

9. EARLY HOMINIDS IN THE BALKANS

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INTRODUCTION

The aim of this paper is to introduce the human factor, in the shape of our Palaeolithic past, into the study of Balkan biodiversity and to identify those parts of the story of Pleistocene hominids in the Balkans that are most relevant to this study. The paper's temporal perspective will thus be a long one, since this period encompassed many thousands of years, witnessing the alternation of cold and warm stages and the geographic restriction and expansion of various plant and animal populations. Against this periodically changing Ice Age background there took place the arrival of ancient hominids in the Balkans, the extinction of certain species and the arrival and subsequent expansion of our species, *Homo sapiens*, through even the most remote of upland regions, formerly inaccessible. The Balkan Peninsula, the south-eastern entrance to Europe, is a region of critical concern in the process of reconstructing ancient European history. As one of the many pieces in the European hominid mosaic, the Balkan record will be discussed here in conjunction with the major issues of early European prehistory.

The story of ancient hominids in this part of the world is woven from many different threads: emergence and extinction, arrival and colonisation, social life, subsistence patterns, settlement patterns, demography and more. All of these threads have to do with the past, yet they are woven together by means of techniques and motivations shaped by the present: the methodological tools developed by the archaeological and biological disciplines and the questions that are currently regarded as of particular interest. I have chosen to follow the thread of the history of hominid presence in this area, a theme that will be dealt with within three subheadings: speciation, variation and adaptation.

SPECIATION

Many of you must be familiar with scenarios of human evolution such as the one represented in Figure 1. This is a typical example of what was until very recently considered to be a scientifically correct visual reconstruction of the sequence of major human evolutionary events. Such images are representative of the main paradigms that have informed research into early humans. This approach does not ignore biodiversity altogether, but reduces it to a neat linear sequence consisting of a limited number of species. The image overlooks the possibility that more than one hominid species may have existed at the same time and assigns the business of evolution exclusively to our white male ancestors, female or non-white hominids generally being conspicuous by their absence. The scheme of Figure 1, the product of a western, male-dominated tradition of palaeoanthropological research, conveniently obscures the considerable difficulties faced by taxonomists of human fossils, who must distinguish morphological variation within a single species from variation between different species and assign fragmentary elements of ancient skeletons to discrete species according to hard-tissue characteristics alone (Tattersall, 1986). All the skeletal and cranial remains found on the Balkan Peninsula have been identified as belonging to one of three hominid taxa: *Homo heidelbergensis*, *H. neanderthalensis* and *H. sapiens*.

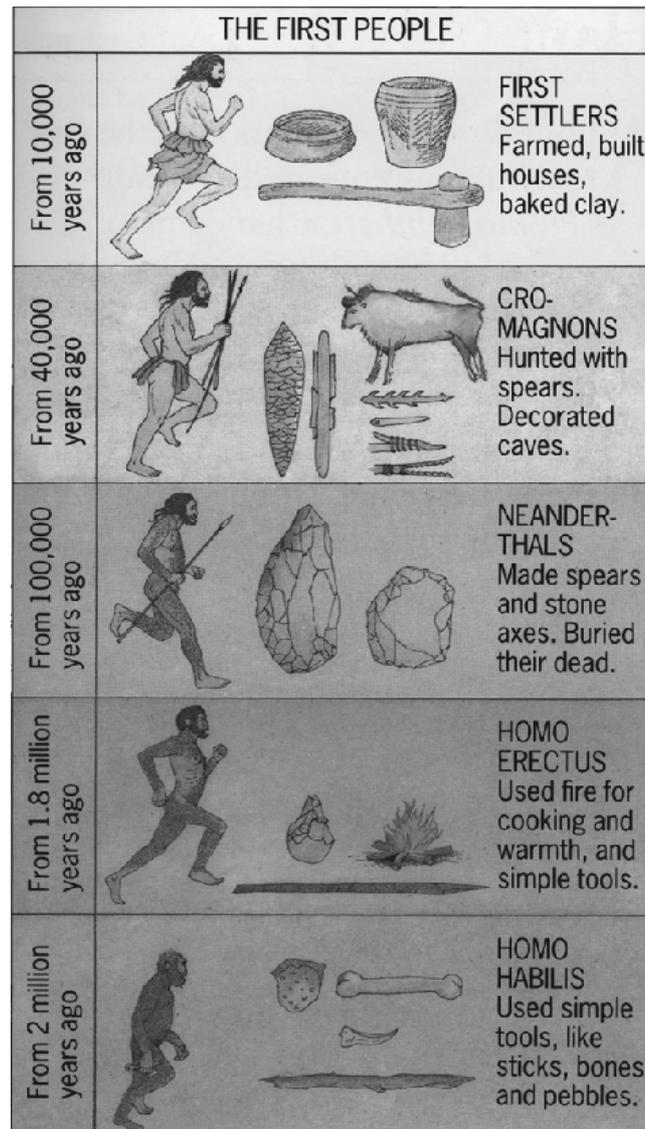


Figure 1. An outdated model of hominid evolution (reproduced from Maynard, 1996, by permission of Kingfisher Plc. All rights reserved).

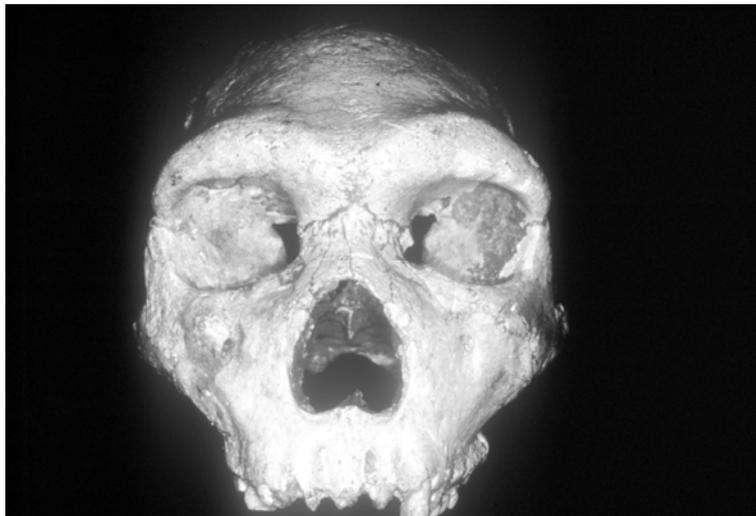
In phylogenetic terms the earliest human species present in the Balkans was *Homo heidelbergensis*, represented by the Petralona skull (Figure 2). This specimen was discovered accidentally by a villager in the homonymous cave in northern Greece in 1960. The skull was well protected by the stalagmitic material that had accumulated on its surface, and is as a result one of the best preserved European Middle Pleistocene crania we have. Despite claims to the contrary, no postcranial remains that can safely be attributed to the same hominid have been recovered from the cave. The Petralona site is an impressive karstic formation, 300 m a.s.l., at the foot of Mount Katsika in Chalkidiki. Excavations carried out in various parts of the cave long after the discovery of the skull revealed a long stratified sequence rich in macro-faunal and micro-faunal remains, with some lithic and bone artefacts. The thoroughness with which the cave's fauna have been documented (Kretzoi & Poulianos, 1981; Kurtén & Poulianos, 1977, 1981) is in marked contrast to the treatment of the artefacts, concerning which we have as yet no detailed publication, although photographs and illustrations have appeared sporadically (Poulianos, 1971, 1978, 1982).

For many years the species, the context and the period to which the skull should be assigned were some of the most bitterly debated questions in Balkan prehistory. This controversy, which divided the scientific community, students and the general public, damaged careers and aroused bitter resentment, was not confined to the boundaries of scientific meetings and journals, but frequently overflowed into the magistrates' courts. Today it has been established beyond all doubt that the Petralona specimen should be classified as *Homo heidelbergensis*, a species whose fossils have been found in both Africa

and Europe (previously referred to in some literature as ‘European *Homo heidelbergensis*’, ‘African archaic *Homo sapiens*’ or ‘archaic *Homo sapiens*’). The European sample consists of cranial and skeletal remains from Arago, Atapuerca, Boxgrove, Bilzingsleben, Mauer, Petralona, Steinheim and Swanscombe. The cranial remains suggest an average cranial capacity of 1100cc, but the fragmentary nature of the postcranial finds does not permit detailed reconstruction of *H. heidelbergensis* anatomy.

Deriving its name from the specimen (a lower jaw) found in a sand quarry at Mauer, near Heidelberg, in 1907 (Schoetensack, 1908), *Homo heidelbergensis* is widely considered to have evolved from *H. erectus* about 500 ka. *Homo erectus* was as far as we know the first species to leave Africa, at some time not longer than 1.7 Ma, and spread as far afield as China and Java. It is not clear, however, whether *erectus* made it as far as Europe and there formed an early population that later evolved into *heidelbergensis* (a question that applies equally to the Balkans) or whether *heidelbergensis* itself evolved in Africa, then became the first hominid to populate Europe (Gowlett, 1999). A. Templeton’s recent analysis of genetic data identifies two other major hominid expansions outwards from Africa after the original spread of *H. erectus* (Templeton, 2002). This new model of human evolution, which places the second expansion between 840 and 420 ka, is compatible with the significant changes that appear in both the archaeological and the fossil record during this period (Gowlett, 1999): the first emergence of Acheulean technology in Eurasia and an increase in average cranial capacity.

We know that both Africa and Europe had *heidelbergensis* populations about 400 ka, but do not know how long ago the Petralona hominid lived. Various Lower and Middle Pleistocene dates, estimated on the basis of either the faunal evidence or the speleothems (Ikeya, 1980; Poulianos, 1982; Shen & Yokoyama, 1986), have been proposed for strata excavated in various areas of the cave some time after the removal of the skull. Useful though these dates may be, they cannot be taken as reliable measures of the age of the hominid remains, since the skull was recovered in a manner that left the original context of its deposition and discovery extremely uncertain and thus impeded any subsequent attempt to date it. The most reliable dates that have been obtained for the Petralona hominid are based on calculations of the age of the calcitic crust on the skull’s surface. This approach places the Petralona hominid in the later Middle Pleistocene (Grün, 1996; Hennig *et al.*, 1982; Latham & Schwarcz, 1992).



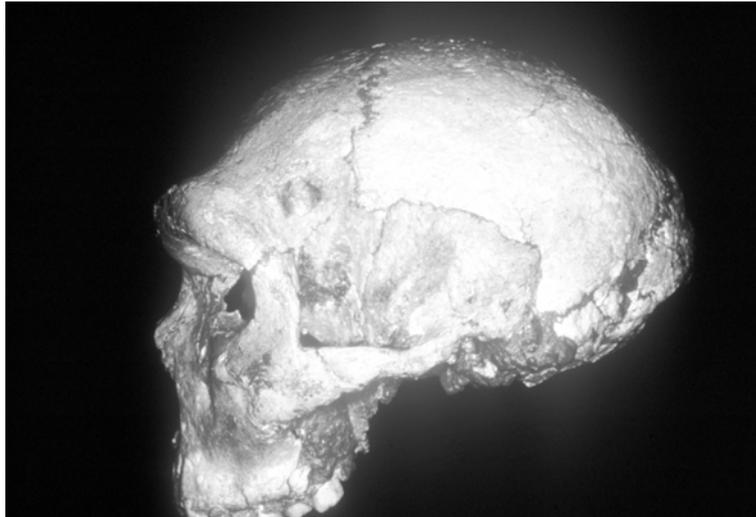


Figure 2. The Petralona specimen (front view and profile).

The proper dating of the Petralona hominid is linked to the question of early hominid arrival in Europe. This issue has given rise to two hypotheses, popularly termed the ‘long’ and the ‘short chronology’ (Roebroeks & van Kolfschoten, 1994). The former claims that there is sufficient evidence, both archaeological and palaeontological, to prove that hominids were present in Europe prior to the Brunhes/Matuyama boundary (777 ka) and in some places from before 1.5 Ma. The latter raises three separate objections to the theory of a long chronology, querying the real ages of certain allegedly early sites, the authenticity of the artefacts found at some sites and the actual species of the various remains claimed to be those of hominids. This theory asserts that the first unequivocal evidence of hominid presence only appears in the record from *ca.* 500 ka onwards. Although its criticisms are valid for most areas of Europe, the short chronology model fails to account for the Iberian Peninsula, where uncontested evidence has been found (at Gran Dolina, Atapuerca and possibly Fuente Nueva 3) for hominid presence dating from around 800 k yr. BP. The data we have suggest that hominids did indeed reach the SW gateway to Europe early on. The question of whether or not something similar may have happened at the other end, the SE gateway, must for the moment remain open. It is nonetheless worth mentioning the argument, unsupported by any hard evidence, that the earliest hominids to reach Iberia could have done so by crossing the straits of Gibraltar. This would of course mean that early dates in Iberia did not necessarily imply early dates elsewhere in Europe.

Amongst the Balkan fossils sharing a number of anthropometric and morphological characteristics with the Petralona specimen is one of the two skulls found in Apidima Cave A, one of the many karstic formations on the steep coast near Areopolis in southern Greece. The skulls, $\Lambda\text{AO1}/\Sigma 1$ and $\Lambda\text{AO1}/\Sigma 2$, were embedded in a single block of hard breccia that filled a recess in the inner cave. This block was extracted from the site in one piece so that the skulls might be worked free of it under laboratory conditions. The heavy overlying sediments have damaged and distorted the skulls. Of the two, $\Lambda\text{AO1}/\Sigma 2$ is the better preserved, lending itself to comparison with other pre-*sapiens* cranial fossils. It exhibits a number of affinities with the Petralona skull, but also several differences in the cranial vault and facial skeleton (Pitsios & Liebhaber, 1995). In view of these differences, pending the complete extraction of the second skull from the surrounding breccia, the excavator has proposed that $\Lambda\text{AO1}/\Sigma 2$ should be classified as belonging to an archaic group with traits transitional between those of *Homo erectus* and *H. sapiens* (Pitsios, 2000) that he has provisionally named *H. (sapiens) taenarius*. On the basis of the geological context and the morphology of the better-preserved fossil, he has suggested a date of between 300 and 100 ka BP (Pitsios & Liebhaber, 1995). Radiometric techniques will be required to evaluate the age of these hominids more precisely. Clarification of their species will have to wait until the second specimen has been worked clear of the breccia, and must of course take into account the latest archaeological and genetic evidence, which does not support the multiregional hypothesis of modern human evolution (see below for a more detailed discussion).

In phylogenetic terms the second earliest hominid species found in the Balkans is *Homo neanderthalensis*, represented by the fossil collections from the caves of Krapina and Vindija, both in the Hrvatsko Zagorje, NW Croatia. This hominid, whose remains are restricted to Europe and western Asia, and possibly North Africa (*e.g.* Haua Fteah), is known for its distinctive anatomy (fairly short stature and robust build). Neanderthals lived in Europe between about 130 ka and 30 ka. They are

generally considered to have evolved through regional differentiation. According to this view the Sahara desert acted as a natural barrier promoting hominid isolation and speciation, *heidelbergensis* populations north of the Sahara giving rise to the Neanderthals, and those south of the Sahara evolving into modern humans (Beaumont *et al.*, 1978; Stringer & MacKie, 1996). According to Gamble the traits of the fossil human crania found at Sima de los Huesos, Atapuerca, in Spain support the view that the Neanderthals in Europe evolved locally from *heidelbergensis* groups (Gamble, 1999). The hominids found at La Sima have an anatomy that combines African *erectus* features with others that show some degree of adaptation to the colder European climate. This combination of elements is suggestive of a species that is developing into the Neanderthal.

Recent genetic research has lent further support to this theory by extracting and analysing mtDNA sequences from three Neanderthal samples: the original specimen found in the Feldhofer cave in Germany (Krings *et al.*, 1997), a child found in the Mezmaiskaya cave in the Caucasus (Ovchinnikov *et al.*, 2000) and a specimen from the Vindija cave (Krings *et al.*, 2000). These three have given us some idea of the Neanderthals' genetic makeup. Like modern humans, they seem to have exhibited very little genetic variation, suggesting that the original population from which they developed was small (Krings *et al.*, 1997, 2000). The same studies have shown the Neanderthal genome to have differed considerably from that of modern humans. Although modern humans and Neanderthals share a common ancestry, the Neanderthals are thought to have become separated from the ancestors of modern humans about 600 to 700 ka, although this date is based on the DNA clock and should therefore be treated with caution.

The largest collection of Neanderthal remains ever found at a single European site was discovered over a century ago in the Krapina rockshelter, at the foot of Hušnjak, a sandstone cliff 120m above sea level in northern Croatia. Excavations began in the last year of the 19th century and were completed in 1905 by D. Gorjanović-Kramberger (1902, 1906). His field technique, which aimed to expose the horizontal distribution of the finds following the rockshelter's natural stratigraphy, was accompanied by detailed recording of the position and depth of each fossil find (Karavanić, 2000). 5000 archaeological finds were recovered. Between the early Gorjanović-Kramberger publications and the 1990s these finds received little archaeological attention (but see Miracle in press; Simek, 1991; Simek & Smith, 1997). Krapina, nonetheless, immediately became well known for its palaeoanthropological remains. A recent study has shown that these are part of the cranium of an adult female and about 800 fragments belonging to between 12 and 28 individuals aged from infancy to adulthood (Radović *et al.*, 1988; Smith, 1982). Krapina is unique amongst sites containing human fossils in having yielded the remains of what was almost certainly a biological population of Neanderthals. Mousterian artefacts and faunal remains were also found in the hominid zone. ESR and U-series dates obtained using tooth enamel from the Krapina hominids suggest that this population lived over a period of up to fifty thousand years, with a mean date of ca. 130 ka (Rink *et al.*, 1995).

The state of preservation of the Krapina sample has raised many questions about the conditions and context of its deposition. The fossils are highly fragmented and disarticulated; some have been exposed to fire and others bear on their surfaces what appear to be scratch or cut marks. It is, moreover, impossible to associate any of the postcranial bones with cranial or dental remains (Kricun *et al.*, 1999) or indeed to assign any two anatomical parts to the same individual. Although finds from all over the Neanderthal distribution area have made it clear that some Neanderthal groups buried their dead in caves, there is no indication that the Krapina hominids were buried intentionally. The questions of how so many bones came to be incorporated into the Krapina cave sediments and why they are so fragmented thus demand an answer. Gorjanović-Kramberger responded to these questions by hypothesising that the Krapina Neanderthals practised cannibalism, a suggestion that has received both support and severe criticism. Alternative hypotheses attribute the condition of the bones either to taphonomic factors (Trinkaus, 1985) or to postmortem treatment of the corpses in preparation for a secondary burial ritual (Russell, 1986a, b). This issue remains a murky one, but the Krapina finds have shed light on several other aspects of Neanderthal economic and social life. Miracle's study of subsistence practices at Krapina finds that the Merck's rhino bones found in the cave, some with signs of surface modification or burning, demonstrate an age distribution that suggests systematic selection of young-juvenile animals, which would have had to be separated from their mothers by means of some well planned strategy. His study thus argues for advanced ways of procuring meat that would have required considerable co-ordination and collective effort by the Neanderthal groups (Miracle, in press).

The second major Balkan sample of Neanderthal fossils is from Vindija, a limestone cave in the Hrvatsko Zagorje, 50 km from Krapina. This site contained sediments that were rich in archaeological material and human fossils. Of the Vindija hominid sample, 40 specimens from layer G3 and 4 specimens from layer G1, all of which are postcranial or cranial fragments or teeth, have been

identified as belonging to *Homo neanderthalensis* (Malez *et al.*, 1980). Despite their fragmentary condition, these fossils have told us much about the life and dietary habits of the Vindija Neanderthals and about the time at which they lived. This population was more lightly built (gracile) than the Neanderthals in other parts of Europe (Smith, 1982) and most of the protein in its diet was of animal origin; in other words, these groups subsisted largely on meat (Richards *et al.*, 2000).

The lowermost Vindija sequence (level K) overlaps in time with some of the Krapina Mousterian, but the G complex in which the Neanderthal remains were found has produced dates that seem rather recent. The most reliable dates obtained are those for the upper level, G1: 33,000±400 yr. BP, obtained from a bear bone, and 29,080±400 yr. BP and 28,020±360 yr. BP, obtained directly from Neanderthal bones (Karavanić, 1995; Smith *et al.*, 1999). The Vindija population would seem from this to have been amongst the last surviving Neanderthal groups, along with the late Neanderthals of the Zafarraya cave in southern Spain (Tattersall, 1999) and those of the Mezmaiskaya cave in the northern Caucasus (Golovanova *et al.*, 1999). It is interesting to note that Wolpoff's reaction to the results of ancient DNA analysis was to question on morphological grounds whether the Mezmaiskaya infant was really a Neanderthal, or a modern human (Hawks & Wolpoff, 2001). Observing the conjunction of these apparently late dates with this population's overall morphology and lack of robustness compared to other western European Neanderthals, some researchers suggested that the Vindija fossils belonged to a group in a state intermediate between that of the majority of central European Neanderthals and that of early Upper Palaeolithic humans (Smith, 1982). In other words, the hypothesis was advanced that the type represented by the Vindija population was a transitional stage between Neanderthal and modern humans (Malez *et al.*, 1980). This hypothesis was tenable within the context of the multiregional theory of modern human evolution, founded partly upon empirical data concerning the Vindija Neanderthals. According to this theory, modern human populations were descended from local populations of *Homo erectus* or *H. ergaster* that spread out of Africa into Eurasia at least 1 Ma and evolved locally and independently into the various archaic *H. sapiens* of the Old World (Thorne & Wolpoff, 1992). Modern European populations thus evolved from Neanderthal ones. More recent research using genetic (*e.g.* Cann *et al.*, 1987) and archaeological (*e.g.* Yellen *et al.*, 1995) evidence indicated, however, that it was more probable that modern humanity was of African origin. This suggested that Stringer and Gamble (1993) might be right in seeing the Vindija population's lack of robustness as the result either of intra-species variation (in other words, this particular group of Neanderthals was simply physically smaller on average than most other groups) or of interbreeding with contemporaneous modern humans. The latter hypothesis was made more tenable by the fact that level G1, in which some hominid specimens were found, also contained an industry that was distinctively Early Upper Palaeolithic (Aurignacian) and a few bone artefacts. This created a case for a possible association of Neanderthal groups with material culture created by modern humans (Karavanić, 1995; Karavanić & Smith, 1998). Too many unresolved issues surrounded Vindija's stratigraphy to allow this matter to be decided on an archaeological or anthropological basis.

The question of the Vindija hominids' species was clarified by analysing the mtDNA sequence extracted from a bone found in level G3. This sequence differed in only nine respects from that extracted from the Feldhofer cave specimen, but showed 35 differences from sequences extracted from modern humans, leaving us in no doubt that the Vindija hominids were definitely Neanderthals (Krings *et al.*, 1997, 2000). The morphological variation observed in the Vindija fossils is therefore probably best explained not as the outcome of a speciation process, but as an instance of just such intra-species variation as is clearly visible in modern human populations (compare, for example, the anatomy of an Inuit Eskimo with that of a Masai).

Table 1. Upper Pleistocene *Homo sapiens* remains from the Balkans.

Country	Site	Hominid remains	Cultural material date	Source
Bulgaria	Bacho Kiro layer 11	Fragment of juvenile left mandible with 1 molar	39,000 - >43,000 yr. BP	Kozłowski, 1982
Croatia	Vindija level D	34 cranial and postcranial remains		Smith, 1976, 1982
Greece	Apidima cave Γ	1 female skeleton	A few artefacts of Aurignacian character	Momperrattou & Pitsios, 1995; Darlas, 1995
Greece	Klithi	2 teeth	16.5-13 k yr. BP	Bailey, 1997;

Greece	Theopetra	Calvaria and fragments of long bones	13,723 ± 60 yr. BP	Gamble, 1997 Stravopodi & Manolis, 2000
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Genetic investigation has likewise contributed to a better understanding of the ancestry of modern humanity. Molecular research on nuclear and mtDNA shows that of modern African populations to have the greatest variability, suggesting that the modern human genome first evolved in this area of the world (Cann *et al.*, 1987; Goldstein *et al.*, 1995; Harpending *et al.*, 1993; Rogers & Jorde, 1995). Although the process by which our species evolved has yet to be worked out in greater detail by means of fossil, archaeological and molecular analysis (see Brooks, 1996 for discussion), current thinking is therefore basically that *Homo sapiens* evolved from a small founder population in sub-Saharan Africa and from this region spread outwards to the rest of the world. Templeton's model assumes that interbreeding, rather than replacement, should be regarded as the key to the human evolutionary process, gene flow and territorial expansion leading to genetic interchange between human populations (Templeton, 2002). His analysis places the third hominid expansion out of Africa between 150 and 80 ka.

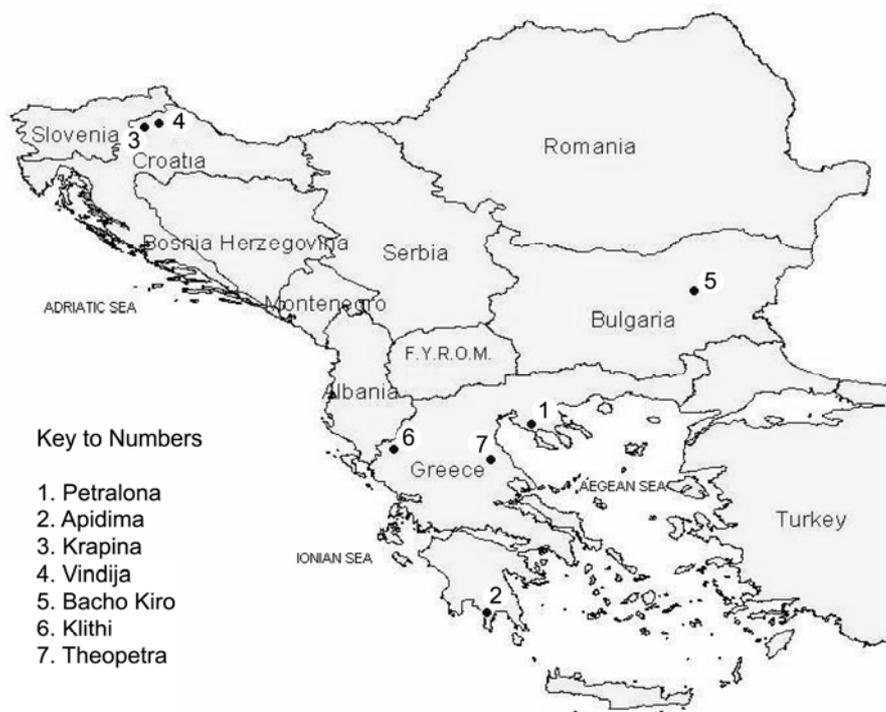


Figure 3. A map of the Balkans showing the sites with hominid remains referred to in the text.

It is not clear when modern humans first arrived in the Balkans, partly because so few fossil hominid remains have been found there (Table 1, Figure 3) and partly because the correct dating of this region's early modern human record is problematic. The ages calculated for Bacho Kiro layer 11 are too imprecise to be of much use in this connection; we have no radiometric dates for other sites such as Apidima cave Γ, while in the case of other sites such as Temnata layer 4 the dates obtained using different techniques (TL and ^{14}C) are inconsistent (Kozłowski, 1996). Amongst the earliest human remains found to exhibit distinctively modern traits are a fragment of a mandible with molar, found in Bacho Kiro layer 11 (Bulgaria), that dates from between 37 and >43 k yr. BP (Table 1). The ages of the stratum in which modern human remains have been found and of those containing the remains of the Vindija Neanderthals do, however, make it clear that Neanderthal and modern human populations co-existed in the Balkans for some part of the period between approximately 40 and 28 k yr. BP.

The Balkan *Homo sapiens* sample dating from the Pleistocene is smaller than the Neanderthal sample and tells us little about past pathology, demography or diet (Table 1); incidentally, the number of modern human remains increases exponentially in sites that date from the early Holocene, when formal disposal of the dead in caves, in settlements or on the peripheries of settlements became a more

regular and widespread practice. Despite the limitations of these fossil remains, however, our picture of the modern human groups that lived in the Balkans during the Pleistocene is complemented by the richer archaeological record of the period between 40 and 10 k yr. BP. This brings us to the next issue under discussion: variation in cultural remains.

VARIATION

The picture of human evolution that we see in Figure 1 demonstrates another implicit assumption that has informed Palaeolithic research almost from its inception. This assumption was based upon the premise that the morphological variation seen in the lithic industries recovered was directly related to hominid variation. A lithic industry is the set of stone tools, together with cores and other waste products of the knapping process, recovered from a site. Certain human species were associated with particular lithic industries and the archaeological record of each of the three major subdivisions of the Palaeolithic was in effect assigned to a different hominid, the Aurignacian and Epigravettian industries of the Upper Palaeolithic being bestowed upon *Homo sapiens*, the Mousterian industries of the Middle Palaeolithic upon *H. neanderthalensis* and the Oldowan and Acheulean industries of the Lower Palaeolithic upon *H. habilis* and *H. erectus*. In recent years, however, developments in genetic research, refinements in archaeological recovery and dating techniques and the discovery of a large number of human fossils in Africa and the Near East have changed the picture radically. It has become clear that many more hominid species evolved during the Pleistocene than had previously been thought, that some of these co-existed in time and space and that some of them shared the same technology and material culture.

Biological events of speciation and extinction do not by any means fall neatly within the traditional Palaeolithic subdivisions (*i.e.* Lower, Middle, Upper), instead frequently crossing their boundaries. For instance, Vindija shows us that Neanderthal groups survived in what is today Croatia until after 30 k yr. BP, well into the Upper Palaeolithic. By this time modern humans had been established elsewhere in the Balkans (in the caves of Bacho Kiro and Temnata, in what is today Bulgaria, and in Kleisoura cave 1, in Greece, for example) for many millennia (Kozłowski 1996; Koumouzelis *et al.*, 2001). Likewise, if the late dates obtained for the Petralona hominid are valid (Grün, 1996), these together with the early dates calculated for the Krapina fossils (Rink *et al.*, 1995) permit the hypothesis that during the last part of the Middle Pleistocene *H. heidelbergensis* and *H. neanderthalensis* may have lived side by side on different parts of the peninsula.

The deconstruction of the idea that biological variation equates to variation in material culture has rendered the Lower–Middle–Upper Palaeolithic scheme inadequate to the task of signifying industrial diversity. This scheme, developed within the intellectual milieu of the late 19th century, today fails to account for the temporal and regional peculiarities of ancient hominid manifestations. Dispensing with the old scheme is, of course, easier than replacing it: a daunting task, since the generic and global character of the old scheme made it both flexible and widely applicable. At present a more effective and refined, though not purely archaeological, framework for discussing the archaeology of the Palaeolithic in the northern hemisphere is the Marine Oxygen Isotope Record, which acts as the global standard for reconstructing Quaternary chronology and climate. This record replaces the old geological scheme of Glacials and Interglacials rather than the scheme linking industries with hominid types. The Isotope Record is only as effective or as ineffective as our ability to correlate with it isolated fragments of the terrestrial record, or cultural and hominid remains.

The demise of the old scheme has also challenged the ways in which we conceptualise and analyse lithic industries. These, the most abundant and enduring remains of ancient hominids, are a dynamic expression of cognitive abilities, of technical traditions and of the social context within which they were produced. In recent years Palaeolithic archaeology has opened up its agenda, moving on from its previous purely descriptive typological approach to examine operational sequences as a means to the better understanding of the conceptual, technical and economic issues involved in the production and use of stone tools (Perlès, 1992). Along with these developments has come the recognition that either the lithic record or our approach to it is insufficiently refined for any answer to the question of which hominid was responsible for which part of the record to be possible. This is true both of the European and Near Eastern industries previously described as ‘Lower’ or ‘Middle’ Palaeolithic and of the Balkan industries.

The African record offers a basis for discussion of the earlier part of the Palaeolithic. Broadly speaking, two main technocomplexes can be identified here. The earlier Oldowan technocomplex consists of core and flake tools of types that began to be manufactured about 2.5 Ma and remained in production for at least a million years. The more recent Acheulean technocomplex, which appeared about 1.5 Ma, consists of core tools of another kind: bifaces, in the form of hand axes or cleavers. Both of these technological traditions are found in the Balkans. Choppers and flakes have been found on the

banks of the river Peneios in Thessaly, Greece (Runnels & van Andel, 1999), in the Yarimbuzgaz cave near Istanbul, which dates from the middle of the Middle Pleistocene (Arsebük & Özbaşaran, 1999), in the Gajtan cave in northern Albania and on the fluvial terrace of Baran in the same region (Fistani, 1993). The occasional chopper or chopping tool has been reported at the Korrision lagoon, on the island of Corfu in the Ionian sea (Kourtessi-Philippakis, 1999), at the Sandalja cave, near Pula in Croatia (Malez, 1974), and in the fluvio-lacustrine deposits of the river Oltet (a tributary of the Olt) in south Romania (Valoch, 1995). Elsewhere in Europe, Oldowan-like industries have been found at (early) Orce in Spain and (later) Isernia in Italy, at Bilzingsleben in Germany and at Vértesszöllös in Hungary.

So far two Balkan sites have produced hand axes that fall within the Acheulean tradition: Palaiokastro, in western Macedonia, and Kokkinopilos, an old polje that is now an impressive terra-rosa formation on the left bank of the Louros river in NW Greece. Two hand axes have been reported at this site (Runnels & van Andel, 1993; Ammerman *et al.*, 1999). A few more, smaller bifaces, possibly deriving from Middle Palaeolithic contexts, have also been found: one at Krovili, in the Rhodope province of Aegean Thraki (Ammerman *et al.*, 1999), some small ovate tools at Tripotamia and Kastro, in the Peloponnisos (Reisch, 1982), and others at Punikve in Croatia (Malez, 1979).

Judging by archaeological finds in other parts of Europe such as Germany and Britain, *H. heidelbergensis* used tools made of wood, antler and stone. The stone industries associated with this hominid generally fall within the Acheulean tradition, whereas choppers and chopping tools are traditionally considered the hallmarks of hominids that preceded *Homo heidelbergensis* in phylogenetic terms. Few choppers and chopping tools have been found in the Balkans and more often than not those we do have lack properly dated stratigraphic provenience. Certainly they cannot be considered a reliable data set permitting the hypothesis that *H. heidelbergensis* was not the earliest hominid to inhabit the peninsula. The questions that naturally arise are whether such tools were used by other hominid species that are not represented in the fossil record, whether the tools represent the survival of old technological traditions into a later period or whether tools of this sort were later developed anew and used by other species in response to the nature of the lithic raw materials available to them. None of these possibilities can be excluded, since the Balkan data, like those from the rest of Europe, are sparse and inconclusive. The matter is further complicated by the existence of lithic assemblages that contain elements of more than one technological tradition. Many Mousterian assemblages, for example, contain large numbers of bifaces and chopping tools (Panagopoulou, 1999). In the light of recent discussion of biological and cultural variation, it is now widely accepted that neither the biface nor the chopper can be used as a type fossil (in other words, a tool characteristic of a single species, culture or date). The Acheulean industries in this part of the world cannot, moreover, be presumed to have been preceded by those consisting of simple flakes, choppers and cores, since early dates have been assigned to some bifaces found in this area, while certain choppers are of later date (Gowlett, 1999). Similar conclusions have been reached in other parts of Europe. In Britain, for example, Clactonian industries have recently been shown both to pre-date and to post-date Acheulean biface industries (Roberts *et al.*, 1995). It is thus not improbable that Acheulean and chopper-flake industries should have existed side by side in time and space in the Balkans, and the question of whether or not they were manufactured and used by *H. heidelbergensis* alone remains open. What we are perhaps seeing in this early record is what Gowlett has called 'dancing of industries' (Gowlett, 1999: 48). Many more modern excavations of clearly stratified sites are needed to clarify the picture.

From at least 130 k yr. BP onwards the Balkans were inhabited by human groups that used Mousterian artefacts, as is shown by the early Krapina dates that we have already discussed and by the sequence from Asprochaliko, in NW Greece, whose deepest strata have been TL dated to 102±14 k yr. BP (Huxtable *et al.*, 1992). It is not clear which type of hominid produced these industries at some sites. Recent evidence from the Near East suggests that for some thousands of years Neanderthals co-existed with anatomically modern humans. We do not know whether or not the two interacted, but they certainly shared the same industrial technocomplex. Sites such as Krapina and Vindija, where Mousterian artefacts have been found in contexts containing Neanderthal bones, give us good reason to hypothesise that Neanderthals created the material culture recovered there. The Mousterian lithic assemblages recovered from some other sites cannot be assigned to either species. Mousterian signatures have been found in numerous cave sites in Greece (Asprochaliko, Kalamakia and Theopetra), in Croatia (Krapina, Mujina pećina and Vindija), in northern Bosnia, in Slovenia, in Bulgaria, in Turkey and in Romania (Bordul Mare and Curata) that have not necessarily yielded hominid remains.

To this sample we may add a large number of unstratified or poorly stratified open-air Mousterian sites where dating and preservation of organic remains are problematic. Elements of earlier technological traditions (such as bifaces) or of later ones (such as backed bladelets) are often unearthed

at these sites (at Kokkinopilos, in NW Greece, for example [Dakaris *et al.*, 1964]). Our picture of these open sites suffers from interference. The fundamental question that remains unanswered is whether they are merely palimpsests of temporally separate events of use by various hominids or whether they are evidence of different technical traditions coexisting in a single lithic industry.

ADAPTATION

It is widely agreed that the Balkans and Gibraltar must have been the gateways to Europe used by early human migrants. The Balkan Peninsula is an area of extremely diverse landscapes, with climatic conditions varying from the maritime climate of the Mediterranean coast to the continental conditions of the north and east. Within this general trend may be found numerous microclimates whose temperatures and rainfall differ markedly despite their physical proximity to one another (Bailey & Gamble, 1990). The mountain ranges in the Balkans, which reach heights of about 3000 m a.s.l., may have delayed the expansion of early humans to the west and north, but they certainly did not prevent it; the mosaic habitats encountered in this area offered conditions that would probably have been favourable to the survival and continuity of the various hominid species.

An important marker of how well a species has adapted to a habitat is population density. Out of all the periods of human prehistory, however, the Palaeolithic is the one over whose population densities there hangs the largest question mark. Although at one time or another various formulae and numbers have been proposed (*e.g.* Sturdy & Webley, 1988), these have been based on generic models of environmental sustainability borrowed from the biological sciences. This approach neglects humanity's most vital weapon: social organisation. Social organisation cannot be quantified; forming any estimate whatsoever of the population densities represented by the early record thus remains an inherent difficulty.

We know very little about how well *Homo heidelbergensis* adapted to the Balkans. This is because many uncertainties still surround the material culture associated with this species. Forty years after the cave of Petralona was discovered, deficiencies in the publication of its archaeological finds have left it merely a palaeontological site, rather than an archaeological one. The number of Mousterian sites found and the diversity of their locations lead us to suspect that the Neanderthals and early modern humans may have been better adapted to the Balkan landscape than was *H. heidelbergensis*. The anatomically modern human populations of the Pleistocene probably were too. It should be remembered, however, that neither here nor elsewhere did adaptation develop linearly, with numbers of settlements and population density increasing steadily over the course of time. The climatic changes of the last 100,000 years and the loss of former habitats such as the productive Adriatic plain that today lies submerged under the Adriatic sea, to which human groups had become accustomed and adapted over the course of many millennia, must have had a significant impact upon human population densities and survival strategies.

As we have already said, the Balkan landscape is of considerable variety, essential to biodiversity. Its mosaic of heterogeneous biotopes, some naturally isolated and thus protected, may explain how different hominid species could have managed to coexist (initially *Homo heidelbergensis* with *H. neanderthalensis*, if the late Middle Pleistocene dates derived for the Krapina and Petralona hominids are valid, and later *H. neanderthalensis* with *H. sapiens*, as we observed in the previous section).

It must also have favoured the adaptation of individual hominid species. This is best seen in the record left by anatomically modern humans, who survived challenges such as periods of climatic change by making use of the many alternative habitats offered by this landscape. During the process of de-glaciation, for example, when the resources exploited by modern human groups before the Last Glacial Maximum changed significantly, modern humans were able to expand into previously unexplored mountainous areas. During this period new camps associated with specialised ibex and chamois hunting sprang up in previously inaccessible upland locations. Klithi and Megalakkos, two sites in the Voidomatis river valley in NW Greece, are a good example of this sort of adaptation (Bailey, 1997).

CONCLUSIONS

The discussion of ancient hominid biodiversity has two closely related parts: the reconstruction of ancient hominid morphology and the reconstruction of social, economic and symbolic behaviour. Bringing together these two different lines of study demands a continuous interaction between archaeologists, palaeontologists, geneticists, and palaeoecologists. Here Palaeolithic archaeology meets biology. Unlike biologists, who work directly with living or extinct species, archaeologists research by proxy. We come to grips with past human societies by excavating and studying the material culture

they have left behind: their artefacts, their settlement structures and their food residues, along with the occasional skeletal remain.

For most of the 20th century the two components of ancient hominid biodiversity were researched more or less independently of one another, biologists exploring pure phylogeny and pure morphology while archaeologists studied the various hominid species' behavioural hallmarks. Since the 1990s, however, discoveries and developments in palaeoanthropological research have raised many questions about the fundamental nature of the differences and similarities between species (Trinkaus & Shipman, 1994). An interdisciplinary and multidisciplinary approach in which archaeologists, palaeontologists, geneticists and palaeoecologists all cooperate is vital if the two parts of the human biodiversity puzzle are to be put together. Our aim must be to build a global view out of detailed local records. In line with this aim, the present contribution has pieced together the main lines of evidence for the presence of ancestral hominid populations in the Balkans and highlighted the questions that have arisen from these.

For many years biologists and archaeologists, and through them the world at large, assumed that the various hominid species developed linearly through processes of progressive change, extinction and replacement. It has now been recognised that in most instances the linear view is not correct. The continual discovery of new finds and of new methodological refinements makes palaeoanthropology one of the fastest changing areas in science. The palaeoanthropology of the Balkans is no exception. Our uncertainties about this area's record are part of a far wider uncertainty as to how events of this sort took place throughout the world.

I began this section by pointing out the main difference between Palaeolithic archaeologists and other researchers in biodiversity. I shall end it with the features that they share.

Firstly, present-day national borders are irrelevant to our research. More often than not, indeed, they are an obstacle to a thorough understanding of the regional patterns of the human past. The populations we study, the human groups of the Pleistocene, were highly mobile throughout the vast expanses of southeast Europe. It was only during the last part of the Stone Age, the Neolithic, that human groups settled down and ethnic traits began to show up in the archaeological record. Although collaboration and the transmission of information across borders are absolutely essential to our research, we are hampered by our different archaeological traditions and schools of thought, by socio-political factors to do with modern Balkan history and of course by language barriers.

The second similarity has to do with our objects and angles of research. Like other animal populations, the human groups of the Palaeolithic spent many thousands of years foraging. They remained highly dependent on the ecosystem in which they lived and must have developed various strategies to manage the resources they lived off. The process of actively modifying natural resources by clearing vegetation for large-scale agriculture and by domesticating and systematically exploiting what were originally wild plants and animals appeared later on in Balkan prehistory, as the Holocene advanced. Biologists and archaeologists alike are thus centrally concerned with adaptation in populations highly dependent on environmental conditions and change. We share, moreover, an interest in the relations between human and animal, between human and plant and between predator and prey. Just what impact, for instance, did human strategies have upon the natural environment of the Pleistocene? Although the traditional view in both archaeology and theoretical biology would hold that Pleistocene humans imposed no undue pressure on natural communities, recent computer modelling of human ecodynamics during the Palaeolithic does not support this view (Winder, 1997). It appears that there is open ground for an interchange of ideas, hypotheses and methods between the two disciplines.

Finally, just as most biologists in this area are actively concerned with conserving the local fauna and flora and with the future of the Balkans' natural heritage, archaeologists here are concerned with conserving a cultural heritage. The fact that certain threatened natural resources have been saved because they are close to significant archaeological sites and *vice versa* is a potent symbol. The Palaeolithic record affords us a long perspective on human history. Learning from the past, archaeologists are able to appreciate the fragility of the ecosystem in which we live. Let us not forget that the Pleistocene witnessed the rise and extinction of many different hominid, animal and plant species. Communication between prehistorians and those whose interest is biodiversity can only have positive results.

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