

**TROUBLING THE NEANDERTALS: A REPLY TO LANGBROEK'S 'THE TROUBLE WITH
NEANDERTALS'**

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We cannot but agree with the basic contentions of Langbroek's paper that 1) the replacement of Neandertals by early modern humans in Europe is best understood from a perspective of historical contingency and 2) that it must have had a lot to do with the 'very dynamic spatio-temporal redrawings of the population maps of Europe during the Weichsel glacial' against the background of 'the emergence of increasing climatological instability during the later part of OIS 3, with significant fluctuations at relatively short timescales'. This is the kind of approach we have been advocating to effectively supersede the reductionist 'superiority' paradigm that has dominated the literature on Neandertal extinction for the last twenty years.

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This said, we believe that Langbroek's constructive paper suffers from several inconsistencies, which weaken the thrust of his model. Moreover, it still includes some of the tenets of the 'superiority' paradigm. Langbroek's two fundamental assumptions are that 'the Aurignacian is equal to Europe's earliest modern humans' and that they 'featured basically the same kind of mobility systems which are in evidence for their Gravettian and Solutrean descendants and modern hunter-gatherer societies'. He recognises that both assumptions are dangerous, whereas the first is contentious and the second unsubstantiated.

Biological associations of cultural entities Archaeologists tend to argue that continuity in technology between the early and the late Aurignacian suggests that we are dealing with a coherent cultural tradition and, hence, make it likely that the early modern humans who manufactured the late Aurignacian must also have been the authors of the early Aurignacian. However, unless a one-to-one correlation between culture and biology is assumed, this needs not be so. In fact, many radiocarbon dates between 36 and 33,000 B.P. have been obtained for the early Aurignacian (Zilhão and d'Errico 1999a), but no unquestionably anatomically modern human fossils have so far been directly dated to before 32-33,000 B.P. (Smith et al. 1999; Richards et al. 2001). The latest in a string of failures to obtain such evidence is the establishment of a Holocene age for the Hahnöfersand material (Street and Terberger 2001).

The strongest argument in favour of an early modern human authorship for the early Aurignacian lies not in the postulated continuity with the later Aurignacian, but in the spatio-temporal patterning of late OIS 3 archaeological entities. Aurignacian I industries, with their distinctive split-based bone points, have an extensive geographic distribution and a tight chronological patterning; they have been found from the Middle East to Iberia, and they are associated with dates of ca 36,000 B.P. at both ends of their range (Fortea 1995; Bar-Yosef and Belfer-Cohen 1996). This contrasts markedly with the regional fragmentation of pre-Aurignacian, likely Neandertal-made, early Upper Palaeolithic cultures (such as the Châtelperronian and its contemporary equivalents). This continent-wide break in local cultural sequences, together with the spatial homogeneity of the Aurignacian I, implies that the latter is the only possible candidate to being the cultural signature (if such a thing exists) of a modern human dispersal into Europe. Yet, it remains at best a cultural horizon which, in terms of human biology, can be associated with any combination of gene flow, colonisation, absorption of aboriginal populations, population replacement and local population continuity.

Thus, the hypothesis that Neandertals made the early Aurignacian must be seriously entertained or, at least, cannot be disregarded until definite proof of who actually made it is secured. Moreover, if spatio-temporal patterning, not putative cultural continuity, is the best clue we have to a late OIS 3 population input from the east, then it becomes impossible to sustain the corollary of Langbroek's first assumption, i.e., that Willendorf II-3, Geissenklösterle III, and the Bachokirian represent early modern humans in Europe between 39 and 36,000 B.P. Arguments on the significance and integrity of the 'Geissenklösterle III' assemblage remain unresolved, particularly where the issue of the stratigraphic provenance of the ornaments therein is concerned (Zilhão and d'Errico 1999a). Therefore, the argument must rely on the other sites, where, 1) the only reason to consider that the extremely small assemblage from Willendorf II-3 belongs to the Aurignacian is the presence of the odd car-

inated scraper, and 2) the postulated links between the Bachokirian and the Aurignacian revolve around the abundance of thick scrapers in the former.

However, the Willendorf II-3 assemblage is too small to warrant secure industrial diagnosis (Zilhão and d'Errico 1999a; Haeserts and Teyssandier 2001), and the Bachokirian is clearly not an Aurignacian (Kozłowski 1979): its 'thick scrapers' are true endscrapers made at the end of long, thick blades, whereas the carinated/nosed 'scrapers' of the Aurignacian are bladelet cores made on thick flakes or chunks and prepared for the extraction of blanks to be transformed into Dufour bladelets. Moreover, such carinated/nosed 'scrapers' are not exclusive to the Aurignacian; they are well known, for instance, in such pre-Aurignacian Upper Palaeolithic complexes of central Europe as the Szeletian and the Bohunician. Therefore, their use as evidence for 'cultural continuity' between the Bachokirian and the Willendorf II-3 industries, on the one hand, and the early Aurignacian, on the other, is unwarranted (Zilhão and d'Errico 1999a).

Sustaining that such a cultural continuity exists and that it stands for modern humans being the makers of the Bachokirian and the Willendorf II-3 industries also has methodological implications. What is being proposed, in effect, is that a carinated/nosed 'scraper' stands for the Aurignacian and the whole suite of behaviours which Langbroek defines as idiosyncratic of modern humans. This confuses a minute (even if taxonomically useful) detail of stone tool technology with culture as a whole.

In sum, even if cultural continuity is accepted as an argument to attribute the manufacture of the early Aurignacian to modern humans, it simply does not justify a similar attribution in the case of the Bachokirian and the other assemblages which Langbroek takes as evidence of early modern human presence in the Danube basin between 39 and 36,000 B.P. Therefore, all that can be said on the basis of the currently available empirical data is that there is 1) direct evidence for modern humans in Europe after 32-33,000 B.P., 2) indirect evidence that their presence in Europe may go back to ca 36,000 B.P., 3) no evidence that they were there before ca 36,000 B.P. This part of Langbroek's scenario is unsupported by the archaeological record.

Behavioural correlates of biological distance As pointed out by Langbroek, a basic foundation of the 'superiority' paradigm is that Neandertals and modern humans were different species. This is based on morphological contrasts between Neandertal and early modern human fossils, as well as on the differences in mtDNA composition between Neandertals and present-day humans.

Where the former is concerned, we will not discuss whether the amount of morphological difference is sufficient to warrant the classification of Neandertals as a separate palaeontological species. We accept that such may well be the case, but a palaeontological species is not necessarily a biological species. Since there is no one-to-one correlation between morphological distance, genetic distance, and behavioural distance (Pilbeam 1998), establishing the Neandertals as a separate palaeontological species is irrelevant to expectations regarding their cognition and behaviour. If biologically-based cultural differences existed, their foundation should be documented on a purely biological basis. However, all current fossil evidence relating to the size and structure of the brain (Ruff et al. 1997; Weaver 2001), the

organs of speech (Arensburg et al. 1989), manipulation (Niewoehner 2000) and posture and locomotion (Trinkaus 1985) is fully compatible with functional equivalence between these two groups.

Genetic evidence is equally inconclusive. The comparisons that have been made are irrelevant, since they contrast the Neandertals, not with their early modern human contemporaries, but with extant humans living 30,000 years later (Krings et al. 1997; Krings et al. 2000; Ovchinnikov et al. 2000). This is legitimate only if one accepts that, once they become differentiated as a separate phylum, modern human mtDNA stopped losing variants through the extinction of maternal lineages and stopped acquiring new variations by random replication error. Moreover, the comparison also overlooks the fact that, by primate standards, the amount of difference recognised is much smaller than that found at the inter-individual level in, for instance, separate populations of chimpanzees (Gagneux et al. 1999).

More importantly, even if we were to accept that such evidence does substantiate a significant amount of biological difference between Neandertals and their modern human contemporaries, this need not have had any behavioural implications. The use of mtDNA for phylogenetic purposes, i.e., for the establishment of distances in structure and inferred time of separation from a last common ancestor, requires that comparisons are made solely on the basis of the non-coding, hypervariable regions, so that only drift, not change brought about by adaptation, is measured. Consequently, finding that there is a significant mtDNA difference between Neandertals and early modern humans carries, by definition, no meaning in terms of assessing the cultural capabilities of the two palaeontological taxa.

The only palaeontological assessments that have been made and that imply a behavioural difference between the Neandertals and early modern humans (Trinkaus 2000; *in press*) relate mainly to developmentally and/or degeneratively plastic aspects of their skeletal and dental anatomy and reflect principally manipulation and stress levels, both of which changed culturally markedly during OIS 3. There are also skeletal reflections of subtle changes in mobility patterns, but on a level comparable to that seen between the pre- and post- last glacial maximum European Upper Palaeolithic populations. In other words, whereas there were undoubtedly behavioural differences between these groups, those contrasts cannot be accurately couched in terms of differential capabilities. Careful assessment of what is (given available sample sizes) principally a Middle Palaeolithic to Gravettian human comparison provides evidence of both strong similarities in behavioural patterns and more or less marked shifts in the distributions of the load levels and patterns being placed upon human anatomy. It also provides evidence of a gradual shift in these anatomical reflections of behaviour through the earliest Upper Palaeolithic (Trinkaus et al. 1999; Churchill and Smith 2000).

The fundamental logical flaw of the 'superiority' paradigm, therefore, is that it is based on the wrong expectation. First, even if Neandertals were a different species, this does not mean that we should expect them to have had a different behaviour. Second, even if there were major behavioural contrasts between Neandertals and early modern humans, this need not mean that the differences reflected anything more than pronounced shifts in the distributions of the included behaviours. And third, the presence of a major behavioural shift need not, and is unlikely to, be the result of one or two 'prime movers' (whether biological or cultural) which then promoted the rest of the perceived changes in the cultural system.

Despite his acknowledged attempts to do otherwise, Langbroek nonetheless falls into these traps. For example, he postulates that Aurignacian modern humans are just 36,000 year old archaeological images of ethnographically-observed hunter-gatherer societies, and that the Salzgitter-Lebenstedt Neandertals behaved 'to a surprising degree like modern humans in their capture, selection and processing of large migratory game, and use of bone resources'. The first statement implies that ethnographic hunter-gatherers have no history or, put another way, that nothing fundamental changed in their lifeways for tens of millennia. Such lifeways thus become an immanent property of the category 'modern', i.e., behaviour is conceived as a species-specific feature and a one-to-one correlation between culture and biology is indeed established. The second comment bespeaks surprise that some Neandertals should be 'modern' in their archeologically reflected behaviour. In addition, his emphasis on changing mobility patterns and landscape use is yet one more example of a prime mover, if a more interesting one than language, art or 'blades', to explain the ultimate dominance of early modern humans.

We should also note, contrary to Langbroek's contention, that our use of the expression 'behaviourally modern' in no way implies acceptance of a standard for 'what it means to be human'. It is a shorthand created by our predecessors in the Neandertal controversy to refer to a set of behaviours that are also otherwise described as the 'Upper Palaeolithic package'. What we and our co-workers have tried to point out is that the package is non-existent, that most, if not all, of its features appear before the traditionally accepted lower chronometric boundary of the European Upper Palaeolithic, and that their emergence takes place independently in time and space, occurs in different historical trajectories, and does not respect biological or cultural taxonomic boundaries, implying that it cannot be explained as the archaeological correlate of the demographic expansion of early modern humans. In sum, that 'modern behaviour' is not specifically 'modern'. Much the same has been argued for the later Pleistocene of Africa (McBrearty and Brooks 2000).

The implication of the above comments is that arguments on the 'behaviour' of Neandertals must rely exclusively on the empirical evidence, irrespective of any taxonomic considerations. We disagree, therefore, with Langbroek's contention that 'it might be more profitable to consider what it meant to be behaviourally Neandertal' rather than 'focusing and elaborating on the behaviourally modern (or nearly modern) aspects of the Neandertals'. We believe that it is fundamentally wrong to approach the archaeology of the Late Pleistocene under the paradigm that in the genus *Homo* behaviour is species-specific. We believe that the subject of our research is the variability in time and space of 'human behaviour', inferred from functional anatomical or eco-archaeological evidence, not the definition of 'Neandertal behaviour' versus 'modern behaviour'. This is particularly so in the period between ca 40 and ca 30,000 B.P., when, most of the time, we have little idea who – Neandertals or modern humans are the human actors involved in the production of the archaeological assemblages under scrutiny.

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Fact and fiction Where the archaeology is concerned, Langbroek's stand that Neandertals used their cognition very differently is based solely on spatial patterns: intra-site organisation and features, on the one hand, and residential mobility, on the other.

Where the first is concerned, it is said that 'Neandertals did not invest in building resilient structures'. This is simply incorrect. In the way of hearths, for instance, there is nothing in the archaeological record of pre-Gravettian times – with the single exception of the Aurignacian hearths from the Abri Pataud (Movius 1966) – that even remotely approaches the complexity of the large Mousterian fireplaces excavated at Vilas Ruivas, Portugal (GEPP 1983). Their outlines are made of large boulders and their interiors are filled with heat-radiating quartz and quartzite river cobbles. Refitting of broken fragments removed from the outline shows that these structures were maintained and that their use reflects a lot more than the simple creation of 'a highly temporal personal space'.

Where the second is concerned, Langbroek concludes that 'the Neandertal way of life thus seems to have been one of establishing a new highly transient home each evening, with daily itineraries between these localities incorporating visits to subsistence points in the landscape'. If so, Neandertals would have been quite different from all ethnographically known hunter-gatherers. However, there is nothing in the evidence supplied to indicate that such was the case. Interpreting the patterns in site structure and raw-material mobility used by Langbroek to say that Neandertals changed camp everyday requires demonstration of what in the data is incompatible with the alternative hypothesis that each individual occupation event whose remains make up the archaeological palimpsests in question lasted several days, weeks, or even months.

Data on transported lithic technology, 'from distances of tens of kilometres to incidentally 100 to 200 kilometres' are supplied to suggest that Neandertals were highly mobile people. This is based on research carried out in western and central Europe. If Langbroek had used Iberian data, he would have seen something entirely different. In the Portuguese Mousterian, raw-material movements of that scale are simply unknown (Zilhão 2001). Procurement is strictly local, although fluctuations in the percentage of different raw materials across time suggest that the size of provisioning territories increased during colder periods, and decreased during temperate ones, probably as a result of variation in the density of tree cover and correlative restructuring of biomes, economic strategies, social networking, and physical limitations to long-distance travelling. Moreover, the distances over which items travelled before discard are a complex product of raw material availability, human mobility and the degree of curation of the specific component of the technology.

This does not mean that Portuguese Neandertals were less mobile than central European ones. In fact, it could be argued that the opposite is true, since degree of residential mobility and size of procurement territories tend to vary inversely (Binford 1983). The problem lies in that Langbroek's interpretation of 'the repeated peaks in lithic transport distance distributions (typically 30–40 kilometres and multiples of this distance)' as indicating 'daily journey distances' is simplistic, as is his suggestion that the larger distances found in east-central Europe reflect even larger displacements between consecutive nights.

Even if we accepted that Langbroek's diagnosis is correct for all of Europe, it cannot be ignored that the same contrast in mobility between early modern humans and Neandertals, but in reverse terms, has been proposed for the Middle East (Lieberman and Shea 1994). What we are seeing in Langbroek's argument, therefore, is probably another example of the pitfalls of the 'behaviour as species-specific' paradigm; the assumption is that whatever

Neandertals did with hearths, or raw-material procurement, or herbivore hunting, in, say, France or Holland, is what Neandertals-as-a-species did at any place in their geographical distribution and at any time in their chronological range. This is counter-intuitive and, as the examples above show, empirically wrong.

Langbroek incurs in a similar error when he states, quoting Binford's work on Klasies River Mouth, that, 'while exploiting the environment, Neandertals seem to have moved from locality to locality on a daily or near-daily base, hunting and gathering resources in a routed foraging way as opposed to a modern ethnographic pattern of logistic procurement with a prolonged stay at a central place'. What Binford (1983) in fact showed is that 'forager' and 'logistically-organised' or 'collector' are the theoretical extremes of a range of strategies of landscape exploitation that are all observed among ethnographic hunter-gatherers and, hence, by definition, that are all equally 'modern'.

Conclusion The issue, thus, is not whether Iberian, or Middle Eastern, Neandertals are a better standard than western and central European ones for 'what it means to be a Neandertal'. The issue is that no such standard exists. In the time period during which the historical trajectories of Neandertal and early modern humans can be tracked in parallel, between 100 and 40,000 B.P., there were Neandertal societies with high residential mobility, as well as Neandertal societies with reduced residential mobility; there were Neandertal societies that exploited marine resources (Barton 2000), and others that focused almost exclusively on continental herbivores; there were Neandertal societies with labour-intensive hearths, as well as Neandertal societies with simple hearths; there were Neandertal societies with bone tools and ornaments (d'Errico et al. 1998; Zilhão and d'Errico 1999a; 1999b), as well as Neandertal societies without them; there were Neandertal societies which buried their dead, as well as Neandertal societies that didn't. In any given regional trajectory, some, if not all, of these features, as well as others, may have appeared and disappeared, or changed, as a result of adaptation to changing environments, or as a result of historical events or social processes.

The same is probably true for early modern humans, although comparisons must keep in mind the need to contrast groups inhabiting structurally similar environments (such as South Africa and southern Europe, for instance). The challenge to the field, therefore, is not to find out which were the taxon-specific behavioural features that explain why one outcompeted the other, but to reconstruct what happened in each concrete regional/temporal instance of contact. It is quite possible that there are ultimate causes that, irrespective of the historical details involved in each situation, explain why it was modern humans that prevailed. As we and our co-workers, and others before us (cf. Zubrow 1989), have suggested, these in all likelihood relate to biogeography and demography, not to presumed biologically-based behavioural differences. Neandertals disappeared, in our opinion largely through absorption, simply because they were peripheral, not because of the idiosyncrasies of their anatomy or of their adaptations.

To conclude, we just wish to make two minor corrections directly related to our work as referenced by Langbroek. The first is that Zilhão (1993), not Hublin et al. (1995), should be listed as the original formulation of the 'Ebro frontier' model. The second is that, as a qualification of our interpretation of the Lagar Velho child, Langbroek references the unfortunate

commentary of Tattersall and Schwartz (1999). We have replied point-by-point to their criticisms (Trinkaus and Zilhão 1999) and demonstrated the inaccuracy and irrelevance of their attempt to reject our interpretation of the fossil as indicating some degree of admixture between regional Neandertal and early modern human populations. Since that exchange, only one substantive and scientifically accurate critique of that interpretation has appeared (Hublin 2000), and it concludes by remaining sceptical but fully acknowledging that such admixture may have taken place. Indeed, even a casual perusal of the abundant literature of the past decade on modern human phylogenetic origins in Europe by those who accept a post-1947 modern synthesis of evolutionary biology and are directly involved in the analysis of the relevant palaeontological and molecular data indicates that the field as a whole either actively supports some degree of admixture (e.g. Smith and Trinkaus 1991; Frayer 1993; Smith 1994; Simmons 1994; Bräuer 2001; Wolpoff et al. 2001; Relethford 2001) or fully accepts its possibility (e.g. Hublin 1990; 2000; Stringer 1994; Gambier 1992; Vandermeersch 1995; Bräuer and Stringer 1997; Nordborg 1998; Jorde et al. 1998; Wall 2000). Moreover, increasingly (e.g. Adcock et al. 2001; Relethford 2001; Wolpoff et al. 2001) Lagar Velho 1 is being taken *de facto* as evidence of such admixture. As Langbroek correctly points out, the issue here is not the presence or level of admixture between these two human groups that we all recognise to have been biologically distinct in many aspects, but the behavioural and historical context of, and implications for, the Lagar Velho 1 human remains, on which we are in broad agreement.

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