emphasize small curved-backed and tanged points. By c.11 kya there is proof positive of the invention of the arrow and, presumably, the bow, in an Ahrensburgian context at Stellmoor, near Hamburg (Fig. 11).

The last reindeer herds in sub-Scandinavian Europe were hunted during this period. These herds included an isolated relict population in the Pyrenees as well as treating populations of this Ice-Age larder-on-the-hoof around the southern shores of the new Baltic Lake. The disappearance of the large herds of reindeer, horses, bison, and saiga from the middle latitudes of western Europe, along with the replacement of their rich Pleistocene steppe-tundra biomes by varying degrees of woods and parklands, caused a fairly rapid and ultimately catastrophic change in the lifeways of terminal Paleolithic hunters from France to Poland. In many cases, even new lithic sources had to be found as old ones became masked in dense vegetation and soil. In some regions human populations may have thinned in the face of reforestation, with concentrations of people developing along major water courses and along the new seacoasts. Human groups had to adjust their types of hunting, augmented now with more fishing, birding, and gathering, as well as their size, territories, and mobility patterns.

In contrast, change was much more gradual and far less complete in the Mediterranean regions, especially Iberia, Italy, and Greece. Epigravettian and Epimagdalanian industries show considerable regional continuity, with increasing emphasis on microliths. Subsistence intensification proceeded apace, involving continued hunting and trapping of smaller animals living in small groups or solitary together with increased exploitation of plants, shellfish, fish, and birds, following a trajectory established at least 10 kya before the end of the Last Glacial.

With these changes in both the Mediterranean and more northerly zones came the demise of the classic portable art and cave art of the Upper Paleolithic, which had been an integral part of the ideology of Ice Age hunters. A system built on perfecting the ability to survive under glacial conditions in which the margins for error or failure were slim, based on collective hunting, widespread sharing of information, and demarcation of territories of exploitation, came to an end. It was replaced by a more relaxed, more individualistic system in which complex symbolic and cybernetic devices embedded in magico-religious activity became anachronistic, devoid of meaning. There was a general abandonment of cave art. Moreover, mobile art in the Azilian and its contemporaries changed almost completely into geometric engravings and paintings on pebbles or bones.

![Figure 10: Photo of an engraved flat bone showing an enigmatic animal from the late Magdalenian of La Pijéte Cave (L. Strauss & G.A. Clark excavations; photo by M.P. González Morales).](image-url)

![Figure 11: Azilian artifacts from La Pijéte Cave: 1-8, thumbnail endscrapers; 9-10, backed bladelets & micro-points; 17-19, Azilian points; 20, antler harpoon (L. Strauss & G.A. Clark, La Pijéte Cave).](image-url)
The Upper Paleolithic of Europe: An Overview

LAWRENCE GUY STRAUS

The Upper Paleolithic of Europe, 40,000–10,000 years ago, presents one of the richest, most complex records for the anatomy and cultural adaptations of fossil hominids in the world. New chronological information points to roughly simultaneous appearance of certain Upper Paleolithic technological traits in both SE and SW Europe, while growing evidence suggests a significant degree of biological and cultural continuity between the Middle and Upper Paleolithic. On the other hand, there is considerable evidence that evolution continued to operate in both domains throughout the course of the late Upper Pleistocene, apparently in adaptive relationships to the major environmental changes of the Upper Pleniglacial and Tardiglacial. Spectacular developments in the realms of art and ideology may be understood in the special biogeographical, social, and economic conditions of Europe at the height of the Last Ice Age; both ended rather abruptly with the onset of the Holocene as the landscapes of Europe underwent pervasive upheavals.

Beginning more than 130 years ago with the systematic work of Larret and Christy, the Upper Paleolithic of Europe has been studied longer and more intensively than any other period or area of paleoanthropology. Nevertheless, our knowledge and understanding of the European Upper Paleolithic continues to change. This fact is reflected by the large number of recent volumes and works that synthesize different aspects of the period.

Nowhere in the world are the cultural and anatomical records of the development of human modernity denser and richer than in many regions of Europe. However, we should never forget that Europe is a small cul-de-sac, an appendage of Asia living at the northwest periphery of the inhabited world of the Middle and Upper Pleistocene (Fig. 1). Rather than being taken as the model sequence for the rest of the world, Europe must be understood in relation to developments in Africa and Asia. This is a lesson we have only recently begun to absorb, in large part as a result of the “OuT of Africa” debate. Nevertheless, because of the wealth of its record, Europe must still be used as one of the chief laboratories for the analysis and explanation of diverse late Paleolithic human adaptations and behaviors, especially within the context of the Ice Age environmental fluctuations and closely spaced regional differences. These differences were especially marked because of Europe's pivotal position across the middle latitudes, as well as its complex coastlines, broad plains, and many major mountain chains.

Because of the abundance of archaeological materials in Europe, the record pertaining to that continent has been subdivided, both temporally and regionally, far more than in the records for most other parts of the world, creating the illusion of greater complexity than exists elsewhere. However, this should be comparatively analyzed in light of lesser environmental variability in tropical Africa. Within Europe, historical and geological accidents have given the record for France's secular dominance over European cultural and stratigraphic systems, as well as nomenclature throughout the Paleolithic. The names and concepts—Acheulean, Micoquian, Mousterian, Chatelperronian, Aurignacian, Gravettian, Solutrean, Magdalenian, and Azilian—all reified since the nineteenth century, are still pervasive, still in widespread use, not only with reference to the countries adjacent to France, but also ones as far afield as Poland and Bosnia. The reality of these names and concepts is increasingly questioned, but it is hard not to use them.

Fifty years ago, a review such as this would have focused almost exclusively on the French record, into which the records of a few limited regions such as Cantabrian Spain, southwest Germany, or Moravia might be plugged. A Francocentric approach would still have been acceptable 25 years ago, but by 15 years ago, it would have become problematical due to the explosion of detailed Upper Paleolithic research in most other European countries and growing awareness of the complex nature of interassemblage variability and regional adaptations. It is testimony to both the richness of the French record and the high-quality research of French prehistorians that the French model held sway so long. Today the French research is emulated, but its record is no longer blindly cloned.

In this review I will outline the present state of our understanding of the period between about 40 kya and 10 kya in western and central Europe, including the Balkans. I am excluding eastern Europe by drawing a line at the western border of the former Soviet Union. The environments and archaeological records of European
After an initial period of readjustment during the Preboreal, when simplified forms of terminal Paleolithic tool kits were still being made and used, new technologies centered on the bow and reaping knife (geometric microliths) and on equipment for tree-felling, woodworking, grubbing, and mollusk collecting (axes, choppers, picks, and other microliths) were developed in the full-fledged Mesolithic. In part these changes enabled successful adaptation to the forest, marsh, estuarine, and coastal environments of Europe; in part they were a prelude to the advent of the Neolithic and food production c.7.5-5 kyA. These Mesolithic lifeways were the heirs to a long, rich, and diverse set of Upper Paleolithic traditions, but Ice Age conditions were no more. The European continent was populated far more completely and densely than it had been at the last transition to interglacial conditions c.125 kyA. Its early Postglacial inhabitants were, to varying degrees and at differing rates, ready to accept food production as their chief means of subsistence when Near Eastern domesticates became available. They were forced to accept the consequences. The Paleolithic world of hunters then truly died.

ACKNOWLEDGMENTS

I am grateful to John Fleagle for inviting me to contribute this article and for making useful editorial suggestions; to Richard Klein for his usual constructive criticism (as usual, we agree to disagree about the abrupt, invasive nature of the European Upper Paleolithic, though he could, in part, be correct). I also thank the generous sponsors of my research in Spain, France, Portugal, and Belgium over the past quarter century: the National Science Foundation, National Geographic Society, L.S.B. Leakey Foundation, and University of New Mexico. Ron Stauber redrafted Figure 1.

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PER PALEOLITHIC ORIGINS AT ≤40 KVA. BECAUSE OF SIGNIFICANT STANDARD ERRORS IN RADIOCARBON, URANIUM-SERIES, AND ESPECIALLY THERMOLUMINESCENCE DETERMINATION, ALL DATES GIVEN HERE ARE ROUNDED OFF AND UNCALIBRATED. HOWEVER, RECENT DEVELOPMENTS IN U-RADIOCARBON DATING AT THE UPPER END OF THE PERIOD AND IN DENDROCHRONOLOGY, VARIOUS GLACIAL ANNUAL RINGS AT THE RECENT END ARE NOW MAKING IT POSSIBLE TO CALIBRATE RADIOCARBON DATES > 40 KVA.31-34 THSE DETERMINATIONS HAVE BEEN SHOWN TO BE TOO YOUNG: AT 40 K RADIOCARBON YEARS, ABOUT 5-6 KY; AT 20 K RADIOCARBON YEARS, ABOUT 3.5 KY; AT 15 K RADIOCARBON YEARS, ABOUT 2.5 KY; AND AT 10 K RADIOCARBON YEARS, ABOUT 1.5 KY.

THE PALEOENVIRONMENTAL FRAMEWORK

The Upper Paleolithic developed during the second half of Oxygen Isotope Stage 3 and over the whole course of Stage 2 (Table 1). The environmental characterizations shown in Table 1 are simplified generalizations, somewhat biased to the records from western Europe, which are still more complete than those from central Europe.35-39

Artifact assemblages generally attributed to the Upper Paleolithic often include many blades, endscrapers, burins and other specialized light-weight lithic tools; ivory, bone, or antler tools and weapon tips; stone, tooth, or shell beads; and other objects of ornamentation and art. These assemblages appear more or less simultaneously across Europe during the latter part of the Würm Interpleniaglacial, specifically during the Würm Interstadial (c.40-30 Kya). The replacement of Mousterian technologies and Neandertal anatomy by Upper Paleolithic technologies and semi-modern human anatomy, as well as the development of the Aurignacian, occurred under conditions that were intermediate between full glacial and interglacial ones, with wooded areas especially in the south. After about 30 Kya, temperatures gradually began to turn down and environments worsened throughout Europe. The Upper Pleniaglacial bottomed out during the Last Glacial Maximum, at around 18 Kya. The Last
### Table 1. Simplified Climate and Cultural Scheme for the Late Upper Pleistocene and European Upper Paleolithic

<table>
<thead>
<tr>
<th>Cultural Period</th>
<th>Oxygen Isotope Stages</th>
<th>Major Last Glacial Division</th>
<th>Climatic Phase or Pollen Zone (cold)</th>
<th>Approx. C14 age (kya)</th>
<th>Culture-Stratigraphic Units W, SW, &amp; NW Europe</th>
<th>Culture-Stratigraphic Units Central &amp; SE Europe</th>
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<tr>
<td>Neolithic &amp; Mesolithic</td>
<td>Postglacial</td>
<td>Atlantic</td>
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<td>7.5-4.5</td>
<td>Neo and Mesolithic</td>
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<td>Boreal</td>
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<td>Mesolithic</td>
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<td></td>
<td></td>
<td>Preboreal</td>
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<td>10-9</td>
<td>Mesolithic</td>
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<td>10 kya</td>
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<td></td>
<td>Tardiglacial</td>
<td>Dryas III</td>
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<td>Ahrensburgian, Brommian, Tjengerian, Hamburgian, Azilian</td>
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<td>Epipaleolithic, Creswellian</td>
<td>Masovian, Final Epigravettian</td>
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<td>Allerød</td>
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<td>12-11</td>
<td>Early Magdalenian</td>
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<td>Late Upper Paleolithic</td>
<td>2</td>
<td>Upper Pleistiglacial</td>
<td>Lascaux</td>
<td>17-16</td>
<td>Badegoulian</td>
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<td>Laugerle</td>
<td>20-19</td>
<td>Solutrean, Solutreogrunvettian</td>
<td>Early Epigravettian</td>
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<td>Middle Upper Paleolithic</td>
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<td>Turas</td>
<td>26.5-24.5</td>
<td>Gravettian</td>
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<td>Maisières</td>
<td>29-27</td>
<td>Perigordian</td>
<td>Pavlovian</td>
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<tr>
<td>Early Upper Paleolithic</td>
<td>30 kya</td>
<td>Interpliglacial</td>
<td>Arcy</td>
<td>31.5-30</td>
<td>Late Aurignacian</td>
<td>Late Aurignacian</td>
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<td>NW Leaf Points</td>
<td>Bachokrian</td>
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<td>Middle Paleolithic</td>
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<td>60 kya</td>
<td>Lower Pleniglacial</td>
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Glacial Maximum was a period of extreme cold, with continental and montane glaciers at their greatest extent and sea levels at their lowest. The Gulf Stream was deflected far to the south so that it ran west of Scotland and did not flow into the Gulf of Gascony or up toward the then largely glaciated British Peninsula. Intense aridity, combined with the cold, caused Europe to be substantially deforested. Limited stands of trees and shrubs survived mainly in southerly refuge areas, notably the Iberian, Italian, and Balkan Peninsulas. Northerly regions of Europe that remained unglaciated became aridic polar deserts, exerting dramatic effects on animal and human populations. The last major episode of Pleistocene loess deposition occurred during this period. In between, from south-central France to the Pannonian Basin, there developed the classic Pleistocene steppe-tundra biome, with periglacial geomorphological processes and faunas rich in herd game of many species, which, like the plants, are today zonally or altitudinally separated.

The long, fitful relaxation of full glacial conditions began c.16 kya. At the beginning of the Tardiglacial period the climate was still relatively cold but
less arid, leading to limited reforesta-
tion of at least southerly regions. By all
accounts, it was c.13 kya, at the outset
of the Bolling oscillation, when Ice-
Age conditions abruptly broke. Tem-
peratures rose rapidly and the Palaearctic
Front moved northward as the Gulf
Stream began to reestablish itself. Glac-
ciers retreated, sea level began to ad-
vance significantly, and trees started to
repopulate regions even as far north
as England and Belgium. Faunas con-
tinued to include open-ground, cold-
loving ungulates such as reindeer,
de spite the disappearance of such
megafauna as the mammoth, which
was well underway by this time, and
despite the rapid northward migra-
tion of warmth-loving rodent and
beetle taxa.

In some but not all records, there is
some local evidence of a mild cooler
oscillation (Dryas II) c.12–12.5 kya.
Dryas II was followed by the second
half of the Late Glacial Interstadial,
known as the Allerød pollen zone
(maximally 12–11 kya), during which
temperatures approached Postglacial
levels and reforestation progressed
rapidly. These changes either finished
the extinction of Pleistocene faunas or,
in other regions, let them in a reduced
state as they were replaced by the forms
found in pre-industrial Holocene
times.

The warming trend was abruptly and
dramatically stopped c.11 kya by the
Dryas III phase, which lasted not
more than one millennium.40 In the
debate about the causes of this event,
leading contenders include changes in
North Atlantic water temperature and
currents, which seem to have had
global climatic repercussions. The
consequences in Europe were marked,
but not transitory. The Gulf
Stream was forced southward, glaci-
eries readvanced, woodlands shrank
or disappeared, and some cold-
adapted animals reappeared. Al-
though it was cold, conditions did not
reach the great aridity of the
Pleniglacial Maximum.

As abruptly as the Dryas III event
had begun, it ended at c.10 kya, re-
placed by the moderately temperate,
humid conditions of Preboreal. From
south to north the woodlands spread
dominated, especially toward the
north, by pioneer taxa—pines, birch,
and then hazel. Consequent changes
included smaller herds or solitary un-
gulates, often with smaller bodies than
were characteristic of their predeces-
sors, and a new wealth of all sorts of
plant foods. The rising sea level cre-
ated new estuarine habitats, lakes, and
marshes, as well as montane habitats,
in recently deglaciated areas. Condi-
tions like these had not been seen
since Oxygen Isotope Stage 5. The Last
Ice Age was over, and with it the
strictly Upper Paleolithic way of life,
 despite significant continuities in

...the classic characteristics of “The
Upper Paleolithic” did not all erupt full-blown
on the whole European scene at c.40 kya.
Rather, they developed over 30 ky, probably
as responses to major shifts in physical,
demographic, and social environments
and resources.

...some aspects of technology and, espe-
cially in southern Europe, in some aspects
of subsistence.

A VIEW OF THE MIDDLE-UPPER
PALEOLITHIC TRANSITION

Many reviews stress the abrupt, to-
tal nature of the replacement of the
Middle Paleolithic by the innovative
Upper Paleolithic, depicting it as a
bicultural punctuation event. How-
ever, an alternative reading of the
situation suggests a far more complex
mosaic scenario, with differences of
degree.

There is growing, high-quality evi-
dence for significant production of
true blades, which is considered to be
characteristic of the Upper Paleo-
lithic, in Middle Paleolithic contexts,
some of great antiquity.41 Burins, end-
scrapers, perforators, backed and
truncated flakes and blades are regu-
lar components of many Mousterian
assemblages, as François Bordes dem-
onstrated long ago. It has recently
been argued that there is continuity in
long-distance transport of lithic raw
materials and, hence, in human mo-
bility and planning depth (the ability
to plan far in advance) between the
Middle and at least the Early Upper
Paleolithic in Europe, but examples of
uniquely and strictly local lithic pro-
cure do occur in terminal Paleo-
lithic contexts.42 There is a continuum
in many aspects of subsistence be-
tween the Middle and Upper Paleoi-
lithic, including evidence of deliberate
hunting of medium-large ungulates
and, in the former period, rare evi-
dence of mollusc exploitation. Al-
though only rarely, Mousterian contexts
have also produced some
structures, including dug-out and oc-
casionally stone-lined hearths, “post-
holes,” and other pits, as well as buri-
as—even the elaborate “cemetery” at
La Ferrassie, with its deliberately
pockmarked stone slab atop one
Neandertal burial.43

More controversial are finds in
Mousterian levels of perforated, pol-
ished, or engraved stones, bones, and
teeth, which could have been made as
ornaments or symbolic or decorative
objects. Some incisions on teeth were
clearly made by nonhuman proc-
cesses.44 Yet modern-quality excava-
tions continue to yield a few more
convincing “ornamental” or “sym-
bol” artifacts. These include a regu-
larly transversally incised long bone
and a perforated lynx canine from the
uppermost Mousterian level in Cova
Benedo in Southeastern Spain, and,
not far outside Europe, from the 54-
kya Mousterian of Quneitra on the
Golan Heights between Israel and Syria,
a flint nodule, the cortex of which is
engraved with concentric semicircles
and subparallel lines.45,46

On the other hand, the classic char-
acteristics of “The Upper Paleolithic”
did not all erupt full-blown on the
whole European scene at c.40 kya.
Rather, they developed over 30 ky,
probably as responses to major shifts
in physical, demographic, and social
environments and resources.
"points" in Mousterian contexts, but it is in Aurignacian assemblages that such objects are found often, and sometimes abundantly. When they are present, split-base or lozenge-shaped antler points seem to be distinctive hallmarks of the Aurignacian from one end of Europe to the other (Fig. 2). Otherwise, there is little homogeneity among Aurignacian assemblages, despite the existence of semi-diagnostic lithic tool types such as blades with invasive scalar retouch, keeled and nosed endscrapers, inversely nibbled Dufour bladelets, and dihedral burins (Fig. 3). However, as in the case of Cantabrian Spain, many Aurignacian assemblages are rich in Mousterian tools, specifically side-scrapers and denticulates, generally made on flakes, and also overlap considerably with regional Chatelperronian assemblages. Indeed, lithic "fossil directories" of some of the non-Aurignacian complexes, such as backed knives and leaf points, are found in assemblages otherwise qualified as Aurignacian because of the presence of characteristic antler points, special retouched blades, or thick endscrapers.

In short, the degree and significance of interassemblage differences, especially at the beginning of the Early Upper Paleolithic, still needs objective analysis. Years ago, Laplace saw evidence that the initial Upper Paleolithic in southwestern Europe did not develop as separate ethnic phyla, but as a generalized, variable development out of the Mousterian as part of a gradual, irregular process of stone tool lightening.31

The Middle Upper Paleolithic

Although there is a degree of compositional overlap between certain late Aurignacian assemblages and certain Gravettian ones, Upper Paleolithic technology did develop in fairly distinctive ways beginning around 30 kya. The Gravettian techno-complex, geographically at least as widespread as the Aurignacian, is generally characterized by narrower, lighter blades, often steeply retouched into sharp points, a variety of burins, and simple, thin endscrapers, as well as perforators (Fig. 3). Some assemblages in France and Belgium include tanged points, whereas assemblages in Central and Eastern Europe often have shouldered points. Leaf-points continue to be found both there and in northwestern Europe. Organic points, although present, usually are rare. Some Gravettian sites, notably those of Moravia, are extraordinarily rich in objects of mobile art and ornamentation, sometimes found in burial contexts. In regions where mammoths were often hunted or scavenged, tools and artworks were made of their ribs and ivory.

Because of the general correlation with the downturn in temperatures c.30 kya, it is possible to speculate that the development of the Gravettian technology, even in the southern European peninsulas, represented a response to the changing environmental situation. The success of the Gravettian tool kit led to its rapid spread throughout the continent, whether it developed in one area or more or less simultaneously in several regions. Nonetheless, the early Gravettian is characterized by at least a couple of significant phases of relative climatic moderation, with increased humidity, but not a return to the quite temperate conditions of the Würm Interstadiol. The decline of conditions accelerated after about 23 kya, correlated with the terminal "Perigordian" in western Europe and the beginnings of the Late Gravettian in southeastern and central Europe. In northerly regions, aridity adversely affected game resources, including mammoths, possibly leading to greater human mobility and emphasizing the importance of social networks.

The Last Glacial Maximum

The Upper Paleolithic achieved its maximum effect on human adaptations during the Late Glacial Maximum. The most visible effect was on geographic distributions, particularly the abandonment of the northern band of territory that had been occupied by people during the Early Upper Paleolithic: Britain, the Lowlands, northern France, Germany, and most of Poland. Small but apparently highly mobile groups still frequented stretches of the Danube in Austria and Hungary and the Upper Vistula in southern Poland.

Beginning at roughly 20 kya, the artifact industries of Central and southeastern Europe are classified as "Epigravettian," continuing the backed blade or bladelet technology. Although they still are poorly known, such assemblages seem to be relatively abundant in Greece, the Balkans, and especially Italy, where there are also some foliate points c. 20 kya.
Within the context of the double stress of rigorous climate and population packing in the physically constrained environments of the Last Glacial Maximum refugia, it is not surprising to note a ratchetting up of the "arms race" and evidence of subsistence intensification, probably accompanied by increased complexity in the social relations manifested in cave art and open air rock art.

This is part of the wider phenomenon of the Late Glacial Maximum refugia. As the Upper Paleolithic range and *viomene* contracted, leaving northern Europe abandoned after c.22 kya, the density of archeological sites increased in the resource-rich coastal regions of Spain and Portugal (hence, one may assume, so did regional human populations).

Again, a technological development temporally correlates with a climatic event. There was a new emphasis on refinement of lithic weapon tips, the famous Solutrean points of southern France and Iberia. These were sometimes delivered with a new invention, the atlatl, and and 5). The different lithic point types are individually standardized in size, form, retouch type, and basal treatment. Regionalism among the specific subtypes is suggestive of either deliberate or unconscious stylistic marking.

Within the context of the double stress of rigorous climate and population packing in the physically constrained environments of the Last Glacial Maximum refugia, it is not surprising to note a ratchetting up of the "arms race" and evidence of subsistence intensification, probably accompanied by increased complexity in the social relations manifested in cave art and open air rock art. The remnant human populations in the regions of
Europe that were still habitable had to become even more effective and efficient in slaughtering the animals they had already been exploiting—reindeer and horses in France and Central Europe, red deer in Iberia, Italy, and the Balkans. Increasingly, they also had to diversify their food quest, seeking smaller, faster, and more dangerous ungulates, aquatic resources (fish and shellfish), and birds. Intensified subsistence meant both specialized procurement of key resources and overall diversification.34,35

The Tardiglacial

The Solutrean points were phased out in different regions at slightly different times between 18 kya and 16.5 kya. As weapon tips, they were increasingly replaced by backed bladelets and micropoints, which were fixed into antler and, perhaps, wood points. In western Europe, the successor to the Solutrean is known as the Magdalenian techno-complex, whereas in Italy, central and southeastern Europe it continues to be called Epigravettian by prehistorians.

As during the Aurignacian in the Interplano-glacial, enormous variability occurred among the industries of the Tardiglacial as humans re-expanded across Europe. Some of this variability may have been the result of differences in human activities, mobility patterns, practices used to procure lithic and other raw materials, or even...
"ethnicity." In some cases there is even a "reversion" to the use of flakes as tool blanks, although, in fact, the vaunted laminarity of Upper Paleolithic industries had always been more variable than ubiquitous, and had always de-
pended on locally available lithics and functional expediency. Again, there was a general explosion in the use of antler, mainly along the Atlantic facade, but also in Mediterranean Spain, that included invention of the harpoon. Further growth in the use of nongeometric microliths also occurred, and noninvasively retouched shouldered and foliate points recur at various times and places within the co-called Magdalenian world (Figs. 6 and 7).

The Tardiglacial was a world re-expanding. As temperatures rose and glaciers retreated, human groups were able not only to move again into uplands such as the Spanish Meseta and into mountain chains such as the Alps, Pyrenees, and Massif Central, but also to reconquer the northern lands of Europe abandoned at the onset of the Last Glacial Maximum. The first human settlement in France north of the Loire seems to date to c. 16 kya, with significant settlement com-

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Figure 6. Photo of Magdalenian harpoon, harpoon base fragments, eyed bone needle and perforated horse tooth from l'Abri Dufaure (Les Landes, France) (L. Straus excavations).

ing c.13 kya. The British peninsula was reoccupied c.13–12.5 kya. Belgium was visited, probably during the summer, c.16 kya and permanently reoccupied c.13 kya. At least the southern and central areas of Germany were reoccupied c.13 kya. Northwest Germany was reclaimed c.12.5 kya, and the Netherlands c.12 kya. The northern cultures, with their manufacture of distinctive curve-backed and tanged lithic points, are known respectively as the Creswellian in England and Belgium and as the Hamburgian in northern Germany and the Lowlands. This northward re-expansion began with the marked climatic amelioration of Bolling, when trees started to reappear, at least in favored microhabitats.

By Tardiglacial times, mammoths and other archaic faunas had either been extirpated or were declining quickly in western and central Europe. North of the Mediterranean zone, the bases of subsistence were red deer, ibex, and chamois and, increasingly, roe deer, boar, fish, molluscs, and birds—and, undoubtedly, plants. However, Magdalenian and Epigravettian hunters continued to kill reindeer, horses, and bison under the still cold, open conditions of Drvás I. This period is famous for large-scale specialized hunting near sites such as Pincevent and Verberie in the Seine Basin near Paris, Duruthy and Dufaure on the edge of the French western Pyrenees, Andernach and Göhmersdorf on the middle Rhine, and Petersfels in southwestern Germany. Many more sites were not major seasonal residential sites associated with massive hunting episodes, although Magdalenian data in general do suggest fairly lengthy annual rounds and extensive social networks over vast areas. The extent of human mobility was conditioned by regional resources. In southern Europe, mobility and, hence, territory sizes were undoubtedly smaller than in other areas, despite relatively high population densities.

The Aurignacian and Gravettian were extraordinarily rich in such works of mobile art as the ivory figures and baked clay images in the “Pavlovian” culture of Moravia. The Magdalenian, however, brought not only an outburst of engraving and carving in antler and stone, including bas reliefs in several rockshelters in southern France, but also the creation of many of the most complex, spectacular cave drawings and paintings*8- *9 (Figs. 8–10). Striking similarities among cave art representations and among mobile art objects are clues to limited authorship in some cases. They also include geographically bounded style zones, which may have social significance, as well as medium- or long-distance contacts such as individual visits, multiband aggregations, and group-to-group exchanges of objects.*9 Despite rather different adaptations at the southern and northern extremes of the Magdalenian, there are similarities in technology and artistic expression that cannot fail to impress modern observers with the possibilities of widely shared scheduling and mnemonic systems, representational canons, and ideologies within a network of intergroup relationships.

The End of the Pleistocene and of the Paleolithic

Allerød and then Dvras III, with the abrupt, dramatic climatic changes at beginning and end, witnessed the splintering of the world of the Tardiglacial hunters and the development of a myriad of regional technological traditions. Technologies

Figure 8. Photo of a drawing of horses in Ekain Cave (Guipúzcoa, Spain), a Magdalenian site.

Figure 9. Photo of a drawing of a red deer stag in Las Chimeneas Cave (Monte Castillo, Cantabria, Spain).