRIS, A. N. (2003a) - Current issues in Levantine Upper Palaeolithic research. In GORING-NORRIS, N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow Books, p. 1-12.

BELFER-COHEN, A.; GORING-MORRIS, A. N. (2003b) - Final Remarks and Epilogue. In GORING-MORRIS, N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow Books, p. 274-280.

BELFER-COHEN, A; DAVIDZON, A.; GORING-MORRIS, A.N.; LIEBERMAN, D.; SPIERS, M. (2004) - Nahal Ein Gev I: A Late Upper Palaeolithic Site by the Sea of Galilee, Israel. *Paléorient*. Paris. 30:1, p. 25-46.

BERGMAN, C. A. (1987) - *Ksar Akil, Lebanon. A technological and typological analysis of the Later Palaeolithic Levels of Ksar Akil. Vol. II: Levels XIII-VI*. Oxford: BAR International Series 329.

BERGMAN, C. A. (2003) - Twisted Debitage and the Levantine Aurignacian Problem. In In GORING-MORRIS, N.; BELFER--COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow Books, p. 185-195.

BOËDA, E.; MUHESEN, S. (1993) - Umm el Tlel (el Kowm, Syrie): étude préliminaire des industries lithiques du Paléolithiques moyen et supérieur 1991-1992. *Cahiers de l'Euphrate*. Paris. 7, p.47-91.

CHAZAN, M. (2001a) - Bladelet Production in the Aurignacian of Hayonim Cave, Israel. *Paléorient*. Paris. 27:2, p. 81-88.

CHAZAN, M. (2001b) - Bladelet production in the Aurignacian of La Ferrassie (Dordogne, France). *Lithic Technology*. Tulsa, OK. 26:1, p. 16-28.

COINMAN, N. R. (1990) - *Refiguring the Levantine Upper Paleolithic: a comparative examination of lithic assemblages from the Southern Levant*. Tempe: Arizona State University. University Microfilms International, Ann Arbor.

COINMAN, N. R. (1998a) - The Upper Paleolithic of Jordan. In HENRY, D. O., ed. - *The Prehistoric archaeology of Jordan*. Oxford: BAR International Series 705, p. 38-63.

COINMAN, N. R. (2003) - The Upper Palaeolithic of Jordan: new data from the Wadi al-Hasa. In GORING-MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow, p. 151-170.

COINMAN, N. R.; HENRY, D. O. (1995) - The Upper Palaeolithic sites. In HENRY, D. O., ed. - *Prehistoric cultural ecology and evolution. Insights from Southern Jordan*. New York, NY: Plenum, p. 133-214.

COPELAND, L. (1975) - The Middle and Upper Paleolithic of Lebanon and Syria in the light of recent research. In WENDORF, F.; MARKS, A. E., eds. - *Problems in Prehistory: North Africa and the Levant*. Dallas, TX: Southern Methodist University Press, p. 317-350

DAVIDZON, A.; GORING-MORRIS, A. N. (2003) - Sealed in stone: the Upper Palaeolithic Early Ahmarian knapping method in the light of refitting studies at Nahal Nizzana XIII, Western Negev, Israel. *Journal of the Israel Prehistoric Society - Mitekufat Haeven*. Jerusalem. 33, p. 75-206.

DAVIES, W. (2001) - A very model of a modern human industry: new perspectives on the origins and spread of the Aurignacian in Europe. *Proceedings of Prehistoric Society*. London. 67, p. 195-217.

DORTCH, C. (1970) - *The Late Aurignacian Industries of Levels 8-6 at Ksar 'Akil, Lebanon*. Unpublished MA Thesis, London: UCL.

FERRING, C. R. (1977) - The Late Upper Paleolithic Site of Ein Aqev East. In MARKS, A. E., ed. - *Prehistory and paleoenvironments in the Central Negev, Israel. Volume II. The Avdat/Aqev Area, Part 2 and the Har Harif*. Dallas, TX: South Methodist University Press, p. 81-118.

GARROD, D. A. E. (1953) - The relations between southwest Asia and Europe in the Later Palaeolithic Age. *Journal of World History*. 1, p. 13-38.

GARROD, D. A. E. (1954) - Excavations at the Mugharet Kebara, Mount Carmel, 1931: the Aurignacian industries. *Proceedings of the Prehistoric Society*. London. 20, p. 155-192.

GARROD, D. A. E. (1957) - Notes sur le Paléolithique supérieur du Moyen Orient. *Bulletin de la Société Préhistorique Française*. Paris. 55, p. 239-445.

GARROD, D.A.E.; BATE, D. M. A. (1937) - *The Stone Age of Mount Carmel. Excavations at the Wadi-Mughara, vol I*. Oxford: Clarendon Press.

GILEAD, I. (1981) - Upper Palaeolithic tool assemblages from the Negev and Sinai. In SANLAVILLE, P.; CAUVIN, J., eds - *Préhistoire du Levant*. Paris: CNRS, p. 331-342.

GILEAD, I. (1991) - The Upper Paleolithic period in the Levant. *Journal of World Prehistory*. New York, NY. 5, p. 105-154.

GORING-MORRIS, A. N. (1980b) - Upper Palaeolithic sites from Wadi Fazael, lower Jordan valley. *Paléorient*. Paris. 6, p. 173-191.

GORING-MORRIS, A. N.; BELFER-COHEN, A., eds. (2003) - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow.

KERRY, K. W. (2000) - Intra- and inter-site variability within the Levantine Upper Paleolithic: evidence from Jebel Humeima (J412), southwest Jordan. *Proceedings of the Prehistoric Society*. London. 66, p. 1-18.

KUHN, S. L.; STINER, M. C.; GÜLEÇ, E. (1999) - Initial Upper Palaeolithic in south-central Turkey and its regional context: a preliminary report. *Antiquity*. Cambridge. 73, p. 505-517.

KUHN, S. L.; STINER, M. C.; KERRY, K. W.; GÜLEÇ, E. (2003) - The early Upper Palaeolithic at Üçağızlı Cave (Hatay, Turkey): preliminary results. In GORING-MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow, p. 106-117.

LUCAS, G. (1997) - Les lamelles Dufour du Flageolet I (Bezenac, Dordogne) dans le contexte Aurignacien. *Paléo*. Les Eyzies--de-Tayac. 9, p. 191-219.

LUCAS, G. (1999) - Production experimentale de lamelles torses: Approche préliminaire. *Bulletin de la Société Préhistorique Française*. Paris. 96:2, p. 145-151.

MARKS, A.E. (1976) - Ein Aqev: a late Levantine Upper Palaeolithic site in the Nahal Aqev. In MARKS, A. E., ed. - *Prehistory and paleoenvironments in the Central Negev, Israel, vol. I. The Avdat/Aqev Area, Part 1*. Dallas: TX: Southern Methodist University Press, p. 227-292.

MARKS, A. E. (1981) - The Upper Paleolithic of the Levant. In CAUVIN, J.; SANLAVILLE, P., eds. - *Préhistoire du Levant: chronologie et organisation de l'espace depuis les origines jusqu'au VI^{e} millénaire. Colloques Internationaux du CNRS, 10-14 juin Lyon, Maison de l'Orient*. Paris: Centre National de la Recherche Scientifique, p. 369-374.

MARKS, A. E. (2003) - Reflections on Levantine Upper Palaeolithic Studies: Past and Present. In GORING-MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow, p. 249-264.

MCCOWN, T. D.; KEITH, A. (1939) - *The Stone Age of Mt. Carmel, Vol. II. The fossil human remains from the Levalloiso--Mousterian*. Oxford: Clarendon Press.

MINZONI-DEROCHE, A. (1992) - Üçağızlı Mağara, un site aurignacien dans le Hatay (Anatolie). Premiers résultats. *Paléorient*. Paris. 18, p. 89-96.

MINZONI-DEROCHE, A.; MENUE, M.; WALKER, P. (1995) - The working of pigment during the Aurignacian period: evidence from Üçağızlı Cave (Turkey). *Antiquity*. Cambridge. 69, p. 153-158.

NEUVILLE, R. (1934) - La préhistoire de Palestine. *Revue Biblique*. Paris. 43, p. 237-259.

NEUVILLE, R. (1951) - *Le Paléolithique et le Mésolithique du Désert de Judée*. Paris: Archives de l'Institut de Paléontologie Humaine (Mémoire; 24.).

PERROT, J. (1955) - Le Paléolithique supérieur d'el-Quseir et de Masaraq an Na'aj (Palestine). *Bulletin de la Société Préhistorique Française*. Paris. 52, p. 493-506.

PERROT, J. (1968) - La préhistoire palestinienne. In *Supplement au Dictionaire de la Bible, vol. 8*. Paris: Letougey et Ane, p. 286--446.

PLOUX, S. (1998) - Le Paléolithique supérieur d'Umm el-Tlel (basin d'el Kowm, Syrie): observations préliminaires. *Cahiers de l'Euphrate*. Paris. 8, p. 37-54.

PLOUX, S.; SORIANO, S. (2003) - Umm el Tlel, une séquence du Paléolithique supérieur en Syrie centrale: industries lithiques et chronologie culturelle. *Paléorient*. Paris. 29:2, p. 5-34.

RONEN, A. (1976) - The Upper Palaeolithic in northern Israel, Mt. Carmel and Galilee. In WENDORF, F., ed. - *Deuxième Colloque sur la Terminologie de la Préhistoire du Proche-Orient*. 9th Congress, Nice: UISPP, p. 153-186.

RONEN, A. (ed.) (1984) - *The Sefunim prehistoric sites, Mount Carmel, Israel*. Oxford: BAR International Series 230.

RONEN, A.; VANDERMEERSCH, B. (1972) - The Upper Paleolithic sequence in the cave of Qafza (Israel). *Quaternaria*. Roma. 16, p. 189-202.

RUNNELS, C.; VAN ANDEL, T. H. (1988) - Trade and the origins of agriculture in the Eastern Mediterranean. *Journal of Mediterranean Archaeology*. Glasgow. 1:1, p. 83-109.

RUST, A. (1950) - *Die Höhlenfunde von Jabrud (Syrien)*. Neumünster: Karl Wachholtz.

SONNEVILLE-BORDES, D. DE; PERROT, J. (1954-1956) - Lexique typologique du Paléolithique supérieur. Outillage lithique. *Bulletin de la Société Préhistorique Française*. Paris. 51-52-53, p. 327-335; p. 76-79; p. 408-412; p. 547-559.

TIXIER, J. (1963) - *Typologie de l'Epipaléolithique du Maghreb*. Paris: CRAPE.

TIXIER, J. (1970) - L'abri sous roche de Ksar Aqil: la campagne de fouilles 1969. *Bulletin du Musée de Beyrouth*. Beyrouth. 33, p. 173-191.

TIXIER, J. (1974) - Glossary for the description of stone tools, with special reference to the Epipalaeolithic of the Maghreb. *Newsletter of Lithic Technology*. San Antonio, TX. Special Publication Number 1 (translated by M.N. Newcomer).

TIXIER, J.; INIZAN, M.-L. (1981) - Ksar Aqil: stratigraphie et ensembles lithiques dans le Paléolithique supérieur: fouilles 1971-1975. In CAUVIN, J.; SANLAVILLE, P., eds. - *Préhistoire du Levant: chronologie et organisation de l'espace depuis les origines jusqu'au VI[e] millénaire. Colloques Internationaux du CNRS, 10-14 juin Lyon, Maison de l'Orient*. Paris: Centre National de la Recherche Scientifique, p. 353-367.

WILLIAMS, J. K. (2003a) - *Examining the boundaries of the Levantine Aurignacian*. Unpublished PhD dissertation. Dallas, TX: Southern Methodist University.

WILLIAMS, J. K. (2003b) - An examination of Upper Palaeolithic flake technologies in the marginal zone of the Levant. In GORING-MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow Books, p. 196-208.

The Levantine Aurignacian: a closer look

JOHN K. WILLIAMS

ABSTRACT This paper presents the results of a detailed study of lithic assemblages throughout the Levant that have been labeled "Levantine Aurignacian", within both the Mediterranean woodlands and the marginal zone. A review and comparison of these assemblages is presented in this paper according to comparable, relevant artifactual criteria and attributes. These assemblages can be grouped at the broader classification of complex/lineage, but are divided into three industries.
The differences between these industries are explained within a framework of chronological trends reflecting intensified exploitation of certain subsistence strategies, as a response to the combined effects of demographic pressure and climatic deterioration at the end of the Upper Paleolithic.

Introduction

The Levantine Aurignacian has not received the same long history of attention afforded to the European Aurignacian. Nor does it produce the same heated discussion as seen in Europe, primarily because the Levantine Aurignacian is, for the most part, disassociated with the issue of archaic versus modern humans. The appearance of modern humans antedates the Levantine Aurignacian, and indeed the Middle-to-Upper Paleolithic technological shift by tens of thousand years (Valladas et al., 1987; Vandermeersch and Bar-Yosef, 1988). Further, the earliest Upper Paleolithic entity is not the Levantine Aurignacian, but rather a local industry termed the Ahmarian. The Levantine Aurignacian arrives later, and appears to co-exist with the Ahmarian for at least a few thousand years.

Although the attention that it receives pales in comparison with that seen in Europe, the Levantine Aurignacian remains one of the most disputed topics in the Upper Paleolithic of this region. The major issues surrounding the Levantine Aurignacian are its identification and defining characteristics, its geographical distribution, and its relationship with other Upper Paleolithic industries, including the European Aurignacian. Originally defined on the basis of its similarity with Europe, the Levantine Aurignacian remains an entity with unclear boundaries and characteristics. Researchers are divided between those who suggest a refined definition of the Levantine Aurignacian, on the basis of close similarities with the French Aurignacian (Bar-Yosef and Belfer-Cohen, 1988, 1996; Belfer-Cohen and Bar-Yosef, 1981, 1999; Belfer-Cohen, 1994), and those who prefer a broader definition that encompasses most assemblages that produce flakes, thick blades, and twisted bladelets (Gilead, 1981; Marks, 1981). Most of the disagreement is centered on whether or not Levantine Aurignacian assemblages are restricted to a small strip of Mediterranean woodlands in northern Israel and Lebanon, or if they are also found within the steppe and desert regions of the marginal zone.

This paper presents the results of a detailed study of lithic assemblages throughout the Levant that have been labeled "Levantine Aurignacian", within both the Mediterranean woodlands and the marginal zone. A review and comparison of these assemblages is presented in this paper according to comparable, relevant artifactual criteria and attributes. These assemblages can be grouped at the broader classification of complex/lineage, but are divided into three industries, on the basis of their lithic reduction sequences. The differences between these industries are explained within a framework of chronological trends reflecting intensified exploitation of certain subsistence strategies, as a response to the combined effects of demographic pressure and climatic deterioration at the end of the Upper Paleolithic.

Background

Two traditions are broadly recognized in the Levantine Upper Paleolithic: the Ahmarian and Levantine Aurignacian. The Ahmarian is a local industry, representing the first full-fledged blade/bladelet Upper Paleolithic entity. It is found directly after the terminal Middle Paleolithic technologies in the region, and appears to have evolved there (Marks, 1983). The term "Ahmarian" was first introduced by Anati (1963, p. 119), and subsequently adopted by Gilead (1981, p. 339), who applied it to the "blade-bladelet" assemblages in the Negev and Sinai. The Ahmarian was defined by both Gilead (1981) and Marks (1981), as a stone tool assemblage with an elaborate blade-bladelet technology and a tool-kit composed mainly of retouched and backed blades, as well as el-Wad points. Endscrapers are commonly found, although in relatively low frequencies, while burins are generally rare.

Dorothy Garrod (1937) was the first to recognize and define an Aurignacian industry in the Levant. In her earlier writings, Garrod (1937) believed that the continuous sequence from Levalloiso-Mousterian, through the Emiran, and into the Aurignacian at such caves as el-Wad and el-Emireh supported a Levantine origin for the Aurignacian industry. Garrod soon changed her mind, however, and the original home of the Aurignacian shifted to Europe. She later postulated that an Aurignacian cultural diffusion occurred from its home in Europe into southwest Asia (Garrod, 1953).

She recognized the following index fossils, present in both the Levant and in Europe: nosed and carinated scrapers, beaked and prismatic burins, and leaf-shaped points. Shared technology included the use of thick blanks and profuse secondary retouch. Garrod (1953) also noted some differences, such as the lack of strangled blades and the paucity of large blades with Aurignacian retouch in the Levant. Further differences included higher frequencies of carinated scrapers and burins, and lower frequencies of bone tools in the Levant (Garrod, 1953). She postulated that cultural diffusion must have occurred between the Levant and Europe, which was thought to be the homeland of the Aurignacian (Garrod, 1953).

Ofer Bar-Yosef coined the term 'Levantine Aurignacian' in 1969 at the Wenner Gren Symposium in London, during a group discussion with François Bordes, who saw close similarities between Level X at Ksar Akil (Lebanon) and the Aurignacian of Font-Yves (France), on the basis of typological indices (burins, scrapers, and points) (Wenner Gren Symposium, 1969; Bergman, 1987, p. 8). The Levantine Aurignacian was divided into three phases (A, B, and C) on the basis of the sequence at Ksar Akil. Phase A was more blade-oriented than the subsequent phases, and included numerous retouched blades and bladelets (el-Wad points). Phase B is characterized by a rise in Aurignacian elements, such as nosed and shouldered scrapers, carinated pieces, and bone tools (Copeland, 1975). Phase C saw a rise in burin indices, as well as prismatic bladelet cores.

Within the "two-tradition" framework of Marks and Gilead, the unilinear scheme of Neuville and Garrod was abandoned for a more dynamic framework that postulated two Upper Paleolithic traditions, the Levantine Aurignacian and the Ahmarian, which to some extent overlap spatially and temporally. The two-tradition framework departed from the ideas up to that point on a number of issues. The Levantine Aurignacian was expanded both spatially, to the southern marginal zone, and temporally, to the very end of the Upper Paleolithic, judging from the late dates at Ein Aqev (Marks, 1976b). Also, the two traditions were defined largely on the basis of technological attributes, deemphasizing typological indices and index fossils that were the focus up to that point. In the two-tradition framework, the Levantine Aurignacian came to be broadly defined by a blank production aimed at producing flakes and a tool-kit dominated by endscrapers and burins, especially carinated and nosed varieties.

The problem

The Levantine Aurignacian is not clearly understood today, because there are unresolved, competing ideas about what it represents. Researchers of this subject can be divided into two camps. On one side of the debate, the most outspoken members are Ofer Bar-Yosef and Anna Belfer-Cohen, who have maintained Dorothy Garrod's original definition and conception of the Levantine Aurignacian. Like Garrod, they believe that the Levantine Aurignacian represents a cultural migration or diffusion, or a "social network" that spread to the Levant from its European homeland (Bar-Yosef and Belfer-Cohen, 1988, p. 36). In this scenario, the Levantine Aurignacian should share a striking similarity to the French Aurignacian, with specific typological markers such as an elaborate bone/antler tool industry, nosed and shouldered scrapers, thick keeled scrapers, and blades with Aurignacian retouch.

The other position is represented by the two-tradition framework, which was proposed independently by Anthony Marks and Isaac Gilead. Their framework expanded the definition, geographic scope, and temporal scale of the Levantine Aurignacian. The definition was expanded to include assemblages that did not meet all of the typological requirements of the classic perspective, and the Levantine Aurignacian was expanded spatially, to the steppe/desert areas, and temporally, to the terminal Upper Paleolithic. Marks is the most vociferous proponent of this position, giving reasons why he feels it provides a more accurate framework than the other approach. Marks (2003) argues that Bar-Yosef and Belfer-Cohen's definitional criteria include artifacts that can only be found in settings with good preservation (i.e., bone and antler tools). Because most of the sites in the desert/steppe area are open air, where there is poor organic preservation, Marks claims that a Levantine Aurignacian would never be found outside of a cave or rockshelter using such a refined definition. Marks asserts that by ignoring assemblages that do not possess a host of typological elements, one might exclude useful information, such as ephemeral sites within the settlement pattern of a single group, which could be recognized through their shared, underlying technology. In other words, the entire array of Aurignacian tools may not be needed at every locality, and the possibility exists that small desert sites may exist which do not have bone and antler tools and nosed scrapers for reasons of preservation and function, but yet might be recognizable through a shared, underlying technology.

One of the reasons why this issue remains unresolved is a basic confusion of what the Levantine Aurignacian represents. While Garrod and others who have followed her lead have clearly associated the Levantine Aurignacian with a prehistoric culture, possibly from western Europe, there has been confusion about what Marks and Gilead refer to as a "tradition". Marks (2003) has since addressed the confusion and inconsistency surrounding the concept of a tradition, and explicitly defined a new framework. In this framework, the Levantine Aurignacian is attributed to the scale of industry, which is more refined than Marks's original conception of a tradition. According to Marks (2003), an industry is characterized by one or more closely related lithic reduction strategies that produced comparable clusters of blank forms, regardless of activities performed or raw-material used, and a technological consistency or developmental change across time and space. Tools also contribute to industrial classification, but in a technological sense. An industry should exhibit a patterned blank selection for retouched tools, and in the kinds of retouch applied to those tools (Marks, 2003).

Marks has provided a testable classificatory framework for his perception of the Levantine Upper Paleolithic. Bar-Yosef and Belfer-Cohen (1988) also acknowledge the utility of technology, and have devised a testable hypothesis. Noting the dissimilarity between the Levantine Aurignacian cave assemblages in the Mediterranean woodlands and open air assemblages in the marginal zone, such as a lack of bone tools and decorative objects in the marginal zone, they considered the possibility that such differences were governed by: 1) site formation processes (e.g., taphonomic processes or duration of occupation), or 2) separate cultural-technological concepts between these two areas. They suggested that reconstructing the core reduction strategies and tool selection for both areas could test these possibilities, because while tool form might be influenced by nature and habitation type, core reduction strategies should remain constant within the Levantine Aurignacian.

Now the stage is set to resolve some of the ambiguities surrounding the Levantine Aurignacian. We are armed both with a classificatory scheme, and an agreement among researchers about how to compare assemblages to determine if they belong within the same classificatory scale. To this end, this study seeks to reconstruct the reduction strategies of the relevant assemblages, using a consistent and detailed method of analysis that will allow direct comparison. With some understanding of the reduction sequences, it is possible to classify the assemblages at the scale of lineage and industry, and then identify potential sources of this variability, such as developmental changes revealed through chronological information, or adaptive responses to environmental and/or demographic stress, as reflected in technological strategies. In short, the groundwork has not yet been laid to allow us to clearly conceive the Levantine Aurignacian. Before addressing broader issues such as the migration or diffusion of early modern human culture, it is necessary to identify the precise nature of the archeological remains, and how they pattern on a local scale.

Methodology

Assemblages were sampled from the Mediterranean woodlands (Ksar Akil XIII-VI, Hayonim D, Sefunim 8), the Jordan Valley (Fazael IX and Nahal Ein Gev I), and the Negev Highlands (Ein Aqev, D27A, Arkov, Har Horesha I, G11, and K9A) (Fig. 1). This sample encompasses most of the Upper Paleolithic, from ca.30 000 BP to ca.20 000 BP. Some Jordanian assemblages that were previously questionable, such as WHS 618C (Coinman, 1993), Tor Fawaz (J403) and Jebel Humeima (J412) (Coinman and Henry, 1995), were excluded from this study because they were subsequently determined to be Ahmarian in nature (Kerry, 1997; Williams, 2003a), or too undiagnostic to fit into a known category (Kerry and Henry, 2003; Williams, 2003a).

Ksar Akil is by far the most intensively occupied Upper Paleolithic site known in the Levant, with the deepest stratigraphy, with some 23 meters of rich cultural deposits spanning the Middle and Upper Paleolithic. It is situated at the edge of the coastal plain north of Beirut, adjacent to the Lebanese Mountains (Wright, 1951). The rockshelter has been excavated numerous times, beginning in the early part of last century. The most representative surviving artifact samples are derived from the excavations of the Boston College team in the 1930s

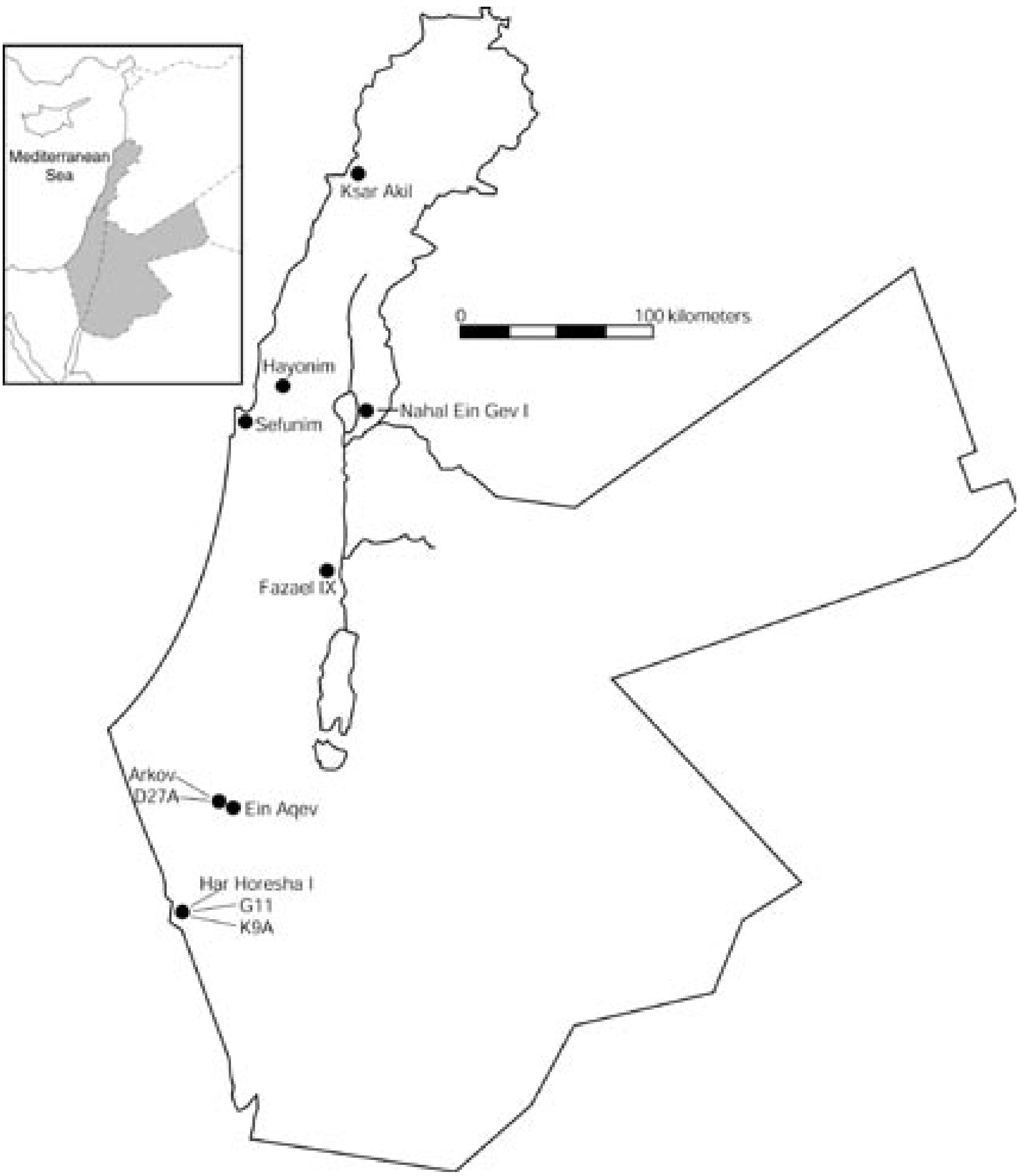

FIG. 1 – Map of the Levant, revealing sites in sample.

and 1940s, which were analyzed in this study. Although the 1937 material has previously been analyzed and published in detail by C. Bergman (1987), the 1947 material remains unpublished. The Levantine Aurignacian levels (XIII-VI) from both seasons were sampled in this study.

The addition of the 1947 material adds important new information about the sequence as a whole. Particularly, blades and bladelets were a much more prominent aspect of the technology throughout these levels than what was previously known from the 1937 season material, a tendency that was observed in Tixier's more recent excavations (Tixier and Inizan, 1981). Apparently, the 1946-47 seasons seem to be a more representative sample than the

1936-37 seasons (see Williams, 2003a). For this reason, only the artifacts from the 1946-47 seasons are used in the following analyses.

Two other assemblages were sampled in the Mediterranean woodlands, in the Galilee and Mt. Carmel regions of Israel: Hayonim D and Sefunim 8. The cave of Hayonim has provided a wealth of cultural material from the Middle Paleolithic through to the Natufian, excavated in a massive project by Ofer Bar-Yosef during the 1980s and 1990s. Aurignacian layers were found inside the major frontal chamber in Stratum D, a layer of light colored grayish loam, 35-45 cm thick, of which 15 m^2 was excavated (Belfer-Cohen and Bar-Yosef, 1981). The Aurignacian deposits at Hayonim represent three successive temporary occupations, yet full recovery and good preservation provided a wealth of information, replete with lithic and bone artifacts, hearths, architecture, ornaments, and art objects.

The cave of Sefunim is situated on a dry watercourse, which drains from Mount Carmel into the Mediterranean about 10 km from Haifa. Directed by Ronen, excavations at the cave during the 1960s-1970s revealed cultural horizons spanning from the Mousterian to the Chalcolithic. Layer 8 yielded the largest assemblage of Sefunim, and was characterized by a flake technology and typical Aurignacian tools. Ronen (1984, p. 102, 107) also characterized Layers 9-10 as "Levantine Aurignacian", but due to a small sample in Layer 9 and apparent mixing with the underlying Mousterian horizon in Layer 10, only Layer 8 was studied.

Two assemblages were also sampled within the Jordan Valley: Fazael IX and Nahal Ein Gev I. Wadi Fazael IX was excavated under the direction of O. Bar-Yosef during part of a larger project in the Lower Jordan Valley (Goring-Morris, 1980). Wadi Fazael is a steep, rock-walled valley with bedrock floors, draining the eastern slopes of the Samarian Hills between the Dead Sea and the Beth Shan Valley.

Six of the assemblages considered for this study are located in the Central Negev Highlands, within two study areas: the Avdat/Aqev, and the Har Harif Plateau. Ein Aqev (D31) occurs in the Nahal Aqev, and consists of 60 cm of stratified cultural deposits, which date to the end of the Upper Paleolithic (ca.17 500 BP) (Marks, 1976b). This open air site revealed abundant lithic artifacts, which were classified as a Levantine Aurignacian assemblage on the basis of a toolkit dominated by carinated scrapers and burins, as well as numerous Dufour bladelets. Ein Aqev represents one of the only sites in the Central Negev that was still largely *in situ* at the time of excavation, both geologically and archeologically (Marks, 1976b, p. 227). It is located 250 m downstream from the present perennial spring of Ein Aqev, within the top of the western side of an Upper Paleolithic terrace at an elevation of 390 m asl.

Situated on the Divshon Plain, two sites, Arkov (D22) and D27A, are characterized by large surface and, in some cases, partially *in situ* artifact concentrations that were spread over large areas on fine eolian deposits (Marks and Ferring, 1976).

Also sampled were three sites collected atop the Har Harif plateau, at an elevation of 980 m asl (Larson and Marks, 1977; Belfer-Cohen and Goring-Morris, 1986). G11, K9A, and Har Horesha I each were characterized by surface lithics covering a large area, apparently moved by extensive deflation and sheetwash.

Sampling procedures were tailored to the overall goals of the research and the idiosyncrasies of the sites (Table 1). In an attempt to control for intra-assemblage patterning, horizontally random samples were taken from the large assemblages. When dealing with stratified assemblages at a single site, each level was sampled separately.

Only complete artifacts were selected for detailed study. Because attribute relationships are focal aspects of the research design, the use of broken pieces would exclude examination of numerous attributes. Complete tools on a broken blank (e.g., an endscraper on a distal segment of a blade) were tabulated only on the basis of type class and the characteristics of the broken blank (i.e., proximal, distal, lateral).

The methodology was designed to provide an accurate representation of the Levantine Aurignacian reduction sequence, from raw material acquisition and core reduction, to core maintenance and blank production, and finally to tool manufacture and maintenance. According to the most frequently cited characteristics (Garrod, 1953; Belfer-Cohen and Bar-Yosef, 1981, 1999; Gilead, 1981; Marks, 1981; Belfer-Cohen and Goring-Morris, 1986; Bergman and Goring-Morris, 1987; Marks and Ferring, 1988; Coinman, 1990; Belfer-Cohen, 1995), the Levantine Aurignacian is defined by specific technological attributes (carination, thick blade blanks and Aurignacian retouch), in addition to specific typological attributes at the class and type levels (thick and steep scrapers, nosed and shouldered scrapers, multifaceted burins, el-Wad points and bone/antler tools). The methodology was created with these characteristics in mind, proceeding from a basic division of class types, to more detailed information about blank types and scar patterns and, finally, to metric measurements of various characteristics and attributes (Williams, 2003a). Only lithic artifacts were included in the study, because they are consistently present in adequate numbers in all studied assemblages. Unfortunately, bone/antler tools and decorations are incomparable among the sampled assemblages and had to be excluded from these analyses, because of the relatively poor organic preservation in areas such as the Negev.

This study deals with technological and typological data at two levels: the artifact type and the attribute class and state. Each assemblage is initially separated into three categories: debitage, cores, and tools, following Marks (1976a). After identifying the appropriate artifact class, various criteria and attributes are recorded for each piece (Fig. 2).

Of particular importance in this methodology is the subcategory of "carinated pieces", which includes both cores and tools in traditional typologies (Fig. 2). The treatment of carinated lithic implements in this study attempts to avoid some of the problems that arise when using typologies that include carinated tools. Many efforts have been made to classify carinated artifacts in western Europe and the Near East. The term "carinated scraper" was first used by Breuil (1906, p. 340), who defined this tool on the basis of the convex shape of the contour, i.e., the profile of the working edge, and the thickness of the blank. The earliest classifications of carinated burins (Noone, 1934, p. 478; Bouyssonie, 1948, p. 16) also emphasized the convex, or keeled shape of the burin spalls, visible in their profile. De Sonneville-Bordes and Perrot (1954, p. 332) defined a carinated endscraper as an "endscraper made on a

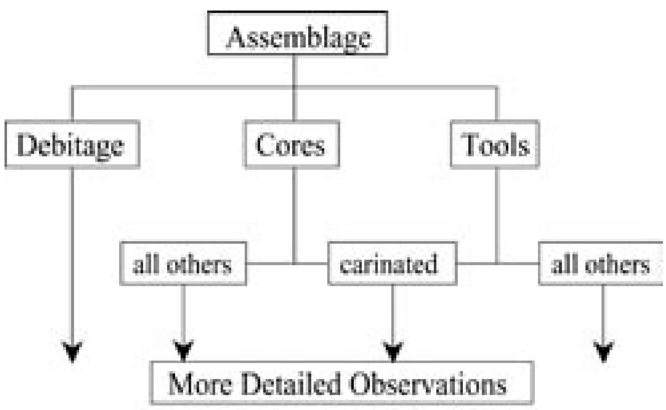

FIG. 2 – Method of dividing each assemblage into analyzable units.

thick flake having a profile of an inverted keel; the scraper front is made by lamellar retouch which may be wide and short or narrow and long".

Since the inclusion of carinated tools in lithic typologies, archeologists have struggled to define the boundaries between carinated burins, carinated scrapers, and cores. Some have proposed the term "core-tools" to deal with the intermediate forms (e.g., the "core-like burin"of Sonneville-Bordes and Perrot, 1956, p. 412), while others such as F. Bordes argued against tool-core hybrids, stating that an artifact "is a core or a scraper, not both" (quoted in Bergman, 1987, p. 12). Recognizing the impracticality of distinguishing many carinated tools from cores, Goring-Morris (1980, p. 45-46) eliminated a number of carinated tool types on Bar-Yosef's type list (1970, p. 18-19) and re-classified them as cores, reserving the terms "carinated burin" and "carinated scraper" to implements on flake blanks. Bergman (1987, p. 12) further reduced the number of carinated tools in his typology for Ksar Akil by using Goring-Morris's restriction to artifacts produced on flakes (or blades), in addition to combining the carinated burin and scraper classes into one tool type: "carinated pieces."

Similarly, the methodology used in this study attempts to avoid making arbitrary distinction between carinated scrapers, carinated burins, and bladelet cores, which can result in major tool class discrepancies that reflect the preferences of the individual archeologist more than reality. The approaches of Goring-Morris and Bergman, however, were not directly adopted in this study. While restricting carinated artifacts to secondary blanks is useful because it avoids making an arbitrary cutoff between carinated artifacts and bladelet cores on blocks of raw material, there is no reason to suspect that secondary blanks could not have also been used as cores. So we are faced with the same impasse, trying to distinguish between cores and supposed tools on secondary blanks. To avoid this problem, all carinated pieces are taken out of the type list entirely, and examined according to a set of detailed attributes (Fig. 2). Carinated pieces are thus identified on the basis of their technique of manufacture, rather than on the basis of their presumed function.

Within the relevant literature (Bardon and Bouyssonie, 1906, p. 402; Breuil, 1906, p. 60; de Sonneville-Bordes and Perrot, 1954, p. 332; Brézillon, 1971, p. 235-236; Marks, 1976a, p. 380-381; Ferring, 1976, p. 216; Bergman, 1987, p. 12-13; Belfer-Cohen and Goring-Morris, 1986, p. 55; Demars and Laurent, 1989, p. 44, 52), these are the most frequently cited characteristics of carination: invasive, steep retouch with bladelet-dimension removal scars on a thick blank; a removal surface with a keel-shaped profile; convergent retouch; and twisted removal scars. Although most researchers would agree that all of these are common characteristics of carinated implements, none of these characteristics by itself must be present for an artifact to be considered carinated. The criteria used to identify carination in this study are the following, all of which must be present for an implement to be considered carinated: a removal surface with a keel-shaped profile; three or more removals possessing bladelet dimensions; at least two twisted removals; and convergent to semi-convergent retouch (a natural result of twisted removals,). While twisted removals are rarely used as a necessary attribute of carination, it is deemed important in this study to restrict carination to a specific kind of reduction sequence, which sets it apart from typical bladelet manufacture found throughout the Upper Paleolithic and Epipaleolithic (e.g., the Ahmarian reduction sequence, which involves the production of primarily non-twisted debitage). Using these criteria, carination includes both secondary blanks and cores/chunks. It is suggested that carinated implements, by their nature, are potentially tools and/or bladelet cores, and as a result it is regarded more appropriate to apply the same method of analysis to all carinated implements before further divisions. It should be noted that this methodology does not ignore important characteristics of carinated implements, such as whether the blank is a chunk/core or a flake/blade, as these and other attributes are recorded after the artifact is put into the "carinated" category.

Chronology of the assemblages

Many of the assemblages used in this study have been radiometrically dated, and together span nearly the entire duration of the Upper Paleolithic, from the earliest fully-fledged blade technologies at the beginning of the Upper Paleolithic some 40 000 years ago, to the latest manifestations of this period at around 19 000-17 000 BP.

Dating and correlating Ksar Akil

Unfortunately, only one direct radiocarbon date was obtained from the Boston College excavations at Ksar Akil, and this was taken from the upper Mousterian levels (GrN-2579, 43 750 ± 1500 BP; Vogel and Waterbolk, 1963). Later excavations by Tixier, however, provide a suite of reliable radiometric dates from the Upper Paleolithic sequence (Mellars and Tixier, 1989). Although Tixier's excavations were directly adjacent to Ewing's, precise correlations between the Boston College collections and those by Tixier are difficult for a number of reasons. One reason is that three datum-points were used: 80.9 m asl by Ewing (1947), 75 m asl by Wright (1951, 1960), and 76 m asl by Tixier and Inizan (1981). Further, Tixier's grid was slightly offset from that of Ewing (less than 5 degrees). Lastly, Tixier used much more refined levels, often identifying natural stratigraphic levels of only a few centimeters in thickness, as opposed to the Boston College's use of large geological units, sometimes exceeding 1 m in thickness.

Nevertheless, broad comparisons can be made based on various lines of evidence. A rough correlation has already been performed by Copeland (in Bergman, 1987, p. vii), who used the heights above sea level published by both authors, while also accounting for the slope and the different grid angles. For the most part, this study, which includes the 1947 material that was excavated adjacent to Tixier's sondage, confirms Copeland's correlations, with minor modifications. A correlation between the levels/phases excavated by the Boston College team and Tixier was performed on the basis of technological and typological characteristics, as well as the discrepancy in slope between the geological levels and the archeological layers at Ksar Akil, identified in this study. It was discovered in this study that the techno-typological characteristics of the 1937 season are consistently found in lower levels in the 1947 season, according to the labels given by the Boston College team (Levels XIII-VI). The Boston College team excavated in broad geological levels, and it is apparent from this study that the geological levels are somewhat offset from the cultural layers, a phenomenon noted by Tixier (1970) during his excavations. Specifically, the cultural layers seem to have a steeper slope southwards than the geological levels. Given that using the original level designations provides misleading information, Bergman's phase divisions have been adopted. Based on his analysis of Levels XIII-VI from the 1937 material, Bergman (1987) designated three phases for these levels — 3 through 6. The first two phases were identified by Azoury's (1971) study of the earliest Upper Paleolithic material (levels XXV-XXI and XX-XV, respectively). Based on Bergman's descriptions of these phases, and the correlation between the 1937 and 1947 material in this study, it was possible to assign Bergman's phase designations to the 1947 material. An additional Phase 7 was identified in this study, in the 1947 material at a stratigraphically higher position than Bergman had access to in the 1937 material.

Table 2 displays the correlation between the 1937 and 1947 seasons, as well as how these compare to Tixier's levels and phases, with the associated dates. This correlation follows that provided by Copeland (in Berman, 1986, p. vii), and includes the 1947 material, which was closer to Tixier's excavations. This proposed correlation is of course open to question, given the natural difficulty of linking archeological entities that were excavated decades apart.

Dating the remaining assemblages

As revealed in Fig. 3, the dated assemblages in this study span the period between ca.32 000 and 18 000 BP, with a possible break around 22 000-25 000 BP. The oldest assemblage is Ksar Akil Phase 4, which averages 30 000 BP, while the youngest assemblages are Ein Aqev and Fazael IX, both falling about 18 000 BP.

There appears to be two sub-sets of dates from Hayonim D. The break between these two clusters of dates is large enough to warrant the separation of the entire suite of dates from Hayonim D into two groups: early and late. The early dates average around 29 000, while the later dates average around 21 000 BP. It seems probable that the late dates are intrusive, from unrelated activities known to have taken place in the cave at a later period (Bar-Yosef, 1991).

Many of the assemblages in this study are undated. Yet they can be tentatively grouped into certain time frames on the basis of their technological relationship with dated assemblages. Sefunim 8, for example, is very similar technologically to Hayonim D and Ksar Akil Phase 5, and the logical assumption is that the occupation at Sefunim dates to this earlier period (30 000-25 000), rather than later with assemblages which it has little in common with, such as Ein Aqev and Fazael IX, which average around 18 000 BP. Similarly, the undated assemblage of Nahal Ein Gev I can be tentatively grouped together with the dates from Fazael IX, because the assemblages are nearly identical.

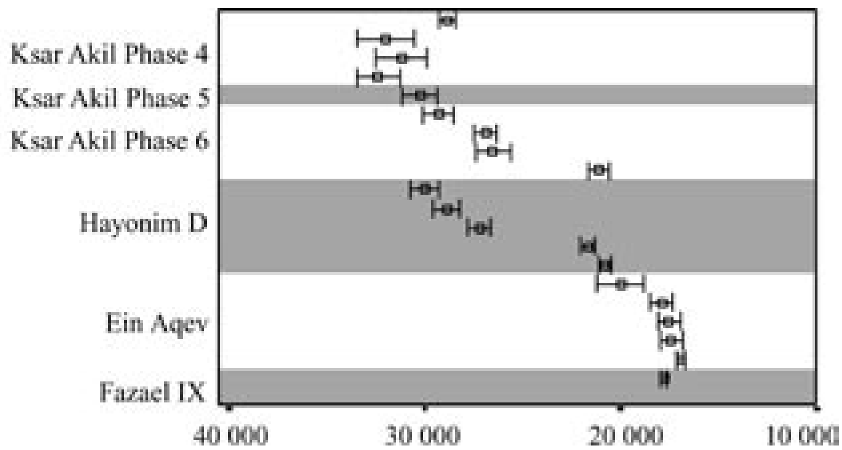

FIG. 3 – Radiocarbon dates for the sampled assemblages.

Paleoenvironment of the sampled assemblages

Given that some of the assemblages in this study have been dated, it is possible to reconstruct the paleoenvironmental conditions during their occupation. A good representation of the paleoenvironments for the Levant is provided by combining various lines of evidence, including pollen cores (Weinstein-Evron, 1990), geomorphological evidence from Upper Pleistocene sediments by Besançon (1981), Sanlaville (1981), and Goldberg (1981, 1986; Goldberg and Bar-Yosef, 1982), deep-ice cores (Mayewski et al., 1994; Petit et al., 1997, 1999) and various isotopic studies (Gat, 1981; Luz, 1982; Issar and Gilead, 1986; Martinson et al., 1987; Goodfriend and Margaritz, 1988; Rossignol-Strick, 1993). The following reconstruction is a result of these studies.

Prior to 75 000 BP, the early Middle Paleolithic was one of the wettest periods of the Upper Pleistocene and Holocene (Gilead, 1991). This is evidenced by an intensive deposition of conglomerates, breccias, and travertines (Goldberg, 1981) and high-moisture plants represented in the pollen spectra from Tabun D (Horowitz, 1979, p. 250-253) and the Negev Mousterian sites (Horowitz, 1976).

A very dry period followed during the late Middle Paleolithic, which correlates mainly with the early part of isotope Stage 3 (Shackleton and Opdyke, 1973, Table 3). The southern Levant shows evidence for a dry period beginning around 60 000 BP, when the thick gravelly deposits of the early Middle Paleolithic were truncated by erosion during the late Middle Paleolithic (Bar-Yosef, 1989, p. 602-603). This event caused a depositional hiatus between the Middle and Upper Paleolithic sediments when the former was disconformably overlain by fine-grained, mostly Upper Paleolithic, sediments (Gilead, 1991; Horowitz, 1979, p. 250-253).

The climate remained relatively dry between 45 000 and 32 000 BP during the later part of isotope Stage 3 (Horowitz, 1989). This period includes the Middle to Upper Paleolithic transition and the early Upper Paleolithic. Regional variations appear to exist for this general trend. For example, a palynological sample from Boker Tachtit suggests a dry climate in the southern Levant (Horowitz, 1983), whereas a wetter phase in the caves of the Mediterranean core zone is evidenced by large-scale alluviation during the early Upper Paleolithic occupations (Bar-Yosef and Vandermeersch, 1972). Temperatures were relatively cool with warmer fluctuations.

To summarize these various lines of evidence, the humid conditions during the early Middle Paleolithic began to turn drier around 60 000 BP. This drying trend continued throughout the Middle Paleolithic and early part of the Upper Paleolithic. Around 40 000 BP, during the transitional period from the Mousterian to the early Upper Paleolithic, the climate was basically cold and dry throughout the Levant. A climatic amelioration began ca.32 000 BP, marked by notably wetter conditions. Corresponding broadly to the early isotope Stage 2, this period became the most humid of the Levantine Upper Paleolithic. While the temperature during this period was cool compared to today's standards, there were several global fluctuations between warm and cold between ca.40 000 and 23 000 BP, according to $^{18}O/^{16}O$ records in the GISP2 deep-ice core (Mayewski et al., 1994), after which cooler temperatures subsisted until the end of the Pleistocene. Around 20 000 BP the climate again turned drier and that tendency continued until around 14 500 BP, when the climate became more hospitable for human habitation.

To consider how the dated assemblages relate to global temperature changes, data from the GISP2 deep-ice core was used. Because ice-core paleoclimatic data are recorded on a calendrical time-scale, it was necessary to convert the uncalibrated ^{14}C dates of the assemblages used in this study. To perform this calibration, CalPal (Cologne Radiocarbon Calibration & Paleoclimatic Research Package) was used (Weninger et al., 2002). Fig. 4 displays the results of this calibration, together with the deep-ice core paleoclimatic proxies. The gradient shaded area within the lower portion of Fig. 4 represents the general precipitation levels during this period; the darker shaded areas represent more precipitation. The precipitation follows the broad trends outlined above, and does not represent a precise, measurable level of precipitation, as these levels apparently varied throughout the Levant. The shaded area only represents the general trend of a peak in precipitation around 32-30 000 BP.

The majority of sites in this sample seem to have been occupied during warmer and wetter phases, particularly within the period between 28-32 000 cal BC. GISP2 ice core data

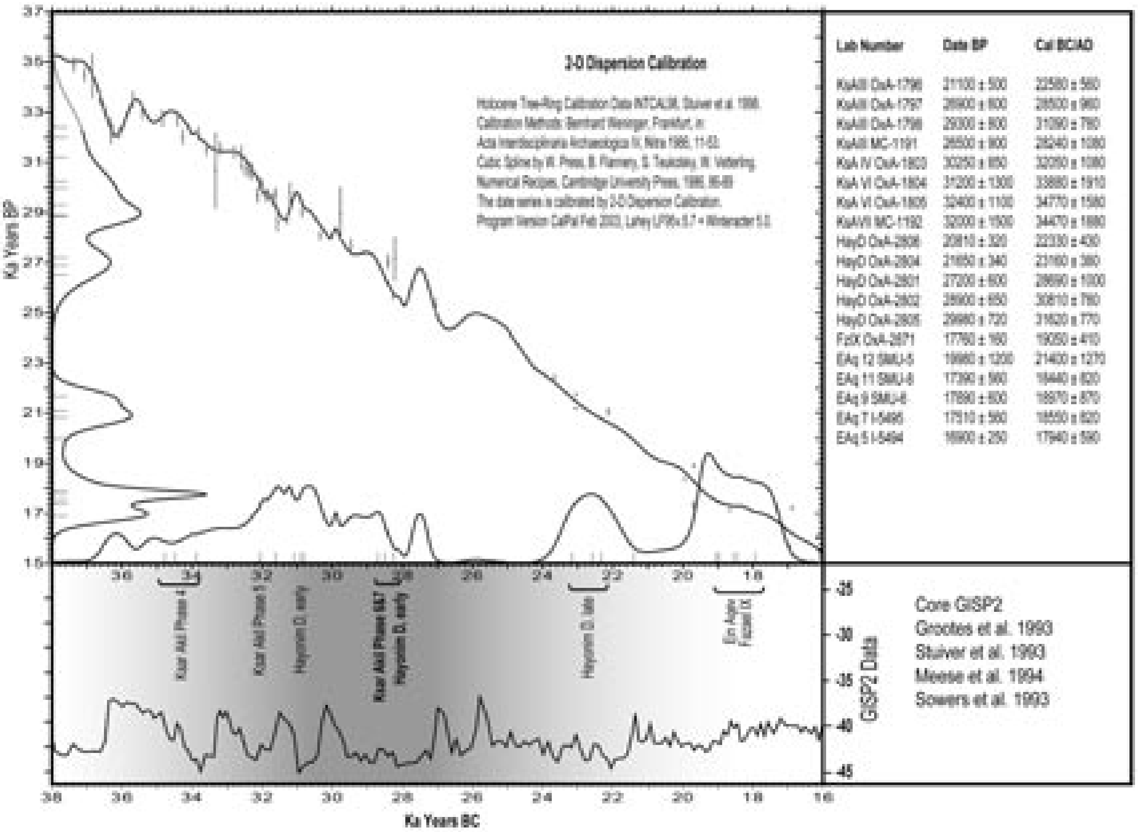

FIG. 4 – Calibrated radiometric dates for sampled assemblages, with paleoclimatic proxies.

suggest that several warm peaks are associated with this period (Grootes et al., 1993), and various local paleoenvironmental data suggest notably wetter conditions during this period (Goldberg, 1986, p. 239; Weinstein-Evron, 1990; Gilead, 1991). Notable exceptions to warm--wet climate occupations are Ein Aqev and Fazael IX, which fall within the cold phase of the record. The late dates at Hayonim D are found just at the boundary of the warmer peak around 23 000 cal BC, and the beginning of the cold phase. Given the tentative correlation for the Ksar Akil dates, and the general spread of the Hayonim "early" dates, it is impossible to associate any of these assemblages with a particular spike in the $^{18}O/^{16}O$ records. Therefore, the most meaningful trend in Fig. 4 is the association Ksar Akil Phases 5-7 and Hayonim D with the climatic amelioration around 30 000 years ago, and the occupations at Ein Aqev and Fazael IX during the cold and dry conditions during the late Pleistocene.

Results

A goal of this study was to eliminate some of the ambiguity surrounding the Levantine Aurignacian by taking all of the assemblages that have been called by this name and analyzing them on equal terms to determine how they compare among themselves, and to the broader Upper Paleolithic.

The classification of assemblages in this study follows schemes put forward by Henry (1989a, p. 81-89) and Marks (2003). In short, this scheme uses four archeological fields of data, ordered from broad to specific: complex/lineage, industry, phase/facies, and assemblage. The assemblage is the most spatially- and temporally-refined unit that can be identified at any given archeological site, and forms the basic comparative unit for the higher-order classificatory scales. A complex, or lineage, is defined on the basis of a broad level of technological affinity, recognized as similar methods of blank reduction. An industry is defined by more specific technological attributes (e.g., metric parameters and frequency ranges), and activity-independent typological criteria such as tool blank selection and type of retouch. Phase/facies criteria are highly specific, such as a highly distinctive retouch type that in all probability would not occur independently at different locales or during different periods. It is clear that among the sampled assemblages in this study, there are no elements of the lithic assemblages that are sufficiently distinctive to allow identification at the scale of phase/facies. There are no technological characteristics that were solely restricted to a certain geographic region within the study area, or to a small time frame within this sample. There is not enough resolution to allow the identification of a phase/facies, which might even hold true for the entire Levantine Upper Paleolithic.

A possible exception to this generalization is the Ksar Akil scraper, which is found right around 25 000 BP at three sites with seemingly similar technologies: Ksar Akil Levels IV and V of the 1947 excavations (Ewing, 1947), Boker BE Levels III-VI (Jones et al., 1983), and Thalab al-Buhira (Coinman, 2000). The distinctiveness of the Ksar Akil scraper, coupled with technological similarities and seemingly tight chronological resolution, appears to represent a subdivision or phase of the larger Ahmarian. The Ahmarian, however, is not the focus of this study.

Most of the assemblages in this sample belong to a single complex/lineage, which is characterized broadly as a flake-oriented technology. While blades and bladelets were produced at some of these assemblages, sometimes in large numbers, the technology, on the whole, is oriented toward relatively thick blanks that are less than twice as long as they are wide.

While a flake technology is important at most of the sampled assemblages, blade and bladelet production was also present, and was practiced in earnest at a few of the assemblages. It is necessary to consider carinated items when discussing core technology for the sampled assemblages. That carination is related to twisted bladelet production is becoming more apparent as this issue is further researched.

The strategies used to produce flakes are generally related among these assemblages, while other aspects of the technology (e.g., bladelet production) vary considerably. Also, typological characteristics are divergent within this group of flake technologies. The impact of carination on core technology is apparent in Fig. 5. When carinated items are placed in the bladelet core category (graph B), the core inventory of assemblages with significant carination indices are markedly influenced. In particular, the relative proportion of bladelet cores is increased. Given the evidence supporting carination as a means of producing twisted bladelets, and the definition of carinated items used in this study, it is reasonable to consider graph B in Fig. 5 as a more accurate representation of core technologies. When carinated items are considered in the bladelet core percentages, the assemblages cluster into three broad groups, represented by bladelet-rich core technologies at the top of the tripolar graph, and two other groups characterized by fewer bladelet cores and higher percentages of flake cores. Arkov is excluded from any grouping because of the extreme paucity of cores other than carinated items in this assemblage.

Two of the sampled assemblages can not be considered flake technologies as a result of their blade-bladelet oriented reduction sequences: Ksar Akil Phases 3 and 4. Ksar Akil Phase 3 is characterized by habitual production of blades and twisted bladelets, with the use of a reduction sequence unlike the others in this sample. Ksar Akil Phase 4 is characterized by blade and bladelet production, with many more incurvate profiles than the preceding period, and a large percentage of el-Wad points. In many ways, Ksar Akil Phase 4 resembles the Early Ahmarian

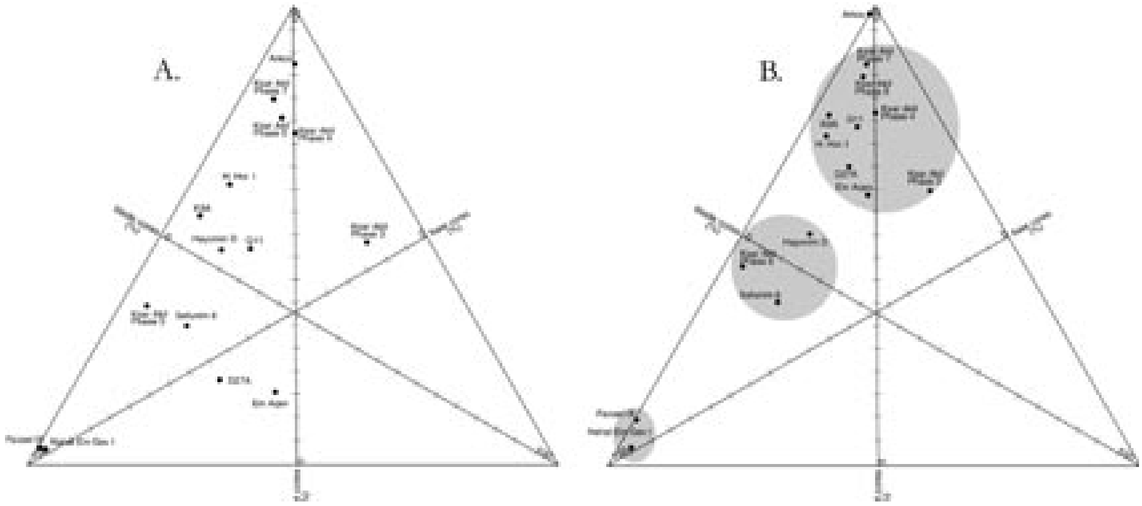

FIG. 5 – Tripolar graphs: (A) - Core scar pattern frequencies, excluding carinated items. (B) - Scar pattern frequencies, cores and carinated items (twisted bladelet cores).

industry of the southern Levant. Ksar Akil Phases 3 and 4 fall squarely within the "Leptolithic" complex described by Marks (2003), and as a result, will not be further considered in this study (for detailed information about these assemblages, see the study in Williams, 2003a).

Using the information from various analyses, such as scar pattern complexity, blank profile, and length-width ratios (Williams 2003a), some generalizations can be made about the reduction sequences for the sampled assemblages (Table 7). Most assemblages have multiple reduction strategies, where flakes were produced with one strategy, and blades and/or bladelets were produced with another strategy. There are only two assemblages with a single reduction strategy (Fazael IX and Nahal Ein Gev I), which was solely oriented toward flake manufacture. Of the blade-bladelet producing reduction strategies, one was geared toward the manufacture of incurvate blanks, while the other produced blanks with twisted profiles.

Fig. 6 displays how the assemblages were classified in this study, and the major characteristics of each classificatory unit. Providing a list of criteria and attributes that does justice to the classificatory scheme is difficult. Nevertheless, the most pertinent criteria are listed in Fig. 6 in some cases with the representative range of variability among the sampled assemblages. The ranges listed do not represent precise exclusionary break points, but rather show what is typical for a particular complex or industry. Indeed, some of the assemblages in this sample fall outside the given ranges, but for known reasons (Williams, 2003a).

At one time or another, all of the assemblages listed in the flake-oriented complex/lineage in Fig. 6 have been called Levantine Aurignacian. These assemblages, however, can be divided into three industries. Marks (2003) recognized all of the reduction strategies of the flake-oriented complex/lineage within his discussion of the Levantine Aurignacian. Noting the difficulties of using published information to compare assemblages, he tentatively grouped all of the flake-oriented assemblages sampled in this study within a single industry because each of them seemed to possess all of the identified reduction strategies. In contrast, this study found that all of these assemblages do not share the same reduction strategies, and they can be divided into three industries, each with their own specific characteristics.

We are now faced again with the ongoing debate between various researchers: what is and what is not Levantine Aurignacian? Is it useful to classify these industries under a broader Levantine Aurignacian heading, possibly defining geographic sub-regions, or temporal ranges, or is it more productive to reserve this title for a particular industry that is more fundamentally

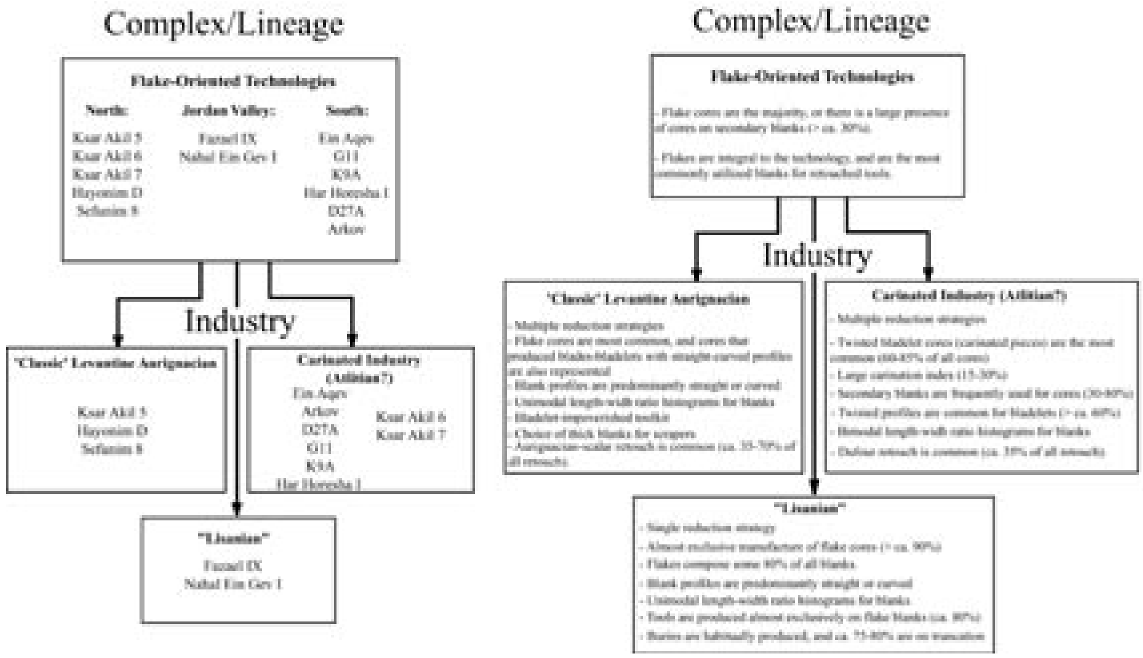

FIG. 6 – Classificatory scheme for the sampled assemblages, and the characteristics and criteria of each classificatory unit.

Aurignacian than the others? It seems that the title "Aurignacian" has somehow been awarded an intrinsic value, probably by virtue of its application to assemblages throughout the Near East and Europe, and the implied association with a an early modern human culture, spread throughout the Old World through diffusion or migration. The problem with this scenario is that in the Levant, the Aurignacian arrives some five to ten thousand years later than the Initial Upper Paleolithic, which itself exhibits all of the features of the Upper Paleolithic behavioral complex, including bone tools and ornaments (Kuhn, 2003). Thus the utility of the Levantine Aurignacian, as Kuhn (2003) rightly remarks, is not some implicit notion of behavioral superiority, but rather how it is found in areas so far apart as southwest France and the eastern Mediterranean. Such a question is beyond the scope of this study, which is concerned with how to classify and explain the identified industrial variability within the Levant.

Both the classificatory framework provided by Marks (2003), and the hypothesis provided by Bar-Yosef and Belfer-Cohen (1988) have been tested in this study, revealing that, firstly, the questioned assemblages do not belong to a single industry, and secondly, that the dissimilarity between the "classic" Levantine Aurignacian assemblages in the Mediterranean woodlands and the remaining assemblages in the marginal zone are a result of different core reduction strategies, rather than site formation processes.

We know that there is a Levantine Aurignacian in the Mediterranean Woodlands, which in this study occurs at Ksar Akil Phase 5, Hayonim D, and Sefunim 8. These assemblages bear some resemblance to the classic Aurignacian from Europe, particularly southwest France, including thick nosed and shouldered scrapers, Aurignacian blades, and even split-based antler points and art (Bar-Yosef and Belfer-Cohen, 1988). As detailed below, we also know that toward the end of the Upper Paleolithic, assemblages are found with some Aurignacian characteristics, but possessing a fundamentally different core reduction strategy, aimed at the habitual production of twisted bladelets, or "carinated" reduction, as it is defined in this study. These differences indicate that the classic Levantine Aurignacian and the carinated assemblages are two, distinct industries, but the question remains, should the term Aurignacian also be applied to the carinated industry, noting perhaps a temporal or geographic distinction? "Early" and "Late" Levantine Aurignacian might be used, but at this point, a developmental link between the two industries has not been clearly demonstrated. Perhaps the best way to proceed with the classification is to search for previous terminology applied to similar entities.

There has been a division of the Levantine Aurignacian before, based on the sequence at Ksar Akil. It was divided into Levantine Aurignacian A, B, and C at the London Conference (1969), corresponding to Phases 3-4, 5, and 6-7 in this study, respectively. Using this framework, the industry represented by Ksar Akil Phase 5, Hayonim D, and Sefunim 8 could be termed "Levantine Aurignacian B", and the industry represented by Ksar Akil Phases 6-7, Ein Aqev, and the remaining carinated assemblages in the Negev could be termed "Levantine Aurignacian C". This author is hesitant to use the London Conference classification, however, because in a separate study (Williams, 2003a), Ksar Akil Phase 4 was found to resemble the local Ahmarian industry more than any Levantine Aurignacian assemblage. The resemblance of Ksar Akil Phase 4 to the Ahmarian was also noted by Bergman (1987, p. 146), thus casting doubt on the utility of the term "Levantine Aurignacian A". Kebara Levels I-II have also been compared to the "Levantine Aurignacian A" (Bar-Yosef and Belfer-Cohen, 1996), but recent analyses indicate very different reduction sequences at Kebara I-II and the corresponding levels at Ksar Akil (Williams, 2003a).

The participants at the London Conference also agreed to abandon the term "Atlitian", first proposed by Garrod (1937), and use instead "Levantine Aurignacian C. Given that "Levantine Aurignacian A" seems to be a problematic term, perhaps we should return to Garrod's terminology, applying the term "Atlitian" to the "Levantine Aurignacian C" material. In fact, the term "Atlitian" has not been abandoned entirely, and it has recently been revived by Belfer-Cohen and Goring-Morris (2003), in their outline of Upper Paleolithic entities. This study is largely in agreement with Belfer-Cohen and Goring-Morris, with the exception of the "Atlitian" category. They noted the poor fit of some assemblages within this category, particularly Fazael IX and Nahal Ein Gev I, which are "quite different" than el-Wad C — the type site for the Atlitian (Belfer-Cohen and Goring-Morris, 2003, p. 8).

Garrod first defined the Atlitian at el-Wad cave, Level C (Garrod and Bate, 1937, p. 41-44). She noted that Level C at el-Wad bore some resemblance to the underlying Aurignacian level (D), which she believed to be European in origin. But Level C was sufficiently distinctive from the Aurignacian to warrant its own name (Atlitian) which she believed was "a specialised development of the Aurignacian, so far unknown outside Palestine." (Garrod 1953, p. 20). Atlitian assemblages were "less elaborate" than the Aurignacian (i.e., fewer tools with profuse retouch and less tool diversity), and steep or carinated scrapers and burins became the predominant tools, as opposed to rostrate scrapers with projecting noses in the Aurignacian (Garrod, 1953). Furthermore, microliths make their first appearance. It is important to note that many of Garrod's polyhedric burins and steep scrapers would have been classified as carinated pieces and bladelet cores in this study, judging from the artifact illustrations (Garrod and Bate, 1937, Plates XVI and XVII), and that a large microlithic component was almost certainly missed without some of the more advanced excavation techniques that developed after Garrod's time.

All things considered, Garrod's Atlitian appears to be similar to the carinated industry identified in this study, with some obvious exceptions (e.g., Châtelperron points). Ksar Akil Phase 6, Fazael IX, and Nahal Ein Gev I have all been compared to the Atlitian, based on the presence of burins on truncation. But this study has revealed that the underlying technology is considerably different between Ksar Akil Phase 6 on the one hand, and Fazael IX and Nahal Ein Gev I on the other. While burins on truncation are found at Ksar Akil Phase 6, these tools were produced habitually at Fazael IX and Nahal Ein Gev I, to the virtual exclusion of anything else, within a technology geared solely for a single purpose — the production of thick flakes for burin manufacture. In contrast, Ksar Akil Phase 6 is characterized by a carinated technology, particularly lateral carinated pieces, and shares more in common with the other carinated technologies in this study, such as Ein Aqev.

Therefore, the term "Atlitian", if it were to be used, seems more appropriate for the carinated industry in this study, or the "Unnamed flake-based entities" identified by Belfer-Cohen and Goring-Morris (2003, p. 8). It is impossible to say with certainty that el-Wad C is part of the same industry as the carinated technologies in this study, because there is no complete collection from Garrod's excavations at el-Wad. This author did have the occasion to look at a portion of the collection from el-Wad C at the Peabody Museum. No detailed analysis was performed because of the incomplete nature of the collection, but it did bear some resemblance to the carinated technologies in this sample, most notably the presence of carinated pieces and dihedral burins. Nevertheless, we may never know the exact nature of Garrod's Atlitian, and it is a problematic term, given its uncertainty. As a result, the term "carinated industry" will be used in this study, and a tentative association is made with the Atlitian, until we know with more certainty Garrod's perception of this industry.

Finally, a new name is proposed for Fazael IX and Nahal Ein Gev I: Lisanian. Given their apparent association with the settings of the prehistoric Lake Lisan, and their very distinctive lithic assemblages, it seems fitting to provide Fazael IX and Nahal Ein Gev I with an equally distinctive and refined name. Other researchers have repeatedly compared these assemblages to the Atlitian, but this study has revealed a reduction sequence sufficiently distinct as to warrant a separate name. At present, it seems that the Lisanian reduction sequence is as different from assemblages such as Ksar Akil Phase 6 as it is from the Levantine Aurignacian.

The following is a description of the industries identified in this study.

The Levantine Aurignacian industry

This industry is characterized by multiple reduction strategies designed to produce each of the following: flakes, blades, and bladelets. Flakes and blades are the most predominant blanks. Flakes are produced on globular cores, which typically have more than one platform and orientation. Sefunim 8 is an exception, where most flake cores are single platform varieties. These cores produced thick flakes that were used primarily in the production of scrapers, which are characteristically thick and shouldered or nosed.

Bladelets are generally rare, and appear to represent activity-specific episodes, such as the "kitchen midden" at Hayonim D (Belfer-Cohen and Bar-Yosef, 1981). At Hayonim D, the bladelet cores appear to represent small versions of blade cores, which were used to produce the characteristic blades that were sometimes made into tools with Aurignacian-scalar retouch, the dominant method of retouch (generally greater than 50% of all retouch). Both the blade and bladelet cores are typically single platform, with little in the way of treatment, and are typically conical shaped.

Blades and bladelets are almost exclusively incurvate in profile, and there is an associated near absence of carinated pieces. The exception to this paucity of bladelets is Ksar Akil, where bladelets are relatively abundant throughout the sequence. Also, twisted bladelets are relatively common throughout — a phenomenon also noted by Bergman (2003). In this case, it is important to note the general trend within the sequence at Ksar Akil, where Phase 5 produces distinctly fewer twisted debitage than the preceding or succeeding phases (Table 8). When compared to the plethora of twisted profiles/carination in Phases 6-7, the numbers are very minor in Phase 5. In addition, the broad geological levels excavated at Ksar Akil most probably led to mixing of cultural layers in the excavated levels. The carinated pieces in Phase 5, therefore, could represent some mixing from Phase 6, judging from their increased presence in the upper sub-levels. Twisted bladelets and carinated pieces are also present in moderate numbers at Sefunim 8. If these pieces are *in situ* and are not derived from a more recent layer above 8, they might represent the introduction of a new technology within an otherwise non-carinated sequence of reduction.

One of the more diagnostic properties of the Levantine Aurignacian industry is the use of thick blanks for scrapers. Not only does this industry exhibit a larger mean scraper bit thickness than the remaining industries, but also apparently thicker blanks were preferentially chosen for use as scrapers. Table 9 presents the mean scraper bit thickness (i.e., working edge length) for all scrapers in all assemblages. It is clear that the Levantine Aurignacian exhibits the largest mean value for this measurement. It is worth examining if thick scrapers in all of the assemblages represent extensive resharpening, or a preference to produce thick scrapers. Support for the second scenario (a preference for thick scrapers) is provided by Table 10, which shows the largest discrepancy between debitage blank thickness and scraper blank thickness in the Levantine Aurignacian. This industry was not producing the thickest flakes, but scrapers were produced on considerably thicker flakes than what is represented in the debitage — a difference that exceeds all other industries.

Another diagnostic element of this industry is the use of Aurignacian-scalar retouch. Unlike the non-invasive nibbling most commonly practiced in the other industries, the majority of retouch in the Levantine Aurignacian industry is distinct in its invasiveness onto the face of the blank.

The Carinated industry

Most of the Negev assemblages in this study, as well as Phases 6-7 at Ksar Akil, are characterized by a technology oriented toward the production of twisted bladelets via carination (twisted bladelet removal). An important conceptual break separates this industry from all others. Carinated technologies in this sample produce a subset of final products (bladelets) in a two-step process involving the manufacture of a thick flake, and then the use of that flake as a core for the manufacture of twisted bladelets. This interrelationship between flakes and bladelets does not consistently exist within any of the other industries. Rather, there is a discontinuity between flakes and bladelets in the other industries.

This industry utilizes multiple reduction strategies to produce two primary blank subsets: flakes and twisted bladelets. Flakes were used both as tools and as cores, as described above. Burins and scrapers were produced from the flakes, and the relative proportion of these tools among the assemblages in this industry appears to represent activity-specific episodes. Burins are typically dihedral varieties, and scrapers are typically simple endscrapers. Retouch is typically non-invasive, typically of the Dufour variety. Also, Aurignacian-scalar retouch is rare.

The most characteristic aspect of this industry is the use of secondary blanks for the production of twisted bladelets (i.e., lateral carination). This is a novel approach to bladelet manufacture within this sample, and is clearly visible in Table 11, which displays the type of blanks used for bladelet manufacture. Typical bladelet cores are produced on primary blanks (chunk/cores), and presumably reduced from blocks of raw material and reduced in a single process. Bladelets produced from secondary cores, however, involves a two-stage process, where a blank is first removed from a primary core, and then the secondary blank (usually a thick flake) is used as a core itself to remove smaller bladelets. This usually involves carination, due to the tendency of bladelet removals to twist around the edge of a blank.

The assemblages of the carinated industry are plainly visible in Table 11 by the leap in the percentage of secondary blanks for bladelet manufacture. The carinated assemblages are typically above 30%, while the remaining assemblages fall around 20%.

While all assemblages in this industry have carination in common, there is some variability among the assemblages. Arkov does not fit comfortably within the group, as it exhibits some uncommon characteristics. Namely, the carinated pieces are often very large, and were produced on tabular raw material, which may account for some of the irregularities. There is a paucity of flake cores, which might relate to an incomplete sample. Nevertheless, Arkov shares enough affinity with the carinated industry to tentatively be considered as such.

It should also be noted that K9A has come under scrutiny (Belfer-Cohen et al., 1991), for its possible misidentification as an Upper Paleolithic assemblage. The collection from K9 was originally divided into two separate groups (A and B), on the basis of differential raw material (flint and chalcedony) in what were thought to be two overlapping concentrations of artifacts — flint was assigned to the Upper Paleolithic and chalcedony to the Epipaleolithic "Negev Kebaran" or "Ramonian" (Larson and Marks, 1977). Since this time, differential raw material usage has been observed at exclusively Epipaleolithic assemblages from the Negev, which purportedly look similar to the K9 complex (Belfer-Cohen et al., 1991; Marder, 1994). However, the analyses of this study indicate that the reduction strategies at K9A share the same industrial affiliation with the other carinated assemblages in the Negev. K9A is particularly similar to the neighboring sites of G11 and Har Horesha I on the Har Harif plateau. It will be interesting to know if such a degree of technotypological affinity exists at Epipaleolithic sites such as Nahal Neqarot (Belfer-Cohen et al., 1991), when detailed information is published.

The Lisanian industry

Fazael IX and Nahal Ein Gev I are certainly distinctive in the sampled assemblages as the only single reduction strategy oriented solely toward flake production. Flakes were produced in great abundance, to the virtual exclusion of blades and bladelets, and they were habitually used for the manufacture of burins on truncation. The simplicity of this reduction strategy was consistently revealed in a number of analyses (Williams, 2003a). The habitual production of flake cores is reflected in Fig. 5. These cores are not particularly large, and are globular in shape, often with more than one platform and numerous flaking surfaces. Blank types reflect a flake technology, with broad, thick flakes being predominant. The tool kit is heavily dominated by burins on truncation (80,9% and 74,9% of total burins at Fazael IX and Nahal Ein Gev I, respectively).

Discussion

With the assemblages set within a classificatory framework, it is now possible to search for what might be influencing the perceived similarities and differences among the assemblages. The first avenue of inquiry involves potential influence of environmental conditions on the material record. Lithic technology might be closely related to social entities, yet the resolution of the existing archeological record during this period is not sufficient to allow conclusions to be drawn about social entities. The highest resolution this study was able to discern from the lithic artifacts was industrial variability. Certainly social/cultural issues must be sought at the phase/facies level. So it is necessary to work with the information at hand. An attempt is made here to search for broad relationships between technology and the environment. Because there are over 20 000 years to work with in the Upper Paleolithic, perhaps there is some chance that relationships could be found, at least at a very large scale.

In the broadest sense, the Upper Paleolithic period experienced two major climatic regimes: a warmer and more humid period from its onset, up until around 24 000 BP, when the climate turned cold and dry. The first climatic regime during the early and mid-Upper Paleolithic witnessed several oscillations between warmer and cooler temperatures, while the final Upper Paleolithic seems to exhibit more climatic stability: cold and dry (Fig. 4). The broadest association that might be made with technological change is the increased production of microliths (bladelets) during this period. The Dufour bladelets produced in the carinated industry contrast sharply with the Levantine Aurignacian, where microliths are generally rare. Perhaps it is no coincidence that the dates of this broad industrial variability correspond to the extreme periods of each climatic regime: a climatic optimum at 30-35 000 BP, and the most severe portion of the cold-dry phase, at around 17-20 000 BP.

There is evidence that twisted bladelets were curated extensively throughout the Central Negev Highlands (Williams, 2003b). This is evidenced at sites such as Arkov and D27A where hundreds of carinated pieces/twisted bladelet cores are found, but twisted bladelets are virtually absent. These sites are all situated on plateaus near raw material outcrops, and appear to represent ephemeral episodes of twisted bladelet production, where the cores were left and the twisted bladelets were carried away. If the bladelets were removed by Upper Paleolithic people rather than by nature, then the carinated assemblages on the plateaus of the Negev Highlands appear to represent gearing-up episodes where cores were reduced and the twisted bladelets were carried away. Such a scenario seems to suggest ephemeral camps within a mobile settlement system. Another possibility is that the bladelets were used within the general vicinity for utilization of local resources, and thus did not necessarily represent groups traversing great distances. In this latter scenario, perhaps Ein Aqev can be considered less ephemeral than the other carinated industries up on the plateaus, even a base camp of sorts, judging from its much greater artifact density, larger size, and greater level of activities represented (including large limestone blocks carried into the site, a large firepit, comparatively rich faunal remains, Mediterranean shells, ochre, and ground stone).

Nevertheless, mobility is suggested at Ein Aqev at varying scales. On a smaller scale, the presence of steppic mammals such as *Equus hemionis* (onager) in the faunal inventory suggests that game procurement also took place somewhat far afield. Also on a local scale, the presence of two basalt groundstone artifacts suggests trips to the closest basalt outcrop, at Giv'at Ga'ash some 30 km to the southeast in Maktesh Ramon (Bar-Am and Shalem, 1983). On a larger scale, the presence of Mediterranean shells suggests either trading networks, or that the Mediterranean coast was included within the range of movement for the people who inhabited Ein Aqev. Ein Aqev is situated 54 km from the coast as the crow flies, and foot passage to the coast entails moving some 75 km along winding wadi beds to avoid sheer cliff ascents and descents.

Given this evidence, as well as independent studies (e.g., Henry, 1987; Almeida, 2000), carinated technologies are well-suited for a mobile settlement pattern, which traditionally has been considered to be most advantageous during periods of diminishing resources resulting from dry and/or cold climatic conditions. The first carinated industries, however, occurred before the cold-dry phase at the Terminal Upper Paleolithic. Carinated technologies appear as early as Phase 3 at Ksar Akil, and are found in earnest in Phases 6-7, around 26 000 BP, just after the Levantine Aurignacian industry. It is indeed too simplistic to correlate microliths at

Ksar Akil with cold-dry conditions, as bladelets occur throughout the Upper Paleolithic sequence, both before and after Phase 6. What can be said about Ksar Akil is that increased microlithization occurred throughout the Upper Paleolithic sequence, with a brief hiatus in Phase 5. Judging from Tixier's (1974) publication, bladelets became increasingly smaller and more prolific in the layers above those analyzed in this study (post-30 000 BP).

Unfortunately, the more recent levels above Ksar Akil Phase 7 were not analyzed in this study. Judging from Tixier's publications (1974), twisted bladelet manufacture begins fading around 27 000 BP as curved bladelets become more common, and by 25 000 BP, there is an Ahmarian industry present, complete with the micro-denticulated Ksar Akil scrapers, seen at sites with the exact same date in the Negev (Boker BE) and in Jordan (Thalab al-Buhira), as described earlier.

The period around 25 000 years ago appears to represent a brief period of climatic amelioration, when Ahmarian industries proliferated throughout the Levant, occupying both the Mediterranean woodlands and the deserts, down to Jordan and the Negev. The assemblages of Boker BE II in the Negev and Thalab al-Buhira in the Wadi Hasa are so similar to each other that they appear to represent the exact same group of people, exploiting similar environments. It is no coincidence, then, that each provides the same dates, as well as the closest thing in the Upper Paleolithic to a type fossil: the Ksar Akil scraper, which is also found at Ksar Akil with a similar technology and the same date. Thus it seems that up to 25 000 BP we are witnessing pulses of groups, following the expansion of resources into marginal areas during periods of climatic improvement.

The impact of the deteriorating climatic conditions after 25 000 years ago can be seen in the archeological record. First, there are no dated sites between 25 000 and 22 000 BP (Phillips, 1994). When sites begin reappearing, they display increasing specialization in bladelet manufacture. This is exemplified by the Late Ahmarian industry on one hand, and the carinated industry on the other. The Late Ahmarian industry appears to be relatively common within the marginal zone, given the presence of identical assemblages in the Negev and west-central Jordan (e.g., Ein Aqev East and Ain al-Buhira), and when equated with Goring-Morris's "Mazraqan", a different term for the same industry, it apparently is spread from the Sinai up through the Rift Valley and into Lebanon and Syria (Goring-Morris, 1995). It is important to note that fully-fledged microlithic technologies were present since the beginning of the Upper Paleolithic, with the Early Ahmarian, which has been shown with detailed refitting to be an elegant, efficient, and redundant method of producing bladelets (Davidzon, 2002; Monigal, 2003). There is still, however, a general trend of increasing microlithization within the Ahmarian itself, indicated through increasingly small bladelet manufacture in the Late Ahmarian (e.g., Goring-Morris et al., 1998)

A framework where technologies produce ever-smaller microliths toward the end of the Upper Paleolithic as a response to deteriorating climatic conditions cannot be applied in a sweeping fashion across the study area for a number of reasons. The main reason is that Fazael IX and Nahal Ein Gev I, which are roughly contemporaneous with Ein Aqev, are both very large, blocky flake technologies, where blades are almost non-existent. These two assemblages form an industry that appears to represent a specialized adaptation to a lake setting. Fazael IX and Nahal Ein Gev I were occupied at the maximum extent of Lake Lisan and both appear to represent specialized adaptations to this particular setting.

At its maximum extent, Lake Lisan covered some 320 km from north to south, forming a connection between the modern water bodies of The Sea of Galilee and the Dead Sea. It is somewhat problematic to correlate assemblages with high lake levels, because there were large fluctuations over the course of a few thousand years. Apparently, there were repeated

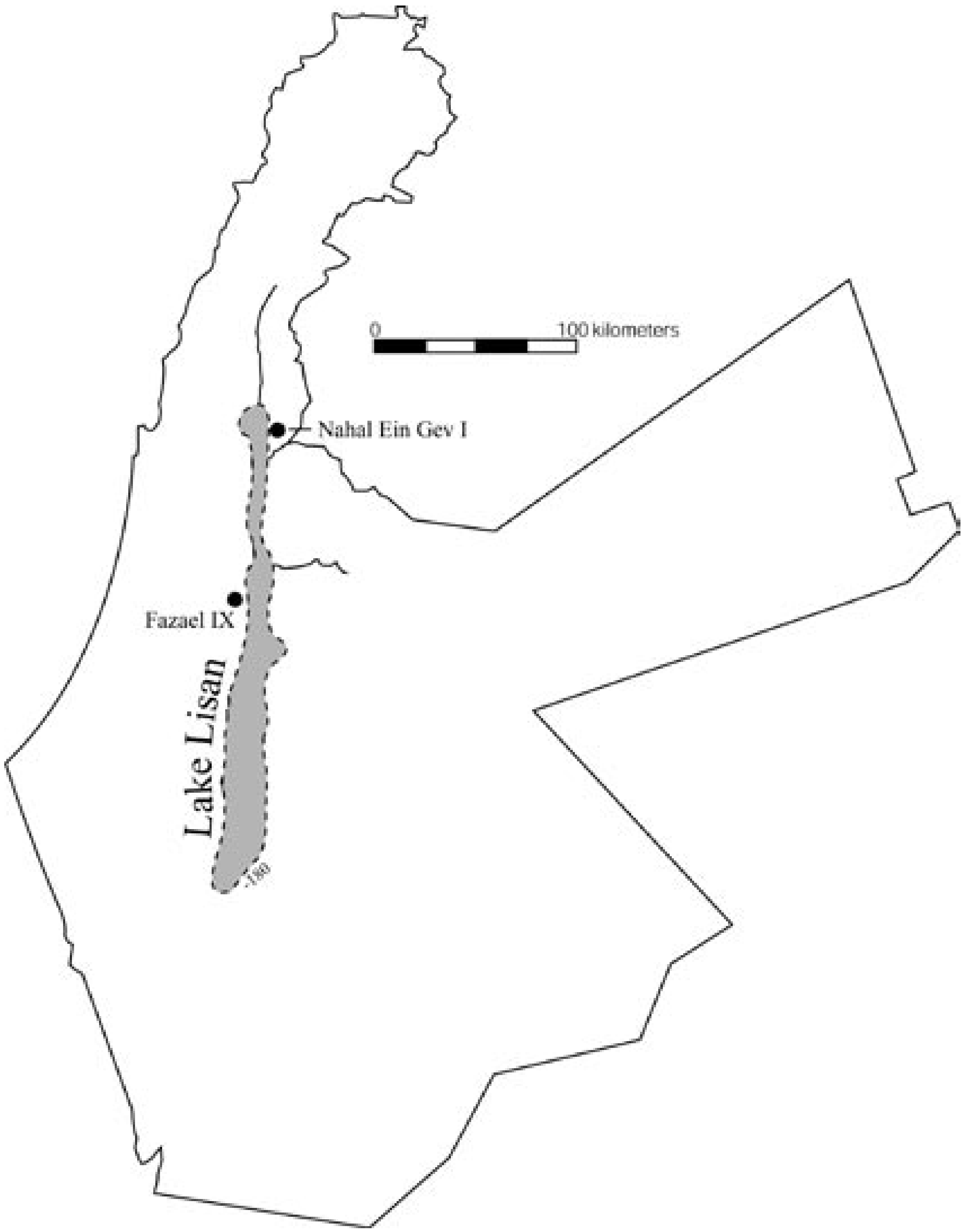

FIG. 7 – Lake Lisan between ca.20 000 and 17 000 BP, at -180 m below sea level, and the location of the Lisanian industry sites in relation to the lake.

termination/refilling episodes for Lake Lisan, where the lake would separate into two bodies, equivalent to the modern Sea of Galilee and Dead Sea, only to refill and combine again into a single lake after a couple thousand years. Lake Lisan certainly terminated around 23 000 years ago, when Ohalo II was occupied on the southern coast of the Sea of Galilee, at an elevation of 212 m below sea level. This site has been soundly dated from huge quantities of recovered charred material, providing a calibrated date of ca.23 000 BP (Nadel et al., 1995, 2001).

This date coincides with a low lake level postulated by Begin et al. (1985). Apparently, Lake Lisan refilled by 20 500 BP, then terminated again quite rapidly about 17 000 BP as a result of subsidence of the Dead Sea and Lake Kinneret basins, combined with a continued drying trend. The lake again returned to its former level about 15 000-14 000 BP, where it remained for about 2500 years before dropping to an all-time low of -700 m below sea level during the Younger Dryas (Neev and Hall, 1977; Begin et al., 1985).

The inhabitants at Fazael IX and Nahal Ein Gev I appear to have exploited environment of the lakeshore during a high stand around 17-18 ka BP (Fig. 7). The lake was probably too saline to support freshwater fish. Salinity levels varied both temporally and spatially within the lake, and generally increased north to south. In the southern part, around the modern location of the Dead Sea, salinity was 100 g/L of total dissolved solids (TDS) during the highstand (Hurwitz et al. 2000), compared to the current value of 340 g/L (10 times the value of sea water). Also, the northern tip of Lake Lisan was much more saline than the present-day Sea of Galilee (~0.45 g/L TDS; Hurwitz et al. 2000). Fish are usually absent in inland saline lakes, and the majority of wildlife is waterfowl, which feed on various invertebrates living in the saline lake. Indeed, avifauna and freshwater crab were recovered in a rich faunal assemblage at Fazael IX that was primarily represented by gazelle (81%) and Persian Fallow deer (21%) (Goring-Morris, 1980, p. 26, Table 3). Other remains included goat, aurochs, roe deer, wild boar, and red deer. The presence of a few marine mollusks indicates either trading or a settlement pattern that included the Mediterranean coast. The significance of burins on truncation remains unknown, but they might have been used to fashion bone tools, which included awls produced on various gazelle bones, a fragment of a point produced on a deer antler, and a polished rib fragment (Goring--Morris, 1980).

Intensification during the Terminal Upper Paleolithic

The broadest trend visible in this study is that lithics become increasingly small toward the end of the Upper Paleolithic. The global trend toward microlithization during the terminal Pleistocene has often been explained in evolutionary terms by various authors, who suggest that compound tools with microlithic inserts may have provided energetic or strategic advantages in the food quest (Kuhn and Elston, 2002). There does not appear to be a single cause for microlithization, as explanations for this phenomenon vary in different areas and among different researchers. Various authors have proposed a range of advantages afforded by microlithic technologies, including high residential mobility (Goebel, 2002; Neeley, 2002), reduction of subsistence risks associated with expanding into unfamiliar territories (Elston and Brantingham, 2002; Hiscock, 2002), and the simultaneous diversification of both toolkits and subsistence regimes (Goebel, 2002; Hiscock, 2002; Kuhn, 2002). The common theme shared by all of these approaches is that microlithization provides a viable response to whatever external pressures might be causing a "riskier" existence (Kuhn and Elston, 2002, p. 12). Composite tools with microlithic inserts might have provided strategic advantages, such as ease of manufacture, interchangeable weapon parts, and heightened effectiveness and versatility.

With reference to this study, perhaps resource dwindling associated with climatic deterioration after 25 000 BP made microlithization a desirable option. If access to food sources becomes unpredictable, one solution is to turn to more abundant but less nutritionally valuable or more costly foods, as Stiner et al. (1999) have suggested in a model of small animal exploitation and population growth pulses at the onset of the Upper Paleolithic in the eastern

Mediterranean. In short, Stiner's model reveals that dietary breadth expanded in response to demographic packing at the onset of the Upper Paleolithic, evidenced by the steady increase of small game exploitation.

There is ample evidence that intensification was taking place on a large scale during the Terminal Upper Paleolithic. The specialized occupations at Fazael IX and Nahal Ein Gev I, for example, appear to be taking advantage of the lake setting, which included not only larger land mammals (gazelle, wild cattle, fallow deer, and fox) but also waterfowl, crab, and terrestrial molluscs (Goring-Morris, 1980). Further to the south, Ein Aqev is comparatively rich in faunal remains, including ibex, gazelle, onager, as well as some smaller animals such as hare, hardun, and ostrich (Tchernov, 1976), indicating the exploitation of numerous animals from various environments.

Probably the best example of intensification during the Terminal Upper Paleolithic is Ohalo II. This was a camp on the present-day Sea of Galilee that was occupied ca. 23 000 BP (calibrated), during a low lake level similar to that of today (Nadel, 2002; Nadel et al., 1995, 2001). Because it was submerged for most of its post-occupational history, it provides a unique example to observe a Paleolithic camp in a near-pristine state of preservation. Huge quantities of fish, bird, mammal, and rodent bones were found at the site, as well as the remains of a fishing net. Thus Ohalo II presents a perfect example of an intensified subsistence strategy utilizing numerous species of small animals that are harder to catch, or require a novel technology, while providing a more stable food source than larger prey. Of particular importance is evidence for technological innovations (nets) to exploit a new resource (fish). Also, botanical remains indicate that the occupants were eating numerous wild plants, including local cereals (wheat and barley), and various fruits (Kislev et al., 1992). The lithic assemblage at Ohalo has been classified as early Epipaleolithic, with some aspects of a Terminal Upper Paleolithic assemblage (Nadel, 2003).

A relevant model for this study is one developed by Stiner (2001; Stiner et al., 1999) dealing with small animal exploitation and population growth pulses. When Stiner's model is used as a backdrop against these data, a number of interesting patterns emerge. As Stiner suggests, when there are local shortages in high-ranked resources, one solution is to turn to more abundant but more costly or less nutritionally valuable foods. For much of the Upper Paleolithic, this option was perhaps more viable than another option, moving to another location with the high-ranked resources. This apparently occurred to some extent during the early and middle portion of the Upper Paleolithic, particularly when compared to the Middle Paleolithic. This is clear from the research of Stiner et al. (1999) at various caves throughout the eastern Mediterranean. When viewed at a somewhat smaller temporal scale in this study, it is evident that the other option was also practiced: moving to another location with high-ranked resources. This occurred during periods of climatic amelioration, most notably around 35-30 000 BP, and again around 25 000 BP, when Early Ahmarian groups occupied the Negev and Sinai along with the expansion of resources sustained by warmer and wetter conditions. In support of Stiner's model, it appears that during various phases of less-desirable climatic conditions, the marginal zone was largely vacant, suggesting that people chose to restrict their subsistence to resources within a particular area (in this case, the Mediterranean phytogeographic zone), while avoiding adjacent and less-productive areas.

Before the onset of unfavorable climate during the final Upper Paleolithic, it seems that risk was alleviated by diversifying subsistence to all available resources within a given environmental niche and/or by spreading-out within that niche during times of abundance. At the onset of a new climatic regime around 24 000 BP, apparently the same strategy of intensification within traditionally productive areas was attempted. The marginal zone was evacuated, and assemblages are only found in higher-resource areas, such as Ksar Akil and possibly in unique oasis settings such as Uwaynid 18 in eastern Jordan (Garrard and Gebel, 1988, p. 326). Nevertheless, intensification can only take you so far. Given increased external pressure (e.g., demographic and/or environmental), at some point resource diminution will reach a point where a given number of people will be forced to expand their area of exploitation to get the same amount of food, even if this entails expanding into marginal areas. This is apparently what happened beginning around 23 000 BP, when populations expanded throughout the study area, including the marginal area. Associated with this territorial expansion was a proliferation of microlithic technologies, from the Late Ahmarian/Mazraqan, to the carinated industry identified in this study. Also, a uniquely non-microlithic strategy was found around Lake Lisan, indicating that microlithization was not the only viable option. Further, it appears that this period witnessed not only an expansion of people into new territory, but also increased mobility within groups. In other words, they did not expand into a new area and then live there year-round. Rather, they included adjacent areas within a large settlement pattern of increased mobility.

All of the available evidence suggests that the occupants at Ein Aqev were either trading extensively with non-local groups, or more likely, that their settlement pattern was large enough to at least reach the Mediterranean coast. There is, however, an exception to a highly mobile settlement pattern during this period. Botanical and faunal evidence from Ohalo II indicates a year-round occupation (Nadel et al., 1995, 2001). This was almost certainly allowed by the abundant resources available at this particular location, particularly fish. Other areas, it seems, were less productive year-round, and required greater mobility to procure adequate food.

During the early and middle part of the Upper Paleolithic, better climate allowed the population pressure of prehistoric groups to be offset by intensifying already-existing subsistence strategies. Thus, mobility was not increased in some cases, and probably was even decreased during this early period. In other cases, populations expanded into new areas with climatic amelioration, following resources. When the climate shifted for the worse after 25 000 BP, the resulting stress on the system produced a threshold event, where populations were forced cover a larger area to procure the same resource return. Marginal areas such as the Negev springs and even the highland plateaus were occupied even during this cold and dry phase. Apparently, for the first time in the Upper Paleolithic, people moved into the marginal zone during a period of undesirable climate. It is this switch in behavior that suggests environmental pressures necessitated the expansion of exploited territory, as intensification and demographic pressure may have reached their limits.

Conclusions

The goals of this study were two-fold: to resolve some of the ambiguity in the Levantine Aurignacian by directly comparing the reduction sequences of relevant assemblages, and to search for what influenced any perceived variability in the assemblages that have been named “Levantine Aurignacian”. Although the exact nature of the Levantine Aurignacian is far from fully known, hopefully this study has resolved some of the existing ambiguities. At the very least, it is apparent that the assemblages under question can indeed be divided into three industries, based upon demonstrable differences in their reduction strategies. At a broad level, these differences seem to reflect intensified subsistence in response to climatic deterioration after 25 000 years ago. Unfortunately, the Upper Paleolithic chronology in the Levant is rather vague. Promising new research in places such as Kebara Cave (Bar-Yosef et al., 1992), the Wadi Hasa (Coinman, 2003) and Ohalo II (Nadel, 2003) are providing some of this much-needed chronometric precision, but the dates for the Upper Paleolithic as a whole are still far from clear. Nevertheless, there is a clear association between a major climatic shift for the worse after 25 000 BP, and microlithization/intensification afterwards that is exemplified by assemblages such as Ein Aqev and the other Negev assemblages in this study. It is also interesting to observe that, in this sample, microlithization was not the only option for intensification. For example, the Lisanian industry is characterized by a blocky flake technology, which habitually produced burins on truncation. These burins were perhaps related to bone/antler tool manufacture, judging from the relatively abundant bone tools at Fazael IX (Goring-Morris, 1980). The importance of the Lisanian within this model of intensification is the proposed exploitation of a lake setting at the end of the Upper Paleolithic.

Perhaps with continued research we will soon be able to address some of the larger issues, such as the relationship between the Aurignacian of Europe and the Levant, and possible diffusion of early modern human culture. The "classic" Levantine Aurignacian at Ksar Akil Phase 5, Hayonim D, and Sefunim 8 in this study is largely thought to bear the most resemblance to the Aurignacian of western Europe, based on various stone tools and bone/antler tools (Bar-Yosef and Belfer-Cohen, 1988, 1996; Belfer-Cohen, 1994; Belfer-Cohen and Bar-Yosef, 1999). Hopefully other papers in this volume will allow a more detailed comparison than was previously possible. Assuming the Levantine Aurignacian is directly related to the European Aurignacian, we are presented with a host of research questions unique from those of Europe. The Aurignacian is not the emblem of behavioral modernity in the Levant, as it appeared well after the Ahmarian — a local Upper Paleolithic industry. As Kuhn (2003) correctly expressed, the relevant research questions include why the Aurignacian spread so far, and if not, why it was reinvented thousands of kilometers apart. Also, we are faced with the question of whether the Levantine Aurignacian left the same way it came, or if it stayed and developed into some of the later entities, such as the carinated industry. The model outlined in this study of intensification as a result of climatic deterioration at the end of the Upper Paleolithic provides a potential reason for this broad industrial variability. With any luck, further research will allow some of the specifics in the questions above to be resolved.

Acknowledgments

The research presented in this paper was made possible in part through support from the National Science Foundation, grant no. BCS-0080079. The Department of Anthropology, Southern Methodist University, generously provided a Provost's Dissertation Fellowship to assist in the completion of this study. This study would have been possible without the expert advice and encouragement from several people, including Tony Marks, Nigel Goring-Morris, Anna Belfer-Cohen, Ofer Bar-Yosef, Don Henry, Garth Sampson, Omry Barzilay, Angela Davidzon, Kris Kerry, Cheryl Makarewicz, Jeff Rose, and Katherine Monigal. I am forever thankful for the help I received from these people. All mistakes are my own.

TABLE 1

General information for each collection, including sampling procedures.

Collection	*Location*	*Site Type*	*Total Debitage (n)*	*Total Cores (n)*	*Total Tools (n)*	*Sampling Procedure*	*Total Artifacts Sampled*
Ksar Akil XIII-VI, 1936-37	London	rockshelter	unknown	640	13 974	C	4703
Ksar Akil XIII-VI, 1946-47	Cambridge, MA	rockshelter	unknown	unknown	unknown	C	6569
Hayonim D	Jerusalem	cave	5174	298	844	A2	1123
Sefunim 8	Haifa	cave	713	126	199	A2	635
Nahal Ein Gev I	Jerusalem	open air	unknown	120	447	B	835
Fazael IX	Jerusalem	open air	5242	25	684	A1	856
Ein Aqev (D31)	Dallas	open air	8981	272	1287	B	669
Arkov (D22)	Dallas	open air	3463	227	314	A2	481
D27A	Dallas	open air	1967	115	457	A2	501
K9A	Dallas	open air	2446	171	222	A2	453
G11	Dallas	open air	2164	226	266	B	615
Har Horesha I	Jerusalem	open air	5283	107	757	C	384

A1 - Random sample of debitage from all units in each level (or surface), all cores and tools.
A2 - All debitage from randomly sampled units in each level; all cores and tools.
B - All debitage from randomly sampled units in each level (or surface); cores and tools in sampled units only.
C - A combination of two or more of the above strategies

TABLE 2

The correlation between each season in the Boston College excavations at Ksar Akil, and a broad correlation of these with Tixier's levels.

	Boston College 1937-1938	*1947-1948*	*Tixier 1969-1975*	*Date BP*
Phase	*Levels*	*Levels*	*Levels*	*Mean)*
3	XIII, XII, XI	XII	–	–
4	X, IX	XI, X-C	10i-12	31 866 (3 dates)
5	VIII, VII	X-B - IX-C	9-10h	30 250 (1 date)
6-7	VI	IX-B - VII	7-8	25 950 (4 dates)

TABLE 3

Radiocarbon dates for the sampled assemblages.

		Date BP	±	Lab Number	Reference
Ksar Akil Phase 4	(Tixier's VII)	32 000	1 500	MC-1192	Mellars and Tixier, 1989
	(Tixier's VI)	31 200	1 300	OxA-1804	Mellars and Tixier, 1989
		32 400	1 100	OxA-1805	Mellars and Tixier, 1989
Ksar Akil Phase 5	(Tixier's IV)	30 250	850	OxA-1803	Mellars and Tixier, 1989
Ksar Akil Phase 6	(Tixer's III)	29 300	800	OxA-1798	Mellars and Tixier, 1989
		26 900	600	OxA-1797	Mellars and Tixier, 1989
		26 500	900	MC-1191	Mellars and Tixier, 1989
		21 100	500	OxA-1796	Mellars and Tixier, 1989
	Hayonim D	29 980	720	OxA-2805	Bar-Yosef, 1991, p. 85
	Hayonim D	28 900	650	OxA-2802	Bar-Yosef, 1991, p. 85
	Hayonim D	27 200	600	OxA-2801	Bar-Yosef, 1991, p. 85
	Hayonim D	21 650	340	OxA-2804	Bar-Yosef, 1991, p. 85
	Hayonim D	20 810	320	OxA-2806	Bar-Yosef, 1991, p. 85
	Ein Aqev 12	19 980	1,200	SMU-5	Marks, 1976, p. 230
	Ein Aqev 9	17 890	600	SMU-6	Marks, 1976, p. 230
	Ein Aqev 7	17 510	560	I-5495	Marks, 1976, p. 230
	Ein Aqev 11	17 390	560	SMU-8	Marks, 1976, p. 230
	Ein Aqev 5	16 900	250	I-5494	Marks, 1976, p. 230
	Fazael IX	17 760	160	OxA-2871	Hedges et al., 1992, p. 342

TABLE 4

Blank types among debitage.

	Flake		Blade		Bladelet		Primary Element		CTE		burin spall	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Ksar Akil Phase 5	67	25,2	108	40,6	68	25,6	1	0,4	20	7,5	2	0,8
Ksar Akil Phase 6	98	9,1	280	26,0	616	57,1	10	0,9	68	6,3	6	0,6
Ksar Akil Phase 7	51	10,5	137	28,3	266	55,0	4	0,8	24	5,0	2	0,4
Hayonim D	266	53,8	35	7,1	77	15,6	90	18,2	16	3,2	10	2,0
Sefunim 8	111	36,6	74	24,4	37	12,2	59	19,5	22	7,3		
Nahal Ein Gev I	188	68,4	22	8,0	8	2,9	42	15,3	4	1,5	11	4,0
Fazael IX	211	48,1	14	3,2	35	8,0	47	10,7	4	0,9	128	29,2
Arkov	121	45,5	50	18,8	27	10,2	31	11,7	37	13,9		
D27A	14	17,1	26	31,7			28	34,1	14	17,1		
Ein Aqev	68	32,5	42	20,1	49	23,4	29	13,9	21	10,0		
G11	132	55,5	38	16,0	9	3,8	48	20,2	11	4,6		
K9A	133	55,0	40	16,5	25	10,3	32	13,2	12	5,0		
Har Horesha I	75	57,3	9	6,9	9	6,9	24	18,3	14	10,7		

TABLE 5

Blank types among tools.

	Flake		*Blade*		*Bladelet*		*Primary Element*		*CTE*		*burin spall*	
	Count	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*
Ksar Akil Phase 5	488	65,4	134	18,0	34	4,6	83	11,1	4	0,5	3	0,4
Ksar Akil Phase 6	384	55,8	109	15,8	77	11,2	89	12,9	23	3,3	6	0,9
Ksar Akil Phase 7	102	53,4	31	16,2	32	16,8	16	8,4	6	3,1	4	2,1
Hayonim D	208	38,7	119	22,1	85	15,8	105	19,5	21	3,9		
Sefunim 8	64	37,0	48	27,7	16	9,2	39	22,5	6	3,5		
Nahal Ein Gev I	304	59,8	56	11,0	33	6,5	112	22,0	3	0,6		
Fazael IX	198	57,4	51	14,8	40	11,6	50	14,5	6	1,7		
Arkov	76	49,7	38	24,8	8	5,2	21	13,7	10	6,5		
D27A	153	53,1	83	28,8	2	0,7	41	14,2	9	3,1		
Ein Aqev	96	45,9	62	29,7	28	13,4	22	10,5	1	0,5		
G11	169	73,5	50	21,7	8	3,5	2	0,9	1	0,4		
K9A	75	56,0	26	19,4	3	2,2	28	20,9	2	1,5		
Har Horesha I	60	65,2	10	10,9	9	9,8	12	13,0	1	1,1		

TABLE 6

Typology for sampled assemblages.

	Scraper		*Burin*		*Retouched Blade*		*lamelles Dufour*		*Denticulate*		*Retouched Piece*	
	Count	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*
Ksar Akil Phase 5	449	64,1	89	12,7	84	12,0	2	0,3	41	5,9	35	5,0
Ksar Akil Phase 6	178	26,8	381	57,3	65	9,8	16	2,4	8	1,2	17	2,6
Ksar Akil Phase 7	65	35,3	70	38,0	30	16,3	10	5,4	2	1,1	7	3,8
Hayonim D	145	30,0	113	23,4	112	23,2	13	2,7	14	2,9	86	17,8
Sefunim 8	64	41,0	29	18,6	30	19,2	3	1,9	8	5,1	22	14,1
Nahal Ein Gev I	59	16,0	193	52,4	37	10,1			33	9,0	46	12,5
Fazael IX	15	4,5	255	76,8	16	4,8	7	2,1	1	0,3	38	11,4
Arkov	40	32,8	49	40,2	15	12,3			2	1,6	16	13,1
D27A	139	53,3	76	29,1	14	5,4	1	0,4	19	7,3	12	4,6
Ein Aqev	59	30,1	66	33,7	22	11,2	20	10,2	11	5,6	18	9,2
G11	89	39,9	53	23,8	1	0,4			10	4,5	70	31,4
K9A	62	51,2	31	25,6	9	7,4			9	7,4	10	8,3
Har Horesha I	52	62,7	21	25,3	3	3,6	3	3,6	2	2,4	2	2,4

TABLE 7

Summary of various reduction strategies among the sampled assemblages.

Single Reduction Strategy	*Multiple Reduction Strategies*	
Flake	*Flake + Twisted Bladelets*	*Flake + Curved Blade-Bladelets*
Nahal Ein Gev I	Ksar Akil 6	Hayonim D
Fazael IX	Ksar Akil 7	Ksar Akil 5
	Ein Aqev	Sefunim 8
	G11	
	K9A	
	Har Horesha I	
	Arkov	
	D27A	

TABLE 8

Blank profile throughout the Ksar Akil sequence, showing a paucity of twisted profiles in Phase 5, and a large increase in twisted profiles in Phases 6 and 7.

	straight		*curved*		*twisted*		*Total*
	Count	*%*	*Count*	*%*	*Count*	*%*	*Count*
Ksar Akil Phase 3	37	2,2	838	49,4	823	48,5	1698
Ksar Akil Phase 4	46	3,7	723	57,6	487	38,8	1256
Ksar Akil Phase 5	49	6,0	632	77,4	136	16,6	817
Ksar Akil Phase 6	57	3,3	674	39,2	987	57,5	1718
Ksar Akil Phase 7	6	0,9	269	40,9	382	58,1	657

TABLE 9

Statistics for scraper bit thickness (i.e., working edge length) among sampled assemblages and industries

Scraper bit thickness (working edge length), mm		*Count*	*Mean*	*Mean S.E.*	*Industry Mean*
Levantine Aurignacian	Ksar Akil Phase 5	449	12,67	0,24	10,78
	Hayonim D	145	10,36	0,56	
	Sefunim 8	64	9,32	0,58	
Carinated Industry	Ksar Akil Phase 6	178	8,77	0,32	7,89
	Ksar Akil Phase 7	65	8,80	0,70	
	Arkov	40	5,22	0,42	
	D27A	139	6,49	0,30	
	Ein Aqev	59	7,00	0,57	
	G11	88	10,77	0,73	
	K9A	62	7,89	0,38	
	Har Horesha I	52	5,55	0,34	
Lisanian	Nahal Ein Gev I	59	7,70	0,67	7,28
	Fazael IX	15	5,64	1,16	

TABLE 10

Thickness statistics for debitage flake blanks and scrapers on flakes, according to industry.

	Count	*Mean*	*Mean Standard Error*
Debitage flake blanks, thickness (mm)			
Levantine Aurignacian	835	7,53	0,15
Carinated Industry	931	8,93	0,15
Lisanian	470	6,40	0,19
Scrapers on flakes, blank thickness (mm)			
Levantine Aurignacian	494	13,26	0,21
Carinated Industry	452	12,04	0,26
Lisanian	41	6,85	0,57
Mean difference between debitage and scraper blank thickness			
Levantine Aurignacian		5,73	
Carinated Industry		3,11	
Lisanian		0,45	

TABLE 11

Bladelet core blanks among sampled assemblages, including traditional bladelet cores and carinated pieces.

		Primary (chunk/core)		*Secondary blank*		*Total*
		n	%	*n*	%	
Levantine Aurignacian	Ksar Akil Phase 5	63	77,8%	18	22,2%	81
	Hayonim D	29	78,4%	8	21,6%	37
	Sefunim 8	44	80,0%	11	20,0%	55
Carinated Industry	Ksar Akil Phase 6	389	72,3%	149	27,7%	538
	Ksar Akil Phase 7	48	66,7%	24	33,3%	72
	Arkov	25	43,1%	33	56,9%	58
	D27A	16	21,1%	60	78,9%	76
	Ein Aqev	11	34,4%	21	65,6%	32
	G11	45	60,8%	29	39,2%	74
	K9A	35	66,0%	18	34,0%	53
	Har Horesha I	20	57,1%	15	42,9%	35
Lisanian	Nahal Ein Gev I	1	–	1	–	2
	Fazael IX	1	–	1	–	2

REFERENCES

ALMEIDA, F. (2000) - *The terminal Gravettian of Portuguese Estremadura: technological variability of the lithic industries*. Unpublished Ph.D. Thesis. Dallas, TX: Southern Methodist University.

ANATI, E. (1963) - *Palestine before the Hebrews: a history, from the earliest arrival of man to the conquest of Canaan*. New York, NY: Alfred A. Knopf.

AZOURI, L. (1971) - *A technological and typological analysis of the transitional and Early Upper Paleolithic levels of Ksar Akil and Abu Halka*. Ph.D. dissertation, University of London.

BAR-AN, A.; SHALEM, I. (1983) - Geography of Israel. In *Carta's official guide to Israel and complete gazetteer to all sites in the Holy Land*. Jerusalem: Ministry of Defense, p. 57-93.

BARDON, L; BOUYSSONIE, J. (1906) - Grattoir caréné et ses dérivés à la Coumba-del-Bouïtou, près Brive (Corrèze). *Revue de l'Ecole d'Anthropologie de Paris*. Paris. 16:11, p. 401-412.

BAR-YOSEF, O. (1970) - *The Epipaleolithic cultures of Palestine*. Unpublished Ph.D. thesis, Jerusalem: The Hebrew University.

BAR-YOSEF, O. (1989) - Geochronology of the Levantine Middle Palaeolithic. In MELLARS, P.; STRINGER, C., eds. - *The human revolution, behavioral and biological perspectives on the origins of modern humans*. Edinburgh: Edinburgh University Press, p. 589-610.

BAR-YOSEF, O. (1991) - The archaeology of the Natufian layer at Hayonim Cave. In BAR-YOSEF, O.; VALLA, F. R., eds. - *The Natufian Culture in the Levant*. Ann Arbor, MI: International Monographs in Prehistory, Archaeological Series 1. p. 93-110.

BAR-YOSEF, O.; BELFER-COHEN, A. (1988) - The Early Upper Paleolithic. In HOFFECKER, J.; WOLF, C., eds. - *Levantine caves in the early upper paleolithic: evidence from Europe and the Near East*. Oxford: British Archaeological Reports International Series 437, p. 23-41.

BAR-YOSEF, O.; BELFER-COHEN, A. (1996) - Another look at the Levantine Aurignacian. In DI CESNOLA, A. P.; MONTET-WHITE, A., eds. - *Coloquium XI – The Late Aurignacian. - Section 6 – the Upper Paleolithic. XIII International Union of Prehistoric and Protohistoric Sciences, Forli*. ABACO Edizioni, p. 139-150.

BAR-YOSEF, O.; VANDERMEERSCH, B. (1972) - The stratigraphical and cultural problems of the passage from middle to upper Palaeolithic in the Palestine caves. In BORDES, F. - *The origins of Homo Sapiens*. Paris: UNESCO, p. 221-226.

BAR-YOSEF, O.; VANDERMEERSCH, B.; ARENSBURG, B.; BELFER-COHEN, A.; GOLDBERG, P.; LAVILLE, H.; MEIGNEN, L.; RAK, Y.; SPETH, J. D.; TCHERNOV, E.; TILLIER, A-M.; WEINER, S. (1992) - The excavations in Kebara Cave, Mt. Carmel. *Current Anthropology*. Chicago, IL. 33, 5, p. 497-550.

BARZILAY, O. (2001) - *The Meged rockshelter flint analyses (1995-1997)*. M.A. Thesis. The Institute of Archaeology, Jerusalem: The Hebrew University.

BEGIN, Z. B.; BROEKER, W.; BUCHBINDER, B.; DRUCKMAN, Y.; KAUFMAN, A.; MARGARITZ, M.; NEEV, D. (1985) - *Dead Sea and Lisan Lake levels in the Last 30,000 years, a preliminary report*. Jerusalem: Geological Survey of Israel.

BELFER-COHEN, A. (1994) - Problems in defining a prehistoric culture: an example from the southern Levant In OTTE, M., ed. - *Nature et culture. Colloque de Liège (13-17 décembre 1993)*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 68), p. 245-257.

BELFER-COHEN, A.; BAR-YOSEF, O. (1981) - The Aurignacian at Hayonim Cave. *Paléorient*. Paris. 7:2, p. 19-42.

BELFER-COHEN, A.; BAR-YOSEF, O. (1999) - The Levantine Aurignacian: 60 years of research. In DAVIES, W.; CHARLES, R., eds. - *Dorothy Garrod and the progress of the Palaeolithic. Studies in the prehistoric archaeology of the Near East and Europe*. Oxford: Oxbow Books, p. 119-134.

BELFER-COHEN, A.; GILEAD, I.; GORING-MORRIS, A. N.; ROSEN, S. A. (1991) - An Epipalaeolithic rockshelter at Nahal Neqarot in the Central Negev. *Mitekufat Haeven-Journal of the Israel Prehistoric Society*. Jerusalem. 24, p. 164-168.

BELFER-COHEN, A.; GORING-MORRIS, A. N. (1986) - Har Horesha I: An Upper Paleolithic occupation in the western Negev Highlands. *Mitekufat Haeven-Journal of the Israel Prehistoric Society*. Jerusalem. 19, p. 43-57.

BELFER-COHEN, A.; GORING-MORRIS, A. N. (2003) - Current issues in levantine Upper Palaeolithic research. In GORING--MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow Books, p. 1-12.

BERGMAN, C. A. (1987) - *Ksar Akil Lebanon: a technological and typological analysis of the Later Palaeolithic levels of Ksar Akil, Volume II: levels XIII-VI*. Oxford: BAR International Series 329.

BERGMAN, C. A. (2003) - Twisted debitage and the Levantine Aurignacian. In GORING-MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow Books, p. 185-195.

BERGMAN, C. A.; GORING-MORRIS, A. N. (1987) - Conference: The Levantine Aurignacian with special reference to Ksar Akil, Lebanon, March 27-28, 1987, London: Institute of Archaeology. *Paléorient*. Paris. 13:1, p. 142-147.

BESANÇON, J. (1981) - Stratigraphie et chronologie du quaternaire continental du Proche Orient. In CAUVIN, J.; SANLAVILLE, P., eds. - *Préhistoire du Levant: chronologie et organisation de l'espace depuis les origines jusqu'au VI^{e} millénaire. Colloques Internationaux du CNRS, 10-14 juin Lyon, Maison de l'Orient*. Paris: Centre National de la Recherche Scientifique, p. 33-53.

BOUYSSONIE, J. (1948) - Un gisement aurignacien et périgordien. Les Vachons (Charente). *L'Anthropologie*. Paris. 52, p. 1-42.

BREUIL, H. (1906) - Les gisements présolutréens du type d'Aurignac. In *Coup d'œil sur le plus ancien Âge du Renne*. Monaco: CIAAP, p. 323-350.

BRÉZILLON, M. N. (1968) - *La dénomination des objets de pierre taillée. Matériaux pour un vocabulaire des préhistoriens de langue française. IVe supplément à Gallia Préhistoire, Seconde édition*. Paris: Centre National de la Recherche Scientifique.

BLADES, B. S. (2001) - *Aurignacian lithic economy: ecological perspectives from Southwestern France*. New York: Kluwer Academic/ Plenum Publishers.

COINMAN, N. R. (1990) - *Refiguring the Levantine Upper Paleolithic. A comparative examination of lithic assemblages from the Southern Levant*. Unpublished Ph.D. dissertation, Department of Anthropology, Tempe: Arizona State University.

COINMAN, N. R. (1993) - WHS 618 – Ain El-Buhira: An Upper Paleolithic site in the Wadi Hasa, west-central Jordan. *Paléorient*. Paris. 19:2, p. 17-37.

COINMAN, N. R. (2000) - The Upper Paleolithic in the Wadi al-Hasa. In COINMAN, N. R., ed. - *The Archaeology of the Wadi al-Hasa, West-Central Jordan, Volume 2: Excavations at Middle, Upper and Epipaleolithic Sites*. Tempe, AZ: Arizona State University (Anthropological Research Papers; 52), p. 143-160.

COINMAN, N. R. (2003) - The Upper Palaeolithic of Jordan: new data from the Wadi al-Hasa. In GORING-MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow Books. p. 151-170.

COINMAN, N. R.; HENRY, D. O. (1995) - The Upper Paleolithic sites. In HENRY, D. O., ed. - *Prehistoric cultural ecology and evolution. Insights from Southern Jordan*. New York, NY: Plenum Press, p. 133-214.

COPELAND, L. (1975) - The Middle and Upper Paleolithic of Lebanon and Syria in the light of recent research In WENDORF, F.; MARKS, A., eds. - *Problems in Prehistory: North Africa and the Levant*. Dallas, TX: Southern Methodist University Press, p. 317-350.

DAVIDZON, A. (2002) - *Sealed in stones: The Knapping Methods at Nahal Nizzana XIII, an Upper Palaeolithic Site in the Negev, Israel.* (In Hebrew). M.A. Thesis, Jerusalem: Hebrew University.

ELSTON, R.; BRANTINGHAM, P. J. (2002) - Microlithic technology in northern Asia: a risk-minimizing strategy of the late Paleolithic and early Holocene. In KUHN, S.; ELSTON, R., eds. - *Thinking small: global perspectives on microlithization.* Arlington, VA: American Anthropological Association (Archaeological Papers; 12), p. 103-116.

EWING, J. (1947) - Preliminary note on the excavation at the Paleolithic site of Ksar Akil, Republic of Lebanon. *Antiquity.* Cambridge. 21, p. 186-196.

FERRING, C. R. (1976) - Sde Divshon: an Upper Paleolithic site on the Divshon plain. In MARKS, A. E., ed. - *Prehistory and Paleoenvironments in the Central Negev, Israel, Volume 1, The Avdat/Aqev Area, Part 1.* Dallas, TX: Southern Methodist University Press, p. 199-226.

GARRARD, A. N.; GEBEL, H.-G., eds. (1988) - *The Prehistory of Jordan: the state of the research in 1986.* Oxford: British Archaeological Reports (BAR International Series; 396).

GARROD, D. A. E. (1937) - The Near East as a gateway of prehistoric migration. In MACCURDY, G., ed. - *Early Man.* Philadelphia: Lippincott, p. 33-40.

GARROD, D. A. E. (1953) - The relations between southwest Asia and Europe in the latter Paleolithic age. *Journal of World History.* Neuchâtel. 1, p. 13-38.

GARROD, D. A. E.; BATE, D. M. A. (1937) - *The Stone Age of Mount Carmel.* Vol. 1. Oxford: Clarendon Press.

GAT, J. R. (1981) - Paleo-climate conditions in the Levant as revealed by the isotopic composition of paleowaters. *Israel Meteorological Research Papers.* Bet-Dagan. 3, p. 13-28.

GAT, J. R.; MAZOR, E.; TZUR, Y. (1969) - The stable isotope composition of mineral waters in the Jordan rift valley, Israel. *Journal of Hydrology.* Amsterdam. 7, p. 334–352.

GILEAD, I. (1981) - Upper Paleolithic tool assemblages from the Negev and Sinai. In CAUVIN, J.; SANLAVILLE, P., eds. - *Préhistoire du Levant: chronologie et organisation de l'espace depuis les origines jusqu'au VI*e *millénaire. Colloques Internationaux du CNRS, 10-14 juin Lyon, Maison de l'Orient.* Paris: Centre National de la Recherche Scientifique, p. 331--342.

GOEBEL, T. (2002) - The "microblade adaptation" and recolonization of Siberia during the late Upper Pleistocene. In KUHN, S.; ELSTON, R., eds. - *Thinking small: global perspectives on microlithization.* Arlington, VA: American Anthropological Association (Archaeological Papers; 12), p. 117-132.

GOLDBERG, P. (1981) - Late Quaternary stratigraphy of Israel: an eclectic view. In CAUVIN, J.; SANLAVILLE, P., eds. - *Préhistoire du Levant: chronologie et organisation de l'espace depuis les origines jusqu'au VI*e *millénaire. Colloques Internationaux du CNRS, 10-14 juin Lyon, Maison de l'Orient.* Paris: Centre National de la Recherche Scientifique, p. 55-66.

GOLDBERG, P. (1986) - Late Quaternary environmental history of the southern Levant. *Geoarchaeology.* New York, NY. 1, p. 225-244.

GOLDBERG, P.; BAR-YOSEF, O. (1982) - Environmental and archaeological evidence for climatic change in the southern Levant. In *Palaeoclimates, palaeoenvironments and human communities in the Eastern Mediterranean region in Later Prehistory.* Oxford: BAR International Series, p. 399-414.

GOODFRIEND, G. A.; MARGARITZ, M. (1988) - Paleosols and late Pleistocene rainfall fluctuations in the Negev Desert. *Nature.* London. 332, p. 144-146.

GORING-MORRIS, A. N. (1980) - *Late Quaternary sites in Fazael, Lower Jordan Valley.* Unpublished M.A. thesis. Jerusalem: The Hebrew University.

GORING-MORRIS, A. N. (1987) - *At the edge: terminal Pleistocene hunter-gatherers in the Negev and Sinai.* Oxford: BAR International Series 361(i).

GORING-MORRIS, A. N. (1995) - Complex hunter/gatherers at the end of the Paleolithic. In LEVY, T., ed. - *The archaeology of the Holy Land.* London: Leicester University Press, p. 141-168.

GORING-MORRIS, A. N.; MARDER, O.; DAVIDZON, A.; IBRAHIM, F. (1998) - Putting humpty together again: preliminary observations on refitting studies in the Eastern Mediterranean. In MILLIKEN, S., ed. - *The organization of lithic technology in Late Glacial and Early Postglacial Europe.* Oxford: BAR International Series 700, p. 149-182.

GRIP members (1993) - Climate instability during the last interglacial period recorded in the GRIP ice core. *Nature.* London. 364, p. 203-207.

GROOTES, P. M.; STUIVER, M.; WHITE, J. W. C.; JOHNSEN, S.; JOUZEL, J. (1993) - Comparison of oxygen isotope records from the GISP2 and GRIP Greenland ice core. *Nature.* London. 366, p. 552-554.

HENRY, D. O. (1989a) - *From foraging to agriculture.* Philadelphia, PA: University of Pennsylvania Press.

HENRY, D. O. (1989b) - Correlations between reduction strategies and settlement patterns. In HENRY, D. O.; ODELL, G., eds. - *Alternative approaches to lithic analysis*. Washington DC: American Anthropological Association (Archeological Research Series; 1), p. 106-113.

HISCOCK, P. (2002) - Pattern and context in the Holocene proliferation of backed artifacts in Australia. In KUHN, S.; ELSTON, R., eds. - *Thinking small: global perspectives on microlithization*. Arlington, VA: American Anthropological Association (Archaeological Papers; 12), p. 163-178.

HOROWITZ, A. (1976) - Late Quaternary environments of prehistoric settlements. In MARKS, A. E., ed. - *Prehistory and paleoenvironments in the Central Negev, Israel*. Vol. II. Dallas, TX: Southern Methodist University Press, p. 54-57.

HOROWITZ, A. (1979) - *The Quaternary of Israel*. New York: Academic Press.

HOROWITZ, A. (1983) - Boker Tachtit and Boker: The pollen record. In MARKS, A. E., ed. - *Prehistory and paleoenvironments in the Central Negev, Israel, Vol. III*. Dallas: TX: Southern Methodist University Press, p. 63-68.

HURWITZ, S.; STANISLAVSKY, E.; LYAKHOVSKY, V.; GVIRTZMAN, H. (2000) - Transient groundwater-lake interactions in a continental rift: Sea of Galilee, Israel. *Geological Society of America Bulletin*. Boulder, CO. 112:11, p. 694-1702.

ISSAR, A.; GILEAD, I. (1986) - Pleistocene climates and hydrology of the Negev (Israel) and Sinai (Egypt) deserts. In THORWEIHE, U., ed. - *Impact of climatic variation on east Saharan groundwaters - modeling of large scale flow regimes*. Berlin: Dietrich Reimer (Berliner Geowissenschaftliche Abhandlungen A/72).

JONES, M.; MARKS, A. E.; KAUFMAN, D. (1983) - Boker: The Artifacts. In MARKS, A. E., ed. - *Prehistory and paleoenvironments in the Central Negev, Israel Part III*. Dallas, TX: Southern Methodist University Press, p. 283-332.

KERRY, K. (1997) - Jebel Humeima: a preliminary lithic analysis of an Ahmarian and Levantine Mousterian site in Southwest Jordan. In GEBEL, H. G.; KAFAFI, Z.; ROLLEFSON, G. O., eds. - *Prehistory of Jordan II: perspectives from 1997*. Berlin: Ex oriente, p. 125-136.

KERRY, K.; HENRY, D. O. (2003) - Tor Fawaz (J403): an Upper Palaeolithic occupation in the Jebel Qalkha Area, Southwest Jordan. In GORING-MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow Books, p. 171-184.

KISLEV, M. E.; NADEL, D.; CARMI, I. (1992) - Epipalaeolithic (19,000) cereal and fruit diet at Ohalo II, Sea of Galilee, Israel. *Review of Palaeobotany and Palynology*. Amsterdam. 73, p. 161-166.

KUHN, S. L. (2002) - Pioneers of microlithization: The "Proto-Aurignacian" of southern Europe. In KUHN, S.; ELSTON, R., eds. - *Thinking small: global perspectives on microlithization*. Arlington, VA: American Anthropological Association (Archaeological Papers; 12), p. 83-94.

KUHN, S. L. (2003) - What did the Aurignacian bring to the Levantine Upper Paleolithic? *Archaeology, Ethnology & Anthropology of Eurasia*. Novosibirsk. 2:14, p. 2-8.

KUHN, S.; ELSTON, R. (2002) - Introduction: thinking small globally. In KUHN, S.; ELSTON, R., eds. - *Thinking small: global perspectives on microlithization*. Arlington, VA: American Anthropological Association (Archaeological Papers; 12), p. 1-8.

LARSON, P. A.; MARKS, A. E. (1977) - Two Upper Paleolithic Sites in the Har Harif. In MARKS, A. E., ed. - *Prehistory and paleoenvironments in the Central Negev, Israel*. Vol. II. Dallas: TX: Southern Methodist University Press, p. 173-189.

LUZ, B. (1982) - Palaeoclimatic interpretations of the last 20,000 yr record of deep sea cores around the Middle East. In *Palaeoclimates, palaeoenvironments and human communities in the eastern Mediterranean region in later prehistory*. Oxford: BAR International Series, p. 41-61.

MARDER, O. (1994) - *Refitting studies of Epipaleolithic assemblages from the Negev, Israel*. Unpublished MA Thesis, Jerusalem: Hebrew University (in Hebrew).

MARKS, A. E. (1976a) - Glossary. In MARKS, A., ed. - *Prehistory and paleoenvironments in the Central Negev, Israel. Vol 1. The Avdat/Aqev area, Part 1*. Dallas, TX: Southern Methodist University Press, p. 371-382.

MARKS, A. E. (1976b) - Ein Aqev: A late Levantine Upper Paleolithic site in the Nahal Aqev. In MARKS, A., ed. - *Prehistory and paleoenvironments in the Central Negev, Israel. Vol 1. The Avdat/Aqev area, Part 1*. Dallas, TX: Southern Methodist University Press, p. 227-292.

MARKS, A. E. (1981) - The Upper Paleolithic of the Negev. In CAUVIN, J.; SANLAVILLE, P., eds. - *Préhistoire du Levant: chronologie et organisation de l'espace depuis les origines jusqu'au VI[e] millénaire. Colloques Internationaux du CNRS, 10-14 juin Lyon, Maison de l'Orient*. Paris: Centre National de la Recherche Scientifique, p. 343-352.

MARKS, A. E. (1983) - The Middle to Upper Paleolithic transition in the Levant. In WENDORF, F.; CLOSE, A. E., eds. - *Advances in world archaeology*. Vol. 2, New York: Academic Press, p. 51-98.

MARKS, A. E. (2003) - Reflections on Levantine Upper Palaeolithic studies: past and present. In GORING-MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow Books, p. 249-264.

MARKS, A. E.; FERRING, C. R. (1976) - Upper Paleolithic sites near Ein Avdat. In MARKS, A. E., ed. - *Prehistory and paleoenvironments in the Central Negev, Israel. Vol 1. The Avdat/Aqev area, Part 1.* Dallas, TX: Southern Methodist University Press, p. 141-198.

MARKS, A. E.; FERRING, C. R. (1988) - The Early Upper Paleolithic of the Levant. In HOFFECKER, J.; WOLF, C., eds. - *The Early Upper Paleolithic, evidence from Europe and the Near East.* British Archaeological Reports - International Series 437, Oxford: B.A.R., p. 43-72.

MARTINSON, D. G.; PISIAS, N. G.; HAYS, J. D.; IMBRIE, J.; MOORE, J. T. C.; SHACKLETON, N. J. (1987) - Age dating and the Orbital Theory of the Ice Ages: Development of a high-resolution 0 to 300,000-year chronostratigraphy. *Quaternary Research.* New York, NY-London. 27, p. 1-29.

MAYEWSKI P. A.; WUMKES, M.; KLINCK, J.; TWICKLER, M. S.; PUTSCHER, J. S.; TAYLOR, K. C.; GOW, A. J.; WADDINGTON, E. D.; ALLEY, R. B.; GIBB; J. E.; GROOTES, P. M.; MEESE, D. A.; RAM, M.; WHALEN, M.; WILSON, A. T. (1994) - Record drilling depth struck in Greenland. *Eos - Transactions of the American Geophysical Union.* Washington, DC. 75:10, 113, 119, 124.

MELLARS, P.; TIXIER, J. (1989) - Radiocarbon-accelerator dating of Ksar 'Aqil (Lebanon) and the chronology of the Upper Paleolithic sequence in the Middle East. *Antiquity.* Cambridge. 63:241, p. 761-768.

MONIGAL, K. (2003) - Technology, economy and mobility at the beginning of the Levantine Upper Palaeolithic. In GORING--MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East.* Oxford: Oxbow Books, p. 118-133.

NADEL, D. (2002) ed. - *Ohalo ii, a 23,000-year-old fisher-hunter-gatherers' camp on the shore of the Sea of Galilee.* Hecht Museum, Haifa University (English with Hebrew translation).

NADEL, D. (2003) - The Ohalo II Flint Assemblage and the Beginning of the Epipalaeolithic in the Jordan Valley. In GORING--MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East.* Oxford: Oxbow Books, p. 216-229.

NADEL, D.; CARMI, I; SEGAL, D. (1995) - Radiocarbon dating of Ohalo II: archaeological and methodological implications. *Journal of Archaeological Science.* London. 22:6, p. 811-822.

NADEL, D.; BELITZKY, S.; BOARETTO, E.; CARMI, I.; HEINEMEIER, J.; WERKER, E.; MARCO, S. (2001) - New dates from submerged late Pleistocene sediments in the Sea of Galilee, Israel. *Radiocarbon.* Tucson, AZ. 43.3, p. 1167-1178.

NEELEY, M. P. (2002) - Going microlithic: A Levantine perspective on the adoption of microlithic technologies. In KUHN, S.; ELSTON, R., eds. - *Thinking small: global perspectives on microlithization.* Arlington, VA: American Anthropological Association (Archaeological Papers; 12), p. 45-56.

NEEV, D.; HALL, J. K. (1977) - Climatic fluctuations during the Holocene as reflected by the Dead Sea levels. In GREER, D., ed. - *Desertic terminal lakes.* Logan, UT: Utah State University, p. 53-60.

NOONE, H. V. V. (1934) - Burins, un nouvel essai de leur classification. *Bulletin de la Société Préhistorique Française* (– Actes du Congrès Préhistorique Français de Périgueux, 11.e session). Paris, p. 478-488.

PETIT, J. R.; BASILE, I.; LERUYUET, A.; RAYNAUD, D.; LORIUS, C; JOUZEL, J.; STIEVENARD, M.; LIPENKOV, V. Y.; BARKOV, N. I.; KUDRYASHOV, B. B.; DAVIS, M.; SALTZMAN, E.; KOTLYAKOV, V. (1997) - Four climate cycles in Vostok ice core. *Nature.* London. 387, p. 359-360.

PETIT, J. R.; JOUZEL, J.; RAYNAUD, D.; BARKOV, N. I.; BARNOLA, J.-M.; BASILE, I.; BENDERS, M.; CHAPPELLAZ, J.; DAVIS, M.; DELAYQUE, G.; DELMOTTE, M.; KOTLYAKOV, V. M.; LEGRAND, M.; LIPENKOV, V. Y.; LORIUS, C.; PÉPIN, L; RITZ, C.; SALTZMAN, E.; STIEVENARD, M.; (1999) - Climate and atmospheric history of the past 420,000 years from the Vostok ice core, Antarctica. *Nature.* London. 399, p. 429-436.

PHILLIPS, J. L. (1994) - The Upper Paleolithic chronology of the Levant and the Nile Valley. In BAR-YOSEF, O.; KRA, R. S., eds. - *Late quaternary chronology and paleoclimates of the Eastern Mediterranean.* Tucson, AZ: Radiocarbon, p. 169-176.

RONEN, A. (1984) - *Sefunim prehistoric sites, Mount Carmel, Israel.* Oxford: BAR International Series 230(i).

ROSSIGNOL-STRICK, M. (1993) - Late quaternary climate in the Eastern Mediterranean region. *Paléorient.* Paris. 19:1, p. 135-152.

SANLAVILLE, P. (1981) - Stratigraphie et chronology du Quaternaire marin du Levant. In CAUVIN, J.; SANLAVILLE, P., eds. - *Préhistoire du Levant: chronologie et organisation de l'espace depuis les origines jusqu'au VI[e] millénaire. Colloques Internationaux du CNRS, 10-14 juin Lyon, Maison de l'Orient.* Paris: Centre National de la Recherche Scientifique, p. 21-31.

SHACKLETON, N. J.; OPDYKE, N. D. (1973) - Oxygen isotope and palaeomagnetic stratigraphy of equatorial pacific core, V28-238: Oxygen isotope temperatures and ice volumes on a 105 and 106 year scale. *Quaternary Research.* New York, NY-London. 3, p. 39-55.

SONNEVILLE-BORDES, D. de; PERROT, J. (1954-1956) - Lexique typologique du Paléolithique supérieur. *Bulletin de la Société Préhistorique Française.* Paris. 51, p. 327-335, 52, p. 76-79, 53, p. 408-412, p. 547-559.

STINER, M. C. (2001) - Thirty years on the "Broad Spectrum Revolution" and Paleolithic demography. *Proceedings of the National Academy of Sciences*. Washington, DC. 98:13, p. 6993-6996.

STINER, M. C.; MUNRO, N. D.; SUROVELL, T. A.; TCHERNOV, E.; BAR-YOSEF, O. (1999) - Paleolithic population growth pulses evidenced by small animal exploitation. *Science*. New York, NY. 8, p. 190-194.

TCHERNOV, E. (1976) - Some late Quaternary faunal remains from the Avdat/Aqev area. In MARKS, A. E., ed. - *Prehistory and paleoenvironments in the Central Negev, Israel. Vol. 1. The Avdat/Aqev area, Part 1*. Dallas, TX: Southern Methodist University Press, p. 69-73.

TIXIER, J. (1970) - L'abri sous roche de Ksar 'Aqil. La campagne de fouilles 1969. *Bulletin du Musée de Beyrouth*. Beirouth. 23, p. 173-191.

TIXIER, J. (1974) - Fouilles a Ksar 'Aqil, Liban (1969-1974). *Paléorient*. Paris. 2:1, p. 83-195.

TIXIER, J.; INIZAN, M.-L. (1981) - Ksar 'Aqil, stratigraphie et ensembles lithiques dans le Paléolithique Supérieur: fouilles 1971-1975. In CAUVIN, J.; SANLAVILLE, P., eds. - *Préhistoire du Levant: chronologie et organisation de l'espace depuis les origines jusqu'au VI^e^ millénaire. Colloques Internationaux du CNRS, 10-14 juin Lyon, Maison de l'Orient*. Paris: Centre National de la Recherche Scientifique, p. 353-367.

VALLADAS, H.; JORON, J. L.; VALLADAS, G.; ARENSBURG, B.; BAR-YOSEF, O.; BELFER-COHEN, A.; GOLDBERG, P; LAVILLE, H; MEIGNEN, L.; RAK, Y.; TCHERNOV, E.; TILLIER, A. M.; VANDERMEERSCH, B. (1987) - Thermoluminescence dates for the Neanderthal burial site at Kebara in Israel. *Nature*. London. 330, p. 159-175.

VANDERMEERSCH, B.; BAR-YOSEF, O. (1988) - Evolution biologique et culturelle des industries et des populations du Levant de la fin du paléolithique inférieur au début du paléolithique supérieur. *Paléorient*. Paris. 14:2, p. 115-116.

WILLIAMS, J. K. (2003a) - *Examining the boundaries of the Levantine Aurignacian*. Unpublished Ph.D. dissertation, Department of Anthropology. Dallas, TX: Southern Methodist University.

WILLIAMS, J. K. (2003b) - An examination of the Upper Palaeolithic flake technologies in the marginal zone of the Levant. In GORING-MORRIS, A. N.; BELFER-COHEN, A., eds. - *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. Oxford: Oxbow Books, p. 196-208.

WEINSTEIN-EVRON, M. (1990) - *Palynological history of the last Pleniglacial in the Levant*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 42), p. 9-25.

WENINGER, B. (1986) - High-precision calibration of archaeological radiocarbon dates. *Acta Interdisciplinaria Archaeologica*. Nitra. 4, p. 11-53.

WENINGER, B.; JÖRIS. O; DANZEGLOCKE, U. (2002) - Cologne Radiocarbon Calibration & Paleoclimatic Research Package, CalPal-A (Advanced) in the Ghost of Edinburgh Edition, Universität zu Köln, www.calpal.de, Institut für Ur- und Frühgeschichte, Radiocarbon Laboratory, Köln: Weyertal 125, D-50923.

WRIGHT JR., H. E. (1951) - Geological setting of Ksâr 'Akil, a Paleolithic site in Lebanon, preliminary report. In *Ksar 'Akil, its archaeological sequence and geological setting. Journal of Near Eastern Studies*. Chicago, IL. 10, p. 115-119.

WRIGHT JR., H. E. (1960) - Climate and prehistoric man in the eastern Mediterranean. In *Prehistoric investigations in Iraqi Kurdistan*. Chicago, IL: Oriental Institute, University of Chicago (Studies in the Ancient Orient; 31), p. 71-97.

To be or not to be Aurignacian: the Zagros Upper Paleolithic

DEBORAH I. OLSZEWSKI ▮ HAROLD L. DIBBLE

ABSTRACT Studies of lithic assemblages from the Upper Paleolithic levels at Warwasi in Iran have identified two occupational phases. The earlier of these is represented by Levels AA-LL, and has been classified as the Early Zagros Aurignacian. Its characteristics include an interesting combination of what appear to be Upper and Middle Paleolithic formal tools, such as carinated endscrapers, burins, Font-Yves points, Dufour bladelets, sidescrapers, and truncated-facetted pieces. About 66% of the tools are on flake blanks, 17% on blade blanks, and 11% on bladelet blanks. The debitage is dominated by flakes, although prismatic blade technology is also present. This assemblage has the potential to be an example of a transitional industry. If so, it may document one sequence of development from a Middle Paleolithic base into the Aurignacian. Overlying this, in Levels P-Z, is a later Upper Paleolithic, which is classified as the Late Zagros Aurignacian. It is during this phase that the assemblage is most typical in its inclusion of characteristic types of the Aurignacian. These consist of numerous examples of carinated burins and Dufour bladelets, as well as carinated endscrapers and a few Font-Yves points. Tools are made about equally on blade (26%), bladelet (34%), and flake blanks (38%). Technologically, this assemblage is dominated by bladelet debitage, with a slightly greater representation of flake debitage compared to blade debitage. The Late Zagros Aurignacian at Warwasi appears to share broad similarity to assemblages of central Europe, as well as to the Levantine Aurignacian A.
No matter how precisely worded, definitions of lithics and lithic assemblages can be fraught with complications. These arise primarily from the fact that we construct discrete categories from forms that most often are a continuum of shape or design, and we initially designate industries as comprising a particular combination of morphology and technology. As research progresses and new assemblages or new analyses are added to our cumulative database, however, our original definitions of types and industries begin to accommodate variations on the original theme. The designation of the Levantine Aurignacian is one example of this process, and we believe that the Zagros Aurignacian represents another. While we might also discuss what this means in terms of the implications of an ever-geographically expanding Aurignacian, such debates are more closely linked to archaeological interpretation rather than to archaeological definition.

Introduction

Paleolithic research in the Zagros Mountains region of Iraq and Iran is best known from the decades spanning the 1920s through the 1960s. A number of important sites were located and excavated, and many of these were published in preliminary fashion. Despite the history of research, however, our understanding of the industries of this area has remained slight compared to the Levant and Europe. This is due to several factors including a shift of research projects away from the Zagros, particularly after the late 1970s, the lack of complete publication of the earlier excavations, and a consequently reduced appreciation of the significance of the archaeological record here. The Zagros Upper Paleolithic, however, provides an important comparative base for early Upper Pleistocene sequences elsewhere and offers insight regarding cultural evolution during the period widely seen as incorporating the transition from archaic to more modern behavioral sets. In this paper, we describe the Upper Paleolithic lithic assemblages from Warwasi Rockshelter in Iran, and discuss our views on the widespread extent of the Aurignacian as a series of geographical facies.

Examination of the Upper Paleolithic material from Warwasi Rockshelter (Iran) has shown that the industry originally termed the "Baradostian" by Solecki (1958), on the basis of his analysis of material from Shanidar Cave in Iraq, should be renamed the Zagros Aurignacian to reflect the marked similarities between it and other Aurignacian-like industries from Europe and the Levant[1] (Olszewski, 1999, 2001, in press b; Olszewski and Dibble, 1994). The recognition of the Zagros Upper Paleolithic materials as a facies of the Aurignacian is significant for several reasons. First, there is reason to believe that the Early Zagros Aurignacian develops from a local Mousterian foundation. Second, its presence in the Zagros area demonstrates the existence of behavioral sets that result in characteristic Aurignacian lithic typology and technology in a region outside Europe and the Levant, thus extending the known geographical spread of the Aurignacian. Finally, there are major implications for research centered on the appearance of the Aurignacian throughout much of Western Eurasia.

Description of the Warwasi Aurignacian assemblages[2]

The assemblages from Warwasi (Fig. 1) can be divided into two phases, an Early Zagros Aurignacian (Levels AA-LL) and a Late Zagros Aurignacian (Levels P-Z). These assemblages derive from deposits that are approximately 2,2 m in thickness from a 5,6 m deep excavation trench. They are overlain by about 1,6 m of Epipaleolithic (Zarzian) deposits and underlain by ca.1,8 m of Middle Paleolithic (Zagros Mousterian) deposits.

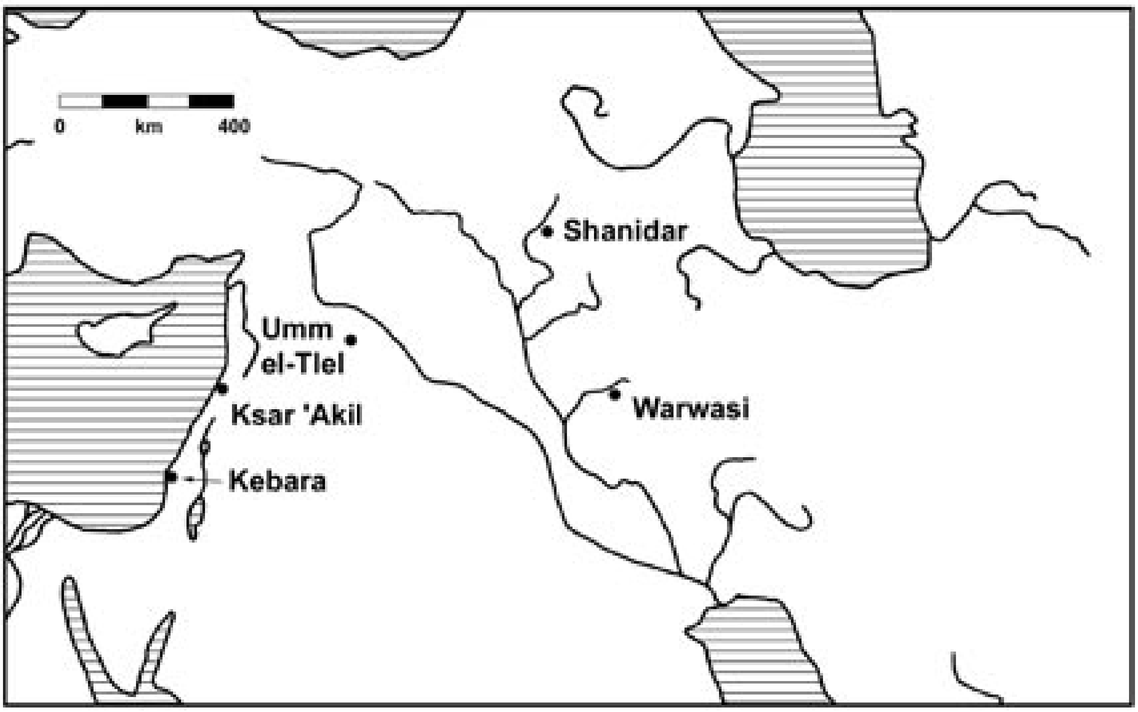

FIG. 1 – Sites with Aurignacian affinities discussed in the text.

The Early Zagros Aurigacian

The Early Zagros Aurignacian contains several features that indicate that it may be a development out of the local Middle Paleolithic. From this standpoint, it could be considered a type of Initial Upper Paleolithic (Olszewski, 2001, in press b), as defined by Levantine researchers such as Marks (1993, p. 15) and Kuhn et al. (1999, p. 506-507). Technologically, the Early Zagros Aurignacian is characterized by a modest frequency (ca.31%) of prismatic blade and bladelet debitage. It also contains laminar flakes that correspond to the Bordian definition of blades (length twice as long as width), which suggests that core reduction here is also characterized by what many would consider a Middle Paleolithic technological strategy. Overall, however, the assemblage is dominated by flake debitage (about 47%) and by cores whose final removals are flakes (ca.80%). Choice of blanks for tools shows that about 28% of tools are manufactured on prismatic blade or bladelets.

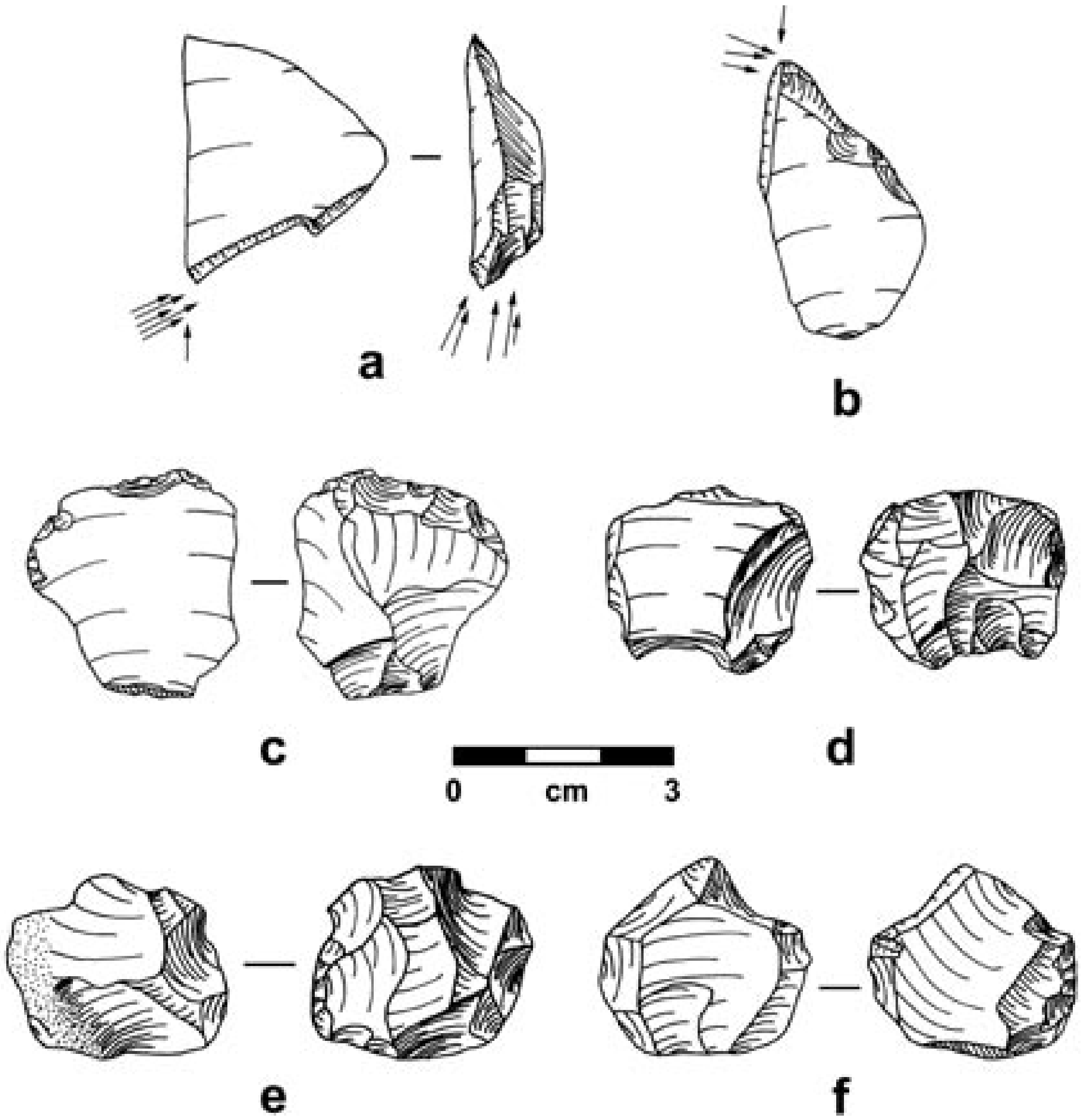

FIG. 2 – Early Zagros Aurignacian at Warwasi: a-b. carinated burins; c-d. truncated facetted; e-f. radial flake cores (drawings by D. I. Olszewski).

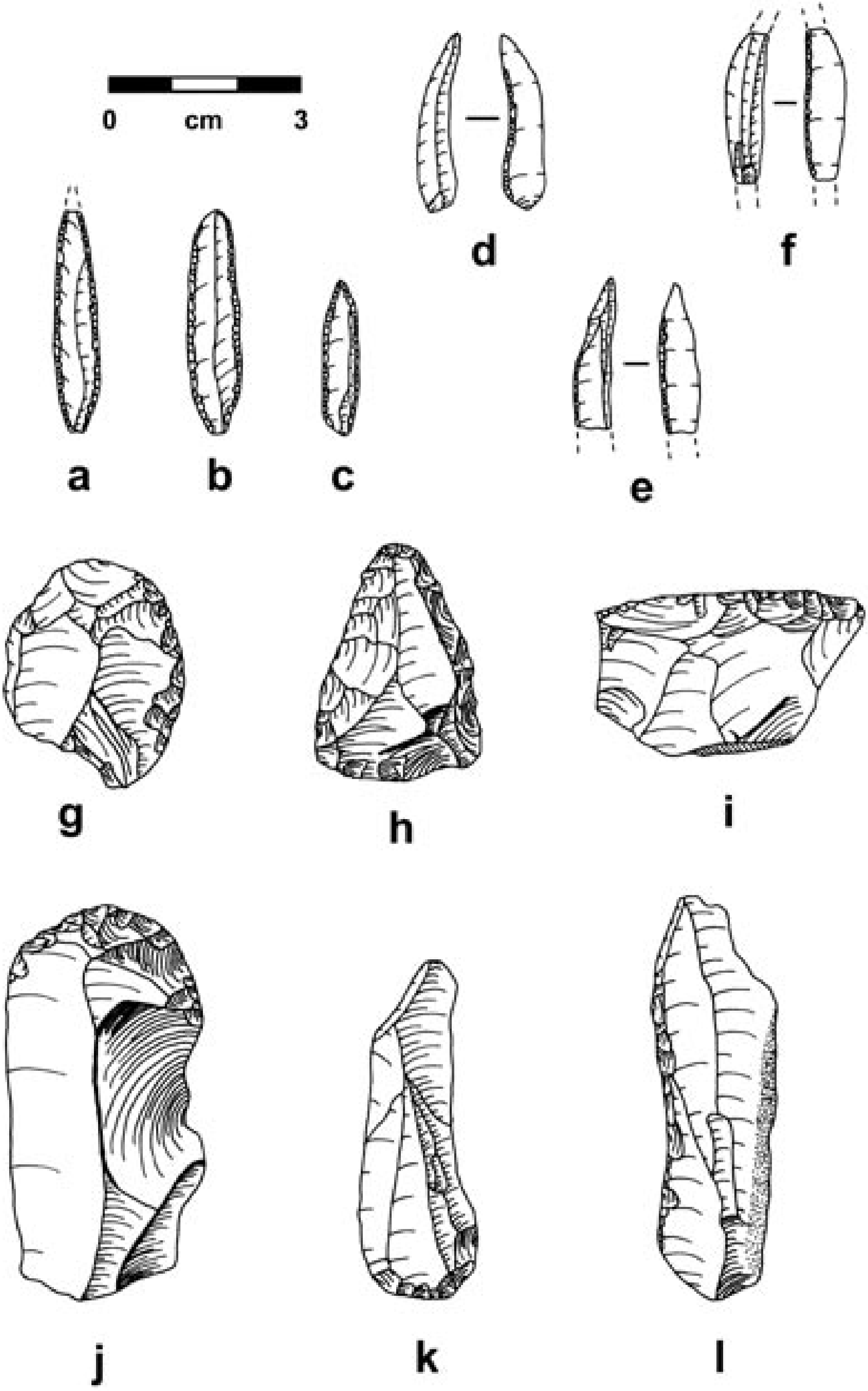

FIG. 4 – Early Zagros Aurignacian at Warwasi: a-c. Font-Yves points; d-f. Dufour bladelets; g, l. single sidescrapers; h. convergent sidescraper; i. flake endscraper; j-k. blade endscrapers (drawings by D. I. Olszewski).

Typologically, the Early Zagros Aurignacian includes both Middle and Upper Paleolithic tool types[3]. This feature is known to occur in some Levantine Initial Upper Paleolithic assemblages, for example, at Kanal in Turkey (Kuhn et al., 1999, p. 514) and Umm el-Tlel in Syria (Bourguignon, 1998, p. 712), but not in other such assemblages, for example, Tor Sadaf in Jordan (Coinman and Fox, 2000) or Boker Tachtit in the Negev (Marks, 1993, p. 8). At Warwasi, representative tools in the Early Zagros Aurignacian consist of a considerable number of sidescrapers (about 24%), as well as low to modest frequencies of carinated endscrapers and carinated burins, Font-Yves points, Dufour bladelets, and truncated-facetted pieces (Figs. 2-3; Table 1).

TABLE 1

Comparison of Early Zagros Aurignacian Tool Types from Warwasi and Bacho Kiro.

	Warwasi Levels AA-LL (n=993)		*Bacho Kiro Layer 11* (n=667)*	
	N	*%*	*N*	*%*
Endscraper				
carinated	16	1,6%	–	–
other	60	6,0%	83	12,4%
Burin				
carinated	5	0,5%	–	–
other	65	6,5%	29	4,4%
Font-Yves/el-Wad Point	13	1,3%		?
Dufour Bladelet	14	1,4%		present
Nongeometric	75	7,6%	13	1,9%
Geometric	3	0,3%	–	–
Special Tool			**222**	**33,3%**
sidescraper	242	24,4%		present
truncated-facetted	9	0,9%		?
other	1	0,1%	–	–
Borer	32	3,2%	19	2,8%
Backed Piece	2	0,2%	–	–
Notch-Denticulate	228	23,0%	83	12,4%
Truncation	14	1,4%	29	4,3%
Multiple Tool	23	2,3%	6	0,9%
Retouched Piece	188	18,9%	111	16,6%
Varia	3	0,3%	72	10,8%

* Counts from Bacho Kiro have been estimated from typological descriptions in Kozłowski (1982, 1999).

There are similarities between the Early Zagros Aurignacian at Warwasi and other sites to the west and northwest, including central Europe, although many of these sites have not been described in sufficient quantitative detail to allow itemized comparisons. For example, at Umm el-Tlel in Syria, Levels II base and III 2a are said to contain an "intermediate" industry representing a transition between the Middle and Upper Paleolithic (Boëda and Muhesen, 1993, p. 54-56; Bourguignon, 1998). This assemblage includes Levallois point technology combined with Upper Paleolithic tool types such as burins and endscrapers, as well as several Middle Paleolithic-like sidescrapers and truncated-facetted pieces (Nahr Ibrahim cores), although these latter two tool types are only a small percentage (ca. 6%).

Farther to the northwest, the early Aurignacian-like industry[4] of Bacho Kiro Layer 11 (Bulgaria), named the Bachokirian (Kozłowski, 1979, 1982, 1999), also has a number of similarities to the Early Zagros Aurignacian at Warwasi. This assemblage yielded a flake-

-dominated industry, with heavily exhausted cores, often with multiple platforms or discoidal in form, and therefore very reminiscent of the majority of cores from Warwasi. There are clear typological similarities as well, with sidescrapers, endscrapers and burins (although not carinated varieties), and a small number of Dufour bladelets. Bacho Kiro also contains examples of Aurignacian blades and nosed endscrapers. Despite certain terminological differences, the industry from Bacho Kiro Layer 11 strongly resembles that from Warwasi Levels AA-LL (see Table 1).

The Late Zagros Aurignacian

The assemblages from Levels P-Z at Warwasi represent the Late Zagros Aurignacian. It is technologically an industry heavily dominated by blades and bladelets (ca.60% of the debitage)—the majority being bladelets. Tool blanks are overwhelmingly on blades and bladelets (about 60%). This pattern is also present in the cores, which are mainly single platform blade/bladelet (ca.53%) with an additional component of blade/bladelet opposed platforms cores (nearly 18%). The heavy emphasis on the production of bladelets is also notable because of the presence of numerous examples of carinated burins, as well as some carinated endscrapers (see below), which are likely cores for the manufacture of bladelets (Almeida, 2001; Barton et al., 1996, p. 117-118; Olszewski, in press a).

Typologically, the Late Zagros Aurignacian is unquestionably related to the Aurginacian phenomenon. The tools, for example, contain a moderate quantity of Dufour bladelets, as well as a significant presence of carinated elements (Figs. 4-5; Table 2). The co-occurrence of these two tool types is widely accepted as a marker for Aurignacian assemblages in Europe (see below). The twisted aspect of Dufour bladelets, in fact, is known through experimental work to be related to bladelet removal from tools classified as carinated burins and carinated endscrapers (Almeida, 2001; Lucas, 2001; Schmider and Perpère, 1995). The rarity of Aurignacian markers such as Aurignacian blades in the Warwasi Late Zagros Aurignacian is not unexpected given the variable occurrence of tools such as these in Aurignacian assemblages across Europe and the Levant.

A brief comparison with Aurignacian facies elsewhere in Western Eurasia highlights the remarkable similarity of the Warwasi Levels P-Z assemblages to these manifestations of the Aurignacian, and exemplifies why the Warwasi materials have been classified as a Zagros Aurignacian facies.

In central and eastern Europe, Hahn (1970, 1972, 1977) has identified two Aurignacian variants. The "ordinary" Aurignacian is composed of endscrapers (including carinates), burins, sidescrapers, sharpened (pointed) blades, notches and denticulates, and rare Dufour bladelets. This industry is similar to the industry from Shanidar Cave Level C and may also resemble the earlier Aurignacian from Warwasi. The other central European variant, the "Krems" Aurignacian, is composed of many bladelets and retouched bladelets, including some Font-Yves and Krems points and numerous Dufour bladelets, carinated scrapers, and burins. This variant bears some resemblance to the later Aurignacian of the Zagros. Since the Krems Aurignacian appears to be found exclusively in open-air situations in central and eastern Europe, there may be an activity separation between the two facies, which may also be a factor underlying assemblage variability in the Zagros. Additionally, Kozłowski (1979) has postulated the coexistence of two early Aurignacian-like variants in the central European area. In this case, there are burin and carinate scraper rich assemblages in Moravia contrasted with the Bachokirian, which is rich in various retouched blades and yields a few retouched bladelets.

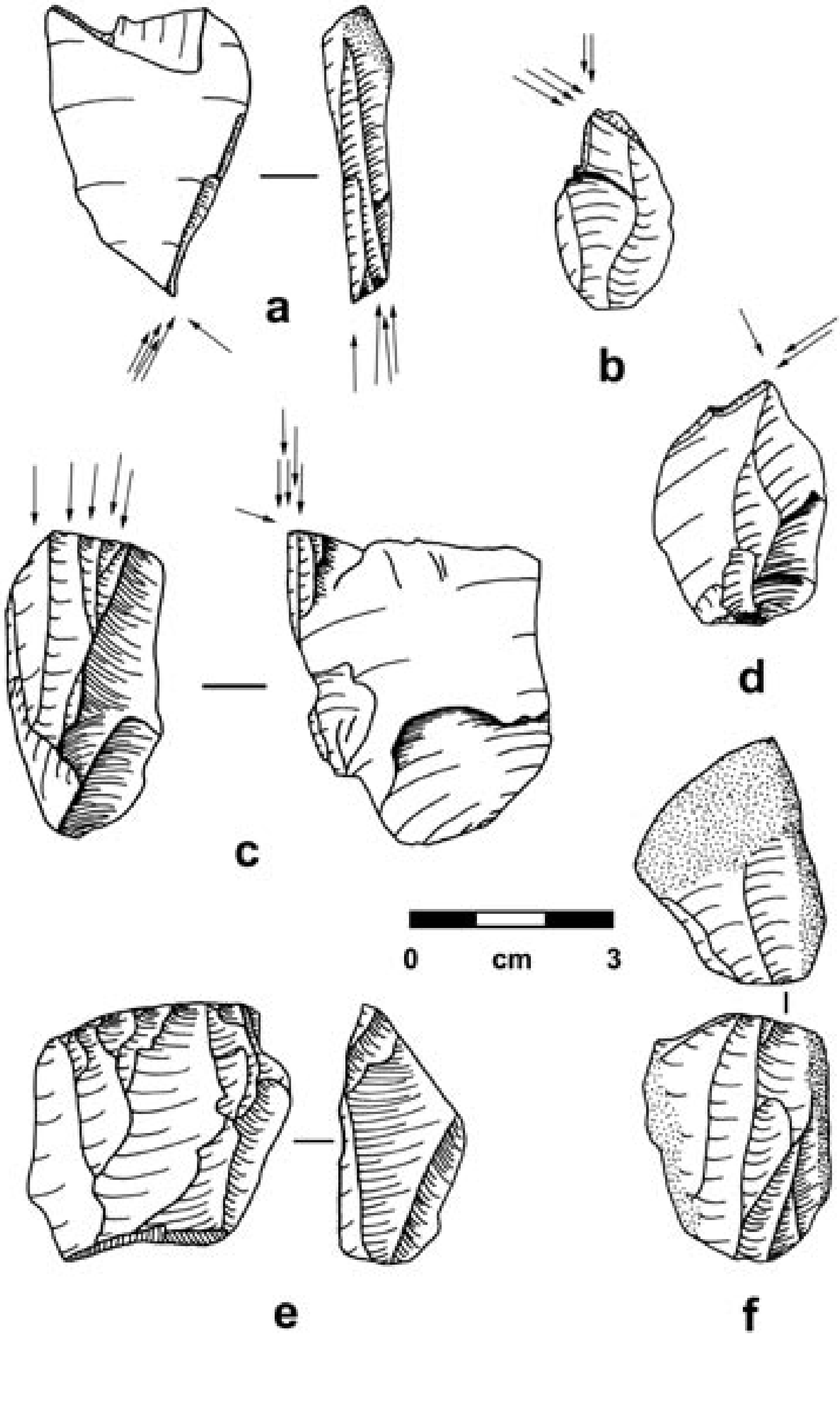

FIG. 4 – Late Zagros Aurignacian at Warwasi: a, c. carinated burins; b, d. offset dihedral burins; e-f. single platform bladelet cores (drawings by D. I. Olszewski).

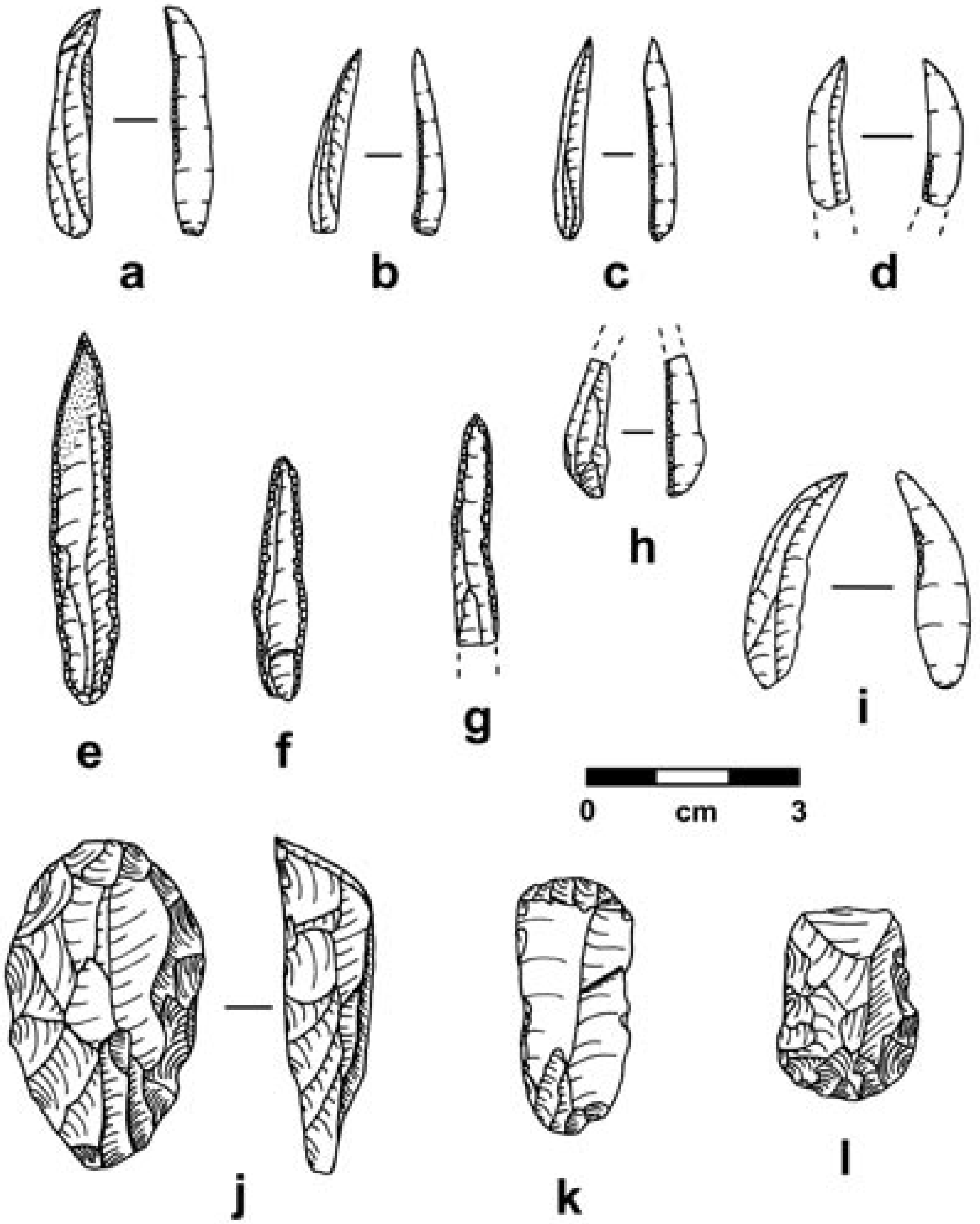

FIG. 5 – Late Zagros Aurignacian at Warwasi: a-d, h-i. Dufour bladelets; e-g. Font-Yves points; j. flake endscraper; k-l. blade endscrapers (drawings by D. I. Olszewski).

Somewhat geographically nearer to the Zagros are sites of the Levantine Aurignacian. Some of these are technologically different from the Warwasi Aurignacian, in part because the Levantine Aurignacian was "redefined" in the early 1980s as containing a flake-based debitage, with tools made equally on blades and flakes (Belfer-Cohen and Bar-Yosef, 1999, p. 127; Gilead, 1981; Marks, 1981). This follows the description of the Levantine Aurignacian B, defined on the basis of the sequence at Ksar Akil (Bar-Yosef and Belfer-Cohen 1996, p. 143). Of some note is the fact that that this manifestation of the Aurignacian in the Levant is identified as "not necessarily identical with the European Aurignacian where the frequencies of Aurignacian blades, Dufour bladelets and Font-Yves or Krems points (similar to el-Wad points) are much higher." (Bar-Yosef and Belfer-Cohen, 1996, p. 143). Perhaps most importantly, its technological basis is quite distinct from the European Aurignacian which is highly laminar. In this regard, the materials from Warwasi are far more similar to the European Aurignacian than are those of the Levantine Aurignacian B.

Some Levantine Aurignacian sites, however, do have assemblages with a closer resemblance to the Warwasi materials. The site of Umm el-Tlel, in the el-Kowm Basin in Syria, for example, is described as a Levantine Aurignacian consisting of nucleiform burins, carinated burins, various endscrapers, Dufour bladelets, and a few Aurignacian blades (at the base of the Aurignacian deposits), as well as a laminar technology (Molist and Cauvin 1990, p. 59), and are compared to the Tixier excavations at Ksar Akil (Layers 10B to 10H or phase V). Further details of additional excavations at Umm el-Tlel are given in Boëda and Muhesen (1993), Ploux (1998), and Soriano (1998). The Umm el-Tlel Aurignacian is quite similar to that from Warwasi.

Of considerable interest is the Levantine Aurignacian A, described as a blade-based industry with an Aurignacian typology (Besançon et al., 1975-1977, p. 32-33). It is found at Ksar Akil, Levels XIII-XI (Bergman, 1987, p. 145) and Kebara Units I-II (Bar-Yosef and Belfer-Cohen, 1996, p. 143). While some of the details of tool types differ from those of the Warwasi Aurignacian, such as the presence of shouldered/nosed scrapers (2%) and the relative rarity of Dufour bladelets[5] at Ksar Akil, the overall typological configuration is similar to both Umm el-Tlel and to Warwasi (see Table 2). Interestingly, the Levantine Aurignacian A is burin-dominated rather than scraper-dominated and, in the case of Ksar Akil, the carinated elements are even more prevalent than in the Zagros region. Technologically, using debitage figures from Ksar Akil (Bergman, 1987, p. 121-125), the industry has 59% blade/bladelet representation, which mirrors that of Warwasi at 60% (Olszewski, 2001, p. 82). Additionally, in the Ksar Akil assemblage from Layers XIII-XI, there are no bone or antler tools (Bergman, 1987, p. 121-125).

TABLE 2

Comparison of Zagros Aurignacian tool types from Warwasi and Shanidar with the Levantine Aurignacian A at Ksar Akil.

	Warwasi Levels P-Z (n=1,148)		*Shanidar Cave Layer C*(n=271)*		*Ksar Akil Layers XIII-XI*(n=1,925)*	
	N	*%*	*N*	*%*	*N*	*%*
Endscraper	86	7,5%	37	13,6%	313	16,3%
Burin	120	10,4%	47	17,3%	593	30,8%
Carinated Element**	143	12,5%	38	14,0%	435	22,6%
Font-Yves/el-Wad Point	13	1,1%	8	3,0%	205	10,6%
Dufour Bladelet	161	14,0%	1	0,4%	10	0,5%
Nongeometric	154	13,4%	5	1,8%	42	2,2%
Geometric	2	0,2%	1	0,4%	–	–
Special Tool						
sidescraper	49	4,3%	30	11,1%	–	–
Aurignacian blade	–	–	10	3,7%	5	0,3%
other	7	0,6%	6	2,2%	–	–
Borer	23	2,0%	2	0,7%	–	–
Backed Piece	12	1,0%	2	0,7%	64	3,3%
Notch-Denticulate	193	16,8%	34	12,5%	47	2,4%
Truncation	23	2,0%	2	0,7%	97	5,0%
Multiple Tool	16	1,4%	34	12,5%	114	5,9%
Retouched Piece	136	11,8%	5	1,8%	?	?
Varia	10	0,9%	9	3,3%	–	–

* Counts from Shanidar have been estimated from typological descriptions in Solecki (1958). Data from Ksar Akil is from Bergman (1987, p. 121-126).

** These are combined carinated burins and carinated endscrapers because the Ksar Akil data is presented in this form.

Issues surrounding the appellation of "Zagros Aurignacian"

At the conference for which this article was written, several issues became clear regarding our attribution of the Upper Paleolithic materials from Warwasi to a facies of the Aurignacian. We will turn out attention to these and, in the process, try to show that most of the objections being raised have serious flaws, and in some cases the arguments are more personal than intellectual; indeed, in some cases criteria that others insist be applied to our assemblages are not those which they themselves apply to their assemblages! To us, of course, the most important thing is to have a definition of the Aurignacian (and its variants) that can be applied consistently and unambiguously.

One issue that arose relates to how the lithic assemblages were recovered from the site of Warwasi. The charge that has been leveled is that Bruce Howe, who supervised the excavation of Warwasi for Robert Braidwood in 1960 (Braidwood et al., 1961, p. 2008), was "taught" to excavate by Dorothy Garrod and therefore his results are suspect because he used arbitrary levels. We find such statements completely without merit for a number of reasons:

- To begin with, unlike some of Garrod's arbitrary levels at various Levantine sites, which exceeded a meter in thickness, Howe's excavation levels did not exceed 10 cm in thickness. He applied this methodology because visibly distinct natural strata were not present in the rockshelter. While excavation in arbitrary levels always retains the possibility that some mixing between discrete assemblages occurred in deposits that are immediately adjacent to one another, the extent to which this occurred at Warwasi appears to be minimal.

- Unlike Garrod, who is known to have been selective in what she retained from excavated materials, Howe saved everything from the Warwasi excavations, including quite small pieces (<20 mm). The lithic assemblages from this site are therefore quite excellent in terms of representativeness of tools, cores, and debitage components.

- Certainly, Howe had worked previously with Garrod in the Balkans in the 1930s (Garrod et al., 1939). Even if this means he was "taught" by her, then on the basis that Garrod's excavation methodology left something to be desired, which was the undertone at the conference on this issue, we would have to discard all information and collections from every site she worked on throughout Western Eurasia in order to apply this standard "fairly" to all. In fact, this "standard" would mean that work on any of the old collections would be futile, and research such as that by Marks and Williams (this volume), using in part the Ewing excavations at Ksar Akil, would have to be thrown out as tainted by inappropriate excavation methodology. We, however, do not advocate such an extreme view, having ourselves successfully worked with many older collections in which we took excavation/excavator biases into account in designing research problems.

- Finally, we find it ironic that Garrod's work in the Levant makes her practically a "goddess" of Paleolithic research there[6], but that her influence (on Howe) for the Zagros is considered a major disadvantage by some.

The second issue raised during the conference concerns whether the lithic elements/assemblages described for Warwasi can be called Aurignacian. While this theme constitutes discussions and descriptions in the various sections of this paper, we would like to address some of the broader aspects of this issue here.

First of all, we do take exception to the notion that we have based our assessment of the Warwasi assemblages as an Aurignacian facies solely on the presence of carinated elements. We acknowledge Bar-Yosef's (2002, p. 372) recent statement that carination can be found in a variety of different industries and across time, but we have never said that carination alone is what makes the Warwasi Upper Paleolithic a facies of the Aurignacian. Anyone who has read our published work carefully (Olszewski 1999, 2001; Olszewski and Dibble, 1994), and the descriptions provided at the beginning of this paper, can see this clearly.

Second, there are many recent works we could quote about aspects of the Western European Aurignacian and many of the papers in this volume describe characteristics of what constitutes an Aurignacian lithic typology (e.g., Bordes, Conard, Lucas) and technology(ies) (e.g., Bon). We provide two here as a guide to some of what is seen as important in uncontested Aurignacian contexts:

> "Bladelet production is the technological innovation most constant to the emergence of the Aurignacian......with the Aurignacian develops a systematic production of bladelets from carinate pieces....It has been established that the carinated pieces were cores specific to the production of the twisted bladelets necessary for the manufacture of the «Dufour bladelets» characteristic of the Aurignacian culture" (Rigaud, 2001, p. 117-118).

> "The Aurignacian is well known for its richness in bone points, but less so for its numerous microliths. These bladelets, Dufour bladelets in particular..., represent the cultural marker for the Aurignacian..." (Lucas, 2001, p. 99).

At the same time, we also agree with the following statement of Bar-Yosef (2002, p. 372):

> "As the definition of this entity was based on a particular suite of stone tools in France, it is expected that not all types will be available wherever the bearers of this industry went. The question is, what is the minimal number of types required to label an assemblage as Aurignacian? The current literature does not provide a detailed definition....the presence of the Levantine Aurignacian....is based on the assemblages that contain carinated nosed scrapers, Dufour bladelets, bone and antler objects (with split based points), and deer-teeth pendants."

These remarks as to the principal characteristics of the Aurignacian bring us to the third issue, namely that of organic materials, In particular, we refer to the presence of bone points (split-based in the Early Aurignacian, other forms in later phases) and perforated deer canines as defining elements for this "culture." It is our impression that these aspects of the Aurignacian have been recently gathering momentum as required "fossile directeurs," yet there are considerations which in some cases could obviate the usefulness of this element as crucial to the definition of the Aurignacian. The most important of these has to do with the availability of the medium on which the points were made.

One aspect of this problem was recently addressed by Bernaldo de Quirós et al. (2001). They note that "bone" points are often made of antler. The supply of antler, therefore, is a critical consideration. In an assessment of the contrast between the French and Spanish Aurignacian in quantity of "bone" points, for example, Bernaldo de Quirós et al. (2001, p. 27) observe that the great abundance of points in France is likely due to the fact that reindeer antler is the primary organic resource available for points here (both male and female reindeer shed antlers, and their shed patterns result in year-round availability). In Spain, on the other hand, there are no reindeer, so that red deer antler is used (only males shed antler, and thus antler is less available overall, and restricted seasonally).

We suggest that antler availability is a key consideration. It likely explains why "bone" points are relatively rare in the Levantine Aurignacian (Bar-Yosef and Belfer-Cohen, 1996; Belfer-Cohen and Bar-Yosef, 1981, p. 30-34), as the available antler would be from deer[7] (limited to males) and deer would be few in number due to the geographical restriction of the Mediterranean forest zone during much of the Pleistocene.

Conditions during the Pleistocene did not favor a Mediterranean forest for the Zagros region where Warwasi is located (at least, not after the Middle Paleolithic occupation here). We believe that the lack of "bone" points here can be explained at least in part by the fact that there were no deer present during the Upper Paleolithic (Turnbull, 1975, p. 145) and thus no antler available for point manufacture[8]. Nor were there gazelle present to provide horn cores. In a similar vein, perforated deer teeth would also be limited to whether or not this species was in the area.

Finally, there is always the question of adequate conditions for the preservation of organics, including bone and antler. The faunal assemblage from Warwasi, for example, consists primarily of teeth. This suggests that preservation of bone is poor, and that under these conditions, even if rare "bone" points had been present at the site, it is unlikely that they would have survived. The Levantine Aurignacian at Umm el-Tlel in Syria, an open air site, also lacks organics and thus has no "bone" points (Ploux, 1998, p. 30).

A last issue that developed at the conference involves suggestions by some that the Warwasi materials are somehow related to the Gravettian/Eastern Gravettian tradition[9]. We find this to be somewhat far afield for the following reasons:

- There are virtually no typological similarities between the Warwasi Upper Paleolithic tools and those of the Gravettian. Gravettian assemblages are characterized by Font Robert points (stemmed points), Gravette points (backed points), microgravette points (backed bladelet points), an elaborate burin typology including Noailles burins and Rayesse burins, and microdenticulates (Djindjian, 1999, p. 315; Oliva, 1999, p. 222-225; Svoboda et al., 1996, p. 140-143). These are not the tool forms characteristic of the assemblages from Warwasi.

- While there are sometimes a small number of carinated elements in Gravettian/Eastern Gravettian assemblages from which bladelets are struck, the majority of bladelet production is from regular forms of bladelet cores (Rigaud, 1996, p. 259; Svoboda et al., 1999, p. 203). This does not match the materials from Warwasi technologically, which have a considerable amount of bladelet production from carinated elements.

"To be or not to be Aurignacian": the nature of Aurignacian variability

It is common knowledge that there is a great deal of variability in what are considered reputable Aurignacian industries (Clark and Riel-Salvatore, 2003). As everyone recognizes, variability leading to phase or facies designations is at least partly a function of geography and of time. In the case of organic assemblages, it can also be linked to antler availability and to preservation conditions at specific sites. It is interesting to see what different researchers have to say in describing Aurignacian assemblages from different areas.

In speaking of Thèmes in Northeast France, for example, Bernardini et al. (1997, p. 40) state:

"*La présence de burins carénes et busqués associés à des grattoirs carénes et à museau, incite donc à placer cette série dans le techno-complexe aurignacien. Enfin, l'absence totale de pièces à retouche latérale aurignacienne, qui semblent caractéristiques de l'Aurignacien ancien... plaiderait pour une phase évoluée.*"

Referring to Arcy-sur-Cure, Schmider and Perpère (1977, p. 7-8) say that:

"*L'appartenance de cet ensemble à l'Aurignacien se manifeste nettement par la présence des outils marqueurs de cette culture, en particulier les lamelles Dufour et les grattoirs et burins carénes. Toutefois, la composition quantitative de cet outillage, en fait un assemblage original par rapport aux séries considérées de l'Aurignacien...*"

In the Périgord, Rigaud (1999, p. 328-329) points out that:

"...with the Aurignacian appears an important bladelet production, in certain Aurignacian technocomplexes linked to the abundance of 'carinated' forms and certain busked burins....The earliest Aurignacian industries in the Périgord are characterized by an abundance of objects with a scalar retouch, the so-called 'Aurignacian retouch' (generally blades and endscrapers on blades), that become much rarer, even absent, in later industries. The carinated and thick-nosed carinated scrapers are present in variable proportions as are the Dufour bladelets; blade and bladelet production is abundant. These industries comprise the *early Aurignacian* in the Périgord.....the industries that follow it have a different equilibrium: thick endscrapers (carinated and thick-nosed) become more abundant, busked burins are present in variable proportions, and pieces with an 'Aurignacian retouch' become rarer....We have proposed to include these industries in a 'middle Aurignacian'..."

And speaking generally of the Aurignacian, Djindjian (1999, p. 315) notes that:

"Aurignacian industries are based on blade and bladelet debitage. Aurignacian assemblages are characterized by endscrapers more numerous than burins, numerous retouched blades, denticulates, notches, sidescrapers and splintered pieces; carinated and shouldered thick endscrapers, busked and carinated burins, and Dufour bladelets are correlated with temperate oscillations...."

For the Near East, Belfer-Cohen and Bar-Yosef (1996, p. 143-144) say the following:

"The lithic assemblages of the "Levantine Aurignacian B" consist of numerous carinated and nosed scrapers and fewer retouched pieces or blades when compared to the "Levantine Aurignacian A"...Thus the "Levantine Aurignacian B" is considered by some scholars as representative of the "true" Aurignacian tradition....In sum, the Levantine Aurignacian, as originally defined at the London conference in 1969....is characterized by the presence of carinated and nosed scrapers with flakes outnumbering the blades in the debitage, yet present in equal numbers among the tool blanks..."

Bergman (1987, p. 144-145), in describing the Levantine Aurignacian A from Ksar Akil states that:

"Unretouched blade/lets are the most numerous class of debitage...and the flaking technology...is characterised by a predominance of twisted profiles. All three assemblages are primarily composed of scrapers, carinated tools and burins; retouched blade/lets and el-Wad points are present in smaller numbers and tend to be twisted in profile....At the same time a developed blade/let technology is not regarded as a feature of industries currently classified as Aurignacian in the south....In effect, what we have in levels XIII-XI is a blade based technology with a strong Aurignacian typology."

It is clear that assemblages from the Zagros[11] encompass the majority of features associated with early Upper Paleolithic industries from the neighboring regions of central Europe and the Levant, including both the characteristic types and technologies of the Aurignacian techno-complex and the nature of inter-assemblage variability of these regions (Olszewski and Dibble, 1994; Olszewski, 1999, 2001, in press b). These similarities are most clearly seen in the presence of the index fossils of those industries, namely carinate scrapers and burins, Font-Yves points, and Dufour bladelets, as well as bladelet production from both carinated and single platform cores. Therefore, the differences between the Zagros assemblages and other Aurignacian assemblages are not as pronounced as often cited in the literature (Hours et al., 1973; Garrod, 1957) or by some of our colleagues at this conference. Such differences as do exist may reflect both a local continuity and adaptations particular to this region.

While the Zagros Upper Paleolithic lacks clear intra-region differentiation as seen in Europe and the Levant, there are two points to be kept in mind. First, very few Zagros sites have been excavated (and reported in detail), and there are virtually no excavated open-air sites. Second, although data are few, there is a similar nature to the industrial variability in the Zagros in terms of endscrapers and burins on the one hand, and blade/bladelet tools on the other. This is the contrast seen, for example, between Shanidar Cave C and all of the Aurignacian from Warwasi, and between Warwasi and the Khorramabad sites. Contra Bar-Yosef (2000, p. 137), there is no indication from the Shanidar Cave C drawings or tool counts that the materials from Shanidar Cave C are most similar to the Levantine Ahmarian rather than to the Zagros Aurignacian. The drawings and the typology from Shanidar Cave C, which has numerous carinated elements, a modest representation of sidescrapers, and few retouched bladelets (see Table 2), in fact, suggest quite the opposite. This can easily be seen when one considers that the Levantine Ahmarian has few carinates, but does have numerous examples of el-Wad points in its early phase and Ouchtata bladelets in its late phase. These types of bladelet tools are extremely rare at Shanidar Cave C, as well as in the Zagros region as a whole.

As we stated at the beginning of this paper, the recognition of an Aurignacian variant in the Zagros has major implications not only for our understanding of the culture history of the Zagros but also for our understanding of the prehistory of both Europe and the Near East regarding the origin and spread of the Aurignacian. Research to date in Europe and the Levant generally considers the Aurignacian there as being allocthonous (e.g., Bar-Yosef, 1998; Bergman, 1988; Bocquet-Appel and Demars, 2000; Kozłowski, 1988; d'Errico et al., 1998; Mellars, 1998). The fact that the Zagros Aurignacian is present in an area with geographical access to both Europe and the Levantine Near East raises the possibility that the Zagros represents a common origin area for the Aurignacian in both of these regions[12]. Unfortunately, the few radiocarbon dates that exist for the Zagros were all obtained during the 1950s and early 1960s, using the solid carbon method (Hole and Flannery 1967). For Shanidar Cave C, there are eight dates; the youngest is 28 700±700 BP and the oldest is 35 440±600 BP. Yafteh Cave in the Khorramabad area yielded eleven dates. The youngest at Yafteh is 21 000±800 BP and the oldest is >40 000 BP.

The question of whether or not a transition took place from the Zagros Mousterian to the Zagros Aurignacian cannot be resolved definitively with the available data, although there are Middle Paleolithic technological and typological elements present in the Early Zagros Aurignacian. Typologically, these include sidescrapers, truncated-facetted pieces, and small radial cores (Baumler and Speth, 1993; Dibble, 1984; Dibble and Holdaway, 1990, 1993; Solecki and Solecki, 1993). Additionally, the diminutive and flake-based technology of the Early Zagros Aurignacian at Warwasi follows a general trend seen in the Zagros Mousterian at that site (Dibble and Holdoway, 1993). Finally, an emphasis on heavily retouched pieces characterizes both the Mousterian and Aurignacian assemblages at Warwasi; such heavy reduction and utilization is typical of the Aurignacian of western Eurasia in general. In fact, no clear industrial break is seen in the Warwasi sequence, which originally led to the erroneous inclusion of some of the earliest Zagros Aurignacian levels in an earlier report on the Mousterian levels (Dibble and Holdaway, 1990).

Notwithstanding that an abrupt break does not seem to occur between the Mousterian and Aurignacian of this one site, an obviously important consideration in postulating the Zagros as a place of origin for the Aurignacian concerns the absolute chronology. Most of the existing dates for the Zagros Aurignacian from Shanidar and Yafteh are not as early as the earliest dates so far obtained for the Aurignacian from western Europe (Bischoff et al., 1989; d'Errico et al., 1998; Mellars, 1999; Cabrera and Bischoff, 1989) or for Bacho Kiro Level 11 in central Europe (Kozłowski, 1979, 1999). However, it must be remembered that the dates for the Zagros industries were obtained forty years ago and thus may not be directly comparable to those obtained more recently with other methods. Efforts are being made to obtain new dates from samples from Warwasi.

Concluding remarks

Throughout the course of the Paleolithic in the Zagros, similarities to European industries of this time range are more pronounced than are similarities to the industries of the Levant, particularly the widely accepted "Levantine Aurignacian B". In part this reflects a convergence of adaptive responses to conditions in similar terrains within the Zagros and various European areas. It may also suggest that there are fewer contacts between the ancient groups of the diverse regions of the Middle East than might otherwise have been expected. The Zagros appears to exemplify another instance of the development of early Upper Paleolithic industries from an underlying Mousterian base. These have Aurignacian affinities which become more developed in character through time, and they fit within the pattern of heterogeneity that typifies the many facies of the Aurignacian in western Eurasia. The Upper Paleolithic industry from the Zagros region is interesting, therefore, not only as a response to a variety of local factors, but also because it provides comparative data that can be used to help clarify assemblage patterns seen in other areas. The Zagros Aurignacian offers one example of the need for Paleolithic archaeologists to broaden their perspectives to an inter-regional level in order to better interpret local variability. In this light, it is hoped that this discussion will be of interest to those working on similar problems.

Acknowledgments

Research on the Warwasi Upper Paleolithic was made possible with funding to Deborah Olszewski from the American Philosophical Society.

NOTES

1 In particular, its close resemblance to the Levantine Aurignacian A of Ksar Akil and Umm el-Tlel, including the lack of organic technology, for whatever reasons, at all three sites.

2 See the next sections of the paper for the reasoning underlying this designation as Aurginacian.

3 Assemblages containing both MSA and LSA tool types have been argued in the African context to show continuity of development (McBrearty and Brooks, 2000, p. 490-491).

4 Rigaud (2001, p. 117; this volume) concludes that Bacho Kiro Layer 11 is not a form of the archaic Aurignacian, but simply a heavily exhausted industry.

5 The rarity of small objects such as bladelets could be due to the recovery methods used during the Ewing excavations of 1937-1938, which are the basis of Azory and Bergman's (Bergman, 1987) analysis.

6 "...it is still amazing to observe the insight of Garrod when she first defined the chrono-stratigraphy of the Levantine Upper Palaeolithic sequence.....She provided the 'building blocks' of the study of Levantine prehistory which are still used today." (Belfer-Cohen and Bar-Yosef, 1999, p. 130-132).

7 Some bi-points at Hayonim Cave are made on gazelle horn cores or bone splinters (Belfer-Cohen and Bar-Yosef, 1981, p. 31).

8 Larger mammalian fauna is restricted to *Equus hemionus*, *Capra aegagrus*, *Ovis orientalis*, and *Bos primigenius*.

9 Pavlovian is another term used for the central European materials (e.g., Oliva, 1999).

10 In the majority of the literature, the Zagros assemblages have been called Baradostian primarily because although Solecki (1958) recognized the Aurignacian affinity of his materials from the 1951 and 1953 excavations at Shanidar Cave (Layer C), he followed the advice of Dorothy Garrod in naming his early Upper Paleolithic industry after the Baradost Mountains (part of the Zagros chain) in which Shanidar Cave is situated. Other Upper Paleolithic sites in the region include Pa Sangar, Yafteh, Ghar-i-Kar, and Gar Arjeneh (Braidwood and Howe, 1960; Hole and Flannery, 1967; Smith, 1986; Young and Smith, 1966).

11 We do not necessarily contend that there is only "one" origin area for the Aurignacian. It is quite probable, in fact, that local continuities are more the rule than the exception, e.g., see Arrizabalaga et al. (2003) for an example demonstrating continuity from the Chatelperronian to Proto-Aurignacian to Aurignacian in Spain.

REFERENCES

ALMEIDA, F. (2001) - Cores, tools, or both? Methodological consideration for the study of carinated lithic elements: the Portuguese case. In HAYS, M. A.; THACKER, P. T., eds. - *Questioning the answers: resolving fundamental problems of the Early Upper Paleolithic*. Oxford: British Archaeological Reports International Series 1005, p. 91-97.

ARRIZABALAGA, A.; ALTUNA, J.; ARESO, P.; ELORZA, M.; GARCÍA, M.; IRIARTE, M. J.; MARIEZKURRENA, K.; MUJIKA, J.; PEMÁN, E.; TARRIÑO, A.; URIZ, A.; VIERA, L.; STRAUS, L. G. (2003) - The Initial Upper Paleolithic in Northern Iberia: new evidence from Labeko Koba. *Current Anthropology*. Chicago, IL. 44:3, p. 413-421.

BAR-YOSEF, O. (1998) - On the nature of transitions: the Middle to Upper Palaeolithic and the Neolithic revolution. *Cambridge Archaeological Journal*. Cambridge. 8:2, p. 141-163.

BAR-YOSEF, O. (2000) - The Middle and Early Upper Paleolithic in Southwest Asia and neighboring regions. In BAR-YOSEF, O.; PILBEAM, D., eds. - *The geography of Neandertals and modern humans in Europe and the Greater Mediterranean*. Cambridge, MA: Peabody Museum of Archaeology and Ethnology (Peabody Museum Bulletin; 8), p. 107-156.

BAR-YOSEF, O. (2002) - The Upper Paleolithic revolution. *Annual Review of Anthropology*. Palo Alto, CA. 31, p. 363-393.

BAR-YOSEF, O.; BELFER-COHEN, A. (1996) - Another Look at the Levantine Aurignacian. In DI CESNOLA, A. P.; MONTET-WHITE, A.; VALOCH, K., eds. - *The Upper Palaeolithic (6) – Colloquia XI-XII (13th Congress, International Union of Prehistoric and Protohistoric Sciences, Forlì, 1996)*. Forlì: A.B.A.C.O, p. 139-150.

BAUMLER, M.; SPETH, J. (1993) - A Middle Paleolithic assemblage from Kunji Cave, Iran. In OLSZEWSKI, D. I.; DIBBLE, H. L., eds. - *The Paleolithic Prehistory of the Zagros-Taurus*. Philadelphia, PA: The University Museum, p. 1-74.

BARTON, C. M.; OLSZEWSKI, D. I.; COINMAN, N. R. (1996) - Beyond the graver: reconsidering burin function. *Journal of Field Archaeology*. Boston, MA. 23, p. 111-125.

BELFER-COHEN, A.; BAR-YOSEF, O. (1981) - The Aurignacian at Hayonim Cave. *Paléorient*. Paris. 7:2, p. 19-42.

BELFER-COHEN, A.; BAR-YOSEF, O. (1999) - The Levantine Aurignacian: 60 years of research. In DAVIES, W.; CHARLES, R., eds. - *Dorothy Garrod and the progress of the Palaeolithic. Studies in the prehistoric archaeology of the Near East and Europe*. Oxford: Oxbow, p. 118-134.

BERGMAN, C. A. (1987) - *Ksar Akil, Lebanon. A technological and typological analysis of the later Palaeolithic levels of Ksar Akil. Volume II: levels XIII-VI*. Oxford: British Archaeological Reports International Series 329.

BERGMAN, C. A. (1988) - The Upper Palaeolithic of the Levant. *Paléorient*. Paris. 14:2, p. 223-227.

BERNALDO DE QUIRÓS, F.; CABRERA, V.; LLORET, M.; PIKE-TAY, A. (2001) - New kids on the block? Some comments on the Middle-Upper Paleolithic transition in Cantabrian Spain. In HAYES, M. A.; THACKER, P. T., eds. - *Questioning the answers: re-solving fundamental problems of the Early Upper Paleolithic*. Oxford: British Archaeological Reports International Series 1005, p. 27-38.

BERNARDINI, O.; BROU, L.; THÉVENIN, A. (1997) - Le gisement paléolithique supérieur de Thèmes, commune de Cézy (Yonne). Note préliminaire. In *Le Paléolithique supérieur de l'Est de la France: de l'Aurignacien à l'Ahrensbourgien. Actes du colloque interrégional sur le Paléolithique supérieur de Chaumont, 17-18 septembre 1994*. Reims: Société Archéologique Champenoise (Mémoire de la Société Archéologique Champenoise; 13), p. 37-49.

BESANÇON, J.; COPELAND, L.; HOURS, F. (1975-1977) - Tableaux de préhistoire libanaise. *Paléorient*. Paris. 3, p. 5-45.

BISCHOFF, J. L.; SOLER, N.; MAROTO, J.; JULIÀ, R. (1989) - Abrupt Mousterian/Aurignacian Boundary at c. 40 ka bp: accelerator ^{14}C dates from l'Abreda Cave (Catalunya, Spain). *Journal of Archaeological Science*. London. 16, p. 563-576.

BOCQUET-APPEL, J.-P.; DEMARS, P. Y. (2000) - Neanderthal contraction and modern human colonization of Europe. *Antiquity*. Cambridge. 74, p. 544-552.

BOËDA, E.; MUHESEN, S. (1993) - Umm El Tlel (El Kowm, Syrie): étude préliminaire des industries lithiques du Paléolithique Moyen et Supérieur. *Cahiers de l'Euphrate*. Paris. 7, p. 47-91.

BOURGUIGNON, L. (1998) - Les industries du Paléolithique intermédiaire d'Umm el Tlell: nouveaux éléments pour le passage entre Paléolithique Moyen et Supérieur. In OTTE, M., ed. - *Préhistoire d'Anatolie. Genèse des Deux Mondes. Volume II*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 85), p. 709-730.

BRAIDWOOD, R. J.; HOWE, B. (1960) - *Prehistoric investigations in Iraqi Kurdistan*. Chicago: University (Oriental Institute of the University of Chicago, Studies in Ancient Oriental Civilization; 31).

BRAIDWOOD, R. J.; HOWE, B.; REED, C. A. (1961) - The Iranian Prehistoric Project. *Science*. New York, NY. 133, p. 2008--2010.

CABRERA V.; BISCHOFF, V.; BISCHOFF, J. L. (1989) - Accelerator ^{14}C ages for Basal Aurignacian at El Castillo (Spain). *Journal of Archaeological Science*. London. 16, p. 577-584.

CLARK, G. A.; RIEL-SALVATORE, J. (2003) - *What's in a name? An empirical review of the West Eurasian Aurignacian*. Paper presented at the 12th Paleoanthropology Society Meetings, April 22-23, Tempe, AZ.

COINMAN, N. R.; FOX, J. R. (2000) - Tor Sadaf (WHNBS 8): the transition to the Upper Paleolithic. In COINMAN, N. R., ed. - *The Archaeology of the Wadi al-Hasa, West-Central Jordan, Vol. 2: excavations and research at Middle, Upper and Epipaleolithic site*s. Tempe, AZ: Arizona State University (Anthropological Research Papers; 52), p. 123-142.

D'ERRICO, F.; ZILHÃO, J.; JULIEN, M.; BAFFIER, D.; PELEGRIN, J. (1998) - Neanderthal acculturation in Western Europe? A critical review of the evidence and its interpretation. *Current Anthropology*. Chicago, IL. 39 (supplement), p. S1-S44.

DIBBLE, H. L. (1984) - The Mousterian Industry from Bisitun Cave (Iran). *Paléorient*. Paris. 10, p. 23-34.

DIBBLE, H. L.; HOLDAWAY, S. (1990) - Le Paléolithique moyen de l'abri sous roche de Warwasi et ses relations avec le Moustérien du Levant. *L'Anthropologie*. Paris. 94:4, p. 619-642.

DIBBLE, H. L.; HOLDAWAY, S. (1993) - The Middle Paleolithic industries of Warwasi. In OLSZEWSKI, D. I.; DIBBLE, H. L., eds. - *The Paleolithic Prehistory of the Zagros-Taurus*. Philadelphia, PA: The University Museum, p. 75-100.

DJINDJIAN, F. (1999) - The Mid Upper Palaeolithic (30,000 to 20,000 bp) in France. In ROEBROEKS, W.; MUSSI, M.; SVOBODA, J.; FENNEMA, K., eds. - *Hunters of the Golden Age. The Mid Upper Palaeolithic of Eurasia 30,000 – 20,000 BP*. Leiden: Leiden University (Analecta Praehistorica Leidensia; 31), p. 313-324.

GARROD, D. A. E. (1957) - Notes sur le Paléolithique supérieur du Moyen Orient. *Bulletin de la Société Préhistorique Française*. Paris. 54:7-8, p. 439-446.

GARROD, D. A. E; HOWE, B.; GAUL, J. H. (1939) - Excavation in the Cave of Bacho Kiro, North-East Bulgaria. *Bulletin of the American School of Prehistoric Research*. Cambridge, MA. 15, p. 46-70.

GILEAD, I. (1981) - Upper Paleolithic tool assemblages from the Negev and Sinai. In CAUVIN, J.; SANLAVILLE, P., eds. - *Préhistoire du Levant: chronologie et organisation de l'espace depuis les origines jusqu'au VI^{e} millénaire. Colloques Internationaux du CNRS, 10-14 juin Lyon, Maison de l'Orient*. Paris: Centre National de la Recherche Scientifique, p. 331-342.

HAHN, J. (1970) - Recherches sur L'Aurignacian en Europe Centrale et Oriental. *L'Anthropologie*. Paris. 74, p. 195-220.

HAHN, J. (1972) - Das Aurignacien in Mittel- und Osteuropa. *Acta Praehistorica et Archaeologica*. Berlin. 3, p. 77-107.

HAHN, J. (1977) - *Aurignacien, das ältere Jungpaläolithikum im Mittel- und Osteuropa*. Köln-Wien: Böhlau (Fundamenta; 9).

HOLE, F.; FLANNERY, K. (1967) - The Prehistory of Southwestern Iran: a preliminary report. *Proceedings of the Prehistoric Society*. London. 33, p. 151-206.

HOURS, F.; COPELAND, L.; AURENCHE, O. (1973) - Les industries paléolithiques du Proche-Orient, essai de corrélation. *L'Anthropologie*. Paris. 77:3-4, 5-6, p. 229-280, p. 437-496.

KOZŁOWSKI, J. K. (1979) - Le Bachokien: la plus ancienne industrie du Paléolithique supérieur en Europe. In KOZŁOWSKI, J. K., ed. - *Middle and early Upper Palaeolithic in Balkans*. Kraków: Uniwersytet Jagielloński, p. 77-99.

KOZŁOWSKI, J. K. (1982) - *Excavation in Bacho Kiro Cave (Bulgaria): final report*. Warszawa: Państwowe Wydawnictwo Naukowe.

KOZŁOWSKI, J. K (1988) - Transition from the Middle to the Early Paleolithic in Central Europe and the Balkans. In HOFFECKER, J.; WOLF, C. A., eds. - *The Early Upper Paleolithic*. Oxford: British Archaeological Reports International Series 437, p. 193-236.

KOZŁOWSKI, J. K (1999) - The evolution of the Balkan Aurignacian. In DAVIES, W.; CHARLES, R., eds. - *Dorothy Garrod and the progress of the Palaeolithic. Studies in the prehistoric archaeology of the Near East and Europe*. Oxford: Oxbow Books, p. 97-117.

KUHN, S. L.; STINER, M. C.; GÜLEÇ, E. (1999) - Initial Upper Paleolithic in South-Central Turkey and its regional context: a preliminary report. *Antiquity*. Cambridge. 73:281, p. 505-517.

LUCAS, G. (2001) - The origin of Dufour bladelet torsion. In HAYS, M. A.; THACKER, P. T., eds. - *Questioning the answers: resolving fundamental problems of the Early Upper Paleolithic*. Oxford: British Archaeological Reports International Series 1005, p. 99-107.

MARKS, A. E. (1981) - The Upper Paleolithic of the Levant. In CAUVIN, J.; SANLAVILLE, P., eds. - *Préhistoire du Levant: chronologie et organisation de l'espace depuis les origines jusqu'au VI^e millénaire. Colloques Internationaux du CNRS, 10-14 juin Lyon, Maison de l'Orient*. Paris: Centre National de la Recherche Scientifique, p. 369-372.

MARKS, A. E. (1993) - The Early Upper Paleolithic: the view from the Levant. In KNECHT, H.; PIKE-TAY, A.; WHITE, R., eds. - *Before Lascaux: the complex record of the Early Upper Paleolithic*. Boca Raton, FL: CRC Press, p. 5-22.

MCBREARTY, S.; BROOKS, A. S. (2000) - The revolution that wasn't: a new interpretation of the origin of modern human behavior. *Journal of Human Evolution*. London. 39, p. 453-563.

MELLARS, P. (1998) - Comment on Neanderthal acculturation in Western Europe? A critical review of the evidence and its interpretation. *Current Anthropology*. Chicago, IL. 39 (supplement), p. S25-S26.

MELLARS, P. (1999) - The Neanderthal problem continued. *Current Anthropology*. Chicago, IL. 40:3, p. 341-350.

MOLIST, M.; CAUVIN, M.-C. (1990) - Une nouvelle sequence stratifiée pour la prehistoire en Syrie semi-desertique. *Paléorient*. Paris. 16:2, p. 55-63.

OLIVA, M. (1999) - Some thoughts on Pavlovian adaptations and their alternatives. In ROEBROEKS, W.; MUSSI, M.; SVOBODA, J.; FENNEMA, K., eds. - *Hunters of the Golden Age. The Mid Upper Palaeolithic of Eurasia 30,000 – 20,000 BP*. Leiden: University (Analecta Praehistorica Leidensia; 31), p. 219-227.

OLSZEWSKI, D. I. (1999) - The Early Upper Palaeolithic in the Zagros mountains. In DAVIES, W.; CHARLES, R., eds. - *Dorothy Garrod and the progress of the Palaeolithic. Studies in the prehistoric archaeology of the Near East and Europe*. Oxford: Oxbow Books, p. 167-180.

OLSZEWSKI, D. I. (2001) - Ruminations on the Early Upper Paleolithic and a consideration of the Zagros Aurignacian. In HAYS, M. A.; THACKER, P. T., eds. - *Questioning the answers: resolving fundamental problems of the Early Upper Paleolithic*. Oxford: British Archaeological Reports International Series 1005, p. 79-89.

OLSZEWSKI, D. I. (in press a) - Carinated tools, cores, and mobility: the Zagros Aurignacian example. In MCPHERRON, S. P., ed. - *Tools or cores? The identification and study of alternative core technology in lithic assemblages*. Newcastle: Cambridge Scholars Press.

OLSZEWSKI, D. I. (in press b) - Issues in the development of the Early Upper Paleolithic and a "transitional" industry from the Zagros Region. In RIEL-SALVATORE, J.; CLARK, G. A., eds. - *Transitional industries in Europe and Western Asia*.

OLSZEWSKI, D. I.; DIBBLE, H. L. (1994) - The Zagros Aurignacian. *Current Anthropology*. Chicago, IL. 35, p. 68-75.

PLOUX, S. (1998) - Le Paléolithique supérieur d'Umm el Tlel (Bassin d'el Kowm, Syrie): observations préliminaires. *Cahiers de l'Euphrate*. Paris. 8, p. 27-54.

RIGAUD, J. -P. (1996) - L'origine du Gravettien dans le Sud de la France. In DI CESNOLA, A. P.; MONTET-WHITE, A.; VALOCH, K., eds. - *The Upper Palaeolithic (6) – Colloquia XI-XII (13^th Congress, International Union of Prehistoric and Protohistoric Sciences, Forlì, 1996)*, A.B.A.C.O, Forlì, p. 257-262.

RIGAUD, J. -P. (1999) - Human adaptation to the climatic deterioration of the last Pleniglacial in Southwestern France (30,000 – 20,000 bp). In ROEBROEKS, W.; MUSSI, M.; SVOBODA, J.; FENNEMA, K., eds. - *Hunters of the Golden Age. The Mid Upper Palaeolithic of Eurasia 30,000 – 20,000 BP*. Leiden: University (Analecta Praehistorica Leidensia; 31), p. 325-336.

RIGAUD, J. -P. (2001) - Discussion. In HAYS, M. A.; THACKER, P. T., eds. - *Questioning the answers: resolving fundamental problems of the Early Upper Paleolithic*. Oxford: British Archaeological Reports International Series 1005, p. 117-119.

SCHMIDER, B.; PERPÈRE, M. (1995) - Production et utilisation des lamelles dans l'Aurignacien de la Grotte du Renne à Arcy-sur-Cure. In PAUTRAT, Y., ed. - *Paléolithique supérieur et Epipaléolithique dans le Nord-Est de la France*. Dijon: Direction Régionale des Affaires Culturelles, p. 4-10.

SCHMIDER, B.; PERPÈRE, M. (1997) - Données nouvelles sur l'Aurignacien d'Arcy-sur-Cure (fouilles André Leroi-Gourhan). In THÉVENIN, A.; VILLES, A., eds. - *Le Paléolithique Supérieur de l'Est de la France: de l'Aurignacien à l'Ahrensbourgien. Actes du Colloque Interrégional sur le Paléolithique*. Reims: Chaumont, 17-18 Octobre 1994, p. 5-13.

SMITH, P. E. L. (1986) - *Paleolithic archaeology In Iran*. Philadelphia, PA: The University Museum (The American Institute of Iranian Studies Monographs; 1.).

SOLECKI, R. S. (1958) - *The Baradostian industry and the Upper Palaeolithic in the Near East*. Ph. D. Dissertation, Columbia University. Ann Arbor, MI: University Microfilms International.

SOLECKI, R. S.; SOLECKI, R. L. (1993) - The pointed tools from the Mousterian occupations of Shanidar Cave, Northern Iraq. In OLSZEWSKI, D. I.; DIBBLE, H. L., eds. - *The Paleolithic Prehistory of the Zagros-Taurus*. Philadelphia, PA: The University Museum, p. 119-146.

SORIANO, S. (1998) - La production de lamelles torses dans les niveaux du Paléolithique Supérieur Ancien d'Umm el Tlel (Syrie). Exploration théorique et expérimentale de ses modalités. In OTTE, M., ed. - *Préhistoire d'Anatolie. Genèse des deux mondes. Volume II*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 85), p. 731-748.

SVOBODA, J.; KLÍMA, B.; JAROŠOVÁ, L.; ŠKRDLA, P. (1999) - The Gravettian in Moravia: climate, behaviour and technological complexity. In ROEBROEKS, W.; MUSSI, M.; SVOBODA, J.; FENNEMA, K., eds. - *Hunters of the Golden Age. The Mid Upper Palaeolithic of Eurasia 30,000 – 20,000 BP*. Leiden: University (Analecta Praehistorica Leidensia; 31), p. 197-217.

SVOBODA, J.; LOŽEK, V.; VLČEK, E. (1996) - *Hunters between East and West. The Paleolithic of Moravia*. New York, NY: Plenum Press.

TURNBULL, P. F. (1975) - The mammalian fauna of Warwasi Rock Shelter, West-Central Iran. *Fieldiana Geology*. Chicago, IL. 33:8, p. 141-156.

YOUNG JR., T. C.; SMITH, P. E. L. (1966) - Research in the Prehistory of Central Western Iran. *Science*. New York, NY. 153, p. 386-391.

List of contributors

Author	Address	e-mail
Francisco Almeida	Centro de Investigação em Paleoecologia Humana e Arqueociências Instituto Português de Arqueologia Av. da Índia, 136 1300-300 Lisboa Portugal	falmeida@ipa.min-cultura.pt
Miguel Almeida	R. do Olival de São Domingos, cimo 3000-445 Coimbra Portugal	miguel.almeida@dryas-arqueologia.pt
Thierry Aubry	Instituto Português de Arqueologia Extensão de Pombal Largo Piscina Municipal 3100-449 Pombal Portugal	taubry.pavc@ipa.min-cultura.pt
Ofer Bar-Yosef	Anthropology Department Harvard University 11, Divinity Avenue Cambridge, MA 02138 USA	obaryos@fas.harvard.edu
Anna Belfer-Cohen	Department of Prehistory Institute of Archaeology The Hebrew University Jerusalem 91905 Israel	belferac@mscc.huji.ac.il
Michael Bolus	Universität Tübingen Abt. Ältere Urgeschichte und Quartär Ekologie Schloss Hohentübingen 72070 Tübingen Germany	michael.bolus@uni-tuebingen.de
François Bon	UTAH – UMR 5608 Maison de la Recherche Université de Toulouse – Le Mirail 5, allées Antonio-Machado 31058 Toulouse France	bon@univ-tlse2.fr
Jean-Guillaume Bordes	Université de Bordeaux I PACEA – IPGQ – UMR5199 Avenue des Facultés Université Bordeaux 1 341, Cours de la Libération 33405 Talence France	jg.bordes@ipgq.u-bordeaux1.fr

Author	Address	e-mail
Nicholas Conard	Universität Tübingen Abt. Ältere Urgeschichte und Quartär Ekologie Schloss Hohentübingen 72070 Tübingen Germany	nicholas.conard@uni-tuebingen.de
Harold L. Dibble	Department of Anthropology, University Museum 3260 South St. University of Pennsylvania Philadelphia, PA 19104 USA	hdibble@sas.upenn.edu
Patrizia Gioia	Sovraintendenza Comunale ai Beni Culturali, Monumenti Antichi e Scavi Via Ostiense 106 00186 Roma Italy	patgioia@libero.it
Nigel Goring-Morris	Department of Prehistory Institute of Archaeology The Hebrew University Jerusalem 91905 Israel	goring@h2.hum.huji.ac.il
Janusz K. Kozłowski	Instytut Archeologii ul. Golebia 11 31007 Krakow Poland	koslowsk@argo.hist.uj.edu.pl
Despina Liolios	Maison René Ginouvès UMR 7055 – Préhistoire et Technologie 21, Allée de l'Université, 92023 Nanterre Cedex France	despina.liolios@mae.u-paris10.fr
Geraldine Lucas	Université de Bordeaux I Institut de Préhistoire et de Géologie du Quaternaire Avenue des Facultés 33405 Talence France	geraldine.c.lucas@wanadoo.fr
José-Manuel Maíllo-Fernández	Departamento de Prehistoria y Arqueología Facultad de Geografía e Historia Universidad Nacional de Educación a Distancia c/ Senda del Rey, n.° 7 28040 Madrid Spain	jlmaillo@geo.uned.es

Author	Address	e-mail
Margherita Mussi	Dipartimento di Scienze dell'Antichità Università degli Studi di Roma "La Sapienza" Via Palestro 63 00154 Roma Italy	margherita.mussi@uniroma1.it
Fabio Negrino	via Lorenzo Costa 2/6a 16136 Genova Italy	archeoge@tin.it
Maria João Neves	R. do Olival de São Domingos, cimo 3000-445 Coimbra Portugal	mjoao.neves@dryas-arqueologia.pt
Deborah I. Olszewski	Department of Anthropology, University Museum 3260 South St. University of Pennsylvania Philadelphia, PA 19104 USA	deboraho@sas.upenn.edu
Marcel Otte	Service de Préhistoire Université de Liège Place du XX Août, 7, Bât A1 B-4000 Liège Belgium	Marcel.Otte@ulg.ac.be
Jean-Philippe Rigaud	Université de Bordeaux I Institut de Préhistoire et de Géologie du Quaternaire Avenue des Facultés 33405 Talence France	rigaud@iquat.u-bordeaux.fr
Jiří Svoboda	Center for Paleolithic and Paleoethnological Research Institute of Archaology at Brno Academy of Sciences of the Czech Republic CZ-69129 Dolní Věstonice Czech Republic	svoboda@iabrno.cz
Nicolas Teyssandier	UTAH – UMR 5608 Maison de la Recherche Université de Toulouse – Le Mirail 5, allées Antonio-Machado 31058 Toulouse France	teyssandier@univ-tlse2.fr
John K. Williams	Department of Anthropology Southern Methodist University Dallas, Texas 75275 USA	jowillia@post.cis.smu.edu
João Zilhão	University of Bristol Department of Archeology and Anthropology 43 Woodland Road Bristol BS8 1UU United Kingdom	joao.zilhao@bristol.ac.uk