The Extinction of Iberian Neandertals and Its Implications for the Origins of Modern Humans in Europe

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Abstract: Radiocarbon and U-Th dates from several sites in Portugal and Southern Spain now place the replacement of Mousterian industries by the Aurignacian at *ca.* 28-30 Kyr BP. In Cantabria and Northern Catalonia, however, the earliest Aurignacian is now dated at *ca.* 38 Kyr BP. A stable frontier corresponding approximately to the Ebro river valley thus seems to have separated Aurignacian modern humans from Mousterian Neandertals for some ten thousand years. This long coexistence without mutual acculturation forces a reappraisal of current models on the causes for Neandertal extinction. Among physical anthropologists, it is common to attribute this event to a biologically based intellectual inferiority of the latter. The Iberian pattern, however, falsifies the explanation of the Chatelperronian and similar industries as related to a phenomenon of "imitating, but not understanding, modern symbolical behavior" resulting from the inevitable acculturation of Neandertals brought about by contact with Aurignacian moderns. It would seem more parsimonious, instead, to approach the issue of the replacement of Neandertals by anatomically modern humans as a traditional problem of contact between isolated populations with different cultural trajectories. In this case, as has often been documented in both the historical and the ethnographic records, the long-term outcome of contact was that one of those trajectories was truncated and the corresponding genetical lineage went extinct.

Keywords: Neandertal, Portugal, Spain, Mousterian, Aurignacian, Chatelperronian, anatomically modern humans.

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Introduction

Traditionally, the origins of anatomically modern humans in Southwestern Europe have been intimately linked, both at an empirical and at a conceptual level, to the twin issue of the origins of the complex of cultural features that we call the Upper Paleolithic. A popular model for the process is that of Stringer and Gamble (1993), which can be summarized as follows: Neandertal populations were totally replaced by modern humans coming from the Near East and bringing with them a new lithic technology based on the production of blades extracted from prismatic cores; in each newly occupied region the two groups lived side by side for a prolonged period of time, during which local Neandertals went through a process of acculturation; the Castelperronian, with its blade technology, its bone tools and its adornments, would be an example of the operation of such a process, those being foreign elements in an otherwise Middle Paleolithic material culture that continued to lack figurative parietal or mobiliary art.

This model is based on the following key assumptions:

• Neandertals were biologically different from moderns; they represented a different population, possibly even a different species.

• Neandertals and moderns were partially contemporaneous and cannot represent, therefore, the two ends of a chronological continuum of biological evolution.

• The Upper Paleolithic corresponds to a package of interdependent cultural features appearing more or less simultaneously in the archaeological record at about the time of Neandertal extinction; it can be clearly distinguished from the Middle Paleolithic package.

• Due to their different biology, Neandertals did not possess the intelectual capabilities to independently become Upper Paleolithic; whenever Upper Paleolithic features, particularly in the case of personal adornments, appear in association with Neandertals, they represent imitation without understanding, since Neandertals were not capable of symbolic behavior, probably due to the lack of the requisite sophisticated speech skills.

In this paper, the validity of these assumptions will be examined in the light of recently acquired data, with particular emphasis on Iberia. It will be shown that the first two assumptions seem to stand, to a large extent, the test of confrontation with those data, but that the other fail it. An alternative interpretation will be offered that views Neandertal extinction as a result of processes occuring in the domain of population biology. Such processes eventually entailed the truncation of a separate historical trajectory that had been following a developmental path broadly similar, in terms of behavior, to that of the anatomically modern humans of supposed Near Eastern origin.

The Ebro Frontier

As demonstrated by Trinkaus (1986), Vandermeersch (1993) and many others, the Neandertals from Central and Western Europe, on one hand, and the Cro-Magnons and Proto-Cro-Magnons of Central Europe and the Near East, on the other, represent two morphologically discrete populations. In Western Europe, Neandertals were still present *ca.* 40,000 BP, as was shown by the St. Césaire skeleton, TL dated to 36,300±2700 BP (Mercier and Valladas 1993). The dates recently obtained by the same method for the remains recovered at Skhul and Qafzeh show that modern human morphology already existed in the Near East *ca.* 100,000 years ago (Valladas *et al.* 1988). In this context, the hypothesis that European Cro-Magnon populations evolved from local Neandertal ancestors carries several implications that are difficult to accept: first, that such a process could have taken place in only the few millenia that separate St. Césaire from the earliest French Cro-Magnon fossils; and, second, that the emergence of the same complex of anatomical features could have occurred independently, in different moments, separated by many thousands of years, and in different, geographically isolated, populations. The conclusion that, in Europe, the substitution of Neandertal morphology by Cro-Magnon morphology corresponds to a process of population replacement and not to a process of local evolution seems, therefore, inescapable.

In Western Europe, after 50,000 BP, Neandertals have only been found in association with assemblages that are either Mousterian or Castelperronian. All Aurignacian fossils known are anatomically modern (Gambier 1993) and no anatomically modern human remains have ever been found in archaeological contexts containing assemblages attributed to the Mousterian or to the West European Upper Paleolithic technocomplexes of Mousterian tradition (Castelperronian, Lincombian and Ulluzzian). In this context, it seems safe to assume that all Mousterian and Mousterian derived industries were manufactured by Neandertals (Hahn 1993). Similarly, it seems safe to assume that all late Aurignacian industries were manufactured by anatomically modern groups. The authorship of the early Aurignacian is more of a problem since, so far, no human remains have been found in association with it. It cannot be totally excluded, therefore, that it was made by Neandertals or by both Neandertals and moderns. This, however, would carry the implication that the entity of the Aurignacian would have to be questioned, which does not seem to be supported by most recent interpretations. According to these (cf. Brooks 1982; Rigaud 1993), the diachronic variability of the

Aurignacian is expressed mostly through changes in the types of bone tools and of lithic cores. As regards retouched stone tools, early and late Aurignacian industries share basically similar inventories, the differing patterns of assemblage composition revealed by typological analysis resulting essentially from the operation of functional or situational factors of variability. It seems very unlikely, therefore, that early and late Aurignacian tool kits were manufactured by totally different human groups.

If it is assumed that, in Western Europe, Aurignacian contexts can be taken as evidence for modern humans and Mousterian and Mousterian-derived contexts as evidence for Neandertals, the chronology and geographic distribution of all such contexts can be read as evidence of how the two different populations related to each other. Chronometric evidence (Table 1) from the cave sites of Figueira Brava, Caldeirão and Lapa dos Furos, as well as from the open air site of Foz do Enxarrique (located at Ródão, on the Tagus, near the Spanish border), indicates that, in Portugal, Middle Paleolithic industries were being manufactured until *ca.* 28,000-30,000 BP (Zilhão 1993, 1995). A similar late survival of these industries is apparent in Southern Spain, where the idea was first put forward by Vega (1990) and Villaverde and Fumanal (1990) on the basis of chronostratigraphic work at the cave sites of Cariguela (Andalucia) and Cova Negra (Valencia). Recent confirmation has come from the cave site of Zafarraya (Andalucia), where Mousterian industries have been recovered from levels dated to *ca.* 30,000 BP which also contained Neandertal remains (Hublin *et al.* 1995). This survival of Iberian Neandertals that continued to manufacture Mousterian tool-kits into what, elsewhere in Europe, were already late Aurignacian times also supports, in turn, the preceding paragraph's assumption that early Aurignacian industries were also manufactured only by modern humans.

The pattern of a late survival of the Mousterian in these regions is confirmed when the evidence is looked at from the perspective of the Upper Paleolithic. The earliest industries that can be classified as such belong to the Aurignacian technocomplex and are radiocarbon dated at *ca.* 30,000 BP in Mallaetes (Valencia) and at *ca.* 28,000 BP at Pego do Diabo, north of Lisbon. The material culture (bone points exclusively of romboidal type at Mallaetes, predominance of carinated burins among the cores for bladelet production at the Portuguese open air site of Vale de Porcos) also indicates that these occurrences pertain to a late Aurignacian. In Iberia, no split-based bone points or other items typical of the early Aurignacian have so far been found south of the Ebro, which is especially significant in the case of the long and rich cave sequences spanning the Middle/Upper Paleolithic divide such as Beneito, Cariguela or Caldeirão. TL dates of *ca.* 38,000 BP obtained for the Portuguese open air site of Gato Preto (Marks *et al.* 1994; Zilhão 1993), where a lithic assemblage dominated by carinated and nosed scrapers was recovered in a single well defined cultural layer, have suggested the possibility of a very early Aurignacian in the area. Subsequent work, however, has indicated that, for some as yet unknown reason, these dates are not correct. All available evidence suggests the site should be interpreted as a manifestation of the "Aurignacian V/Proto-Solutrean", that is, that it should belong to a period documented elsewhere in Portugal by several similar contexts securely 14C dated to *ca.* 21,500 BP (Zilhão 1995).

The first interesting thing about this pattern is that it meets the expectations derived from the model of Neandertal extinction as a process of population replacement. If Cro-Magnon groups did indeed originate ultimately in the Near East and from there began to spread westwards into Europe around 40,000 BP, then it should be expected that the western shores of Iberia would be the last place in the inhabited parts of the continent where modern anatomy should appear, as it seems to be the case. On the other hand, this is also exactly the opposite of what should be expected if the Neandertal to Cro-Magnon sequence were one of biological evolution within the same population. In that case, the appearance of the new complex of anatomical traits should take place at about the same time throughout the whole area where the parent morphology is documented (unless, of course, absolute barriers to gene flow are documented for specific parts of that area, isolating residual populations that would have retained the ancient complex of traits, which it does not seem likely to have been the case in the Europe of interpleniglacial times).

The second implication of the Iberian pattern is that the valley of the Ebro must have functioned for a significant amount of time as a major biological/cultural frontier (Fig. 1) that separated a Franco-Cantabrian region occupied by anatomically modern humans with an Upper Paleolithic material culture from most of the Iberian penisnula, still occupied by Middle Paleolithic Neandertals (Zilhão 1993, 1995). Biocultural replacement seems to have taken place quite suddenly (at least in comparison with the previous millennia of apparently stable geographical segregation) and is attested by the association of anatomically modern human remains with an Upper Paleolithic tool kit in level Jb of Caldeirão cave (radiocarbon dated to *ca.* 26,000 BP). The amount of time during which this frontier existed is difficult to estimate. Although such early chronologies have not been obtained, so far, for France and Southern Germany, AMS radiocarbon dating at El Castillo and l'Arbreda has pushed the early Aurignacian back to 38,000 BP in Northern Spain. If this chronology is accepted, the frontier would have lasted for some 8000 to 10,000 years. A more conservative estimate, based on the conventional radiocarbon chronology for Mallaetes, on one hand, and for the French Aurignacian, on the other, would be that the frontier lasted for some 5000 years.

Even this more conservative estimate carries the significant implication that many opportunities for acculturation must have occurred through contact between groups living on each side of the frontier. In spite of this, Iberian Neandertals south of the Ebro never became Upper Paleolithic and retained traditional Middle Paleolithic technologies and tool-kits until the end: blade debitage is unknown in the late Mousterian of the peninsula, as are bone tools and personal adornments. The hypothesis that acculturation of Neandertals would inevitably follow from contact with moderns and is the only possible explanation for the Castelperronian and similar cultural phenomena must be, therefore, the object of serious inquiry.

Unpacking the Upper Paleolithic Package

The preceding section illustrates the point that Iberian regions south of the Ebro seem to be the only well documented instance in Western Europe where the traditional idea that the passage from the Middle to the Upper Paleolithic was concomitant with the replacement of Neandertals by anatomically modern humans is not proven wrong. Everywhere else, as the St. Césaire find exemplified, at least some Upper Paleolithic features were already an integral part of the material culture of Neandertals. Spokesmen for the biologically based intellectual superiority of Cro-Magnon people, however, explain away these examples by invoking that such features were introduced through contact with contemporaneous modern groups, not as a result of independent development in a purely Neandertal context. Therefore, the Upper Paleolithic package of cultural features could still be considered as the byproduct of a biological process, the acquisition by modern humans of "symbolically organized behavior" and full language capabilities enabling more complex patterns of behavior.

A close look at the evidence shows that this model is empirically untenable. A list of the items commonly considered to be contained in the Upper Paleolithic package can be compiled from Brézillon (1968) and Mellars (1973):

- Development and generalization of bone tools.

- Lithic debitage oriented towards the production of blades used as blanks for tool types of very diverse typology.

- Regional variation, indicating local traditions and, therefore, ethnic diferentiation.

- Internal spatial organization of camp sites.

- Massive use of colorants.

- Adornments and art, both mobiliary and parietal.

- Increased population density and larger co-resident groups.

- Hunting specialization, with concentration on a reduced number of species (often a single one).

- Broadening of the subsistence base to include birds, fish and sea foods.

Most of these features are already apparent in the archaeological record of Mousterian Eurasia. 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 the Middle East, such as Rosh ein Mor (Marks and Monegal, personal communication), and in France (Révillion 1995).

Stylistic variation in the modes of levallois debitage 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 currently 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 to be in the same stage of the biological evolution of humankind as that represented by European Neandertals (Genet-Varcin 1979). If it is accepted that the several pre-Aurignacian Upper Paleolithic cultures of Europe were manufactured by the latter, as is the case with the Castelperronian, then regional diferentiation with a possible ethnic content certainly must have been a feature of Neandertal material culture as well.

A good example of internal organization of Middle Paleolithic camp sites involving construction of complex features is the Portuguese site of Vilas Ruivas (G.E.P.P. 1983; Stringer and Gamble 1993). The collection of shell fish and other sea foods in the 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. Fishing, as well as the consumption of aquatic birds and of shell-fish is also documented at the German Mousterian open air site of Salzgitter-Lebenstadt (Cohen 1977). Hunting practices identical to those used in the Upper Paleolithic are already a feature of the Middle Paleolithic deposits of Combe-Grenal (Chase 1988). In Cantabrian Spain, settlement and subsistence strategies are identical on both sides of the Middle/Upper Paleolithic divide, and do not seem to change significantly until last glacial maximum times (Straus 1983, 1986).

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 lithics, subsistence and settlement. Actually, the issue is further complicated by the fact that the above mentioned list of criteria does not consider inter-regional variation in the behavior of both Middle and Upper Paleolithic groups. As shown by Combe-Grenal, Middle and Upper Paleolithic patterns of faunal exploitation in the periglacial areas of Southwestern France 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 Neandertals were behaviorally more modern than the anatomically modern humans of the Iberian Upper Paleolithic! And, if blade debitage is the criterion of choice, they were also more modern than Upper Paleolithic modern humans from Southeastern Asia or, for that matter, than most hunter-gatherers of the present!

By comparison with Middle Paleolithic times, the only real Upper Paleolithic novelties seem to be, therefore, bone tools, art and objects of personal adornment, although positive examples of the former are now known in fair numbers in the Mousterian of the Crimea (Marks, personal

communication). As regards art, however, no artifacts that can be conceived as such have so far been convincingly reported from Middle Paleolithic sites anywhere in Eurasia. Thus, only art in its different forms seems to be a really late phenomenon. Since it remains unknown before 40,000 BP, it might indeed be possible to use it as a temporally discriminant criterion for the separation between those two periods of Eurasian prehistory.

Such an understanding of the Upper Paleolithic would lead, however, to a definitional paradox: art, not lithics, as the basis for periodization. This entails several practical problems, since periodization should not be based on the rarest class of remains but on the most abundant which, in the Paleolithic, are stone tools and the byproducts of their production. A possible solution to this problem would be that of finding a really discriminant lithic criterion. A good candidate for that status would seem to be that of the presence or absence of bladelet production, the basic feature that really differentiates the Aurignacian and subsequent industries from the Mousterian and Mousterian derived pre-Aurignacian blade based industries. This clarification would entail the inclusion in the Middle Paleolithic of art bearing cultural complexes (such as the Castelperronian), but would also have the virtue of avoiding the temptation of correlating changes in lithics with changes in other totally independent domains of cultural behavior.

The Evolutionary Meaning of Art

The theoretical framework for trying to understand the appearance of art that best conforms 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. 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: available evidence shows that the latter had been around for at least 50,000 years at the time the earliest examples of art turn up in the archaeological record. It could be argued, however, that art indeed eventually appeared among moderns once the socioecological basis for such appearance were mature, the biological capability for symbolic knowledge having been there right from the beginning. Conversely, the fact that art never appeared among the Neandertals who before them inhabited the same regions under similar environmental conditions would show that the latter did not possess such a capability.

Whether late Neandertals did or did not have parietal art is currently unknown. We do know, however, that, judging from the evidence supplied by the Castelperronian levels from Arcy-sur-Cure, they had adornments. Biological reductionists interpret this as a result of acculturation since, according to them, Neandertals were incapable of authentic artistic behavior and, therefore, if they had objects related to such behavior, those objects could only represent "imitation without understanding" of what they had seen among their modern contemporaries. Since Lieberman's reconstructions of the vocal tract of the Neandertals (Lieberman 1994) have been rejected, and since the hyoid bone of the Kebara Neandertal demonstrated that, to the extent that the issue can be adressed using fossil material, the speculation that Neandertals only had diminished linguistic capabilities finds no support

in the empirical evidence available, there is no objective basis to infer a biologically based difference in the intelectual capabilities of both human types. Acculturation of the Arcy Neandertals is, therefore, a "post-hoc accomodative argument" elaborated to adjust the empirical evidence to an assumption that has not been independently verified in the archaeological record.

For biological reductionists, a more solid line of reasoning would be that of suggesting that the concept of Castelperronian adornments actually derives from a taphonomic illusion: the adornments found in its Castelperronian levels would actually derive from the overlying Aurignacian levels. Post-depositional disturbance, not cultural processes, would have been responsible, therefore, for the presence of those adornments among the archaeological remains thought to belong to the Castelperronian. However, given the fact that no signs of Aurignacian pollution have been identified in the lithics from the Castelperronian levels of the site, and that adornments and bone tools are far more numerous in the latter than in the Aurignacian levels (Leroi-Gourhan and Leroi-Gourhan 1965), the hypothesis has to be rejected.

Notwithstanding, taphonomic processes do have to be considered when dealing with the issue of Castelperronian/Aurignacian contact, something that becomes quite clear upon close inspection of the empirical evidence relating to the contemporaneity of the two technocomplexes in the same region that is postulated by the acculturation model. Since we are in a time period close to the limits of applicability of radiocarbon, it must be considered that the main support for that concept cannot come from available chronometric dates but, instead, from the pattern of interstratification between the two technocomplexes identified in the two rock-shelters from Southwestern France of Le Piage and Roc-de-Combe. Recent research, however, has shown that previous excavations have tended to overlook the potential for disturbance of level integrity caused by the kinds of post-depositional processes that may have been active in the periglacial environments of those times (Bertrand 1994). On the other hand, close scrutiny of Bordes's writings on the famous "Aurignacian V pyramid" of Laugerie-Haute has shown that, once he had decided on a cultural diagnosis for a specific level, he tended to regard as displaced any artifacts that, on typological grounds, were considered not to belong there but to come from some other level (Zilhão 1995). In that specific instance, Bordes rearranged the stratigraphy and the lithic assemblages in accord with such preconceptions. One cannot but wonder, therefore, to what extent the "interstratifications" at those sites are not simply idealized reconstructions of mixed levels (which Laplace, in the framework of a different paradigm, might have used as evidence of his *synthétotype aurignaco-périgordien*). In these circumstances, it seems legitimate to doubt that, in France, Neandertals and moderns lived side by side, with fluctuating territorial boundaries, for the millenia necessary to produce those interstratifications.

Since, apart from parietal art, all other aspects of the "Upper Paleolithic revolution" are documented in the last moments of the historical trajectory of Neandertals, it seems logical to interpret Castelperronian adornments (provided that the doubts raised above on Arcy are found to be unreasonable) 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 anatomicallly modern people with a Near Eastern origin. Although following a paralel track, it is possible that European Neandertal 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 intelectual capabilities that the Selk'nam from Tierra del Fuego or the Aboriginal people from Tasmania did not develop their own writing system. As may have been the case with European Neandertals and art, they went extinct at a moment of their history when the socioecological basis for written communication was simply not there.

An Ecologically Based Model for the Spread of Modern Humans into Iberia

If confirmed by future research, the pattern of the Ebro frontier raises several important questions:

- why did anatomically modern humans, whose east-west spread over north and central Europe was almost instantaneous (at the available scale of resolution), stop at the Ebro?

- why did they finally cross the border and why did they do it at that specific time?

- why was the replacement of Iberian Neandertals by anatomically modern humans so fast (as it had been the case everywhere else in Europe before, particularly if the evidence for Castelperronian/Aurignacian interstratifications is analyzed with due caution)?

The search for an explanation needs to consider the evidence relating to the human ecology of interpleniglacial times in Iberia. In Portugal, climatic conditions seem to have been temperate throughout isotope stage 3. At the cave site of Lapa dos Furos, near Tomar, an archaeologically sterile level underlying a thin Mousterian occupation contained large amounts of land snails, including *Cepaea nemoralis*, associated with red deer bones. A sample of those snails was dated to *ca.* 34,500 BP. This faunal association suggests a woodland environment, as is the case with that from the layer K of the nearby cave site of Caldeirão, where bones of *Capreolus capreolus*, *Castor fiber* and *Sus scrofa* were recovered. The upper part of that layer has been AMS radiocarbon dated on bone to *ca.* 28,000 BP.

Direct data on vegetation come from palynological analyses of littoral peat bogs located north of Peniche (Diniz 1993a, 1993b). In accordance with the data collected in the caves from the Tomar region, those analyses indicate a landscape of heathland and pine on the coast and on the sandy soils of the interfluves, with oak woodlands covering the low altitude limestone massifs. In the Meseta, environmental reconstructions based on the pollen analysis of a fluviatile sequence near Toledo show an interpleniglacial landscape of mediterranean type, with *Quercus* and *Olea* (Martín *et al.* 1996).

The cave site of Figueira Brava is located near Sesimbra, on the southern slope of Serra da Arrábida, where the continental platform is very steep. It provided evidence related to the conditions prevailing on sea during slightly later times. *Patella* sp. shells from the Mousterian occupation in level 2 where radiocarbon dated to *ca.* 31,000 BP, that is, to the beginning of isotope stage 2. The only publication available on the site references the fauna collected there without stratigraphic discrimination of the several taxa (levels 3 and 4, which underlie the dated level 2, are also fossiliferous). It seems reasonable, however, to admit that the sea animals identified — *Pusa hispida* and *Pinguinus impennis* — come from the same level as the *Patella* shells. Given the modern distribution of those species, unknown south of the British Channel, ocean waters off the Portuguese coast must have been colder than at present.

Capra pyrenaica is also reported from Figueira Brava. If it does come from the same levels as the sea taxa, it could indicate that, at higher elevations (the Serra da Arrábida culminates at *ca.* 500 m), the limestone massifs and mountains corresponded to open landscapes, confirming that the trend towards a cooler climate was already well under way in Portugal by 31,000 BP, in good accord with the presence of the arctic seal and of the great auk in the faunal assemblage from level 2. The other large herbivores present (aurochs, horse, red deer) are banal and have a largely ubiquitous ecology. Although the presence of mammoth is also indicated, the anatomical basis for the attribution is not specified, which raises the possibility that the remains in question belong instead to *Elephas antiquus*, which is known to have survived in Portugal until *ca.* 30,000 BP.

This overview of the evidence shows that, south of the Cantabro-Pyrenean mountains, interpleniglacial Iberia would have been dominated by temperate woodlands and must have represented a very

different world from that which existed to the north. If we account for these differences and for their consequences on human adaptations, we can try to outline an explanation of why the Ebro frontier became established and why did it eventually disappear:

• modern humans enter Europe and rapidly replace the local neandertal populations (in all probability with occasional interbreeding) due to factors related to population biology (greater fertility of the moderns, or lack of immunity of the neandertals against new diseases, for instance);

• in the process, moderns adapt to the tundra/steppe/boreal-mixed forest environments of interstadial central and northern Europe, following essentially the same economic (large herbivore hunting) and technical (blade debitage) paths of their local predecessors (their Neandertal cousins);

• moderns stop at the Ebro because, during the interstadial, it represented a major geographical and ecological divide, with environments that were not attractive in the framework of the adaptations developed by the moderns once they entered Europe;

• the different environmental conditions (and their cultural and social correlates, for instance as far as population density is concerned) may also explain why Iberian neandertal populations living south of the Ebro had not yet become "Upper Paleolithic", contrary to what had been the case with their biological brothers to the north since a few millennia before;

• moderns cross the frontier as the trend towards colder conditions begins to compress the human range at its northern end and as it begins to extend southwards, into Iberia, the range of environments to which they were adapted;

• once they do it, replacement of Neandertals follows at the same rapid pace and for the same reasons as 5000 to 10,000 years before in the rest of Europe. **Conclusion**

Although confirmation by future research is certainly necessary, the available evidence suggests that the Iberian pattern of a very late survival of the Mousterian and of its Neandertal makers is strong enough to make it legitimate to derive from it wider anthropological implications. The most important, it would seem, is that it falsifies the major assumption shared by all models of the origins of the Upper Paleolithic as a result of the biological superiority of anatomically modern humans: that a long period of contact between Neandertals and moderns would inevitably entail the acculturation of the former, such being the explanation for the Upper Paleolithic features of late Neandertal material culture in France and in Central Europe.

On present evidence, it would seem more parsimonious to admit that, at the time of contact, European neandertals were going independently through the same "Upper Paleolithic revolution" as the modern immigrants. South of the Ebro, in Iberia, however, cultural behavior seems to have continued to be traditionallly Middle Paleolithic in all domains until modern humans replaced local neandertals *ca.* 30,000 BP. In neighboring regions, such as the Magreb, such "Middle Paleolithic behavior" in subsistence and lithic technology, with no art, is exemplified by the Aterian and seems to have persisted well into the 20,000s. Aterian people, however, were modern in morphology.

These facts show that the "Upper Paleolithic revolution" is better understood as a purely cultural, and essentially Eurasian, process. One of its most visible features, the appearance of art, has been considered by some as marking the appearance on Earth of modern human behavior. Although the many forms of visual symbolic communication that we call art seem to be a universal characteristic of present day humans, one cannot forget that such is the situation after tens of thousands of years of cultural evolution and that such was not necessarily the case at the time such forms of communication began to develop. Leaving aside the issue of archaeological visibility and assuming that, between

40,000 and 20,000 BP, art was not yet universal, this can be interpreted as a simple manifestation of unequal development.

It is the reason or reasons why, on a world scale, culture developed in such unequal ways, that make up an interesting problem worthy of investigation. Postulating that the biology of the brain explains why some had art and others didn't carries the implication that there really is nothing to investigate and that archaeologists should stop worrying about the study of the pre-modern past: if it's all in the wiring of the brain or in the morphology of the pharynx, what for should we worry about artifacts, site features and settlement-subsistence practices? In any case, Wynn's work (Wynn 1989) has shown that all the basic operations of modern human intelligence were required for the manufacture of the symmetric bifaces of the African Upper Acheulean and, therefore, were already present *ca.* 300,000 years ago, if not before (incidentally, Wynn's studies also suggest that manufacturing one such biface actually requires more intelligence than the use of levallois or prismatic blade core strategies for the production of blanks for stone tools). If the *capabilities* were already there by then, it must be in the domain of the evolution of culture — the "collective brain" of humans — that we should seek explanations for why, when and where sophisticated communication systems appeared, developed and ultimately spread universally.

In this framework, models that postulate a biological grounded intelectual superiority of moderns as the cause for the extinction of Neandertals and the origins of the Upper Paleolithic in Europe reveal themselves, in the end, actually to be non-explanatory, since the conclusion is already contained in the premises. As the Iberian pattern demonstrates, it makes a lot more sense, and it is a lot more promising as a research strategy, to approach the issue as a traditional problem of contact between different populations with different (although in some domains, paralel) cultural trajectories. That, in interpleniglacial Europe, due to long term genetic drift, the populations involved in that contact had slightly different skull shapes and body proportions, is an additional feature of the process, not the explanation for its outcome.

SITE	LEVEL	MATERIAL	ARCHAEOLOGY	LAB NUM.	AGE BP	OBSERVATIONS
Caldeirão	Jb (profile)	Bone	Upper Paleolithic	OxA-5542	26,020±320	-
Caldeirão	K top	*Cervus*	Mousterian	OxA-1941	27,600±600	-
Caldeirão	K top	*Cervus*	Mousterian	OxA-5541	18,060±140	b)
Caldeirão	K base (K5)	*Capra*	Mousterian	OxA-5521	23,040±340	c)
Columbeira	16	Carbonaceous sediment	Mousterian	Gif-2703	26,400±700	d)
Columbeira	20	Carbonaceous sediment	Mousterian	Gif-2704	28,900±950	d)
Figueira Brava	2	*Patella* sp.	Mousterian	ICEN-387	30,930±700	-
Foz do Enxarrique	C	Tooth enamel	Mousterian	SMU-225 *	32,938±1055	-
Foz do Enxarrique	C	Tooth enamel	Mousterian	SMU-226 *	34,088±800	-
Foz do Enxarrique	C	Tooth enamel	Mousterian	SMU-224 *	34,093±920	-
Lapa dos Furos	4	Land snail shells	Mousterian	ICEN-473	34,580/+1010/-1160	-
Pedreira de Salemas	2	Bone	Mousterian	ICEN-366	29890/+1130/-980	-
Pego do Diabo	2a	Bone	Aurignacian	ICEN-490	23,080±490	e)
Pego do Diabo	2b	Bone	Aurignacian	ICEN-732	28,120/+860/-780	-
Salemas	T.V.b	Bone	Mousterian	ICEN-379	24,820±550	f)

a) Data from: Delibrias *et al.* 1986; Antunes *et al.* 1989; Raposo 1995; Zilhão 1995.

b) Date too young, possibly due to very low colagen content (0,32%N; 3,66%C; 0,53%H)

c) Date too young, possibly due to very low colagen content (0,32%N; 2,39%C).

d) Date too young, possibly due to the inadequate nature of the sample.

e) Date too young, possibly due to contamination by later material (the Aurignacian level is surface).

f) The association between the dated bones and the diagnostic archaeological materials is questionable.

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