

ANATOMICALLY ARCHAIC,
BEHAVIORALLY MODERN:
THE LAST NEANDERTHALS AND
THEIR DESTINY

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I. THE MAKING OF A BAD REPUTATION

NEANDERTHALS AS A DEAD-END

The concept that Neanderthals are a side branch of humanity, a dead-end in human evolution, can be traced back to Marcelin Boule's classical analysis of the La Chapelle-aux-Saints Neanderthal specimen (Boule 1911-13). Later boosted by the Piltdown finds and the endorsement received from Keith, what came to be known as the pre-Sapiens theory was borne:

"As formulated by Keith and Boule, the pre-Sapiens theory argued that large-brained, modern-skulled humans were so distinctive that they must have had a long (and honorable) evolutionary history. Besides, anything as special as ourselves must have taken a long time to evolve ... Boule and Keith were distinctively uncomfortable with any suggestion that we might have been descended, relatively recently, from anything less human than ourselves. They preferred to believe that pre-Sapiens humans existed far back into the Pliocene ... relegating all known fossil hominids to aberrant side-branches on the family tree" (Trinkaus and Shipman 1993:308).

This attitude not only led to popular views of Neanderthals as the half-man, half-beast of the famous 1953 movie (Fig. 1), but also had scientific implications for the analysis of the hominid fossil record from even earlier times. In fact, such a belief in the phylogenetic time-depth of modern man was still being strongly upheld by Louis Leakey in the 1960s and, in the 1970s-1980s, influenced his son Richard's rejection of Lucy and her kind as ancestral to both the later Australopithecines and the genus *Homo*

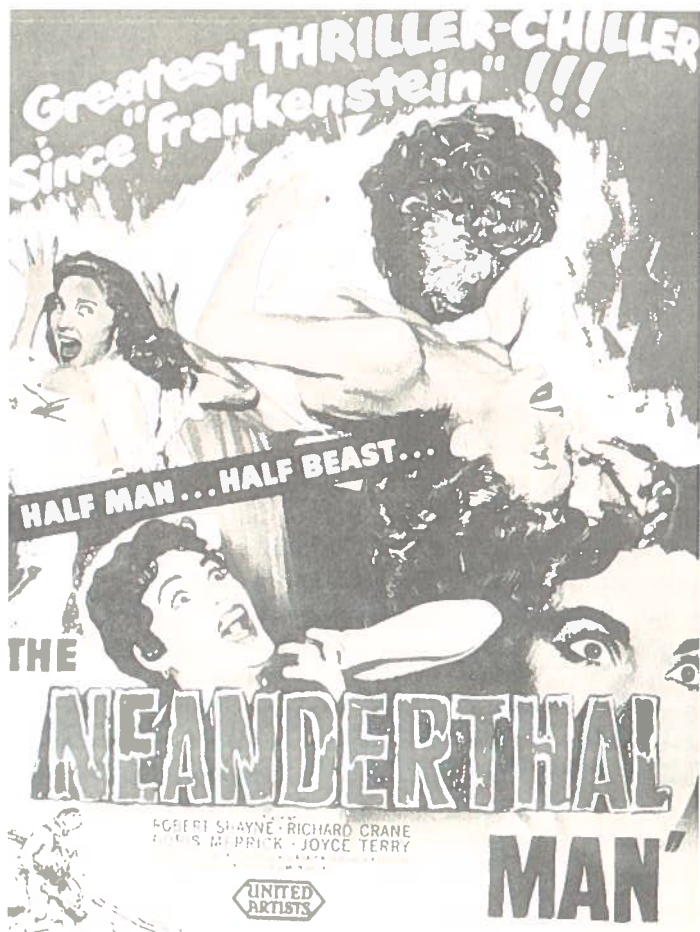


Fig. 1. The 1950s view of Neanderthals as half man half beast as expressed in the poster for the movie The Neanderthal Man (United Artists 1953, reproduced from Trinkaus and Shipman 1993).

(Johanson and Edey 1981; Leakey and Lewin 1981). However, once the Piltdown hoax was exposed, the only paleontological evidence supporting the existence of the pre-Sapiens phylum in

Europe was the Fontéchevade material, upon which Vallois based his reassertion of the theory. Their fragmentary condition and the ill-defined stratigraphic circumstances in which they were found did not prevent Vallois from reconstructing the Fontéchevade fossils with a voluminous cranium and no frontal torus. On the basis of this (questionable, as later studies would demonstrate) reconstruction, Vallois proclaimed that "this is the first time that man, certainly not Neanderthal although earlier than the Neanderthals, has been found in Europe" (Vallois 1949:357).

Besides the fragilities of the interpretation, the paucity of the finds represented another major empirical obstacle to the acceptance of the theory. Whereas Neanderthals and ante-Neanderthal fossils kept being found throughout all of Europe in the post-war years, the pre-Sapiens seemed to be mysteriously absent from the paleontological record. This is how Vallois solved the puzzle:

"Somewhere in the east, doubtless in Western Asia, and prior to the Würm, there must have existed Presapiens men who by gradual development became sapiens proper. ... in parallel fashion in Europe, the Preneanderthals were likewise becoming transformed into the classical Neanderthals. Under these circumstances one may suppose ... that the Swanscombe and Fontéchevade men were emissaries of an Asiatic stock [of humans of modern appearance], coming into Europe during interglacial periods, which however were not able to maintain themselves there... [The Neanderthals] remained in sole possession at the beginning of the Würm. Reappearing with the second period of this glaciation, descendants of the Presapiens lost no time in taking a final revenge on their Mousterian conquerors". (Vallois, *Origin of Homo sapiens*, quoted in Trinkaus and Shipman 1993:310).

The fact that Vallois' pre-Sapiens were almost invisible in the paleontological record did not seem to constitute a problem to

François Bordes' interpretation of the Middle to Upper Paleolithic transition in Western Europe. For him, the Châtelperronian or early Perigordian, with its stone tools made on blades and with its ornaments and bone tools, was a fully Upper Paleolithic culture and the first of its kind to emerge in France. Based on the technology and the typology of lithic assemblages, Bordes asserted that this culture developed from the Mousterian of Acheulian Tradition (MTA). The archaeological continuity between the two, and the belief that Upper Paleolithic culture was the hallmark of modern humans, led him to assume that the makers of the MTA could only have been the biological equivalent of the archaeological remains they left behind: put in other words, the pre-Sapiens makers of a pre-Upper Paleolithic culture.

Bordes also believed that the different Mousterian facies he had recognized in the Périgord represented contemporary ethnic groups who would have lived side by side without culture admixture throughout the whole of the early Würm. Contra Vallois, this implied that pre-Sapiens people would have continued to live in the European continent alongside the classic Neanderthals. This also implied that human bones found in association with the MTA or the Châtelperronian could not be Neanderthal, leading him to reject previously reported associations of Neanderthal remains with the MTA. A case in point is the Neanderthal child found at Pech de l'Azé I, where he argued, against the original excavators, that the fossil had come from some other level, possibly from one with Denticulate Mousterian industries (Bordes 1972, 1984). And he rejected that the Saint-Césaire Neanderthal was the maker of the Châtelperronian materials found in the layer containing his skeleton (Bordes 1981).

As subsequent research has demonstrated (Trinkaus et al. 1999a; Maureille and Soressi 2000), Bordes was wrong on both counts, and his rejection of the empirical evidence in these cases can only

be explained by his philosophical adherence to the pre-Sapiens hypothesis. For him, even if no fossils had been found in early Würm contexts, the MTA as a pre-Upper Paleolithic culture represented archaeological evidence that pre-Sapiens people were not mere phantoms. They had actually existed.

Currently, the view that the classical Neanderthals are the last of a variety of humans that inhabited Europe from at least 300,000 BP onwards and whose origins can be found in the ancestral stock represented by the group of fossils collectively designated as ante-Neanderthals (Arago, Atapuerca-Sima de los Huesos, etc.) is widely accepted: no one seems to be looking for Middle Pleistocene pre-Sapiens fossils any more (Hublin 1996). On the other hand, and since, by definition, contemporary forms cannot be ancestral to one another, the establishment of the fact that Neanderthals in Iberia survived until as late as ca. 28,000 BP (Villaverde and Fumanal 1990; Vega 1990; Zilhão 1993, 1997, 2000; Hublin et al. 1995), whereas modern human fossil remains are now directly dated by AMS elsewhere in Europe from at least ca. 33,000 BP onwards (Richards et al. n.d.), effectively precludes accepting the alternative view initially put forward by Hrdlička (1927) and then developed by Brace (1962) and Brose and Wolpoff (1971), among others. Their multiregional model of human origins asserted that humans had evolved as a single interconnected species throughout the whole of the Old World ever since the time *Homo erectus* left Africa, more than one million years ago. Rather than an extinct side branch, Neanderthals were seen as a phase or grade in the process of overall worldwide change from *Homo erectus* to *Homo sapiens*. This grade was also represented in Africa and Asia by fossil specimens in a similar intermediate morphological stage of the evolutionary process. In sum, the evidence for continuity and depth in the phylogenesis of Neanderthals indicated that there was no need to look elsewhere: Neanderthals were the true pre-Sapiens, that is, the early modern humans of Europe were the result of the local evolution of the

latest Neanderthals, which had become "modern" in morphology and "Upper Paleolithic" in culture in the framework of a gradual, long-term biocultural transition process taking place throughout the period between 50,000 and 25,000 years ago.

If Neanderthals are not pre-Sapiens, and if no pre-Sapiens in Boule's sense ever existed in Middle and early Late Pleistocene times, the only logical way out in the search for the origins of European modern humans was to recuperate the other component of Vallois' model: an extra-continental origin of modern morphology, and a penetration of the latter in Europe through some sort of diffusion process (which did not have to be necessarily represented as the war-like final revenge imagined by him). Vallois had suggested Western Asia. In the 1970s, Vandermeersch's (1981) study of the fossils from Qafzeh and his suggestion that they were Proto-Cro-Magnon and, hence, ancestral to Europe's early modern humans, seemed to vindicate this idea, further strengthened ten years later by the establishment of an early, interglacial chronology, around 100,000 years ago, for the Qafzeh/Skhul people (cf. different papers in Akazawa et al. 1998). However, as the work carried at the same time by Erik Trinkaus (1981) and Günter Bräuer (1984) would show, the search did not end in the Middle East: the ultimate origin of the Qafzeh people was in Africa, where a gradual morphological shift from *Homo erectus* to *Homo sapiens* could be followed throughout the Middle Pleistocene. This continuous phylum was homologous to that represented by the ante-Neanderthal to classical Neanderthal sequence of Europe, and suggested that the two had broken apart many tens of thousands of years ago and had been evolving separately ever since.

The recognition of this fact raised three different problems:

1. what was the extent of the distinction between the two phyla; did they represent different species, different subspecies, or different populations of the same subspecies?

2. what neurological and behavioral implications, if any, could be derived from the existence of such morphological differences?
3. given that Neanderthals disappeared and that this could not have come about as the result of their own isolated transformation into moderns, how, when and why did the modern morphology spread into Europe and eventually replace totally and completely the Neanderthal morphology?

NEANDERTHALS AS DIFFERENT BUT NO LESS HUMAN

Throughout the 1970s and early 1980s, adopting Vallois' premise of looking outside Europe for the origins of modern humans did not entail accepting what had been the basic premise of the pre-Sapiens hypothesis since its original formulation by Boule: the need to distance ourselves from Neanderthals as the archetypal man-as-animal dead end of the human evolutionary process. On the contrary, under the impact of the finds made by Ralph Solecki at Shanidar Cave, emphasis was made on the humaneness of Neanderthals, which tended to be treated in books and television series written for a wider audience as close cousins who, albeit morphologically distinct, would shock no one if dropped in a subway car dressed in proper attire (Fig. 2).

In his popular book and series *Origins*, Richard Leakey, a firm believer, in his family's tradition, in the deep phylogenetic roots of *Homo sapiens* and in the biological separateness of the Neanderthals, explained the bad reputation of the latter in the following terms (Leakey and Lewin 1977:124-125).

"Possibly because he was the first obvious archaic human to be unearthed ... Neanderthal Man has become fixed in the minds of many people as the archetypal human ancestor: a low brow; a thrusting face, but with a receding jaw; fearsome



Fig. 2. The 1970s view of Neanderthals as fairly good-looking people with a primitive technology and not all that different from ourselves (from Leakey and Lewin 1981).

beetle brows; and a stooped, lumbering gait in which a stocky muscular body was dragged about with seemingly malevolent intent. Misconceptions about the Neanderthals' posture came mainly from the relatively complete but severely contorted remains of an old arthritic individual who died at what is now known as La Chapelle-aux-Saints in southern France. The notion of malevolence came from nowhere but a hostile imagination." And he continued: "We can now be sure that the Neanderthals led a complex, thoughtful, and sensitive existence, surviving somehow in the extremely harsh conditions of an ice-gripped Europe."

The archaeological data invoked as the basis for this evaluation were the funerary practices of Neanderthals, particularly the Shanidar burials. Although the evidence has recently come to be regarded as controversial (Sommer 1999), analysis of the pollen contained in the sediment surrounding one of the skeletons found at Shanidar suggested that deliberate arrangements of flowers had been deposited alongside the dead person as part of the burial ritual. The fact that the species present in those arrangements had until recently been used in local herbal medicine further led to the speculation that the Shanidar people already knew the healing properties of those plants. In fact, Leakey concluded his account of the Shanidar Neanderthals with a sentence implying that the evidence for what could be regarded as specifically human behavior was stronger among them than among ancestral modern humans of the same time period: "Although as yet there are no signs of ritual as subtle as the flower burial for our true ancestors, we can be sure that their culture was no less developed". And evidence that the two groups indeed shared a similar level of cultural capabilities was provided, in the Middle East, by the fact that the stone tool assemblages found in the caves containing the burials of Neanderthals and Proto-Cro-Magnon people represented essentially identical Middle Paleolithic technologies.

Leakey's version of how Neanderthals eventually disappeared is also quite telling of the spirit of the time, and seems to have been written as a direct refutation of Vallois:

"By the time the Neanderthal populations slid into eclipse around thirty thousand years ago, truly modern humans had been firmly established for at least twenty thousand years. But there is no convincing evidence to suggest that waves of modern man swept through Neanderthal territory, raping, pillaging, and murdering all who stood in their way. Pockets of Neanderthals, biologically far along their evolutionary

blind alley, would have remained separate from the newcomers until they died out through economic competition. But others who were genetically less distant from the evolving *sapiens* populations might have been absorbed by interbreeding."

The fact that, in the late 1970s, this quite favourable view of Neanderthals prevailed among both physical anthropologists and the media may to a large extent be related to the intellectual environment of the times, still largely influenced, particularly in the anglophone world, by the 1960s ideology of "flower power" and "make love not war", and by the massive opposition among America's University students to their country's intervention in Vietnam. It is not surprising, in this context, that a new research trend emerged precisely at this time. Instead of focusing on the phylogenetic place of Neanderthals in human evolution or on how their looks and achievements compared with those of our "true" human ancestors, some researchers began to look at Neanderthals with a functional perspective, trying to find out to what extent some of their anatomical specificities could be explained as adaptation to their natural and cultural environments. This line of inquiry eventually led to Erik Trinkaus' finding that Neanderthals and Proto-Cro-Magnons had contrasting body shapes that could be explained in simple eco-geographical terms as arctic versus tropical (Trinkaus 1981), which also provided the first hard evidence that the earliest modern humans of Europe, with their tropical body proportions, had indeed come from Africa.

It is also in the framework of this functionalist approach that the notion was borne that robust Neanderthals might have been doing with their muscles what more gracile early modern humans had to do with tools and, hence, the hypothesis that the latter's ultimate prevalence over the former might have been the consequence of a specifically stronger stimulus for cultural and

technological innovation. As Trinkaus and Shipman (1993:417) put it:

“The aspects of their anatomy that are most telling of their behavior are their tremendous strength and endurance. From the robust dimensions of their limb bones ... to the pronounced bony crests and sturdy ridges where brawny muscles attached ... the primary message bespoken by Neanderthal anatomy is “power”. No Olympic athlete of today has a comparable overall robustness... The evidence suggests that the elaborateness and the efficacy of Neanderthal technology was apparently much poorer than that of modern hunter-gatherers, leaving Neanderthals no choice but to accomplish the task of daily life through brute strength, incredible stamina, and dogged persistence”.

In a recent development of this idea, Niewoehner (2001) has shown that there were significant differences in the functional anatomy of the hand between Neanderthals and the Skhul/Qafzeh people, whose carpo-metacarpal remains were much like those of later Upper Paleolithic and Holocene humans. In spite of recognizing that the notion is contradicted by all the available archaeological evidence, which shows that stone tool assemblages associated with both human types in the Near East are indistinguishable in terms of point/tool ratios and of artifactual indicators of the use of hafting, the author was led to suggest that this skeletal evidence meant that early modern humans were using tools with handles much more frequently. This might have given them the adaptive advantage behind their later worldwide spread and consequent disappearance of Neanderthals and other archaic humans with “power”-adapted instead of “precision”-adapted hands.

Even if such paleontological data might be interpreted as strengthening the case for contrasting behavioral performances,

one of the leading figures in Neanderthal research of the last quarter century could still write, as late as 1989, that "the production of complex bone tools, varied personal ornaments and extensive use of red ochre would seem, on the face of it, to provide a strong argument for broadly similar cognitive and social capacities among the late Neanderthals to those of modern humans" (Mellars 1989). This statement, based on the St. Césaire burial evidence, which showed that the Châtelperronian had been the work of Neanderthals (Lévêque and Vandermeersch 1980), is all the more significant since the same author, ten years later, would be arguing strongly in favor of explaining those same features of the Châtelperronian culture as a product of mimicking behavior, as a consequence of the fact that the last Neanderthals of France, impacted by the arrival of modern humans, copied some elements of their culture but without really understanding their full meaning. In ten years time, the Neanderthals had been downgraded from being endowed with similar cognitive and social capabilities to being separated from modern humans by some fundamental cognitive barrier that prevented them from having achieved the fully symbolical behavior evidenced by modern human's extensive use of art in the Upper Paleolithic (Mellars 1998a, 1999).

NEANDERTHALS AS BIOLOGICALLY AND CULTURALLY INFERIOR

Mellars' change of position is a good individual illustration of the major shift in the prevailing attitudes towards modern human emergence that occurred in the academic world during the 1980s. A major factor in this process was the entry in the debate of an entirely new line of inquiry: the inferences regarding past human evolution made from the study of human genetics and, in particular, the mtDNA evidence on which the "Eve" or "Out-of-Africa" hypothesis was based (Cann et al. 1987). Another factor was the gradual incorporation in archaeological interpretation of

the taphonomic method. This incorporation prompted a critical re-evaluation of the major issues of human evolution in the light of a basic principle coined by Lewis Binford (1983). Defining culture as the set of universal behaviors found to be common to all humans on the basis of the ethnoarchaeological study of present day hunter-gatherer societies, he postulated that the capacity for culture could be assumed to have existed in the past only when dealing with the archaeological remains of anatomically modern people. When dealing with archaic humans or with the australopithecines, such an assumption was unwarranted. In other words, such a capacity had to be demonstrated, and the way to do it was to adopt as the null hypothesis that it did not exist: the null hypothesis had to be falsified by showing that the patterns identified in the archaeological record could not be explained in the framework of ordinary mammalian or primate behaviors before accepting that the hominids who produced them were cognitively and behaviourally akin to us.

The geneticists behind the mitochondrial Eve hypothesis argued that all humans today were very closely related, implying a very recent last ancestor, which, on the basis of different measures of diversity and rates of mutation, would have lived in Africa some 200,000 years ago. Neanderthals and other archaic human forms, therefore, had disappeared without contributing to the present gene pool. Put another way, they were not our ancestors, and had been replaced everywhere through the eventual out of Africa migration of Eve's children. This model was elaborated and refined with further genetic studies, culminating in the successful extraction of fossil mtDNA from the original Feldhofer Cave Neanderthal specimen and the inferences derived from its comparison with that of present humans (Krings et al. 1997). The authors of this major paper concluded from their data that the Neanderthals were phylogenetically distant from modern humans and quite probably belonged in an altogether different species.

This line of research, therefore, provided what seemed to be a sound and definitive answer to the first of the three questions outlined above, that of how biologically different Neanderthals were from us. The revision of Lower and Middle Paleolithic archaeology made under the influence of this genetic paradigm and with extensive use of Binford's approach would provide a separate set of arguments that seemed to imply that this biological distance had also had far-reaching behavioral implications. A string of studies, summarized by Binford (1989), Stringer and Gamble (1993) and Mellars (1996a, 1996b), suggested, for instance:

1. That the faunal assemblages found in Lower and Middle Paleolithic archaeological sites represented for the most part scavenging behavior or immediate consumption at the point of procurement; this indicated that the planning depth required for the logistically organized large game hunting documented in Upper Paleolithic times was not part of the behavioral repertoire of Neanderthals; such a lack of planning depth and anticipation could also be seen in the limited distances travelled by raw-materials and, hence, in the small size of groups and social territories; "all indications are that groups in the Middle Paleolithic were uniformly small and their mobility very high whatever the environmental form or dynamics. Related to this lack of mobility and group-size flexibility is the minimal organization of the technology, its quick turnover rate, and the lack of planning depth" (Binford 1989);
2. That the features found in some Middle Paleolithic sites and interpreted as human burials were better explained as accidental preservation or simple discard of dead bodies; even when deliberate interment could be proven, there was no firm evidence of ritual offerings and, therefore, the practice could not be taken as evidence for complex belief

systems; "at best, all the reported occurrences of supposed grave offerings from European [Neanderthal] sites must be regarded as unproven" (Mellars 1996a);

3. That structured hearths and huts were absent from the Lower and Middle Paleolithic record, indicating that the living spaces inhabited were more like the nests of primates than like the organized camps of the Upper Paleolithic, as was also shown by the absence of patterning in the spatial distribution of artifacts and faunal remains; this indicated non-specialized activities and, hence, no division of labor and no evidence for any form of social organization beyond that required by the group's need to reproduce; "we suspect, for example, that the structures at Molodova and Arcy-sur-Cure more resembled "nests" than the symbolic "homes" of the Moderns at Kostenki or Dolní Věstonice (Stringer and Gamble 1993:207)

4. That, in terms of their initial shape, the morphology of Middle Paleolithic tools was largely constrained by the physical laws at work when rocks with a conchoidal fracture were broken, and, in terms of their shape at the time of abandonment, it was the outcome of mechanical wear, through use and resharpening; in sum, instead of representing the imposition of mental templates on external matter, they were the expression of the basic skills required to perform in the framework of a "tool-assisted behavior" as opposed to the true "culture" apparent in the diversity of typologically well-defined bone and stone implements, particularly projectile points, found in the Upper Paleolithic; "... the Ancients, including the Neanderthals, [were] tool-assisted hominids ... Artifacts and weapons, campsites and landscapes were never elaborated in the cultural ways that are so basic to any defini-

tion of what makes a modern human modern” (Stringer and Gamble 1993:216-217);

5. That, combined with the absence of ornaments and representational art, in sharp contrast with the creative explosion of the initial Upper Paleolithic, the above features indicated that Neanderthals lacked the capacity for symbolic thought, implying that the communication device it required, language, did not exist or was exceedingly primitive (Fig. 3); this conclusion, in turn, was in good accord with analyses of the basal skull of the Neanderthals from which a position of the larynx incompatible with or complicative of articulated language was inferred; “They could certainly communicate, as can all social animals, and they no doubt spoke, albeit simply and probably slowly. We argue that the Neanderthals lacked complex spoken language because they did not need it. We could not imagine life without it, but they did not have the social life to require it” (Stringer and Gamble 1993: 217).



Fig.3. *The 1990s view of Neanderthals as a culturally inferior, language-lacking separate species (Observer, reproduced from Stringer and McKie 1996).*

In sum, Neanderthals were not only biologically distinct but also, as proven by the archaeological record, behaviorally inferior. They lacked the capacity for symbolically organized behavior:

“... symbolism in the Upper Paleolithic suffused many elements of behavior, determining such mundane aspects of life as the use of space and objects of everyday existence. In our view, Châtelperronian stone tools and the rudimentary structures found at such sites as Molodova and Arcy-sur-Cure are evidence that the Neanderthals had the capacity for emulation, for change, but not for symbolism.

... when Neanderthals and Moderns came into contact in Western Europe between 40,000 and 35,000 years ago, the Moderns changed the forces of selection on Neanderthal behavior. The social world in which the European Neanderthals now participated was fundamentally different from the preceding 100,000 years, and the archaeological evidence clearly indicates that the Neanderthals imitated certain aspects of modern behavior. But while they could emulate they could not fully understand.”

... the main structural difference distinguishing the Moderns from the Ancients was the practice of symbolically organized behavior.” (Stringer and Gamble 1993:207).

In this framework, the last of the above set of three major questions almost became a non-sequitur: the biologically-based intellectual inferiority of the Neanderthals carried the implication that it was not necessary to explain their disappearance in historical terms, since such would be the inevitable outcome of the massive biologically-based cultural superiority of the moderns. As soon as the latter's expansion began, the Neanderthals, as well as the other kinds of morphologically archaic humans that had developed in eastern Asia, were doomed. However, even if their demise was the inevitable outcome of their biological difference and did not require a historical explanation, two major problems remained before the model could be said to account for all the facts.

"OUT-OF-AFRICA WITH COMPLETE REPLACEMENT"?

The first problem was that the archaeological record suggested that, for more than one hundred thousand years after Eve's death, anatomically modern humans seemed to have behaved just like the Neanderthals. In fact, the above-mentioned list of differences between the Lower and Middle Paleolithic, on one hand, and the Upper Paleolithic, on the other, applied to both Neanderthals and their modern human contemporaries. Therefore, even if the demise of Neanderthals was self-explained by their inferior biology, one still had to explain why, when and how "modern behavior", or "culture", had made its appearance in the evolutionary trajectory of anatomically modern humans. The second problem was that, as proven not only by the Saint-Césaire burial (Lévêque and Vandermeersch 1980) but also by the inner ear of the Grotte du Renne's child (Hublin et al. 1996), the Châtelperronian, the first Upper Paleolithic culture of Europe, heralded in art history studies as the first stage of the creative explosion (Leroi-Gourhan 1964), had been made by Neanderthals. Bordes' argument for continuity between the MTA and the Châtelperronian was vindicated, but the empirical record showed that the implications of that continuity were the exact opposite of what he had expected: not that the MTA was the work of the pre-Sapiens ancestors of Cro-Magnon people, but that the MTA-Châtelperronian sequence represented the Neanderthals' own transition from the Middle to the Upper Paleolithic.

Out-of-Africa supporters have never adequately solved the first of these two problems. Mellars (1998b:107-108) tried by postulating a distinction between "cognitive potential" and "behavioral performance": moderns producing Middle Paleolithic industries in the Near-East or the Middle Stone Age assemblages of Africa possessed a high cognitive potential but were performing below their full capacity as a consequence of "a variety of different environmental and related economic and demographic factors." The

presence of burials such as Skhul or the emergence of blade-based technocomplexes such as the Howiesons Poort demonstrated that the cognitive potential was indeed there, while the incompleteness of the Upper Paleolithic package did not imply that fully modern behavior capabilities were lacking. As noted by Zilhão and d'Errico (1999a), however, this carried the unsolvable internal logical contradiction of recognizing major cognitive abilities among moderns even when they behaved like Neanderthals, while denying them to Neanderthals even when (by burying their dead and by manufacturing blade-based lithic assemblages) they behaved like moderns... In fact, the closest we got to a coherent explanation of why modern behavior took so much time to emerge from modern anatomy was Richard Klein's invoking of a second biological mutation occurring some time around 50,000 years ago. The first mutation would have created the modern anatomy among Eve's immediate descendants, while this second mutation would have been responsible for the advent of language and symbolism among later African moderns, thus promoting a quantum leap in their culture and demography and triggering their invasion of Eurasia:

"For those who favor the replacement hypothesis, a potential difficulty is to explain why anatomically modern or near-modern humans expanded to Eurasia only between 50,000 and 40,000 years ago, more than 50,000 years after they occupied Africa and its immediate southwest Asian margin ... The reason, however, is probably that early modern or near-modern Africans were not behaviorally modern. In every detectable archaeological respect, they were in fact indistinguishable from their Eurasian Neanderthal contemporaries... It was only when anatomically modern Africans developed modern behavior between 50,000 and 40,000 years ago ... that they gained an undeniable competitive advantage over their non-modern Eurasian contemporaries. Arguably, the most likely stimulus for modern behavior was a neurological

advance, perhaps promoting the fully modern capacity for rapid articulated phonemic speech ... The neurological hypothesis requires only a random, selectively advantageous mutation like ones that must have occurred many times earlier in human evolution" (Klein 1998:509-510).

Although logically coherent and, if valid, apt to play the role of the key stone sustaining the intellectual edifice represented by "Out of Africa with complete replacement", this solution had a major weakness, recognized by Klein himself: "the hypothesis is presently impossible to test" (Klein 1998:510). Put another way, it was not a scientific hypothesis to begin with...

The second problem was dealt with by proposing that the Châtelperronian was not an independent achievement of European Neanderthals but, instead, the result of their acculturation by the incoming modern humans (Demars and Hublin 1989; Harrold 1989; Stringer and Gamble 1993; Mellars 1996a, 1996b). A good summary of these authors' reasoning can be found in Hublin (1999:117):

"This Neanderthal transition to the Upper Paleolithic only takes place after the Aurignacian-making modern humans had penetrated in Europe. Among the Neanderthals, the famous "transitional" industries develop in the peripheries of areas where modern groups had settled. It is tempting to see in this the result of contacts, the adoption of techniques, the copying of objects, arms and utensils. Although they continued to manufacture their Mousterian tool-kits and used their own technologies, the contact with Aurignacian populations would have led the Neanderthals to manufacture kinds of objects that had first been brought into Europe by modern humans".

Just proposing a mechanism that worked was not enough, how-

ever, to prove that things actually had happened that way. It was also necessary to falsify any alternative explanations, particularly that of the independent Neanderthal transition to the Upper Paleolithic implied by Bordes' establishment of total continuity between the MTA and the Châtelperronian. In order to achieve this aim, as shown above, Stringer and Gamble (1993) suggested the simplest of all possible solutions: Neanderthals had not made it on their own simply because of their intrinsic incapacities, their lack of truly cultural behavior. Mellars (1998a, 1999) took the argument one step further by fleshing it out with operative analogies for how Neanderthal acculturation might actually have taken place.

Assuming a long-term contemporaneity between the Châtelperronian and the Aurignacian, Mellars pointed out that "in no case of modern ethnographic contact between European and indigenous populations has this kind of separate development been maintained for more than a few centuries" and, therefore, "some fundamental barrier must have existed to prevent the total integration and assimilation of the two populations over this impressive span of 5000-6000 years" (Mellars 1999). Given this, the barrier had to be a cognitive one, and "the ability to copy the habits or appearance of the new, intrusive groups" must somehow have been socially adaptive: "in a contracting, competitive, late Neanderthal world" it would have given individuals "increased personal or social prestige, or even improved mating success." In sum, Châtelperronian ornaments would have functioned as providers of status for male Neanderthals, who would have used them without realizing that contemporary moderns attached much more elaborated meanings to such kinds of artifacts. This "beads for the indigenes" model was typical 19th century anthropology at work one hundred years after going obsolete, as was made explicit in Mellars' example of colonial-time New Guineans as behaving in terms of the "imitation without understanding" of Neanderthals, that is, as people who had copied ob-

jects and technology without a simultaneous transfer of all the associated social, symbolic, ideological and cognitive patterns: "no one has ever suggested that the copying of airplane forms in New Guinea cargo cults implied a knowledge of aeronautics or international travel". And, much as 19th century anthropology liked to compare the behavior of the "primitives" encountered in newly colonized lands with that of European children, so Mellars continued: "to draw another analogy, if a child puts on a string of pearls, she is probably doing this to imitate her mother, not to symbolize her wealth, emphasize her social status, or attract the opposite sex".

From the empirical point of view, this solution rested entirely on accepting as an established fact that there had indeed been a period of close-range, long-term contemporaneity between Châtelperronian Neanderthals and Aurignacian moderns. Although the very early radiocarbon dates reported in 1989 for Aurignacian levels in the Spanish caves of El Castillo (Cabrera and Bischoff 1989; Cabrera et al. 1996) and l'Arbreda (Bischoff et al. 1989; Maroto 1994) came to play a preponderant role in the argument, initially, the proponents of acculturation borrowed elements of Bordes' model of the Middle-to-Upper Paleolithic transition, in this case, the interstratifications between the two cultures described at Le Piage and Roc-de-Combe (Bordes 1984). Bordes, however, had used this evidence to sustain an entirely different argument: that the Châtelperronian was in fact the initial stage of a cultural phylum, the Perigordian, which would have developed in southwestern France alongside the Aurignacian for some 15,000 years. That stratigraphic evidence was invoked to ascertain the independence, the separateness and the evolution without mutual influence of the two cultures and, hence, as further support for Bordes' view on Mousterian variability, synthesized in his famous conclusion that the long-term contemporaneity in a small region of the six Mousterian types that he had identified showed that "people exchanged their genes

more readily than their culture" (Bordes 1968).

Thus, the acculturation solution turned upside down both Bordes' diagnosis of the Châtelperronian and its philosophical premise. Instead of something very different and completely uninfluenced by the Aurignacian (the really solid part of Bordes' analyses of the problem, as confirmed by all subsequent studies — Pelegrin 1995; d'Errico et al. 1998), to the extent that Bordes thought it could only represent the first stage of a completely different culture that would continue to evolve separately for many thousands of years, the Châtelperronian became a geographically isolated episode of imitation of the Aurignacian. Châtelperronian lithics represented Neanderthals copying the blade technology of the Aurignacian, Châtelperron points were stone imitations of the bone points of the Aurignacian, Châtelperronian ornaments, if not the product of spurious associations caused by natural processes (White 1992, 1993), might have been simply traded, scavenged or copied from Aurignacian contexts (Hublin et al. 1996). Hence, contra Bordes, people would have exchanged their culture more readily than their genes... That people actually tend to do both, in the past as well as in the present, seems to have occurred to none of those involved in the elaboration of the acculturation solution.

The combined result of all these studies was that a resurrected and revamped version of the pre-Sapiens hypothesis became the dominant view of the emergence of modern humans in the 1990s. With the exception of the occasional interglacial eruptions of truly ancestral people, this view shared the other basic tenets of Vallois' model: the Neanderthals-as-less-than-human distant relatives that were not part of our ancestry; the Asian (Near-Eastern) origin of the true ancestors of the first modern Europeans; and the complete replacement, with no admixture, of the former by the latter. In fact, even that first exception is not absolute, since some of the staunchest supporters of the accultur-

ation solution have become to speculate that the interglacial and early glacial blade industries and the Neanderthal burials of Europe may be related to an interglacial influx of Skhul/Qafzeh people, or to a long-distance acculturation by the latter: "... the practice of burial and the extensive use of pigments by Near Eastern modern humans seem to predate these behaviors in the Eastern African and European Neanderthals, and this raises questions about the possibility of long-distance diffusion of cultural traits" (Hublin 1998); "... no Neanderthal burial is known ... before early modern humans are proved to have developed this practice in the Near East. Cultural similarities between Neanderthals and modern humans in the Levant might advocate the long distance diffusion of some innovations in the late Middle Paleolithic, such as the extensive use of pigments in the late Mousterian of Eurasia on the eve of OIS 3" (Hublin 2000:171).

Thus we came full circle, fully back to Vallois' 1949 position: at the peak of its popularity, "Out-of-Africa with complete replacement" had become a theoretical proposition which, instead of moving the field ahead into the research of new problems and the refining of previously well-established patterns, had taken it fifty years back in time. Moreover, in order to achieve internal coherence, it had been forced to incorporate lines of reasoning that should have looked very suspicious to any one familiar with the intellectual history of western civilization.

In fact, the "second mutation" solution was pretty much like Teilhard de Chardin's reconciliation between Darwinian evolution and Catholic faith: the bodily evolution of humans was driven by natural selection, but consciousness, what makes us different from the other animals, was proof of God's hand in the process. The internal logic of the model also followed a track that quite paralleled the biblical narrative: Africa as the Garden of Eden; the mitochondrial Eve, like the Eve of the Genesis, as the

mother of all humans; the migration of a “chosen people” (whether the Jews of the Bible or the anatomically modern humans of the model) after having seen the light (or after having been endowed with symbolic thought); mutations happening at a convenient time and in the convenient place in order to be able to play the mechanical role of miracles in driving the events; etc.

The “acculturation” solution, in turn, as it was refined and made more precise in the process of replying to critics, became completely and explicitly modelled after the colonial expansion of European powers over the last five hundred years. Clearly, there had to be something very wrong with an explanation for what happened in the largely empty hunter-gatherer world of 40,000 years ago that was processually akin to what happened when the industrial world started to pour millions of people into the territories inhabited by the last surviving representatives of our pre-urban way of life.

The gradual realization of the fundamental weaknesses of the solutions found by its proponents to the aspects of the “Out-of-Africa with complete replacement” model that were difficult to reconcile with the empirical record contributed to keeping alive healthy but minority alternative views of the emergence of modern humans and of the disappearance of Neanderthals. But the decisive role in the demolition of the model would come from the confluence of a string of studies and discoveries produced in the comparatively short time period of three years comprised between 1998 and 2000.

2. THE COLLAPSE OF A MODEL

Based on the central European evidence, which they interpreted as showing that particular anatomical features of the local Neanderthals were shared by the Upper Paleolithic modern humans of the region, multiregionalists stuck to their view of re-

gional continuity as Out-of-Africa was rising to dominance. Throughout the 1990s, however, the Iberian evidence for a late survival of the Mousterian and of its Neanderthal makers, as well as the dating of the St. Césaire levels containing the Neanderthal skeleton to less than 40,000 BP (Lévêque 1993) became indisputable. It was clear, therefore, that Neanderthals had survived in Western Europe until too late for it to be possible to continue arguing that the emergence of the succeeding modern human groups could be explained solely as the result of the local evolution of that region's archaic population. So, at least in this part of the world, it was clear that some kind of population replacement had indeed occurred, even if how exactly that had happened, with or without biological interaction between locals and immigrants, was unknown or controversial.

This realization was instrumental in triggering a gradual change in the multiregionalists' stand. As is clear in a recent publication by Wolpoff et al. (2001), the original idea of a simultaneous co-evolution into anatomical modernity of the different population stocks created after the dispersal of *Homo erectus* with lots of genetic flux between them has been replaced by what can be dubbed as a "dual ancestry" model of modern human emergence: an African origin of modern anatomy with subsequent dispersal into the Old World yes, but accompanied by substantial hybridization with the local anatomical archaic populations, particularly in such places as central Europe. Smith, in particular, had argued before that the gracile features he identified among the Neanderthal remains from Vindija Cave, in Croatia, could be interpreted as evidence of interbreeding with contemporary modern human populations (Smith 1984, 2000). And the recently reported results of the direct dating by AMS of Neanderthal bones from level G1 of that site to about 29,000 years ago (Smith et al. 1999) certainly represent strong support for that view.

This restatement of the multiregionalist position, however, in fact represents a rejoinder to a middle-of-the-road stance, which, although present before, was explicitly presented as a model of modern human origins by Günter Braüer — the “Afro-European *sapiens* hypothesis” (Braüer 1984). This was also the position previously adopted by Trinkaus, whose 1981 work on body proportions was used to explicitly support an Out-of-Africa model with admixture. Trinkaus’ subsequent popular book on Neanderthals echoed, albeit with much more detail, Richard Leakey’s *Origins* short statement on the possibility of admixture:

“Though the evidence in different regions of the Old World records genuinely different events, nowhere is there evidence for violent confrontations between Neanderthals and modern humans...The mosaic of local evolution, migration, admixture, absorption, or local extinction of Neanderthals was a complex process that occurred over at least 10,000 years. This is a long time for modern humans to spread from the Levant to the Atlantic coast of Europe, whether or not Neanderthals were “in the way”. Slowly, the populations expanded, absorbed or displaced local inhabitants, developed new genetic and behavioral adaptations to new circumstances, retaining the best of the Neanderthals and combining it with the emerging features of the newcomers who more closely resembled ourselves. This same intricate pattern of change, varying in rate and degree, occurred across the entire Old World and gave rise both to modern humanity and to the geographical clusters of traits — many superficial — that are now recognized as racial characteristics. Only humans from the Near East and parts of Europe can claim Neanderthals per se in their direct ancestry. Still, every modern human group surely arose from a Neanderthal-like, archaic human population, even if all these ancestors would not fit our precise and restricted definition of “Neanderthal” (Trinkaus and Shipman 1993:416).

Hard evidence much stronger than any presented before in favor of this view of the facts would come unexpectedly at the end of 1998 with the discovery and subsequent analysis of the Lagar Velho child (Duarte et al. 1999). As it happened, however, the path to understanding the significance of this discovery and to the rapid acceptance of its interpretation was paved by a series of studies published in the preceding years that dealt with the archaeological record, not with the interpretation of fossils. This is because, logically, the "Out-of-Africa with complete replacement" hypothesis had become entirely dependent on the notion of a biologically based inferiority of Neanderthals. The only empirically based biological argument invoked in favor of such a notion put forward in the last thirty years was the shape of the basal skull of the Neanderthals and corresponding inferences regarding the lack of speech capabilities (Lieberman and Crélin 1971). So, once this argument was put to rest (Lieberman 1994; Tobias 1994, 1995), particularly after the discovery of the Neanderthal hyoid bone from Kebara (Arensburg et al. 1989), the notion had to rely entirely on interpretations of the archaeological record from which major behavioral differences and, hence, major differences in the capacity for cultural behavior, were inferred.

UNPACKING THE UPPER PALEOLITHIC PACKAGE

The biological contrast between Neanderthals and moderns has been almost from the beginning of the debate on the phylogenetic position of the former associated with an analogous contrast between the Middle and the Upper Paleolithic. As pointed out notably by Breuil (1913), early Upper Paleolithic industries would indicate a major advance in human behaviors relative to the Neanderthal-associated Middle Paleolithic. Until today, as in the above quotation by Klein (1998), most supporters of the notion of Neanderthal inferiority have continued to sustain that

the Upper Paleolithic is a package of interdependent cultural features appearing more or less simultaneously in the archaeological record at about the time modern humans start to spread out of Africa, shortly before Neanderthals become extinct. They also sustain that the latter never made it into the Upper Paleolithic, even if some of their latest representatives were able to imitate without understanding certain aspects of the package. The notion of an Upper Paleolithic package representing a quantum leap equivalent to the acquisition of true "culture" or "modern behavior" and associated with the emergence of modern humans is also of paramount importance in the theoretical renderings of the process given by Binford (1989), Stringer and Gamble (1993) and Mellars (1996a, 1996b).

A list of the archaeological features commonly considered to define the Upper Paleolithic package can be compiled from Brézillon (1969) and Mellars (1973):

- production of blades used as blanks for tool types of very diverse typology;
- regional variation in lithics, indicating local traditions and ethnic differentiation;
- development and generalization of bone tools;
- internal spatial organization of camp sites;
- broadening of the subsistence base to include birds, fish and sea foods;
- hunting specialization, with concentration on a reduced number of species (often a single one);
- massive use of colorants;
- adornments and art, both mobiliary and parietal.

As research carried out over the last twenty years has demonstrated, however, most of these features are in fact already present in the archaeological record of late Middle and early Late Pleistocene Eurasia. They appear at different times and in differ-

ent places, independently of each other and in association with different types of hominids. Therefore, there is no way they can be defined as a coherent package of features which might be taken as an archaeological proxy for modern behavior.

Debitage strategies oriented for the extraction of blades and producing tool assemblages dominated by Upper Paleolithic types (burins, truncations, backed knives) are documented in last interglacial Europe at sites such as Rocourt and Seclin (Otte 1990). Although Boëda (1990) considers that the core reduction schemes used at these sites are still essentially of a levallois nature (based on the exploitation of surfaces), schemes geared to the exploitation of volumes, that is, of a classical Upper Paleolithic nature, are now documented as well at sites of similar age in France (Révillion 1995) and in the Middle East, where they may go back to ca. 250,000 years ago, as at Hayonim (Meignen 1998). A recent extensive review of the issue (Bar-Yosef and Kuhn 1999) has effectively dispensed with any notion that lithic production systems geared to the extraction of blade blanks are in any way indicative of superior cognitive capabilities or superior adaptive possibilities. They appear tens of thousands of years before the Upper Paleolithic, they are adopted and abandoned many different times, and in many very different and very distant regional cultural trajectories. Their validity as a time-marker and periodization tool is restricted to western Eurasia and Africa, it is not a universal feature of late Upper Pleistocene modern human groups world wide.

Stylistic variation in the modes of levalloisdebitage used in North Africa in early last glacial times patterns along regional lines (Van Peer 1991). The biological status of the authors of such industries is controversial, but in the case of the Magreb they seem to have been the work of the Djebel Irhoud people, a population thought to derive from the local *Homo erectus* and, although belonging in the phyletic line of anatomically modern humans,

to be in a stage of the biological evolution of humankind similar to that represented by European Neanderthals (Genet-Varcin 1979; Hublin 2000). It is also quite likely that the several pre-Aurignacian Upper Paleolithic cultures of Europe, such as the Uluzzian, the Bohunician or the Szeletian were also manufactured by Neanderthals, as is the case with the Châtelperronian. Continuity with preceding Mousterian industries exists in the parts of Europe where those cultures have been identified, indicating that regional differentiation with a possible ethnic content must have been a feature of material culture among Upper Paleolithic Neanderthals and, consequently, among their immediate Middle Paleolithic predecessors as well.

The evolutionary meaning attributed to bone tools seems to have been largely a consequence of the fact that for a long time they were known almost exclusively in the Aurignacian and the following cultures of the European Upper Paleolithic sequence. However, there is no a priori reason to believe that the use of bone and ivory as raw-materials indicates a higher level of cognitive capabilities, unless this is because they have to be shaped using manufacture techniques that imply the existence of mental templates and the imposition of standardized form. But this is also true of wood working, and the set of throwing spears found at Schöningen, in Germany (Thieme and Maier 1995), are there to make the point that both the intellectual requirements and the technical abilities to manufacture the bone points of the Upper Paleolithic already existed 400,000 years ago. True bone tools have also been positively identified even among Australopithecines (Backwell and d'Errico 1999), and bone points have recently been found in South African Middle Stone Age assemblages (Henshilwood and Sealy 1997). Even if the latter were arguably the work of anatomically modern humans, they were not associated with blade-based lithic technologies and, according to Klein, were made at a time when, at least in terms of their settlement and subsistence strategies, those modern humans

were behaving in non-modern ways... The same applies to the widespread use of pigments in Middle Pleistocene African sites dated to more than 300,000 years ago (Barham 1998).

Moreover, bone tools are widespread, although their numbers are highly variable from site to site, in the pre-Aurignacian techno-complexes of Europe likely to have been made by Neanderthals. In some cases they are associated with blade-based lithic production systems, as in the Châtelperronian, in other cases they are associated with Transitional assemblages defined by the production of bifacial points and knives, as in the assemblage from level C of Buran-Kaya III, in the Crimea (Marks 1998). At sites such as the Grotte du Renne, where we can be sure that they were made by Neanderthals, they correspond to large inventories where different types are represented (points, borers, tubes, handles), including items decorated with regularly spaced incisions (d'Errico et al. 1998).

A good example of internal organization of Middle Paleolithic campsites involving construction of complex features is the Portuguese site of Vilas Ruivas (G.E.P.P. 1983; Stringer and Gamble 1993). The collection of shellfish and other seafoods in the late Middle Paleolithic is documented by another Portuguese site, the coastal cave of Figueira Brava, which contained *Patella* shells and bones of arctic seal and of the great auk (Antunes 1990-91). But the regular consumption of aquatic resources goes back at least to interglacial times, as proven by OIS 5 sites from South Africa such as Klasies River Mouth (Klein 1998). Here the shellfish were gathered by early anatomically modern humans, but the mussel hearth recently excavated in Vanguard Cave, Gibraltar (Barton 2000), shows that by at least 50,000 BP, if not before, European Neanderthals were doing the same thing. On the other hand, the consumption of fresh water fish caught in the rivers and lakes of the Eurasian hinterland does not seem to become significant until the Gravettian (Richards et al. n.d.) and

is not, therefore, a feature that may be used to differentiate the early upper Paleolithic from the late Middle Paleolithic.

Hunting practices identical to those used in the Upper Paleolithic are already a feature of the Middle Paleolithic deposits of the Combe-Grenal rock-shelter (Chase 1988). Specialized reindeer hunting patterns similar to those documented in Tardiglacial times have been documented by Gaudzinski and Roebroeks (2000) in northern Germany at the Mousterian open-air site of Salzgitter-Lebenstadt. In fact, as pointed out by Zilhão (1998a), the Neanderthal-as-scavenger model was largely the result of the application of a double standard in the analysis of faunal remains. Most arguments raised in favor of the model were based on the prevalence of "head dominated" or "head and foot dominated" patterns among assemblages from Lower and Middle Paleolithic sites. Such a pattern, however, is also commonly found in later sites, as is the case in the early Neolithic levels of the Dourgne rock-shelter, in France (Guilaine et al. 1993), or in the early Magdalenian levels of Rascaño and El Juyo, in Cantabrian Spain (Altuna 1981; Klein and Cruz-Urbe 1985). In the latter region, moreover, the long-term diachronic analysis of settlement and subsistence strategies showed that no change was detectable at the Middle/Upper Paleolithic divide, and that a significant reorganization of land-use practices did not occur until last glacial maximum times (Straus 1983, 1986).

In spite of the above-mentioned characteristics of faunal assemblages, it has never been argued that Neolithic people obtained their meat from scavenging mouton carcasses killed by wolves or that early Magdalenian Cantabrian hunters (the artists that painted Altamira) scavenged for their venison. Instead, hunting (or butchering of domesticates) was assumed, and body part representation was interpreted in taphonomic or functional terms. Moreover, in their study of the fauna from Kobeh Cave, Marean

and Kim (1998) were able to show that the "head and foot dominated" pattern of the site's Mousterian deposits was reversed once an extensive refitting of shaft fragments was carried out: in the end, they demonstrated that, in fact, leg bones predominated. One of the major implications of this finding was that it questioned the validity of the conclusion that Middle Paleolithic people were predominantly scavengers derived by Binford and others from the bone assemblages of such sites as Combe Grenal, Grotta Guattari, or Klasies River Mouth, where shaft fragments had been discarded by the excavators, thereby seriously biasing the skeletal profiles obtained.

On the other hand, ethological studies demonstrate that, in the mammal world, there can be no such thing as a pure scavenger (Tooby and Devore 1987). If Neanderthals and other pre-modern humans were eating meat, the idea that they were procuring it purely, or mainly, through scavenging, was in the first place counter-intuitive and the least parsimonious explanation of the evidence. Marean and Kim (1998)'s results showed that what was theoretically unlikely was also empirically untenable. Stable isotope analyses have since confirmed their paleontological analyses, showing that Eurasian Neanderthals (including those from the last interglacial levels of Scladina, dated to between 130,000 and 80,000 years ago) were top-level carnivores, obtaining almost all of their dietary protein from animal sources (Richards et al. 2000).

The above examples show that no clear cut division between Middle and Upper Paleolithic seems to be possible on the basis of any combination of criteria relating to stone tool technology, use of bone tools or subsistence and settlement. Actually, the issue is further complicated by the fact that the above list of criteria compiled from Brézillon and Mellars does not consider inter-regional variation. As shown by Combe-Grenal and Salzgitter-Lebenstadt, Middle and Upper Paleolithic patterns of

faunal exploitation in the periglacial areas of Europe rich in reindeer, for instance, are often very similar. But, if such patterns are taken as a criterion of modern behavior, then one would have to consider that French Neanderthals were behaviorally more modern than the anatomically modern humans of the Iberian Upper Paleolithic. And, if blade debitage were the criterion of choice, they would also be more modern than Upper Paleolithic modern humans from southeastern Asia or, for that matter, than most hunter-gatherers of the present.

THE EVOLUTIONARY SIGNIFICANCE OF ART

By comparison with Middle Paleolithic times, the only real novelties in the Upper Paleolithic as traditionally defined are, therefore, art and objects of personal adornment, which do seem to be unknown before 40,000 BP. The whole debate about the emergence of "modern behavior" turns out to be, therefore, about a much more focused issue: when and why did body decoration and figurative art appear in the archaeological record and which is the historical significance of such an appearance.

The most complete and coherent theoretical framework for trying to understand the appearance of art so far presented and one that fits well with the available empirical evidence is Gilman's (1984) model of the "Upper Paleolithic revolution": a relatively slow process beginning in the Middle Paleolithic, whereby increased technological efficiency, bringing about increased productivity and increased population densities, would have culminated in the development of restricted alliance networks, manifested in the appearance of the artifactual indicators of ethnicity (such as the synchronic stylistic variation of functionally identical classes of stone tools) that are already visible in late Mousterian times. At a certain moment, this created the need for forms of personal identification of individuals (adornments) and for ritual practices related with territoriality and group interaction (parietal art).

In this framework, there is no need to assume that the fact that, in Europe, art appears only in the Upper Paleolithic (as defined traditionally), is a consequence of the fact that only anatomically modern humans (not present in Europe before the Upper Paleolithic) possessed the intellectual capabilities demanded by artistic behavior. This model also dispenses with the need to invoke Klein's (1998) second mutation as an explanation for the first appearance of ornaments (ostrich egg-shell beads) in eastern African sites ca. 40,000 BP (Ambrose 1998). That the appearance of this behavior relates to socio-ecological, not biological, processes, is indicated by the simple fact that art is not universally documented among morphologically modern groups: the latter had been around for as much as 100,000 years at the time the earliest examples of art turn up in the archaeological record. Following Mellars (1998b), it could be argued, however, that art indeed eventually appeared among moderns once the socioecological basis for such appearance was mature, the biological capability for symbolism having been there right from the beginning. Conversely, the fact that art never appeared among the Neanderthals who before them inhabited the same regions under similar environmental conditions would show that the latter did not possess such a capability.

Since, apart from parietal art, all other aspects of the "Upper Paleolithic revolution" are documented in the last moments of the historical trajectory of Neanderthals, it seems logical to interpret Châtelperronian adornments and decorated bone tools as a further indication that aboriginal Europeans of interpleniglacial times were in the path towards the completion of that "revolution". If future research confirms that figurative art never actually developed among them, that can be seen as resulting simply from the truncation of that trajectory as a result of the migration into Europe of anatomically modern people with a Near Eastern origin. Although following a parallel track, it is possible that European Neanderthal society had not yet attained, at that time,

the population threshold that would unleash the full gamut of social developments that might have driven their cultural potential in that direction, much as it was not certainly due to the lack of intellectual capabilities that the Selk'nam from Tierra del Fuego did not develop their own writing system. As may have been the case with European Neanderthals and figurative art, they disappeared at a moment of their history when the socioecological basis for written communication was simply not there.

Trinkaus' (2000) recent revision of the skeletal evidence behind the functional approach used to infer behavioral contrasts between modern humans and Neanderthals has also further weakened the case for a biologically-based explanation of the Middle-to-Upper Paleolithic transition. When appropriately scaled for body-size and bone length, many of the lower limb features previously used to indicate a major contrast in robusticity between Neanderthals and the early modern humans of Skhul/Qafzeh and the Early Upper Paleolithic in fact show differences that are not all that significant. Overall, early modern humans of the last interglacial were as "robust" as their Neanderthal contemporaries in many features, and the process of skeletal gracilization was a long-term mosaic process that cut across biological boundaries. Put another way, early modern humans of 100,000 years ago did not enjoy any evolutionarily significant competitive advantage derived from their skeletal morphology and the locomotor or manipulative behaviors it enabled. In Trinkaus' words, most real differences, particularly in the lower limbs, tend to be in "Middle versus Upper Paleolithic rather than late archaic versus early modern human". That is, they tend to be cultural and chronological contrasts related to habitual life-styles and the impact of technological developments. There is no evidence that such contrasts had a genetic basis that would have fixed even late Neanderthals in an archaic body shape unable to accompany the pace of cultural innovation made possible by a modern human body shape fixed since much earlier

times in the evolutionary trajectory of late Middle and early Late Pleistocene African humans.

It is perhaps noteworthy to remark here that most proponents of models of the Middle-to-Upper Paleolithic transition based on the intrinsic biocultural superiority of modern humans have also suggested that the appearance of ornaments and art is in fact best interpreted as the result of social, not biological processes (White 1982; Gamble 1983). However, they sustain that such processes only occurred in the historical trajectory of anatomically modern humans and reject the possibility that that might have been the case among Neanderthals as well. For Stringer and Gamble (1993) and Mellars (1998a, 1998b, 1999), this is because of the Neanderthals' biologically based lack of the required intellectual capabilities. Besides this philosophical *a priori*, the only empirical argument evoked to sustain such a rejection is that of temporal coincidence, also advocated by Hublin (1999). In a nutshell, the argument is that the only evidence for art among Neanderthals (the ornaments of the Châtelperronian) is very late and is contemporary with, or post-dates, the first appearance of art-bearing modern human cultures in Eurasia. It would be an extraordinary coincidence, therefore, if the sudden appearance of this particular behavior among Neanderthals had been a totally independent process: the most parsimonious explanation would be that Neanderthals acquired it in the context of contact with their modern human neighbors, through "acculturation" or through "imitation without understanding".

THE INDEPENDENCE AND ANTERIORITY OF THE CHÂTELPERRONIAN

As pointed out by d'Errico et al. (1998) and Zilhão and d'Errico (1999a), the historical coincidence argument has two major theoretical weaknesses:

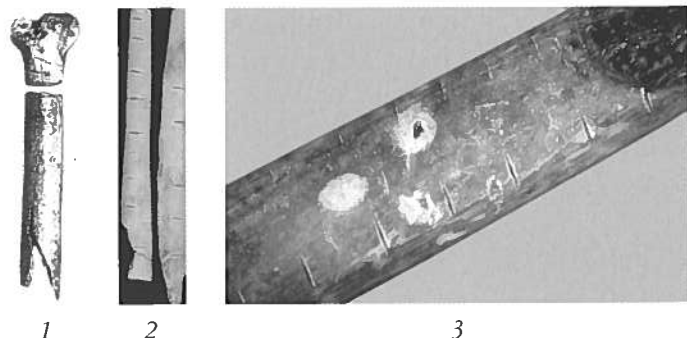
- First, it overlooks that the appearance of art was as sudden among Neanderthals as among modern humans and that this suddenness needs not be considered an anomaly requiring a special explanation. Other innovations, such as agriculture or writing, which arguably had more far-reaching consequences for the environmental and cognitive adaptations of human societies, were invented independently in different places and at almost the same time. Therefore, there is no reason, apart from the adoption of an a priori philosophical stand that the mechanism of human cultural evolution is akin to the phyletic gradualism of Darwin's view of biological evolution, to believe that symbolic expression had to arise as a gradual, long-term process. Much as there was no gradual transition to writing, so the adoption of body ornaments was "sudden", or "punctuated", among Neanderthals as well as among moderns.
- Second, even if it were to be demonstrated that their appearance among the former was accelerated by contact with the latter, that would not warrant the assumption of Neanderthal inferiority. Few present-day anthropologists would accept the view that societies adopting, or adapting, to their own needs, a form of writing system created by their neighbors should be considered inherently incapable of elaborating this system themselves or of possessing, for that reason, a lower level of cognitive ability. It is precisely their use of the new communication system that we consider convincing evidence of equal intellectual standing.

The systematic review of the archaeological and chronometric evidence carried out by d'Errico et al. (1998) and Zilhão and d'Errico (1999b) further weakened the coincidence argument. These studies demonstrated that Châtelperronian ornaments and

bone tools were distinct and showed no influence from the Aurignacian. Moreover, they demonstrated that the emergence of the Châtelperronian and equivalent transitional technocomplexes in Central and Eastern Europe pre-dated the Aurignacian and, hence, the immigration of the anatomically modern people presumably associated with the latter.

The evidence from the Châtelperronian levels of the Grotte du Renne, at Arcy-sur-Cure, shows that the Neanderthal-associated personal ornaments and bone tools found there did not result from a mixing of the archaeological strata, as demonstrated by the coexistence in the same stratigraphic level of finished objects and of the residues of their manufacture. This is in particular the case of a tube of a swan's left ulna found in close proximity to its discarded byproduct (Fig. 4). Not only were these bone tools of local manufacture, they also were typologically and technologically distinct from those most common in the Aurignacian. Reindeer antler, preferred in the latter, was neglected in the Châtelperronian, where the use of ivory is three and a half times more frequent. Small, thick awls made on short bone fragments found in the Grotte du Renne's Châtelperronian levels are unknown in the Aurignacian, whereas such typical Aurignacian types as split-base or lozenge-shaped bone points have never been found in Châtelperronian contexts.

Moreover, the Grotte du Renne's ornaments, as well as those recovered at other Châtelperronian sites, such as Quinçay, were created using techniques different from those favored in the Aurignacian (Fig. 5). With regard, for example, to the pendants — modified bear, wolf, and deer teeth, among others — the carving of a furrow around the tooth root so that a string of some sort could be tied around it for suspension is the technique most commonly used in the Châtelperronian. In the Aurignacian, pendants are always pierced, as also are some Châtelperronian ornaments made on animal teeth or fossil shells. In these cases, however, the



1 2 3

Fig. 4. Châtelperronian bone tools from the Grotte du Renne, Arcy-sur-Cure, France: 1. bone tube of a swan's left ulna (level Xb, square A7) and its manufacture by-product (level Xb, square D11) provide unequivocal evidence of stratigraphic integrity of the levels and of local manufacture of the bone tools (not trade with or collection from Aurignacians). 2.-3. decorated bird bone tubes and bone awls indicate that in late Neanderthal societies symbolism was not a foreign, imported behavior used without understanding but something that permeated all aspects of life, exactly as would be expected in a fully symbolic human culture.

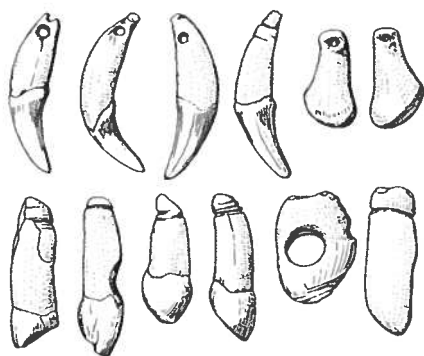


Fig. 5. Châtelperronian ornaments from the Grotte du Renne, Arcy-sur-Cure, France. For suspension, carving a furrow tooth root was the preferred technique, but there are also pierced items obtained by puncturing followed by smoothing and enlarging of the perforation.

Châtelperronian approach involved puncturing the object and then smoothing and enlarging the perforation, whereas the technique most commonly used in the Aurignacian was to thin the whole tooth root by scraping before perforating it.

This evidence shows beyond any reasonable doubt that these kinds of artifacts were an integral part of the material culture of the Châtelperronian, not isolated instances of trade with the Aurignacian or of collection from abandoned Aurignacian sites. On the other hand, as is the case with the new knapping techniques and tool types of the Châtelperronian, they show no influence from the Aurignacian. These facts alone make a strong case against the “acculturation” solution or any other view of the emergence of the Châtelperronian as triggered by the close contact of Mousterian Neanderthals with incoming Aurignacian modern humans. However, there is an even more basic empirical condition of viability for such views to be acceptable: the assumed anteriority of the Aurignacian over the Châtelperronian. The systematic reanalysis of radiometric dates and stratigraphic sequences reveals that the assumption is unsustainable (cf. Zilhão and d’Errico 1999b).

In fact, apart from the “interstratifications” recognized by Bordes in the context of his dual-phylum (Perigordian and Aurignacian) view of the French Upper Paleolithic — interstratifications which, after careful taphonomic reevaluation, reveal themselves to be simple cases of post-depositional disturbance or redeposition with admixture (cf. for Roc-de-Combe in particular, Rigaud 1998) — the case for Aurignacian precedence rests entirely on radiocarbon dating. Due critical consideration of the hundreds of dates available for this period in Europe and the Near East shows that wherever the context of the dated samples is well established, and their chemistry is beyond suspicion, the earliest occurrences of the Aurignacian date to no earlier than around 36,500 years ago. The same radiometric data, however, indicate that the Châtelperronian

and other late Neanderthal cultures such as the Uluzzian of Italy emerged in Europe around 40,000 BP, well before any moderns established themselves in those areas.

Two examples show the impact that taphonomical and definitional issues have had on the chronology of the Middle-to-Upper Paleolithic transition in Europe. El Castillo level 18, conventionally reported in the literature as Aurignacian, has been repeatedly dated to around 40,000 BP (Cabrera and Bischoff 1989; Cabrera et al. 1996). But the samples come from the modern excavations, carried out in an area of the level where no Aurignacian items were recovered. The attribution is made by correlation with the interior area excavated in the early twentieth century where, however, level 18 was a thick palimpsest with at least two occupations: Aurignacian (at the top) and Mousterian (at the bottom).

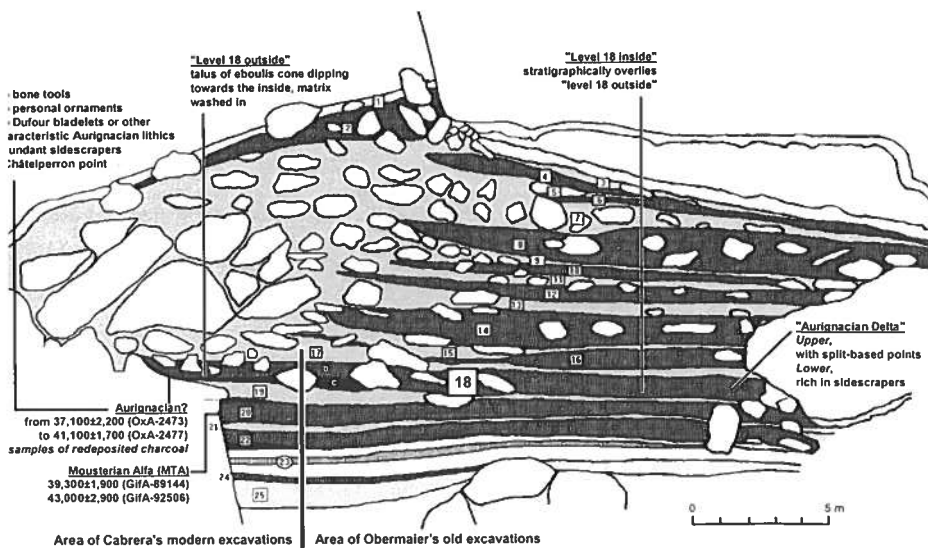
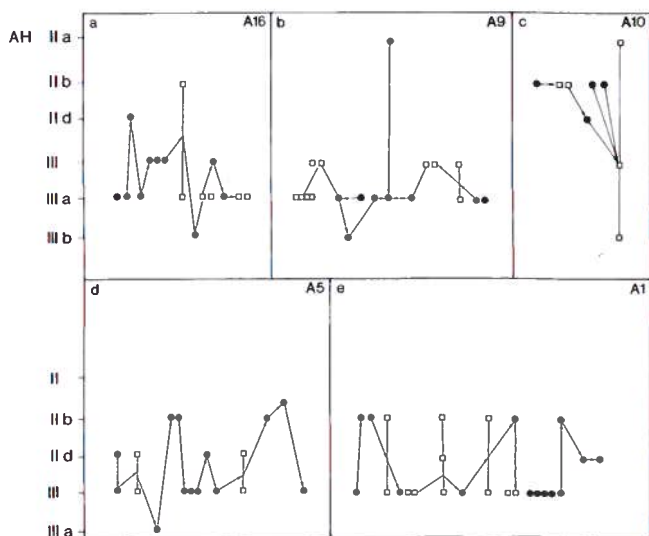


Fig. 6. El Castillo Cave, northern Spain: stratigraphic profile (after Cabrera et al. 1996: Fig. 2, modified) and interpretation of the dating and industrial composition of level 18.

This suggests that the dates may well be chemically and contextually correct but related to the Mousterian, not the Aurignacian (Fig. 6).



Number of refittings between levels						
AH	IIc	IIa	IIb	IIc	III	IIIab
IIc		1	1	2		
IIa			8	7	1	6
IIb				26	13	43
IIc					5	18
III						73
IIIab						63
						59

Fig. 7. Geissenklösterle: evidence for the postdepositional disturbance of the Aurignacian and 'Proto-Aurignacian' levels of the site, after Hahn (1988, Table 4, Fig. 20; points – refittings of debitage, squares – refittings of breaks).

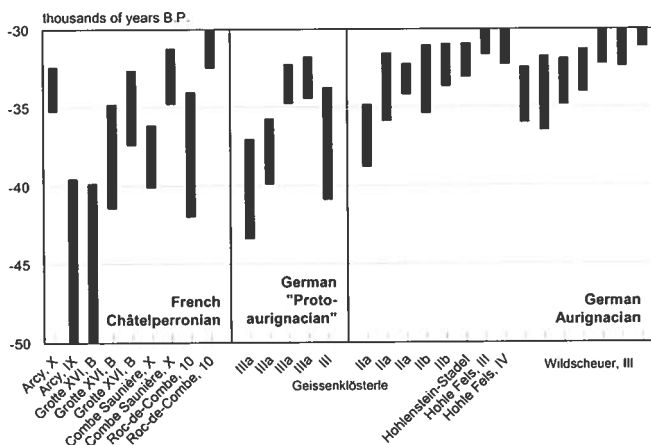


Fig. 8. 95% confidence intervals of AMS C-14 dates on bone for the Châtelperronian of France and the "Proto-Aurignacian" and Aurignacian of Germany. The latter clearly post-dates the emergence of the Châtelperronian. The lack of stratigraphic and industrial integrity of the "Proto-Aurignacian" (as shown by the samples dated to about 33,000 years ago that must be intrusive from the overlying typical Aurignacian) precludes its use as evidence for the contemporaneity between the Châtelperronian and the first early modern human cultures of southern Germany.

In the Geissenklösterle cave, the "Proto-Aurignacian" that has been associated with C14 dates between 37,000 and 40,000 BP (Richter et al. 2000) is a post-excavation reconstructed assemblage (Hahn 1988) whose integrity remains to be demonstrated (Fig. 7). In fact, refits between the "Proto-Aurignacian" levels and the 33,000-year-old typical Aurignacian levels of the site are far more numerous than refits inside this very well defined later horizon. On the other hand, refits inside the "Proto-Aurignacian" levels are more numerous than with the overlying Aurignacian. These facts suggest that, whereas the contamination of the latter by upwardly displaced items may not be as important, the "Proto-Aurignacian" levels contain significant

amounts of material derived from the typical Aurignacian occupation. Two ivory beads considered to belong in the "Proto-Aurignacian", for instance, are identical to the twelve recovered in the overlying art-rich deposits and in all likelihood derive from them. This may as well be the case with the carinated cores and the other types of Aurignacian lithics listed as part of the "Proto-Aurignacian" repertoire. That major vertical displacement of objects took place at the site, for the most part implying the presence of typical Aurignacian material in the lower "Proto-Aurignacian" levels, is also confirmed by the fact that two of the five dated samples collected in the latter gave results identical to those obtained for the overlying deposit (Fig. 8). Consequently, all that can be said about the Geissenklösterle is that bone accumulation, presumably by humans, was taking place at the cave between 37,000 and 40,000 years ago, that such humans may well have been using an Upper Paleolithic lithic technology, and that such an early Upper Paleolithic was indeed contemporary with the Châtelperronian. Nothing warrants, however, the diagnosis of such a possible early Upper Paleolithic occupation as related to the Aurignacian, and its use as evidence for modern human presence in central Europe in that time range is, therefore, unsubstantiated.

Such a presence is all the more questionable once we bear in mind that, in the Near East, where Aurignacian moderns are supposed to have originated, they are no earlier than about 36,000 BP (Bar-Yosef 1996). Once the results that are questionable on chemical, taphonomical or definitional grounds are removed from further consideration, however, the European picture is fully compatible with the data for the Levant. Even in southwestern Europe, where the Aurignacian was supposed to appear quite early on, there is not a single site where it has been reliably dated to before 36,500 BP (Fig. 9). The situation in Italy, Germany, Austria and the Balkans is no different. Conversely, there is no evidence for the presence in post-36,000 BP times of the Châtelperronian

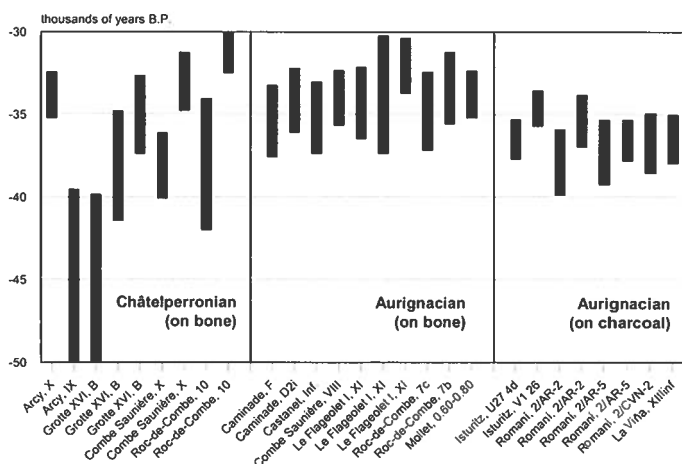


Fig. 9. 95% confidence intervals of AMS C-14 dates for the EUP of France and Spain, including bone samples for Châtelperronian sites, and both bone and charcoal samples for Aurignacian sites. The scatter in the dates for the Châtelperronian after 35,000 BP is due to chemical contamination of the samples. Dates in the range of 36-43,000 years ago that have been related to the Aurignacian but demonstrably correspond to situations where the dated samples in fact are not associated with the Aurignacian material they were supposed to date were excluded.

and equivalent pre-Aurignacian early Upper Paleolithic assemblages anywhere in the geographical range where this earliest Aurignacian has been found. The much younger results, differing at the 95% confidence level, obtained for the Châtelperronian at the same sites and from the same levels where it has been shown to be older than 36,000 BP have often been used to suggest its survival into the period between 35,000 and 30,000 years ago. These discrepancies, however, are more parsimoniously interpreted as evidence for the impact that even a minimal amount of chemical contamination may have on bone samples dating to very near the practical limit of the radiocarbon method than

as evidence for a very late survival of the Châtelperronian and of its long-term local or regional contemporaneity with the Aurignacian.

This stratigraphic and radiometric evidence is an insurmountable obstacle to the acculturation hypothesis and leaves no option other than that of considering the emergence of the Châtelperronian as an autochthonous development, an independent Neanderthal acquisition of "modern behavior". That the manufacture and use of ornaments in the geographical range that would later on be covered by the Aurignacian pre-dates the earliest manifestations of the latter has been confirmed also in the Near East with the recent discoveries made at the Üçagizli site. This cave, located in littoral southeastern Turkey, has an initial Upper Paleolithic level dated to around 39,000 BP which contained perforated marine shell beads (Kuhn et al. 1999; Kuhn personal communication). This find brings the appearance of art in the Near East to the same time range as the emergence of the Châtelperronian and well before the Aurignacian. Although the human type responsible for the Üçagizli material is currently unknown, there is no reason to reject that it was the work of Neanderthals too, particularly given the late dates now available for some Neanderthal specimens from the region, such as that from Amud Cave, ESR dated to about 43,000 years ago by Schwarcz and Rink (1998).

It must be stressed that this review of the evidence in fact brings us back to the evaluation of the Châtelperronian that prevailed thirty years ago, when the acculturation hypothesis made its first appearance in the debate. According to Harrold's (1986) account, the hypothesis can be traced back at least to Klein (1973):

"The fact that this perhaps brutal transition [from the Mousterian] to the Châtelperronian is contemporary with the appearance of the Aurignacian in Western Europe may well be more than a coincidence. Klein (1973:114-118), for instance,

has suggested that the Châtelperronian represents the cultural response of indigenous Neanderthals to the Aurignacian, arriving with *Homo sapiens* from the East, where it is known to be earlier than in Western Europe" (Harrold 1986:164).

At the time Klein formulated his suggestion, however, those who were familiar with the archaeological evidence rejected it altogether. Foremost among them, Paul Mellars, who, after a systematic review of the available data on stone tools, bone-working technology, personal ornaments, subsistence activities, dimension and seasonality of settlements, long-distance contacts and population densities, concluded by posing the following question:

"Does this phenomenon [the middle-upper paleolithic transition] reflect an "invasion" of new human groups into southwest France, or does it represent simply a rapid accumulation of cultural changes occurring within [Mellars' emphasis] the indigenous populations?"

His answer:

"In the writer's opinion the arguments in favor of ethnic and cultural continuity between the Châtelperronian and latest Mousterian populations in southwest France are virtually conclusive ... The implications of the foregoing evidence with regard to the human physical types responsible for the Mousterian of Acheulian Tradition remain to be worked out ... But from the view-point of the archaeological evidence there seems to be little doubt that the first exponents of upper paleolithic technology in southwestern France were of essentially local, as opposed to exotic, origin" (Mellars 1973:272-273).

In sum: before the issue was complicated by the arguments related to the biological distinction of Neanderthals and inferred

cognitive differences, when the archaeological evidence was dealt with at face value and unaffected by prejudices against Neanderthals, the leading researchers of the time had no doubts that the Châtelperronian was an indigenous independent development. Some even went as far as suggesting that there was no limit to what the artistic achievements of the Châtelperronian might have been. Defining his pre-figurative stage of pre-historic art, Leroi-Gourhan (1964), for instance, stated the following:

“The Châtelperronian inaugurates ornaments, but explicit figures have not yet been found. Bones and small stone slabs with regularly spaced incisions, however, are numerous: ochre is very abundant and it is quite possible that figures will be found in the future”.

So far, the practice of figurative art by the last Neanderthals remains an unproven possibility. But there should be no doubt, after the Saint-Césaire skeleton and the inner ear of the Grotte du Renne's child showed that Neanderthals were its makers, that the Châtelperronian stands for the Neanderthal's own “Upper Paleolithic revolution”. Mellars' radical inversion of position is all the more striking in this regard since, in fact, the archaeological evidence sustaining this conclusion has not changed or increased significantly since 1973.

THE LAGAR VELHO CHILD AND THE ADMIXTURE HYPOTHESIS

The site of the Abrigo do Lagar Velho was discovered in November 1998 (Duarte et al. 1999), and it consists of deposits along the base of an east-west limestone cliff on the south side of the Lapedo Valley, near Leiria, Portugal. It was damaged by earth removal in 1992, and all that was left of the original upper 2.5-3 meters of the deposit was a ca 50 cm-thick remnant exposed in a

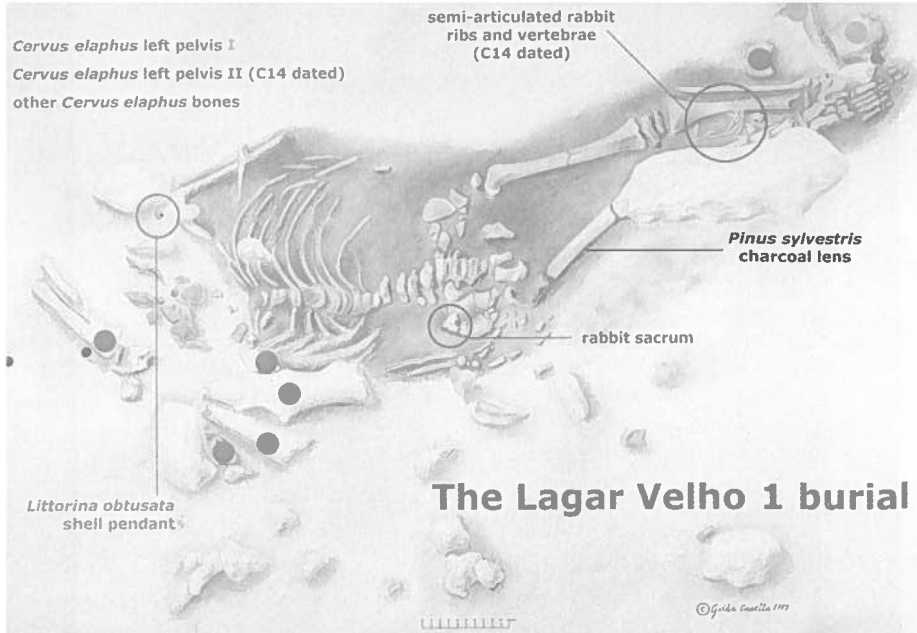


Fig. 10. Plan of the Lagar Velho child skeleton after exposure was completed, showing artifacts and ecofacts associated with the burial.

fissure running along the shelter's back wall and containing Proto-Solutrean and Solutrean industries radiocarbon dated to between 22,000 and 20,000 years ago. The burial of a four year old child (Fig. 10) was found isolated at the east end of the shelter, and Gravettian occupation levels have been identified below current ground level in the west side of the shelter.

The child was on its back parallel to the cliff base, with the head to the east and left side against the cliff. The skeleton and the containing sediment were heavily stained with red ochre, but the alteration of the sediment stopped at the outer border of the skeleton. Analysis of red deer bones found along the edge of the burial pit shows that they are taphonomically distinct from those found in the surrounding and immediately underlying sediments. The latter present eroded surfaces, have a shine that suggests they were chewed and digested by carnivores, often display teeth punctures, and are associated with coprolites. In contrast,

the deer bones found by the head and feet of the child's skeleton — two left pelvises, one distal tibia and two tarsal bones — are very well preserved, show no evidence of carnivore activity, were in contact with the body, and have provided radiocarbon dates showing contemporaneity with the burial event. Furthermore, no artifacts or other evidence of human habitation activities were recovered at this level in this part of the shelter. The simplest explanation for the association is that these bones belonged to parts of deer carcasses deposited with the burial as grave goods. The base of the pit, immediately below and in contact with the child's legs, featured a thin, extensive black lens of charcoal. Anthracological analysis showed that this charcoal came from the burning of a single branch of Scots pine, indicating that a ritual fire was lit before the deposition of the body. This interpretation is strengthened by the fact that no traces of charcoal were found in the adjacent and underlying deposits.

The only diagnostic archaeological items in the burial were the charcoal, the red ochre staining and a pierced *Littorina obtusata* shell found near the cervical vertebrae. In addition, four pierced *Cervus elaphus* canines were discovered during screening of the site, in close association with the cranial fragments scattered by the earth removal, suggesting that the child was wearing some kind of decorated headdress. Similar burials with pierced shells and/or teeth and a covering of ochre are known particularly from the Gravettian of Europe, especially from Britain (Paviland), Italy (Arene Candide, Barma Grande, Caviglione, Ostuni) the Czech Republic (Brno-Francouzská, Dolní Věstonice) and Russia (Sunghir) (Svoboda et al. 1996; Aldhouse-Green and Pettitt 1998; Bader 1998; Giacobini 1999).

AMS radiocarbon dates were obtained from samples of charcoal [24,860 ± 200 B.P. (GrA-13310)] and red deer remains [24,660 ± 260 B.P. (OxA-8421), 24,520 ± 240 B.P. (OxA-8423)] directly associated with the burial and of a vertebra from a semi-articu-

lated section of a rabbit vertebral column [23,920 ± 220 B.P. (OxA-8422)] immediately overlying the legs. The dates for the rabbit vertebra and the charcoal lens effectively bracket the burial between 24,000 and 25,000 B.P., with the date for the charcoal being that which is most closely related to the archaeological event, placing it between 24,500 and 25,300 radiocarbon years ago.

During excavation and the initial cleaning and reassembly of the child's remains, it was assumed that these represented a juvenile of the European late Aurignacian and Gravettian human population. The attribution of the skeleton to this early modern human sample was based on both expectations from its archaeological context (only early modern humans were known from this time period in Europe) and the clear, prominent *mentum osseum* (chin) on the mandible, one of the first elements excavated of the burial and a distinctive morphological feature of modern humans. However, during excavation and early in the paleontological analysis of the human remains, it was noticed that it presented a curious mosaic of features, most of which aligned it with contemporaneous early modern humans. But the following, among others, were reminiscent or even distinctive of the Neanderthals (Trinkaus et al. 1999b):

- supraorbital thickening;
- zygomatic frontal process breadth;
- symphyseal retreat;
- shoveling of the lower second permanent incisor;
- pectoralis major tuberosity;
- crural proportions (Fig. 11);
- tibio-femoral robusticity (Fig. 12).

Crural proportions and their implications in terms of overall body shape are particularly important in this regard because the study of present-day populations has proved that this is a genetically-

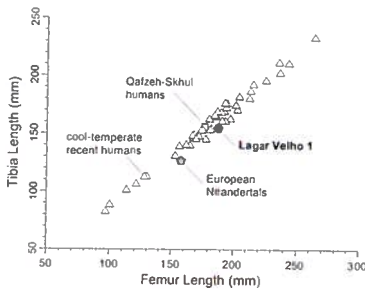


Fig. 11. Plotting of the tibial intermetaphyseal versus the femoral intermetaphyseal diaphyseal lengths of the Lagar Velho child shows that his body proportions were closer to Neandertals than to modern humans.

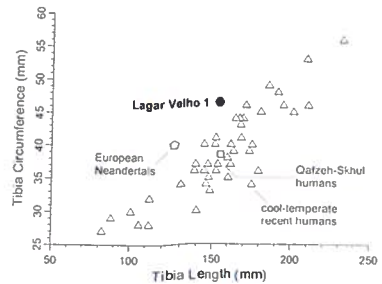
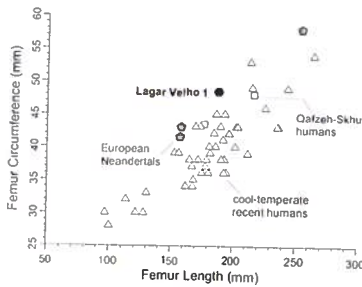


Fig. 12. Indices of lower limb robusticity indicate that the Lagar Velho child was closer Neandertals than to modern humans.

inherited feature, as shown by the fact that the basic patterns of body proportions are already established in the fetal stage of development. This is widely recognized by all students of human evolution, even among supporters of Out-of-Africa. Stringer (1998:30), for instance, has argued that "the apparent presence of the distinctive Neanderthal body shape in a child as young as the [two-year old] Dederiyeh [a cave site in Syria] infant certainly seems to emphasize the importance of a genetic component in its development".

This makes it possible to compare Lagar Velho not only with the few skeletons of other children but also with those of adults from

the same time period. And, among the two possible ancestral populations of the group to which this child belonged, it is a well-established fact that all Neanderthals had arctic body proportions. On the contrary, all European early modern humans had tropical body proportions, betraying their recent (in evolutionary time) African origin, in spite of the fact that they had been living for many millennia in the very cold steppe-tundra environments then extant throughout the unglaciated parts of the continent located to north of the Pyrenees. The trivial developmental lesions and normal growth patterns of developmentally plastic aspects of the Lagar Velho child's skeleton indicate that developmental abnormalities cannot account for his body proportions. Consequently, the observed mosaic was interpreted to indicate that when early modern humans dispersed south of the Ebro Frontier after 30,000 BP (Zilhão 1993, 1997, 2000), they reproductively intermingled with the resident Neanderthal populations. Admixture between Neanderthals and early modern humans is the only explanation which conforms to the empirical evidence of the skeleton, the relevant Late Pleistocene human fossil record, and current knowledge of human developmental biology.

This explanation implies that, when early modern humans dispersing into Iberia encountered local Neanderthal populations, the two groups recognized each other as human, with generally similar behavioral capabilities, repertoires, social systems, communication structures, and adaptive strategies. There may well have been significant cultural contrasts, but the fundamental differences must have been relatively subtle. Even if, in the perspective of some contemporary scientists, one group was less human than the other, the simple fact that they regarded each other as suitable mates leads to the inescapable conclusion that, in the perspective of mid last glacial humans in Iberia, they were all people.

Although, overall, this interpretation was warmly received both by paleoanthropologists and the general public, it also met with some opposition, most of it based on the mtDNA evidence (cf. comments in Trinkaus et al. 1999b). In sum, it was argued that the interpretation had to be wrong because: (a) the genetic evidence showed that Neanderthals belonged to a different species and, therefore, by definition, could not have interbred with modern humans; and (b) if interbreeding had occurred, traces of a Neanderthal input would be detectable in the mtDNA of present-day Europeans in general and Iberians in particular, but such is not the case.

The results reported by Gagneux et al. (1999) on the mtDNA of African apes, however, have shown that contemporary interbreeding populations of chimpanzees are internally more diverse than those of modern humans and our Late Pleistocene fossil ancestors put together, including the one Neanderthal specimen analyzed by Krings et al. (1997, 1999). Geneticists compute the time-depth of a split from a common ancestor on the basis of the amount of genetic difference between the two species whose phylogeny they are trying to reconstruct. The interpretation most commonly derived from the work by Krings et al. is that the genetic difference between Neanderthals and present day humans means that they were two different species which split 300,000 years ago. In that case, however, the much larger difference between populations of chimpanzees would imply that those populations belonged to different species whose last common ancestor would have lived a lot more than 300,000 years ago. Since that is not the case, there are only two possible outcomes to the contradiction: either Neanderthals and moderns were conspecific populations at the time they co-existed and interbreeding at contact is what one should expect; or the use of present genetic variability to predict past phylogenetic processes with the degree of resolution required in the case of the evolution of humans over the last 100,000 years is not warranted.

In fact, both aspects of this contradiction are pertinent. The use of present-day genetic patterns to interpret late Upper Pleistocene demography rests on the assumption of a high degree of demographic continuity from that time until the present. This assumption, however, is highly controversial. In the Iberian case, for instance, we simply do not know whether its present-day relative genetic homogeneity is the product of a long-term continuity in settlement going back as far as the initial Upper Paleolithic, or a consequence of more recent historical and demographic processes, such as the expansion of agriculture along the Mediterranean shores or the large-scale dispersals that occurred in proto-historic and early historic times (Zilhão 1998b). Moreover, since extinction can affect genetic lineages and regional populations as much as it can affect species, the fact that no trace of an extinct lineage such as the Neanderthals can be found in present day Iberian populations does not mean that, in an evolutionary sense, they are not part of our ancestry. For instance, although no specific genetic contribution of *Homo erectus* has so far been identified among present day populations, that does not mean that *Homo erectus* was not an earlier human ancestor. And the fact that Neanderthals may have contributed little or nothing to the genetic makeup of today's Europeans does not mean that they did not contribute significantly to the genetic makeup of the immediately succeeding European populations of early pleniglacial times. An a priori rejection of this possibility would imply believing that the laws of evolution ceased to act upon human populations once the modern morphotype became dominant, that is, that humans have ceased to evolve in the last 30,000 years. This interpretation has been extensively rejected by paleoanthropological research over the past several decades (cf., for instance, Holliday 1997, 1999, and references therein).

Analysis of the mtDNA extracted from a Middle Paleolithic Vindija Cave specimen (Krings et al. 2000) and from a 29,000-year-old fetal or neo-natal skeleton found in Mezmaiskaya Cave,

northern Caucasus (Ovchinnikov et al. 2000), has been claimed to represent further support for the view of Neanderthals as a different species, given its similarity with that of the original Neander valley specimen. The significance of these results, however, is uncertain, given that the taxonomic status of the Mezmaiskaya child, reported as a Neanderthal infant, is in fact controversial. As discussed by Hawks and Wolpoff (2001), the geological, archaeological and dating evidence show that this infant is a burial from a level even more recent than the Upper Paleolithic preserved at the site. Its anatomical features, moreover, make it quite possible that, instead of a Neanderthal, the Mezmaiskaya remains correspond to an eastern European equivalent of the Lagar Velho child.

The correct interpretation of the Neander valley hominid fossil mtDNA evidence is, therefore, that, by primate standards, present-day humans ought to be considered abnormally homogeneous. Their low mtDNA variability is consistent with a single recent origin for modern humans but does not imply that Neanderthals were a different species. It simply confirms, from genetic data, what paleontologists have established for about a century on the basis of the fossil bones: that Neanderthals, as a separate, well-defined geographic variant of humanity which became differentiated during the Middle Pleistocene, are now extinct. That does not mean that they did not contribute to the gene pool of subsequent populations. The Lagar Velho child's anatomical mosaic suggests that they did, even if such a contribution eventually became so diluted as to become unrecognizable today. The issue at stake, however, is not about the pedigree of present humans but about the demographical processes that occurred in Europe between 40,000 and 25,000 years ago. And, in the context of our current knowledge of the phylogenetic significance of the traits present in the Lagar Velho child, one cannot but conclude that Neanderthals contributed to the gene pool of anatomically modern Iberians of 25,000 years ago, even

if such a contribution was subsequently diluted and eventually became invisible.

Testing of these divergent interpretations of the fossil mtDNA evidence required that the Neanderthal material were compared with that from contemporary fossil modern humans instead of present-day populations. The Neanderthals-as-a-different-species hypothesis carries the implication that early modern human mtDNA should be much more similar to that of present-day humans than that of the Neanderthals. Conversely, the Neanderthals-as-a-different-population hypothesis carries the implication that early modern human mtDNA should be as different from that of present-day humans as the Neanderthals. Recent publication (Adcock et al. 2001) of the mtDNA extracted from the Lake Mungo 3 skeleton, an Australian early modern human dated to about 60,000 years ago, is consistent with the second hypothesis, not with the first.

3. NEANDERTHAL EXTINCTION AS HISTORY, NOT TELEOLOGY

At present, therefore, all lines of fossil evidence, both skeletal and genetical, seem to be converging in favor of the view that the modern human morphotype emerged in Africa and subsequently spread to the rest of the world through a demic diffusion process that included extensive admixture with local archaic populations. Even former proponents of strict multi-regionalist models now recognize that modern human emergence in Europe was associated with gene flow from exogenous populations likely to be of ultimate African origin (Wolpoff et al. 2001). Conversely, most former proponents of strict out-of-Africa models now accept that interbreeding between incoming moderns and local Neanderthals may have occurred at least on occasion (Vandermeersch 1995; Hublin 2000).

This new understanding of the evidence is in turn consistent with the archaeological findings which show that, in the European case, at the time of contact, many of those local anatomically archaic populations possessed cultural capabilities identical to those of the modern human immigrants. This makes admixture all the more likely, although, by the same token, it does not preclude situations of conflict, mutual avoidance or social fragmentation followed by extinction. Thus, after two decades of polarization between total continuity and total replacement, the argument about modern human origins in Europe is finally settling around the clarification of three issues:

1. whether interbreeding was occasional or common and what was the resulting degree of admixture between the two groups;
2. whether the extent to which both groups mixed varied in space and time, or can be assumed to have been fairly uniform across the whole continent and throughout the whole period of coexistence;
3. whether contact and admixture were biological, cultural, or both biological and cultural processes.

The available chronometric evidence shows that, south of the Ebro river (Zilhão 1993, 1997) and along the northern shores of the Black Sea (Chabai and Marks 1998), Neanderthals are known to have survived until 30,000 BP or after. The same seems to have happened in Croatia, given the 29,000 BP dates obtained for the Neanderthal material from Vindija (Smith et al. 1999), and in England, where no evidence for modern humans is known before ca. 30,000 BP (Aldhouse-Green and Pettitt 1998). However, assuming that the earliest Aurignacian was the work of moderns, their establishment in the Franco-Cantabrian region and the central European plain dates to about 36,500 years ago (Zilhão and d'Errico 1999b). Thus, even when the standard error of radiocarbon dates is accounted for, the long-term contem-

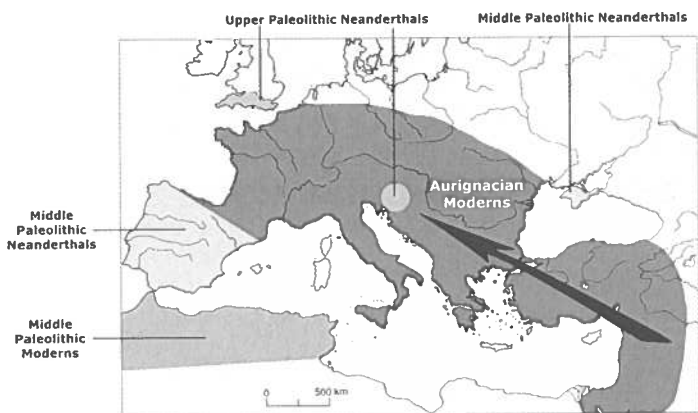


Fig. 13. The last European refugia of Neanderthals, 30,000 years ago.

poraneity of the two groups cannot be denied, at least in the extreme peripheries of Europe (Fig. 13). On a continental scale they did coexist, but such coexistence may have taken place across essentially stable and largely impermeable geographical frontiers, as in the Ebro frontier model of the Middle-to-Upper Paleolithic transition in Iberia (Zilhão 1993, 1997, 2000). Given the size of hunter-gatherer territorial ranges and the length of time involved, this does not imply that each group ignored the existence of the other: chance encounters and cross-border exchange must have occurred, even if separate biocultural identities were maintained for several millennia.

The long duration of these frontier situations nevertheless suggests that a simple model of mutual avoidance between immigrants and locals can explain well the basic features of the European pattern. Retreating before the advance of moderns, for epidemiological, demographic, cultural or economic reasons, Neanderthals would have become restricted to regions where

they maintained some kind of adaptive advantage. In the environmentally homogeneous core areas of the continent, the end-result would have been a rather rapid replacement with minimal cultural interaction and minimal biological admixture. Once the adaptive advantage enjoyed by Neanderthals in the peripheral regions where they survived had vanished, because of changes in the environment or in the demographic and social fabric of both groups, moderns would have begun to encroach in their neighbors' territories. However, contrary to what had been the case in the central European plain a few millennia before, retreat was now impossible, given the cul-de-sac nature of these last Neanderthal refugia. Consequently, interaction was inevitable and extensive admixture likely to have occurred, as suggested for the Iberian case on the basis of the mosaic of modern and Neanderthal features apparent in Lagar Velho skeleton.

In the above scenario, contemporaneity between Neanderthals and moderns would have been extremely short-lived at the local and regional levels. This may go a long way into explaining the lack of convincing evidence for a long-term contemporaneity in the same region between assemblages attributed to Neanderthals on one hand and to modern humans on the other. If, in any particular region, Neanderthals and moderns had lived side by side in closed proximity, that is, in the same territories and competing for the same resources, for many centuries, the cultural remains left behind at sites should give us some indication of that.

The interstratification of Aurignacian and Châtelperronian levels could be one such indication, provided that one could reject the alternative hypothesis that it represented an ebb and flow of territorial boundaries. As discussed above, however, the few reported instances of such an interstratification are best explained by geological or taphonomical, non-cultural processes, or by mistaken readings of the sites' archaeosedimentary sequences. Furthermore, the long-term contemporaneity of Neanderthals

and moderns, at a local or regional level, without admixture, and with Neanderthals being able to maintain their separate biological identity and cultural traditions throughout the process, would surely have entailed many instances where the levels from the time period in question would correspond to non-stratified palimpsests containing a mix of remains left behind by both groups. What the archaeological record shows, instead, is that the Châtelperronian and the Aurignacian are always found in well separated levels (at least in modern excavations), and that the presence in one level of items typical of the other can always be explained by post-depositional disturbance. And when palimpsests do exist and are not an artifact of taphonomical processes, they correspond to situations of very low rates of sedimentation, where the amount of time represented in the strata is in the order of many millennia, not of a few centuries only.

An alternative way of substantiating the long-term contemporaneity of the two groups at a local or regional level would be the demonstration that cultural developments occurring in one could only be explained as a consequence of cultural exchange with (or of cultural influence received from) the other. This is the argument put forward in the framework of the acculturation hypothesis but, as discussed above, the available radiometric data make it impossible to accept the hypothesis that the emergence of the Châtelperronian was triggered by the arrival of Aurignacian moderns to the Neanderthal territories of the Franco-Cantabrian region. Moreover, no convincing instances of mixed Neanderthal/modern cultural entities (that is, genuine assemblages that are part Mousterian or Transitional and part Aurignacian) have so far been described anywhere in Europe. This has been claimed for sites such as the Trou Magrite (Otte and Straus 1995) or Vindija cave (Karavanić 1995; Karavanić and Smith 1998), on the basis of the co-existence in the same levels of items generally considered to be typical of either the Aurignacian or the Châtelperronian and other Transitional cultures. In fact,

however, the levels in question are demonstrably disturbed by post-depositional processes (Zilhão and d'Errico 1999a, 1999b). More importantly, such a coexistence is not enough to demonstrate the influence of one culture on the other since it does not rule out the possibility that we are dealing with palimpsests of different occupations by different groups that may have taken place far apart in time, as indeed must be the case with level G1 of Vindija, given the temporal spread of many millennia shown by the ages obtained on individually dated bone samples. To demonstrate that an actually mixed technology existed, it would be necessary to show, for instance by refitting studies, that items such as a blade with Aurignacian retouch and a Châtelperron point were manufactured from blanks extracted in the framework of a single reduction sequence. So far, such a demonstration is lacking.

As is the case elsewhere in Europe, no demonstrably Neanderthal-modern mixed cultures exist in the Iberian Peninsula either. The earliest Upper Paleolithic industries of Portugal and southern Spain show no Mousterian influence, and no Upper Paleolithic influence is noticeable in the latest Mousterian industries from these regions (Villaverde et al. 1998; Zilhão 2000). Yet, extensive admixture between moderns and Neanderthals has been suggested on the basis of the anatomical evidence provided by the Lagar Velho child. Although it could be argued that the lack of evidence for admixture in the cultural realm contradicts the phylogenetic interpretation of the child's anatomy, such an objection would not be pertinent. The transmission of cultural traits is a completely distinct process from the transmission of biological traits. The former depends on human volition: whether a given technology or behaviour is maintained and taught to the next generation or replaced by something new is a matter decided upon by individuals and social groups. No one, however, has the power to decide whether a given anatomical trait will or will not be transmitted: this is determined by the rules of sexual

reproduction and is the domain of Darwinian natural selection, which operate independently of any conscious individual or social decisions.

In a scenario of short-lived contemporaneity on a local scale, with extensive admixture resulting in the quick absorption of one group by another group, it would not be unexpected to see the culture of the side that predominated become the culture of the new biologically mixed populations. Put another way, in such a scenario one can almost predict that admixture would be much more visible in the realm of biology than in the realm of culture. This is all the more so if we bear in mind that, with few exceptions, only a very small part — stone tools — of past cultural repertoires tends to survive until the present. In the Iberian case, this is exactly the problem: the cultural information we have on the situation immediately before and immediately after the transition is restricted to lithic technology and subsistence behaviour. The lithics of the Aurignacian of Iberian regions south of the Ebro show no Mousterian influence. But this tells us very little about the nature and intensity of the cultural interaction between moderns and Neanderthals in the realm of myths, beliefs, usages or, more simply, the technology of perishable materials.

For the moment, therefore, we can only work with inferences from the biological facts. And the mosaic anatomy of the Lagar Velho child does indicate that, regardless of what we see in the realm of lithics, admixture between the two groups must have been significant, at least in such cul-de-sacs as the Iberian Peninsula. Conversely, the fact that the same genetically inherited traits borne by the Lagar Velho child are not found in the contemporaneous skeletal material from such western and central European sites as Paviland (Trinkaus n.d.) or Dolní Věstonice (Svoboda et al. 1996) suggests that, in these regions, interbreeding may have been rare or insignificant.

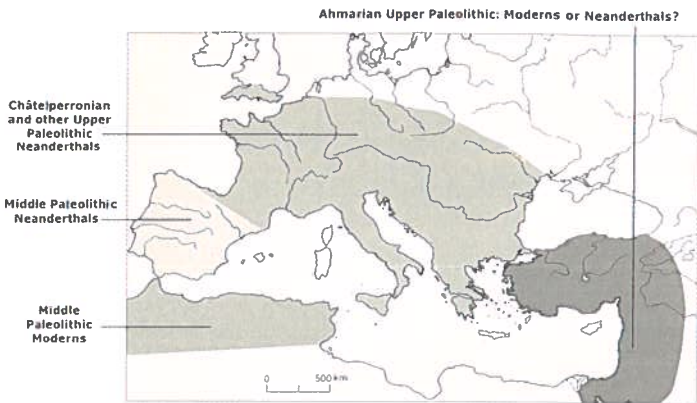


Fig. 14. The geographical distribution of Neanderthals and moderns before ca. 36,000 years ago, when the earliest Aurignacian spreads between Asturias and the Near East.

Alternatively, the absence of such traits may be related to the fact that the central European material dates to ten thousand years after the time of contact, as opposed to only three thousand in the Portuguese case. Such an explanatory framework would make it possible to accommodate the evidence for gene flow claimed by different authors (cf. Smith 1984) on the basis of the earlier (but fragmentary) modern human skeletal material from Hahnöfersand or Mladeč, as well as the suggestion that a genetic input from moderns explains the gracile features of the very late Neanderthals from Vindija's level G1. In at least some regions of central Europe, therefore, it would be possible to model the replacement process after the Iberian case, that is, as a previous instance of extensive biological admixture in which the culture of moderns (or, at least, the archaeologically visible aspects of culture) became the culture of the new admixed groups: put another way, in which Neanderthals were essentially absorbed by the incoming modern human populations. In this scenario, the

anatomical traits inherited from Neanderthals would vanish after a few thousand years, through the operation of demographic or genetic processes that remain to be modelled.

Forty thousand years ago, the Old World was a rather diverse place, from a biological as well as from a cultural point of view (Fig. 14). North Africa was populated by Middle Paleolithic moderns, Iberia by Middle Paleolithic Neanderthals, and West and Central Europe by Upper Paleolithic Neanderthals. In the Near East, a local transition to the Upper Paleolithic from the preceding Tabun D-type industries is documented at such sites as Boker Tachtit (Marks and Ferring 1988), but the human type (moderns or Neanderthals) that manufactured this initial Upper Paleolithic as well as the early Ahmarian remains unknown. This geographic pattern should in itself suffice to show that biological explanations for the Middle-to-Upper Paleolithic transition that explain it as a correlate of modern human emergence, or of the emergence of cultural modernity among previously culturally non-modern moderns, must be abandoned. In Europe, it is also clear that, with few exceptions, the processes of interaction which eventually led to the prevalence of moderns were between fully Upper Paleolithic cultures on all sides, regardless of the particular combination of anatomical traits involved in each particular instance. The disappearance of Neanderthals and other anatomically archaic humans as separate biological entities must have been a complex, uneven and extremely varied historical process, not the simple, straightforward replacement of inferior brands of humans by a superior one.

Now that the biological reductionist view of Neanderthal extinction has been theoretically and empirically refuted, mapping the temporal and spatial variability of these diverse contact situations, and explaining it in historical terms, as sketched in the above discussion, is the task facing twenty-first century paleo-anthropologists. And, in what regards long-term evolutionary

issues, the real question is: if the two groups did not represent biologically different species and had attained a similar level of cultural achievement, why then did modern humans prevail? Why was it that the immigrants absorbed the locals and not the other way around? Biogeographic and demographic explanations may provide the answers. In the Pleistocene period, under climatic conditions much colder than today's, most of Eurasia was uninhabitable. The northernmost areas were covered by ice sheets and barren tundras, and population densities in the settled areas must have been much lower than in Africa. Palaeodemographic analysis of Neanderthal remains reveals those populations were highly unstable (Trinkaus 1995). As a result, it is quite likely that between 100,000 and 40,000 years ago a large majority of all the planet's human beings lived in Africa, where the modern morphological form evolved.

If these African groups also had a higher fertility, as is commonly the case with warm climate populations of the same species when compared with those from colder climates, we can plausibly explain what happened. When Africa became "full" of Africans, Africans started to disperse into the neighboring regions, a process that must have been enhanced by the OIS 3 climate warming, between about 50,000 and 30,000 years ago, during which the savannas of eastern Africa, and their faunas, spread into the Middle East. Given enough time, even a very small difference in fertility would put the much smaller and more scattered populations of Neanderthals at a demographic disadvantage, especially if interbreeding was common.

As research of these issues progresses, it will continue to be necessary, however, to reflect on the reasons why the biological reductionist view of Neanderthals as an inferior, doomed-from-the-beginning side-branch or dead-end of human evolution were still alive and healthy more than one hundred years after the formulation of Darwin's theory of evolution by natural selection

removed the foundations of the essentially religious “us-as-special” view of humankind. In retrospect, it is possible to understand such a view, recently epitomized with sophisticated animation and characterization techniques in the Channel Four (2000) TV series *Neanderthal*, as an anthropological variant of a method of explanation with a “glorious” tradition in paleontology when it comes to extinction: “Blaming the Victim” (Gould 1998:231-249). As the English anatomist Richard Owen, quoted by Gould, said of the dodo bird — “the *Didus ineptus*, through its degenerate or imperfect structure, howsoever acquired, has perished” — so the Neanderthals, through their inferior intellectual capabilities, had been guilty of their own disappearance. Surely, that this view held on for so long reveals a lot more about us, modern humans of the present, than about the Neanderthals of tens of thousands of years ago.

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