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*Editor*

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inspiration as much as taking advantage of new designs, both in terms of architecture and for inspiration for grand projects. For example, in England, Henry II's keep at Dover looked back to an earlier generation of great towers, while Edward I's Caernarfon (Fig. 6) and Thomas of Lancaster's Dunstanburgh both drew inspiration from Arthurian legend. How common examples such as these may have been and to what extent they permeated down the castle-building class are important questions for the future.

The future for castle studies lies in coupling subject specialisms with broader interdisciplinary study. In medieval Europe, the castle was a multifunctional institution that seamlessly blended aspects of fortification, residency, estate management, iconography, and the cultural imagination. It is unrealistic to expect a rounded picture of the castle and its development to emerge without reference to a broad constituency of academic disciplines.

## Cross-References

- ▶ [Fortifications, Archaeology of](#)
- ▶ [France: Medieval Archaeology](#)
- ▶ [Hillfort Investigations in the Czech Republic](#)
- ▶ [Iberia: Medieval Archaeology](#)
- ▶ [Italy: Medieval Archaeology](#)
- ▶ [Medieval Archaeology](#)
- ▶ [New Spain: Forts and Transport Archaeology](#)

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## Europe: Early *Homo* Fossil Records

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## Introduction

Research during the last decades on the first human dispersal out of Africa, into Eurasia, has changed the ideas on the chronology of this event, providing also new data on the ecological scenery that allowed humans to colonize new territories with different environments and climates from those in subtropical Africa, sometimes subject to inhospitable marked seasonality.

The origin of the genus *Homo* is directly related to a radical change in dietary behavior from its mostly vegetarian ancestors, the australopithecines, to more systematic carnivorous activities. This change in diet runs in parallel to an increase in encephalization, which resulted in greater cognitive abilities, and a decrease in gut size (Aiello & Wheeler 1995), thus allowing the emergence of a more intelligent and ubiquitous hominin. Meat is a food resource available everywhere inhabited by large mammals living and dying, which means that the genus *Homo* was not constrained to only exploiting soft vegetables, eggs, insects, and a few other food stuffs. For this reason, the *change in food behavior* is not only a key issue for explaining the major patterns of biological and social evolution in the human lineage but also helps to explain the dispersal and colonization of new territories around the Earth, especially in the middle and high latitudes, where vegetables are scanty in seasonal climates, particularly in winter, and a substantial part of the feeding resources must be obtained from other animals (Martínez-Navarro 2010).

## Definition

There is no evidence outside Africa of the presence of *Homo* without flaked stones. It is probable that our ancestors developed in Africa an unprecedented pattern of dispersals, unusual in the previous related species. So, the presence of *Homo* remains outside Africa implies also the use of technological tools. At this sense, earliest *Homo*, or its ancestor, developed a new kind of nongenetic transmission system, which allowed an unprecedented geographical expansion by increasing its ecological ubiquity during the dispersals across Eurasia. Therefore, the early *Homo* fossil records of Europe are a consequence of different achievements in the development of the genus, modifying forever the basic patterns of biological dispersal among primates.

## Historical Background

There has been a persistent debate on the first human peopling of Europe until the middle 1990s. A number of researchers argued for a *Short Chronology*, as they claimed that humans did not colonize the continent before half million years ago, when evolved Acheulian tools associated with remains of *Homo ergaster* appeared in the European archaeological record (Roebroeks & Kolfshotten 1994). However, the finding of (1) a human mandible together with a huge assemblage of Oldowan (Mode 1) lithic artifacts at the Caucasian site of Dmanisi (Georgia), placed at the gates of Europe and dated ~1.8 Ma; (2) Oldowan tools at the sites of Fuente Nueva 3 and Barranco León (Orce, southern Spain), dated 1.3–1.4 Ma; (3) Oldowan lithic artifacts associated with human remains at the site of Atapuerca TD6 (northern Spain), dated 0.8–0.9 Ma; and (4) other findings of lithic artifacts at Early Pleistocene southern European sites in France (Vallonnet, 1.0 Ma) and Italy (Monte Poggiolo, 0.85 Ma; Isernia La Pineta, 0.6 Ma) helped to change the views of prehistorians and paleoanthropologists, considering a *Long Chronology* for the first human colonization of the continent.

Later, the new findings of human cranial and postcranial remains at Dmanisi (Lordkipanidze et al. 2007), a mandibular symphysis and more lithic artifacts at the site of Sima del Elefante (Atapuerca, Spain), dated to 1.2 Ma (Carbonell et al. 2008), and a human tooth and more tools at the site of Barranco León (Orce, Spain), dated to 1.4 Ma (Toro et al. 2013) – as well as new Oldowan lithic artifacts at Pirro Nord (Italy), dated 1.3–1.6 Ma; at Lézignan-la-Cébe and Pont-de-Lavaud (France), 1.57 and 1.1 Ma, respectively at Kozarnika (Bulgaria) 1.6–1.4 Ma; Vallparadís (Spain), 0.9 Ma; and in England at Pakefield, 0.7 Ma, and Happisburgh, 0.8–1.0 Ma – have definitely convinced researchers that humans inhabited Europe as early as one and a half million years ago (Figs. 1 and 2).



**Europe: Early *Homo* Fossil Records, Fig. 1** Geographical location of some of the most important Early Pleistocene archaeological and paleontological sites of Europe, the Caucasian Region, and the Levantine Corridor: (1) Orce (including Barranco León, Fuente Nueva 3, and Venta Micena), (2) Atapuerca (including Sima del Elefante and Gran Dolina), (3) Vallparadís, (4)

Lézignan-la-Cébe, (5) Vallonnet, (6) Pont-de-Lavaud, (7) Pakefield and Happisburgh, (8) Untermassfeld (only paleontological record), (9) Monte Poggiolo, (10) Isernia La Pineta, (11) Pirro Nord, (12) Apollonia (only paleontological record), (13) Dmanisi, (14) Gesher Benot Ya'aqov, and (15) 'Ubeidiya

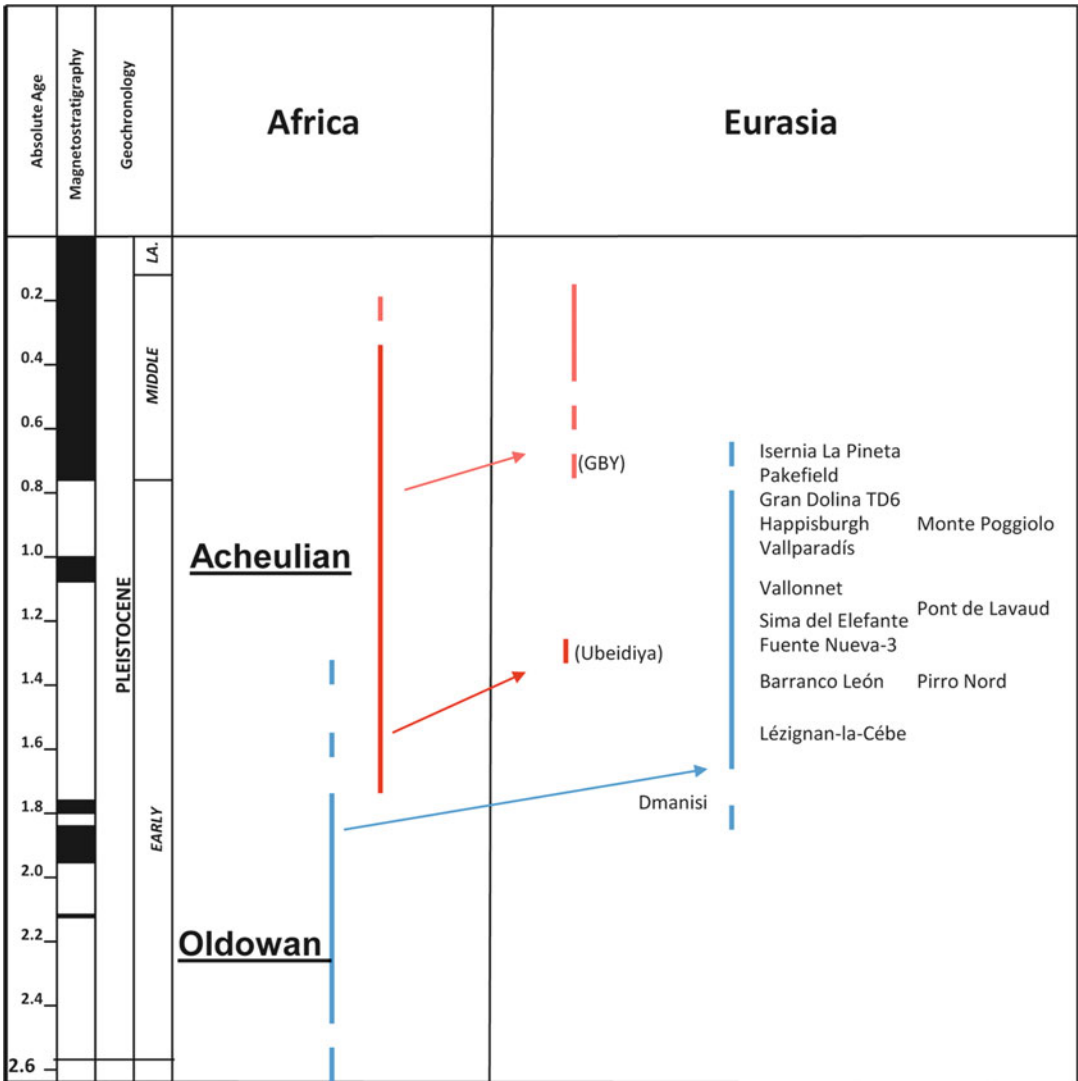
At the base of the middle Pleistocene, the arrival into the continent of hominins that developed Acheulian tools is generalized everywhere in most of southern and central Europe, informing on the important demographic increase of human populations.

### Key Issues/Current Debates

The oldest records of hominins with carnivorous habits, making and using lithic artifacts, are documented at Kada Gona (Ethiopia) at around 2.6 Ma. Curiously, these findings are chronologically coincidental with the Gauss/Matuyama paleomagnetic transition and also with the onset of the “Glacial Plio/Pleistocene” climatic cooling, resulting from bipolar glaciations, which led to the transition to cooler, drier, and more seasonal climates in the temperate latitudes during the Pleistocene epoch. Glacial

ice rafting was produced periodically in the glacial–interglacial fluctuations, being caused by the 41-ka cycle of variations in obliquity of the Earth axis during the interval comprised between 2.8 and 1.6 Ma and by higher-amplitude cycles of 100 ka resulting from variations in orbital eccentricity at 1.2–0.8 Ma (Shackelton 1995).

In Europe, as in Africa, an important faunal turnover is detected around 2.5–2.6 Ma. It is known as the so-called Elephant–*Equus* event, and it is coincidental with the Early–Middle Villafranchian faunal transition. This event is characterized by the arrival in Europe of the first one-toed horses, *Equus livenzovensis*, and the spread of *Mammuthus meridionalis* originated in Africa, although the record of both genera seems to take place somewhat earlier. The same faunal turnover is also detected in Asia, both in the Upper Siwaliks in the Tatrot Formation and Central Asia.



**Europe: Early *Homo* Fossil Records, Fig. 2** Chronologic chart of some of the most important Early Pleistocene European archaeological and

paleoanthropological localities of Europe, the Caucasian Region, and the Levantine Corridor

Although there are some references that point to a possible human dispersal into Eurasia older than 2.0 Ma, the oldest clear human record out of Africa is found in Dmanisi during the Olduvai normal paleomagnetic chron, where a very good collection of fossil hominins (crania, mandibles, and postcranial bones) together with Oldowan primitive lithic artifacts has been unearthed. The fossil record of Eurasia reveals an important faunal turnover at this moment, which is coincidental with the Middle–Late Villafranchian

transition (Rook & Martínez-Navarro 2010, and references there in), and was called *the Wolf event* after Azzaroli (1983). Recently, this episode has been renamed as “the *Pachyrocute brevirostris* event” by Martínez-Navarro (2010), because of the deep impact of this giant, hyperscavenger hyaenid of African origin in most of the Eurasian fossil assemblages during the rest of the Early Pleistocene (which is coincidental with the Late Villafranchian), from the Iberian Peninsula through to eastern and southern Asia (Palmqvist et al. 2011).

This event is also followed by the arrival of other several large mammal species of African origin, most of them chronologically coincidental with this human dispersal, such as the sabertooth tiger *Megantereon whitei*, the giant gelada baboon *Theropithecus oswaldi*, and the aquatic megaherbivore *Hippopotamus antiquus*, which is a sister species, if not the same, of the giant African hippo *H. gorgops*.

At around 1.3–1.4 Ma, a new wave of dispersal is detected, but it is only well recorded in southwestern Asia at the Levantine Corridor, especially at the site of ‘Ubeidiya (Israel), where primitive Acheulian tools have been found together with some large mammals originating in Africa, such as the giant African buffalo *Pelorovis oldowayensis*, the giraffe *Giraffa camelopardalis*, the pig *Kolpochoerus olduvaiensis*, the hippo *Hippopotamus gorgops*, the scavenger and social hunting hyena *Crocota crocuta*, the sabertooth tiger *Megantereon whitei*, and the giant monkey *Theropithecus oswaldi*. These species are mixed with others of Asian origin, such as the giant deer *Praemegaceros verticornis*, the buffalo *Bison* sp., the spiral horned antelope Antilopini indet. (*Spirocerus* sp./*Pontoceros ambiguus*), or the bear *Ursus etruscus* (Tchernov 1986; Martínez-Navarro et al. 2009, 2012). A primitive Acheulian record is also detected in southern India in a chronology close to ‘Ubeidiya at the site of Attirampakkam, dated 1.51 Ma.

A new and mostly pan-Eurasian dispersal event coming from Africa is detected during the Early–Middle Pleistocene transition (~0.8–0.6 Ma). Hominins coming with Acheulian (Mode 2) tools colonize the Levantine Corridor, with the best example at Gesher Benot Ya’aqov (Israel) (0.7–0.8 Ma), bringing the domestication of fire with them and a high degree of socialization (Alperson-Afil 2008). The arrival of this developed tool technology is coincidental with the colonization of Europe by *Homo heidelbergensis* and the arrival into the continent of several large mammals of African origin, such as the bull *Bos primigenius*, the elephant *Elephas (Palaeoloxodon) antiquus* (evolved from *Elephas recki*), the hyenas *Crocota crocuta* and *Hyaena*

sp., the lion *Panthera leo*, and the leopard *Panthera pardus* (Martínez-Navarro & Rabinovich 2011). The arrival of this African fauna is part of the important Galerian faunal turnover, and it is coincidental with the long transition between climates forced by the 41-ka cycles and the later accentuated glacial climate characterized by the alternation of pronounced glacial–interglacial periods modulated by the 100-ka periodicity (Shackelton 1995). This dispersal event has recently been named “the *Crocota crocuta* event” (Martínez-Navarro 2010).

Climate changes, faunal turnovers, and human dispersals into new continents seem to be coincidental. There is no doubt that climate and climate change interact with the biosphere and can therefore be expected to influence also on human activity, either directly or through paths leading from climate to plant cover to faunal resources. What is not so clear is how and to what degree the social and cultural human evolution interacted with these changes. At this sense, an important question is to explain the effects of increasing sociality in early and more recent humans in order to be more successful during the global dispersal process, in competence with other faunal species and/or human populations.

## International Perspectives

### Ecological Landscape of the First Human Dispersal Out of Africa

The study of the extraordinary collection from the southern Spanish Early Pleistocene site of Venta Micena (Orce, southern Spain), dated ~1.5 Ma, with more than 17,000 fossil remains corresponding to a large mammal taphocoenosis unearthed from 350 m<sup>2</sup> of excavation (but with a potential of more than one million m<sup>2</sup> to be excavated), has provided interesting information on the paleobiology and paleoecological preferences of the most important species related with the Early Pleistocene human ecological scenario in Europe. Although no human remains have been unearthed for the moment at Venta Micena,

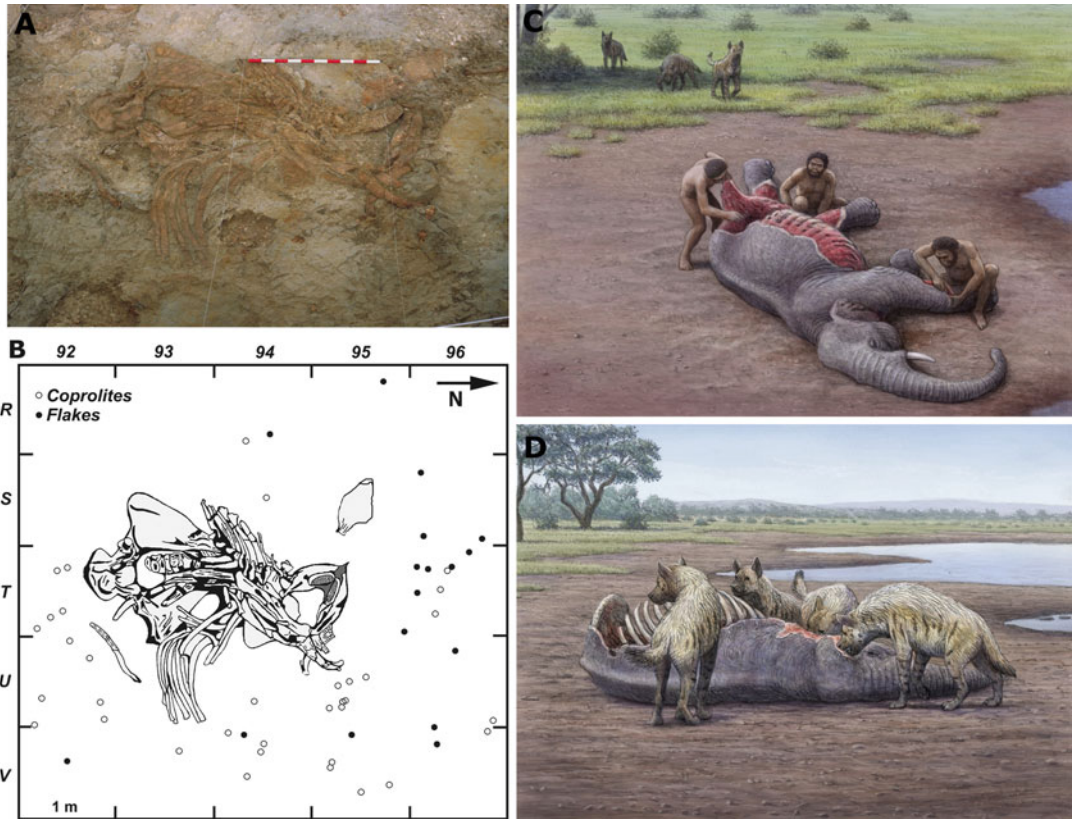
all taxa recorded there are found also in assemblages with lithic artifacts and/or human remains from other archaeopaleontological localities on the continent.

These studies were firstly performed with the African origin sabertooth tiger *Megantereon whitei*, which earliest record outside Africa is at the site of Dmanisi at 1.8 Ma, together with the earliest hominins of Eurasia. It was an ambush, super-predator felid which inhabited mixed habitats and had powerful forelimbs, elongated and non-crenulated upper canines, and a short mandible with reduced precarnassial cheek teeth. It was well adapted to hunt medium- to large-sized ungulates, but its masticatory structure only allowed it to eat the softer parts of its prey, leaving most of the carcass intact for scavengers (see Palmqvist et al. 2007, and references there in; Martínez-Navarro 2010), especially for the giant hyena *Pachycrocuta brevirostris*, but probably also for hominins.

Similar studies were performed with the Early Pleistocene painted dog *Lycaon lycaonoides* thanks to the finding of a pathologic skull preserved complete at Venta Micena, specimen VM 7000. This fossil corresponds to an old individual, 6–7 years old, and shows several pathologies: it is bilaterally asymmetric and, after a radiologic analysis, it was possible to demonstrate that, during its life, it never had the right upper canine (C) and the right third molar (M<sub>3</sub>). These pathologies were, probably, the consequence of a high degree of endogamy in the populations of this carnivore species, which resulted in an increase of the level of genetic homozygosity and thus a loss of developmental homeostasis. The canine is a crucial element for a predatory carnivore, but this specimen survived to an old age without it and with a pronounced asymmetry in the skull. The survival of such a pathologic individual suggests that collaborative social behavior helping sick, disabled, and/or old individuals by the other members of the family, as seen in extant *Lycaon pictus*, was already developed as early as the Early Pleistocene (Palmqvist et al. 1999). Similar social behavior, helping an old and toothless human individual, has been detected at the site of

Dmanisi thanks to the finding of skull D3444 and jawbone D3900 (Lordkipanidze et al. 2005), showing convergent behavior among social large carnivores and early humans with developed carnivorous habits. Curiously, painted dogs dispersed into Africa coming from Eurasia at the same time (1.9–1.8 Ma) as hominins went out of Africa following the same route, the Levantine Corridor, but in the opposite direction (Martínez-Navarro 2010).

Another example is the paleobiological study of the ethology of the superscavenger that lived in Europe during the Early Pleistocene, the giant, short-faced hyena *Pachycrocuta brevirostris*. It was the largest bone-cracking hyaenid that ever existed. With the mass of a lioness, it had massive limbs with shortened distal bones and a heavy, powerfully built mandible with robust, well-developed premolars. All these features reflect its adaptation for dismembering ungulate carcasses, transporting large pieces of them without dragging to the denning site and fracturing bones. The relative contribution of hunting and scavenging to the diet of this extinct hyena was estimated using combined biomechanical, biogeochemical, and taphonomic approaches. Analysis of the bone-cracking behavior of *P. brevirostris* was based on the abundance of skeletal elements in the large mammal assemblage from Venta Micena. Results obtained showed that the bones with greater marrow contents (femur, humerus, and tibia) were preferentially fractured by the hyenas, while those others with less nutritional value (radius and metapodials) were better represented as complete elements in the assemblage. The quantitative analysis of the preservational state of skeletal elements allowed testing specific patterns of bone modification by the giant hyenas, such as a proximo-distal sequence of consumption for humerus and tibia, thus revealing the highly specialized bone-cracking behavior of *P. brevirostris*. Regression equations adjusted with modern carnivores for body size on craniodental and postcranial measurements provided an average estimate of mass of more than 110 kg for the giant hyena. The high moment arms for masseter and temporalis muscles



**Europe: Early *Homo* Fossil Records, Fig. 3** (a) Partial skeleton of *Mammuthus meridionalis* unearthed at the Early Pleistocene site of Fuente Nueva 3 (Orce, southern Spain), (b) spatial distribution of coprolites and flint flakes

surrounding it, and reconstruction of the possible sequence of interaction between hominins (c) and hyenas (d) during the exploitation of the elephant carcass (Drawings by M. Antón)

indicated a substantial strength for bone fracturing with the well-developed premolar teeth. Jaw depth provided resistance against dorsoventral loads during bone-cracking activities. However, the moment arm of resistance for an object positioned at the canines revealed a loss of bite strength compared with spotted hyenas and thus less predatory abilities. These results are in agreement with the scavenging niche deduced for *P. brevirostris* from taphonomic analysis (see Palmqvist et al. 2011 and references therein). After this work at Venta Micena, the direct competence between the giant hyenas and hominins for the exploitation of an elephant carcass (*Mammuthus meridionalis*) has recently been described at the Orce archaeopaleontological site of Fuente Nueva 3 (Espigares et al. 2013) (Fig. 3).

Current work is also in progress with other species, such as the giant African origin hippo *Hippopotamus antiquus* (Palmqvist et al. 2008), showing that this megaherbivore is an aquatic better than amphibious species. The evidence comes from a biogeochemical analysis of bone collagen remains preserved in Venta Micena, which showed that, compared to other ungulates, the hippo  $\delta^{15}\text{N}$  values were extremely high, even more than in the sabertooth tigers *Homotherium* and *Megantereon* from the same faunal assemblage. These results showed that this hippo species did not eat terrestrial grasses, as do modern hippos, but was limiting its alimentary income to only aquatic plants such as macrophytes, which do not fix atmospheric  $\text{N}_2$ . Elevated  $\delta^{15}\text{N}$  values resulted from the high saline contents (strontium sulfates) of the



paleolake waters in the surroundings of Venta Micena, contributed by hydrothermal vents. This inference on the paleobiology of the extinct hippo is also confirmed by skull anatomic adaptations to water living, with more elevated orbital and nasal cavities, and a more elongated muzzle than in the extant, less aquatic and more amphibious species *Hippopotamus amphibius*. In addition, ecomorphological studies have shown that *Hippopotamus antiquus* was 2.2 times heavier than modern hippos and showed shortened limbs, which resulted in less ability for moving on land. The finding of these aquatic megaherbivores in the European Pleistocene sites is very significant and informative, because they need to live in big rivers or lake biotopes and cannot survive in cold waters, under 0 °C, when water became ice. In the case of Venta Micena, contribution of thermal waters resulting from tectonic activity in the Guadix–Baza basin during Early Pleistocene times resulted in a milder environment than today, which made possible the colonization by hippos. Curiously, these ecological and climatic conditions are the best for hominin survival. One interesting data is that Early Pleistocene African origin hippos are recorded in the Levantine Corridor, the Caucasus, Anatolia, and Central and Southern Europe, but they are not found in other regions of Asia, probably because there were not rivers (waterways) to disperse into the eastern continent. Finally, we can say that the finding of hippos is a good track to try to find hominins (Martínez-Navarro 2010).

## Future Directions

### Human Autoecology: Tool Typology and Technology and Their Importance in the Food and Social Behavior

Lithic tools are a key question. Although human teeth are bunodont and polyvalent, they are not adequate to cut the animal skin, dismember a carcass, and eat the meat. Our ancestors became systematic carnivores only thanks to the use of artifacts. Without the lithics, the access to animal resources would have been impossible for Early

Pleistocene hominins. But thanks to this change in our food behavior, we are finally humans. Thus, the extrasomatic cultural/technical evolution prompted a direct biological evolution.

The access to meat and other more energetic animal foodstuffs, such as the marrow and the brain, changed our anatomy and physiology. Our digestive system, starting from the teeth, became shorter, and our abdomen reduced the volume; the neurocranium and brain grew, increasing the intelligence and, of course, the social skills. Humans became able to move and colonize a latitudinal wide spectrum of environments, only constrained by the need of water, the presence of potential food resources (especially animal carcasses), and, of course, the impossibility of surviving in seasonal climates with very cold winters. Social hominins with primitive Oldowan tools and a scavenging behavior colonized the favorable biotopes of the middle latitudes of Eurasia, around 1.8–1.9 Ma (Lordkipanidze et al. 2007), but they were not able to survive in continental and cold climates until one million years later. At the Early–Middle Pleistocene transition, around 0.7–0.8 Ma as documented at Gesher Benot Ya’aqov, Israel (Goren-Inbar 2011), a new hominin coming from Africa with a new technology, the evolved Acheulian, was able to colonize the territories formerly occupied by the Oldowan hominins in Europe and Asia, probably in direct competition with the previous populations, which were less culturally evolved. Most probably, humans with evolved Acheulian tools were able to hunt and did not depend on the scavenging of the prey left abandoned by the large carnivores, as it was the common behavior of the Oldowan hominins. One of the most important data in support of this hypothesis is that in Oldowan and primitive Acheulian assemblages, large carnivores are abundantly preserved, as it is recorded in Dmanisi (Georgia), the Orce sites of Fuente Nueva 3 and Barranco León (Spain), or ‘Ubeidiya, (Israel). However, in the evolved Acheulian assemblages, fossils of large carnivores are usually scanty, as in Buia (Eritrea) at 1.0 Ma, Gesher Benot Ya’aqov (Israel) at 0.7–0.8 Ma, or La Polledrara (Italy) at 0.4 Ma.

The possibility of hybridization of Acheulian hominins coming from Africa with local Oldowan hominins living in Eurasia cannot be discarded, as it is evidenced in modern human populations by data on haplotype trees for mitochondrial DNA, Y-chromosomal DNA, two X-linked regions, and six autosomal regions, which suggest a major expansion event out of Africa at 0.84–0.42 Ma, characterized by interbreeding and not replacement of earlier populations (Templeton 2002).

Then, future research has to affect the improvement of the archaeological and paleontological record around the continent, the paleoecological studies of the fossil human environments, and the cultural and social evolution of the early paleolithic societies.

## Cross-References

- ▶ [Fossil Records of Early African \*Homo\*](#)
- ▶ [Hominin Paleoecology and Environmental Archaeology](#)
- ▶ [West and Central Asia: Early \*Homo\* Fossil Records](#)

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## Europe: Early Upper Paleolithic

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### State of Knowledge and Current Debates

The transition from the Middle to the Upper Paleolithic is a period of the most vital changes in the evolution of population and European cultures when Neanderthals had been replaced by Anatomically Modern Humans and the Middle Paleolithic cultures (Mousterian and Micoquian) were replaced by the Upper Paleolithic cultures.

The process of changes that were taking place in Europe between 45 and 30 Kyr BP was not uniform in its nature, but complex and multilinear (Mellars & Stringer 1989; Mellars 1990; Mellars et al. 2007; Kozłowski & Sacchi 2007). In terms of physical anthropology, the concepts of local evolution of Neanderthals into Anatomically Modern Humans have to be rejected on the basis of recent palaeogenetic analyses. Neanderthals evolved locally in western Eurasia beginning from more than 200 Kyr until their extinction between about 30 and 28 Kyr BP (Stringer & Gamble 1993). These populations created a variety of Middle Paleolithic cultures. The Anatomically Modern Humans evolved in eastern Africa more than 250 Kyr and, from northeastern Africa spread first to Eurasia, subsequently to other continents. These populations created a gamut of different Upper Paleolithic cultures (Boyle et al. 2010).

This model is today commonly accepted on the basis of the evidence of fossil mt DNA. Most reports on the first identifications of fossil sequences of mt DNA seem to support the view that mt DNA of Neanderthals is totally unlike that of mt DNA of European Modern Humans. The final split between DNA of the ancestors of the two populations is assumed to have taken place at about 325 000 years ago, still in Africa. Consequently, a model should be accepted of total replacement of Neanderthals by Modern Humans in the effect of the second "out of Africa" migration via the Near East to Europe and to western, possibly also central, Asia (Caramelli et al. 2003; Currat & Excoffier 2004; Serre et al. 2004).

Recently, however, arguments have appeared in support of some contribution of Neanderthals to the formation of the genome of European Modern Humans. S. Paabo et al. (2004) suggested that Archaic Modern Humans had intermingled with Neanderthals; later, however (2008), he admitted that this could have been contamination of fossil Neanderthal DNA by recent human DNA. This issue still remains highly controversial. Some arguments point to genetic differentiation of Neanderthal populations in the period when they cohabited with Modern Humans (Schmitz et al. 2002;