



## The Late Pleistocene Cultural Shift in Europe

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**Abstract.** – This article examines the transition in Europe from cultural traditions of the Middle Palaeolithic to those regarded as Upper Palaeolithic. Synchronous changes in human morphology are reviewed in the light of recent palaeoanthropological finds and datings. They are found to mirror the parallel gradual change in technology, as does the available record of palaeoart. Nothing in the evidence as it stands supports the notion of an intrusive population or culture, even the very tenuous evidence of genetics favors continuity rather than replacement. In particular, the Aurignacian seems to begin as an industry of “Neanderthals,” yet it accounts for the most sophisticated artistic productions of the Pleistocene era. [*Late Pleistocene, replacement hypothesis, palaeoanthropology, Aurignacian, human evolution*]

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More than a decade ago I considered the evidence for cultural continuity across the perceived divide between the Middle and Upper Palaeolithic periods (Bednarik 1995d). The concept of such continuity is complete anathema to the “replacement hypothesis,” which at that time reigned supremely in Pleistocene archaeology – and to some extent still dominates the discipline today. However, this hypothesis is now buckling under the accumulating weight of refuting evidence and recent developments render it useful to review the issue. In 1995 I also observed that we have no skeletal evidence of the people of the Early Aurignacian (Bednarik 1995a), to which White (1995: 625) responded:

[T]he idea that there is no skeletal evidence to suggest that the Aurignacian was the work of anatomically mod-

ern humans is overdrawn . . . Bednarik seems to have forgotten the modern human crania from Aurignacian sites like Vogelherd, Cro-Magnon, and Mladeč.

I very much doubt that White would use this same argument today, and it is most instructive to reconsider this matter in the light of recent developments. Not only would it serve to clear up previous misunderstandings, it will raise the question how the replacement or African Eve model ever came to such prominence. Such an examination would also serve as a heuristic device to determine why such fads generally gain currency in Pleistocene archaeology so easily. I will attempt such an analysis here.

In this article I use archaeological jargon only to comply with established terminology and to convey generalized concepts, without endorsing any of these terms. All of them can be and should be challenged. To illustrate, it would be absurd to expect that there was a distinctive ethnic or cultural group, or tribe, or society of “Aurignacians” across Europe, coinciding spatially and temporally with those remnant artifact assemblages we collectively tend to define as Aurignacian (even though we are notoriously unable to quite agree among ourselves what they include). Terms such as “Middle” or “Upper Palaeolithic” are merely conceptual crutches of a discipline steeped on creating etic taxonomies. They and all others like them are not historical facts or definable eras, such as those of history are more likely to be. They, like the definitions of tools, rock art motifs, or anything else archaeologists tend to taxonomize, are contingent constructs of archaeologists supposedly aiding communication. While they all may have some

level of justification, it would be an epistemological travesty to treat these formulations as real. Most of what has ever been written or said about the Pleistocene past of humans is either false, probably false or inadequate, and it has proved exceedingly difficult to excise this archaeo-lore from the discipline. For instance, the term “Neanderthal” is widely used as if there really was a “race” or genetically definable subspecies so identifiable, and once such a terminological pigeonhole has established an identity it tends to be further reinforced. It then leads to absurdities such as the very strong belief of some Pleistocene archaeologists that these (purported) Neanderthals became the victims of their (purported) overspecialization when a (purported) army of Africans from the tropics marched into frozen Europe around 40,000 B.C. and “replaced” them through their various (purported) forms of superiority. In the present article I will illustrate a few of the conundrums of Pleistocene archaeology by considering the artificial separation of the Upper from the Middle Palaeolithic, which has led to such misleading constructs of the human past despite having hardly any realistic justification.

### Abel, Cain, and the EUP?

Let us begin with White’s three examples intended to show that the “Aurignacians” were anatomically modern. Anyone who has actually examined the first, the Vogelherd skull (Stetten I), will have been struck by its modern appearance, both anatomically and in terms of its preservation. That is precisely why careful commentators warned that “judging by its appearance it would fit much better into a late phase of the Neolithic” (Czarnetzki 1983: 231; my translation). Gieseler (1974) had expressed similar concerns about Stetten II, a cranial fragment, and H. Müller-Beck (pers. comm. 2002) also favored an attribution to the site’s Neolithic occupation. The placement of the Vogelherd individuals in the Aurignacoid deposits always seemed incongruous, and yet Stetten I has long been one of the replacement camp’s<sup>1</sup> key exhibits. Its putative age of 32,000 years (32 ka) now stands refuted by its direct dating to the late Neolithic period (Conard et al. 2004), confirming the obvious: that it is part of an intrusive burial. Direct carbon isotope determinations, of samples taken from the mandible of Stetten I,

the cranium of Stetten 2, a humerus of Stetten 3 and a vertebra of Stetten 4, all agree, falling between  $3,980 \pm 35$  B.P. and  $4,995 \pm 35$  B.P. Contrary to White (and Churchill and Smith 2000b, among many others), the Stetten specimens tell us, therefore, absolutely nothing about the skeletal anatomy of the makers of the very sophisticated Vogelherd portable art objects from the same site.

The issue is somewhat more complex with the Cro-Magnon sample, derived from four adults and three or four juveniles. Sonnevile-Bordes (1959) placed them in the late Aurignacian, Movius (1969) suggested an age of about 30 ka B.P. and preferred an attribution to the Aurignacian 2. The recent re-dating to about 27,760 carbon years B.P. seems to render both opinions (and numerous others) invalid, and the remains are more likely of Gravettian attribution (Henry-Gambier 2002). Moreover, the frequent reference to the Cro-Magnon remains as the “type fossil” of early “modern” anatomy in Europe requires qualification. Wolpoff has long pointed out that the very pronounced supraorbital torus, projecting occipital bone and other features of cranium 3 are Neanderthaloid rather than gracile. This and other aspects of the generally robust Cro-Magnon series question the full modernity of this group – but irrespective of this, it apparently tells us also nothing about the anatomy of the “Aurignacians.”

Even more tenuous is White’s third example, that of the Mladeč specimens. Since the site has never been the subject of a comprehensive review, some detail is briefly mentioned. There is no clear evidence that Pleistocene humans ever entered this cave. Most of the macrofaunal remains apparently fell through the large shaft in the cave’s roof, and Smyčka (1922: 118f.) was the first to propose that the human remains had also been dropped through this chimney. The first group of documented archaeological materials originates from J. Szombathy’s second digging season, in 1882. The centre of the Dóm mrtvých (Dome of the Dead) yielded in the upper part of the sediments twenty-two perforated animal teeth (probably of a single necklace), a long bone point, several fragments of points or awls, a utilized lower jaw of *Ursus spelaeus* and two flint artifacts (Szombathy 1925: 8). In the subsequent decades the cave became a quarry for phosphate loam, and Knies (1906) reports that there were scattered and trampled bones along the road leading to the top of the Třesín Hill. In 1904 a small quarry was opened 20 m west of the entrance to the main cave (site P in Szombathy’s plan; 1925: 27) and the sediments of the small horizontal passage were quarried (Knies 1906; Smyčka

1 E.g., Protsch 1975; Bräuer 1981, 1984a, 1984b; Stringer 1984a, 1984b, 1985, 1989; Stringer and Andrews 1988; Mellars and Stringer 1989; Wainscoat et al. 1986; Wainscoat 1987; Cann et al. 1987.

1907). It is impossible to determine the find spots of the five bone points from Jan Knies' collection as there is no mention of them in his records (Szombathy 1925: 9). Little is known of the clearing operations of the Museum Society in Litovel from 1911 to 1922, or of the subsequent excavations by J. Fürst, E. Smékal, H. Rohm, and others (Fürst 1922, 1923–24; Smyčka 1922, 1925). It is impossible to locate the sites where the human remains were found, except for a mark made by Rohm on a cave plan (in Weiser 1928: 281, point 3). Szombathy (1925: 10) mentions two hearths and crushed animal and human bones but most archaeological finds seem to have been lost (e.g., lithics and all bones published by Szombathy 1925: Fig. 9; and the 51 fragments of "bone awls" from the old exposition near the cave, Skutil 1938: note 76). Skutil (1938: 32, fig. 60) found two "Aurignacian" stone tools in the loess of the cave entrance and mentioned that J. Novotný discovered a blade core below the chimney (1938: note 77). The excavations by the Moravian Museum from 1958 to 1961 located no evidence of any Upper Palaeolithic occupation within the cave, and the view developed that the cave entrance had become sealed prior to the Würm Glacial. The evidence supporting this view was summarized by Jelínek (1987) and Svoboda et al. (2002). In this they were guided by a comparison with Koněpruské jeskyně (Zlatý Kůň) in the Bohemian Karst, where similar circumstances pertain (which, however, is now thought to be Magdalenian). The paucity of stone implements in the interior of Mladeč Cave, compared to the vast quantities of faunal remains, is conspicuous, and it needs to be emphasized that there is no sound evidence linking the apparently Aurignacian artifacts with any of the human remains. Nor does the assumption that Aurignacians occupied the cave derive any support from the hypothesis that the red pigment marks in its interior (Oliva 1989) are Palaeolithic rock art. My study of the sixteen red marks has shown that four are definitely of the 19th century, and the rest almost certainly so too (Bednarik 2006a). Finally, the dating obtained from the reprecipitated calcite on the wall 7 m west of point "a" (of about 34 ka B.P.) is much older than the dates later obtained directly from bones and has been questioned (Svoboda et al. 2002).

In view of the lack of credible stratigraphic evidence from the site, the recent attempt to provide direct dates from some of the human remains is of greater relevance (Wild et al. 2005). A series of dates derived from Mladeč 1, 2, 8, 9a and 25c ranges from about 26,330 B.P. (the ulna of 25c) to 31,500 B.P. It is therefore, at best, of the latest part

of the Aurignacian period with its duration of about 15,000 years. Moreover, there is considerable evidence that the Mladeč humans were far from fully modern.<sup>2</sup> Notably, there appears to be pronounced sexual dimorphism, with male crania characterized by thick projecting supraorbital tori, Neanderthaloid posterior flattening, low brain cases, and very thick cranial vaults – all typical robust features. As in Neanderthals, cranial capacities exceed those of Moderns (1,650 ccm for Mladeč 5), but there is a reduction in the difference between male and female brain size relative to Neanderthal data. The dimorphism is also expressed in the more inclined forehead in the males, their more angled occipital areas with lambdoidal flattening, broad superior nuchal planes, and more prominent inion. The female specimens show similarities with, as well as differences from, accepted Neanderthal females, such as larger cranial vaults, greater prognathism, lack of maxillary notch, a very narrow nose, and distinct canine fossa. However, the females are more gracile than the males, while still being more robust than males of later periods. The Mladeč population thus seems to occupy an intermediate position between late Neanderthaloid *Homo sapiens*, and *H. sapiens sapiens*, a position it shares with numerous human remains from other Czech sites. The material from Pavlov Hill is among the most robust available from the European Upper Palaeolithic, sharing its age of between 26 and 27 ka with yet another Moravian site of the Gravettian, Předmostí. The more gracile finds from Dolní Vestonice are around 25 ka old and still feature some archaic characteristics (particularly the Neanderthaloid specimen DV16). Morphologically similar specimens also come from Cioclovina (Romania), Bacho Kiro levels 6/7 (Bulgaria), and Miesslingtal (Austria), so this is unlikely to be a local phenomenon.

Turning next to western central Europe, the extraordinary recent developments in German palaeoanthropology are of considerable relevance here. Not only is there the correction to the age of the "robust" Neolithic human remains from Vogelherd, which the Eve advocates had been all too keen to place at 32 ka; nearly all of the German fossils claimed to be of the Upper Palaeolithic are now thought to be of the Holocene. Of particular interest is the Hahnöfersand calvarium, described as so robust that it was judged to show typical Neanderthal features (Bräuer 1980). It was initially dated to the earliest "Upper Palaeolithic" (Fra-24: 36,300

2 Smith 1982, 1985; Frayer 1986; Trinkaus and Le May 1982.

$\pm 600$  B.P.; UCLA-2363:  $35,000 \pm 2,000$  B.P., or  $33,200 \pm 2,990$  B.P.; Bräuer 1980), results that conflict sharply with those now secured by Terberger and Street (2003): P-11493:  $7,470 \pm 100$  B.P.; OxA-10306:  $7,500 \pm 55$  B.P. The redating of the skull fragment from Paderborn-Sande yielded even more dramatic differences. Originally dated at  $27,400 \pm 600$  B.P. (Fra-15; Henke and Protsch 1978), Terberger and Street (2003) and Street et al. (2006) report an age of only  $238 \pm 39$  B.P. (OxA-9879). Then there is the cranial fragment of Binshof near Speyer, dated by R. Protsch in the 1970s as Fra-40 to  $21,300 \pm 320$  B.P. According to Terberger and Street it is only  $3,090 \pm 45$  carbon years old (OxA-9880). These authors also analysed two individuals from the Urdhöhle near Döbritz, which had been attributed to the Upper Palaeolithic, and found them both to be about 8,400 years old. Indeed, of all the German "Upper Palaeolithic" human remains, only one remains safely dated to earlier than 13,000 B.P., the interred specimen from Mittlere Klause in Bavaria. A carbon isotope date of  $18,200 \pm 200$  B.P. (UCLA-1869) from a tibia fragment (Protsch and Glowatzki 1974) has been confirmed by Terberger and Street's date from a vertebra, of  $18,590 \pm 260$  B.P. (OxA-9856). It has therefore become clear that there are currently no "modern" remains from the first half, if not the first two thirds of the west-central European Upper Palaeolithic. Nearly all the dates for German humans from the radiocarbon laboratory of the University of Frankfurt am Main appear to be substantially false, as do some of those from the University of California, Los Angeles. In addition, another German key specimen, the skull from Kelsterbach, has mysteriously disappeared from the safe of the Frankfurt institution. It had been dated to  $31,200 \pm 1600$  (Fra-5) by Reiner Protsch "von Zieten" (Protsch und Semmel 1978; Henke und Rothe 1994), but is also believed to be of the Holocene, perhaps the Metal Ages (Terberger and Street 2003).

Other specimens that have been considered as very early European Moderns include the calotte from Podbaba, near Prague, variously described as sapienoid and Neanderthaloid, but undated; it probably belongs to the Mladeč-Předmostí-Pavlov-Dolní Věstonice spectrum. Then there are the robust but "modern" hominin remains of the EUP (Early Upper Palaeolithic) at Velika Pećina, Croatia, close to the Neanderthal site Vindija. This specimen, too, has been a principal support for the replacement advocates, but it too has joined the long list of European humans whose age was grossly overestimated. It is now considered to be only  $5,045 \pm 40$  radiocarbon years old (OxA-8294; Smith et al. 1999).

The currently earliest "intermediate" finds in Europe, the Peștera cu Oase mandible and skull from southwestern Romania (Trinkaus et al. 2003; Rougier et al. 2007), are perhaps about 35,000 radiocarbon years old, but they are without an archaeological context. Although in some aspects "modern," the "derived Neanderthal features" of the mandible include cross-sectional symphyseal orientation, exceptionally wide ramus, exceptionally large third molars, and unilateral mandibular foramen lingular bridging. The partially preserved cranial remains, apparently from another individual and found in a different part of the extensive cave system, also combine robust and gracile features. Recently, Soficaru et al. (2006) have reported six human bones from another Romanian cave, Peștera Muierii, which are clearly intermediate between robust and gracile Europeans. Although found in 1952, they have now been dated to about 30,000 carbon years, which might correspond to around 35,000 sidereal years, and combine a partly modern, partly archaic brain case with a suite of other intermediate features.

The loss of the only relevant Spanish remains, from El Castillo and apparently of the very early Aurignacian, renders it impossible to determine their anatomy. French contenders for EUP age present a mosaic of unreliable provenience or uncertain age, and direct dating is mostly not available. Like the Vogelherd and other specimens, those from Roche-Courbon (Geay 1957) and Combe-Capelle (originally thought to be of the Châtelperronian levels; Klaatsch and Hauser 1910) are thought to be of Holocene burials (Perpère 1971; Asmus 1964), and the former is now apparently lost. Similar considerations apply to the partial skeleton from Les Cottés, whose stratigraphical position could not be ascertained (Perpère 1973). Finds from La Quina, La Chaise de Vouthon, and Les Roches are too fragmentary to provide diagnostic details. The *os frontale* and fragmentary right maxilla with four teeth from La Cruzade, the mandible fragment from Isturitz and the two juvenile mandibles from Les Rois range from robust to very robust. Just as the Cro-Magnon human remains now appear to be of the Gravettian rather than the Aurignacian, so do those from La Rochette. The Fontéchevade parietal bone does lack prominent tori (as do many other intermediate specimens) but the site's juvenile mandibular fragment is robust.

This pattern of features intermediate between what palaeoanthropologists regard as Neanderthals and Moderns is found in literally hundreds of specimens apparently in the order of 45 to 25 ka old. They occur in much of Europe, and intermediate

forms between archaic *Homo sapiens* and *Homo sapiens sapiens* existed also in Asia and Australia. They include examples, some of them much older, from right across the breadth of Eurasia, such as those from Largo Velho, Crete, Starosel'e, Rozhok, Akhshtyr', Romankovo, Samara, Sungir', Podkumok, Khvalynsk, Skhodnya, Narmada, as well as Chinese remains such as those from Jinjushan. This presents an overall picture that is very different from that which the replacement protagonists prefer. Their model cannot tolerate such intermediate forms, nor can it allow hybrids, yet in Europe there is a clear continuation of some Neanderthaloid features right up to and into the Holocene. This is demonstrated not only by the Hahnöfersand specimen but also by others, such as the equally robust Mesolithic skull fragment from Drigge, also from northern Germany, which is about 6,250 years old (Terberger 1998) and numerous other late specimens previously thought to be of the EUP. They range in age from the Magdalenian through the Neolithic, and even younger.

The second issue emerging from this brief review is that there are now almost no supposedly modern specimens left as possible contenders for attribution to EUP or Aurignacoid industries. The maxilla from Kent's Cavern, United Kingdom (~31 <sup>14</sup>C ka B.P.), and the Romanian remains from Pestera Cioclovina (~29 <sup>14</sup>C ka B.P.) lack secure and diagnostic archaeological association. There are, however, numerous "Neanderthal" remains to fill this void. Of particular interest are the most recent, those from Saint Césaire (~36 ka), Arcy-sur-Cure (~34 ka), Trou de l'Abîme (Aurignacian), Zafarraya Cave (~33.4 ka), Máriaremete Upper Cave (Jankovichian, ~38 ka), and Vindija Cave (~28 and ~29 ka). At the first site, the Neanderthal remains of a burial occur together with clear Châtelperronian artifacts, which until 1979 had been generally assumed the work of anatomically modern humans. Arcy-sur-Cure, also in France, yielded numerous ornaments and portable art objects, again from a Châtelperronian. This prompted various convoluted explanations of how these pendants could have possibly found their way into a "Neanderthal" assemblage (e.g., White 1993; Hublin et al. 1996; a similar argument was used by Karavanic and Smith 1998 in explaining the UP bone points of Neanderthals in Vindija layer G1). On the other hand, Zafarraya Cave, near Malaga, provides Mousterian tools (Hublin et al. 1995). The Jankovichian or Trans-Danubian Szeletian (Allsworth-Jones 2004) has provided three mandibular "Neanderthal" teeth (Gábori-Csánk 1993). Trou de l'Abîme near Couvin in southern Belgium yielded Neanderthal re-

mains together with a typical Aurignacian industry, and there can be no question that the Vindija late Neanderthals used EUP tools and technology. Not only has that site yielded the most recent "Neanderthals" found so far – and from a site in south-central Europe at that – these are more gracile than Neanderthals of much earlier periods, and they are considered to be transitional by some.<sup>3</sup> Vindija Vi-207 is a mandible of 29,080 ± 400 carbon years B.P. (OxA-8296), Vindija Vi-208 is a parietal of 28,020 ± 360 carbon years B.P. (OxA-8295) (Smith et al. 1999). These "late Neanderthals" (or very robust Moderns) exhibit significant reduction in "Neanderthaloid" features, such as midfacial prognathism and supraorbital tori. The related stone tools are of EUP typology, and Ahern et al. (2004) report the occurrence of apparent bone fabricators.

Ignoring these many contradictions to their ideas, the replacement proponents have responded to the recent developments in Germany by contending that the new data bolster their model, because the "Neanderthaloid" Hahnöfersand specimen had been suggested to be a hybrid (Bräuer 1980). In this futile argument they seem to have overlooked that the new evidence shows, ironically, that they have argued themselves into a corner. They have hailed each of the very late dates for Neanderthal remains as they appeared in recent years as a confirmation of their prediction that the evidence "effectively precludes any hypothesis of a gradual evolution from Neanderthal to anatomically modern populations within Western Europe itself" (Mellars and Stringer 1989: 8). They had strongly contended that "a whole spectrum of radical cultural innovations" (8) appeared with the beginning of the Aurignacian, and that the "'symbolic-explosion' explanatory model for the Middle–Upper Paleolithic transition, criticized by Bednarik, has the merit of emphasizing the entirely modern character of the Aurignacian behaviour" (D'Errico 1995: 618). According to them, the people of the Aurignacian are "indistinguishable" from us in terms of cognition, behavior, and cultural potential. Perhaps this is so, but what the evidence now shows is that the period from 45 ka to 28 ka B.P. has produced dozens of Neanderthal remains in Europe, but no securely dated, unambiguously fully modern human remains. This point is reinforced by the occurrence of undisputed Neanderthal finds together with EUP lithic traditions at five sites at least, but no Moderns have so far been found in clear association with Aurignacian or any other EUP artifacts (Churchill and

3 Smith and Raynard 1980; Wolpoff et al. 1981; Frayer et al. 1993; Wolpoff 1999; Smith et al. 2005.

Smith 2000a). Therefore, one would have thought that the proposition to test is not whether the replacement advocates were correct, but the proposition that the Aurignacian and other Aurignacoid or EUP industries are traditions of Neanderthals, or of their descendants. Unless that proposition is refuted, we are left with the dictum coined by the African Eve advocates themselves: *that the EUP people, i.e., late Neanderthals, from about 45 ka B.P. on, were of "entirely modern behaviour."*

The "short-range" advocates have apparently failed to grasp the effects of the new data on their embattled hypothesis (Mellars 2005). There are only three realistic alternatives to account for the EUP tool, rock art, and portable art traditions: that they are the work of Neanderthals, or of the descendants of Neanderthals, or of invading, perhaps genocidal Moderns. Since there is currently no evidence for the third possibility, and the two others are entirely unacceptable to the African Eve advocates because they would refute their hypothesis, one would have thought that they might reconsider. Certainly, the onus is presently on these scholars to present evidence that there were anatomically fully modern humans, free of any "Neanderthaloid" features, in Europe during the entire first half of their "Upper Palaeolithic", i.e., since 45 ka B.P. Until they do this, their contentions about human evolution over this period in the European theatre are contradicted by all available skeletal evidence.

### The Lost Tribes from Israel?

The record so far mentioned already suffices to significantly discredit all of the replacement or "short-range" models, but there is much more that its proponents have consistently ignored. To begin with, there is the record of technologies straddling the imposed division between Middle and Upper Palaeolithic technocomplexes. Here, the evidence is perhaps even more persuasive. Across Europe, from Spain to Russia, the evolution of the EUP traditions from the preceding Mousterian and Micoquian technocomplexes is evident at literally hundreds of sites. Since the times of Lothar Zotz, it has been widely purported that the "invading Moderns," the first in history bringing beads to the natives, entered Europe from the southeast, perhaps through a "Danube corridor" or through the Balkans. However, there is no archaeological indication of any EUP technology spreading from the southeast to western Europe – or, for that matter, from the Levant or anywhere else, supporting the replacement model. The earliest appear-

ance of EUP industries occurs fairly simultaneously between 45 ka and 40 ka B.P., or slightly earlier, across much of southern and eastern Europe (and in Siberia; e.g., Makarovo 4/6 and Kara Bom). The Aurignacian of El Castillo level 18, in Spain, seems to commence well before 40,000 years ago (Cabrera Valdés and Bischoff 1989; carbon dates of 40,000 ± 2,100, 38,500 ± 1,800, 37,700 ± 1,800 B.P.), but unfortunately the human remains from the deposit have been lost. On the available evidence, they were probably Neanderthaloid. Near where the sample providing the older carbon date was collected, a bone fragment decorated with a series of incised markings was found. The tool industry shows distinctive typological continuities from the underlying typical Mousterian in layer 20 (Cabrera Valdés and Bernaldo de Quirós 1985). Diagnostic Aurignacian types such as carinated and nosed scrapers occur in the Mousterian levels, not only at El Castillo but also at El Pendo and Cueva Morín. The change from the "Middle Palaeolithic" to the EUP is marked here primarily by a progressive increase in the number of burins and end scrapers, at the expense of side scrapers. At Abric Romani, the lowest AMS dates from the Aurignacian average 37 ka B.P., but the probably more relevant uranium series dates point to a sidereal age of 43 ka B.P. (Bischoff et al. 1994). This distortion (see below) suggests, therefore, that the earliest Aurignacian in northern Spain should be up to 45 ka old. On the other hand, in Caldeirão Cave, Portugal, the change from the Mousterian to the basal EUP occurs only at about 27.6 ka B.P., shortly after the Aurignacian appears in the far south of Spain (e.g., at Gorham's Cave, Gibraltar, at 28 ka B.P.). At El Pendo, the Lower Perigordian (i.e., Châtelperronian) industry, which in France has been attributed to Neanderthals, overlies two Early Aurignacian levels, a stratigraphic pattern also observed in France, e.g., at Roc de Combe (Bordes and Labrot 1967) and La Piage (Champagne and Espitalié 1981). The El Pendo Châtelperronian from level VII has yielded a series of bone points and perforated objects (González Echegaray et al. 1980). The latter were almost certainly used as pendants, such as those found at Arcy-sur-Cure. The Châtelperronian at Morín Cave has been dated to about 36,950 B.P., an antiquity similar to that of the same tradition at French sites (37–33 ka B.P.). The most recent "Middle Palaeolithic" occupation known in Spain, however, is at Abric Agut. According to both radiocarbon and U-series dating, it occurred 13 to 8 ka B.P., i.e., at the Pleistocene-Holocene interface (Vaquero et al. 2002). Perhaps those who perceive a distinct separation of the Mid-

dle and Upper Palaeolithic could focus on explaining this “anomaly.”

The Iberian pattern of a mosaic of regional EUP lithic industries continues further east along the Mediterranean. In southern Italy, several Aurignacoid variants have been reported, such as the Uluzzian (Palma di Cesnola 1989), the Uluzzo-Aurignacian and the Proto-Aurignacian (43–33 ka B.P.). Here, as much as 30% of lithic assemblages are comprised of blades and prismatic cores (Kuhn and Bietti 2000; Kuhn and Stiner 2001). The pattern of a gradually decreasing component of Middle Palaeolithic technology evident in Spain is found here also, particularly in the three stages of the Uluzzian (Palma di Cesnola 1976). In the Alpine region, the final Mousterian grades seamlessly into the Olschewian, another Aurignacoid tradition (42–35 ka B.P.). Further east this mosaic includes the Bachokirian of the Pontic region (>43 ka B.P.), the Bohunician of east-central Europe (Svoboda 1990, 1993; 44–38 ka B.P.), and the Spitsyn culture of Russia (>40 ka). Then there is a succession of traditions connecting Middle Palaeolithic biface technocomplexes, including the late Eastern Micoquian, with typical late Palaeolithic ones, through the Szeletian of eastern Europe (Allsworth-Jones 1986; 43–35 ka B.P.), the Jankovician of Hungary with its osteal artifacts, the Streletsian with its still numerous leaf points, and those of the north European Altmühlian (c. 38 ka B.P.), Lincombian (38 ka B.P.), and Jerzmanovician (38–36 ka B.P.). These and other “intermediate” industries, such as those of Anatolia, all indicate that a separation between Middle and Upper Palaeolithic technocomplexes is severely misleading. Such a distinction is not reflected in the technologies of the period from perhaps 45 ka to 30 ka. Indeed, a degree of regionalization precedes this period even in the late Mousterian.<sup>4</sup> That period is marked by both miniaturization and increasing use of blades, by improved hafting and the use of backed or blunted back retouch, apparently heralding subsequent developments. Therefore it is useful to challenge the concept of an EUP: there is no clear-cut separation from the late “Middle Palaeolithic” industries, and this artificial dichotomy has only served to emphasise gradual changes in technology (Fedele et al. 2003). Instead of denoting these numerous intermediate tool traditions as an early Upper Palaeolithic, they could just as credibly be defined as late Middle Palaeolithic. Indeed, there are almost no parts (as distinct from individual sites) of Europe where a

clear separation of Middle and Upper Palaeolithic stone tool sequences can be observed.

Looking further afield, these two definitions have even less currency. In parts of Africa, Upper Palaeolithic technologies occur tens of thousands of years before their advent in Europe: the micro-lithic features of the Howieson’s Poort phase, the prismatic blades of the Amudian, the bone harpoons from Katanda come to mind. In India, the Upper Palaeolithic is notoriously hard to pinpoint, while China lacks a distinctive Middle Palaeolithic (Xing Gao and Norton 2002). In Australia, the Middle Palaeolithic mode of production (Foley and Lahr 1997) continues until well into the Holocene (and in Tasmania to European contact), while the Acheulian of Africa remains prominent as recently as 40 ka ago, and the Middle Stone Age of sub-Saharan Africa continues until 20 ka ago. On the Indonesian island of Flores, a putative separate hominin species derived from *Homo erectus* or even older stock is said to have used “Upper Palaeolithic” tool types, while one of the two different Acheulian hominins at Narmada (Kennedy et al. 1991; Sankhyan 1997) has a brain capacity well above that of Moderns, and the other is as tiny as the Flores people (Bednarik et al. 2005). Nothing seems quite as well ordered in hominin evolution as our neat theories predict it should be. The challenge, then, is to avoid forcing the evidence into the straightjacket of premature interpretations. Our sound knowledge of these processes remains pathetically inadequate, and all of the confident models about this that we have seen mushrooming for several decades are severely premature.

The overwhelming impression of the collective evidence from the artifact assemblages of Europe, from the time interval of about 45 ka to 25 ka ago, is that there is no evidence of any sudden change of technology as one would expect to find had there been an intrusion of genetically different people with a superior culture. Instead, there is a complex mosaic of regional traditions that, in general, exhibit a gradual change of several variables, such as tool size, knapping method, retouch, and reuse. In numerous cases, in the continent’s east, south, and southwest, the gradual evolution of so-called Upper Palaeolithic traditions from Middle Palaeolithic ones can be traced at individual sites. This alone negates any ideas of a movement of people to account for changes. This would be no different than the early ideas of Peyrony or Bordes, who perceived the movement of Perigordians to explain the occurrences of Châtelperronian and Gravettian technologies. Moreover, the idea that different ethnic groups such as Neanderthal sapiens people and

4 Kozłowski 1990; Stiner 1994; Kuhn 1995; Gamble 1999; Riel-Salvatore and Clark 2001.

Moderns used different technocomplexes is perhaps one of the greatest fallacies of the African Eve proponents. Several “Upper Palaeolithic cultures” are the work of “Neanderthals,” just as “Moderns” used a Middle Palaeolithic mode of production, for instance in the Maghreb, Levant, in Spain, and Ukraine. Wherever robust and more gracile forms of humans apparently coexisted, be it in the Levant, in Australia, or in any part of Europe, they appear to have shared fairly similar cultures, technologies, even ornaments. Therefore, the idea that one can trace ethnic differences through tool assemblages is unlikely to be helpful. Certainly, the Aurignacian did not arrive from the Levant, on current evidence it would seem to commence in Catalonia and Cantabria, and other EUP traditions seem to emerge about the same time in various eastern European centers, such as the Russian Plain, as well as in Siberia. Similarly, the use of unproven taxonomic technological divides, especially that between Middle and Upper Palaeolithic, as reified tools of analysis and definition is as unfortunate as the use of minor skeletal differences, such as those between “Neanderthals” and “Moderns,” in inventing movements of populations. Not only is there no evidence of any major population replacing another in Europe during the period in question, this is again an exercise in trying to make the evidence fit the theory. All of this has long been known and, to some extent, appreciated, but now there is a new possibility: that the Aurignacians, and indeed all “Aurignacoid people,” were not Moderns but Neanderthals. This should prompt the capitulation of the African Eve advocates, because in the end they placed all their trust on the unassailability of the concept that the Aurignacian derives from Moderns. They have for decades waxed lyrical about the cognitive sophistication evidenced by palaeoart and beads that could not possibly have anything to do with Neanderthals. If all this wonderful art were the work of Neanderthal descendants, where would that leave the replacement model? Only a foolhardy scholar would now argue that the early Aurignacians were anatomically fully modern. So even if the retreating argument were to be now, perhaps the Aurignacian started as a Neanderthaloid tradition, but by the time of Chauvet and Vogelherd it had become the province of Moderns, it would totally negate the integrity of the Eve model.

### The Mother of All People?

At this point it becomes appropriate to examine the African Eve model itself, how it came into exist-

tence in the first place, and how and why it was so heavily promoted. The most obvious deductions to be made from that model are that our ancestors conquered the world during the Late Pleistocene because they were genetically, technologically, cognitively, culturally, and intellectually superior to all of their contemporaries of the period preceding their Exodus (from modern Egypt to modern Israel, no less). Because these “anatomically modern” ancestors of ours, the pinnacle of evolution, were a separate species, unable to breed with other hominins, all extant human populations must originate from a small, isolated population from some unspecified genetic Shangri-la of Africa. Indeed, ultimately they all descend from one single female and male. According to the most radical form of this model, they were the only humans who ever succeeded in crossing that Rubicon between the subhuman and the human, between instinct and intelligence, between absence and presence of culture. At first sight, this paradigm has the appearance of a rather harmless origins myth or religious doctrine. It certainly does not resemble a realistic model of phylogenetic evolution or demographic population dynamics. Perhaps more pertinently, especially in the setting of the dominant ideology of the 1990s, it extols the virtues of competition, it explains and rationalizes colonization, even genocide, as a historical phenomenon and as an inevitable process. Therefore, it is not just a simplistic and naive but harmless mythology, it can underpin and legitimize certain ideologies by appealing to “common sense” and prejudice. Moreover, since this model has dominated archaeological thought for decades, it determines current dogma in that discipline, it has dictated research directions and priorities, and it biases the discipline. Yet, this Eve model is not based on an unrefuted proposition of scientific status, but on controversial contentions of *some* geneticists (opposed by others), and there is virtually no archaeological evidence in its favour.

Even the genetic justification of this model is fundamentally flawed. Different research teams have produced different genetic distances in nuclear DNA, i.e., the distances created by allele frequencies that differ between populations.<sup>5</sup> Some geneticists concede that the model rests on untested assumptions; others even oppose it.<sup>6</sup> The various genetic hypotheses about the origins of “Moderns” that have appeared like mushrooms over the past couple of decades place the hypothetical split be-

5 E.g., Vigilant et al. 1991; Barinaga 1992; Ayala 1996; Brookfield 1997.

6 Cf. Barinaga 1992; Templeton 1996; Brookfield 1997.

tween Moderns and other humans at times ranging from 17 to 889 ka B.P. They all depend upon preferred models of human demography, for which no sound data at all are available. This applies to the contentions concerning mitochondrial DNA (African Eve) as much as to those citing Y chromosomes (“African Adam”; Hammer 1995). The divergence times projected from the diversity found in nuclear DNA, mtDNA, and DNA on the non-recombining part of the Y chromosome differ so much that a time regression of any type is now extremely problematic. Contamination of mtDNA with paternal DNA has been demonstrated (Gyllenstein et al. 1991) and Kidd et al. (1996) have shown that, outside Africa, the elements the haplotypes are composed of largely remain linked in a limited set of them. The genetic picture in Africa as well as elsewhere has been found to be far more complicated than the Eve proponents ever envisaged. The much-promoted claims that Neanderthals were genetically different from modern Europeans, based on very fragmentary DNA sequences, were seriously misleading, Gutierrez et al. (2002) have shown. Their analysis suggests that the pairwise genetic distance distributions of the two human groups overlap more than claimed, if the high substitution rate variation observed in the mitochondrial D-loop region and lack of an estimation of the parameters of the nucleotide substitution model are taken into account. Relethford (2002) has detected drastic spatiotemporal changes in the genetic profiles of three recent Chinese populations, negating the idea of regional genetic homogeneity. He found that the Linzi population of 2,500 years B.P. is genetically more similar to present-day Europeans than to present-day eastern Asians. This refutes the idea that regional comparisons of DNA can establish affinity or its absence. Assumptions about a neutral mutation rate and a constant effective population size are completely unwarranted, and yet these variables determine the outcomes of all the genetic calculations. For instance, if the same divergence rate as one such model assumes (2%–4% base substitutions per million years) is applied to the human-chimpanzee genetic distance, it yields a divergence point of 2.1 to 2.7 million years, which we consider unambiguously false. Nei (1987) suggests a much slower rate, 0.71% per million years, according to which the human-chimpanzee separation would have occurred 6.6 million years ago, which is close to the estimate from nuclear DNA hybridization data, of 6.3 million years. However, this would produce a divergence of Moderns at 850 ka B.P., over four times as long ago as the favored models, and eight times as long ago

as the earliest fossils of *purported* Moderns ever found (though their dating is controversial). To explain away the perplexingly late split of the Moderns, some of the short-range geneticists have even resorted to suggesting mtDNA transfer between “protohumans” (e.g., Australopithecines) and proto-chimpanzees (i.e., species presumably separated by millions of years of evolution), while at the same time excluding such a possibility for archaic and modern populations (Hasegawa et al. 1985).

Interestingly, when the same “genetic clock” used in all this is applied to dogs, and suggests that the split between wolves and dogs occurred 135 ka ago, archaeologists reject it on the basis that there is no palaeontological evidence for dogs prior to about 14 ka B.P. In other words, the weak theory that provides the *only* basis for the African Eve scenario is rejected when applied to another species. The scenario of genetic isolation, long enough to render Eve’s progeny unable to interbreed with any other humans, is also unsupportable. Interbreeding yielding fertile offspring occurs between many species (in wolf and coyote, for instance) and we know from the example of dogs that a period of significantly more than 135 ka of genetic isolation would be needed for the Eve model to work. We need to ask, what would be the minimum population necessary for continued isolated existence over a couple of hundred millennia, and what is the probability that their reproductive isolation was never interrupted by external genetic input over that period? In combining the model of a population bottleneck with that of an endemic population we also need to remember that genetic bottlenecks tend to reduce fitness in the population (Bryant et al. 1986), rather than bring about the population’s supremacy (cf. Hawks et al. 2000), so how did Eve’s progeny attain their superior qualities? Another genetic model (Pennisi 1999) has modern humans evolving from two discrete populations, one resulting in modern Africans, the other in non-Africans.

It is also of concern that the first colonization dates assumed by these geneticists are mostly false (see Cann et al. 1987), and these researchers admitted from the beginning of their involvement that their base-pair substitution rates were based on the (almost certainly false) assumption of single colonization events. It has long been known in Australia, for instance, that there were multiple settlement events, and the same can be assumed in most other cases of maritime colonization (Bednarik and Kuckenburg 1999). In Australia, the lineage of the earliest known “anatomically modern” remains, Lake Mungo 3, has been shown to have probably

diverged before the most recent common ancestor of contemporary human mitochondrial genomes (Adcock et al. 2001). Therefore, the African Eve model, once again, has failed to account for the evidence, as it does in every critical test.

One potential test would be to apply mtDNA analysis to *Homo floresiensis*, to see when it diverged from its ancestral clade. DNA results extracted from the numerous remains already available of that species are likely to spell doom for the Eve supporters. Instead of unambiguously showing that Moderns originate conclusively in one region, Africa, all the available genetic data suggest that gene flow occurred in Old World hominins throughout much of recent human evolution (Templeton 1996), which is also strongly suggested by all available empirical evidence, both palaeoanthropological and archaeological. *Homo sapiens sapiens* seems to have evolved as a single extended breeding unit across much or most of the region then occupied by hominins, from southern Africa to eastern Asia. Extensive genetic drift rather than mass migration probably accounts for the mosaic of hominin forms through time. In the absence of any reliability of the proposed rates of nucleotide changes and the many variables still to be accounted for effectively, the contentions by the replacement advocates are clearly premature, and nucleotide recombination renders their views redundant (Strauss 1999).

The African Eve model derives from Bräuer's work, which relied on the "datings" of Protsch. It now appears that Professor Protsch's dates for German human remains were spectacularly false, and that the Eve supporters had been the subjects of a hoax right from the beginning. If they had not relied on the claimed ages of the German fossils, it is unlikely that the model would have been quite so enthusiastically received. Once the dust has settled on this latest ignominious episode in palaeoanthropology, perhaps someone will examine the writings of those most vocal in their support for Eve, in order to determine how this blunder came about. After all, Protsch's datings were already attacked by Michael Mehlman in 1984 – well before the Eve phenomenon took off in a grand way. Interestingly enough, the recent rejection of the Upper Palaeolithic age of most German human remains, formerly attributed to that period, has its distinct parallel in the rejection of each and every claim ever made for German Pleistocene rock art (Bednarik 2002b).

## For Art's Sake

This brings us to the perhaps gravest shortcoming of the African Eve model of human evolution. To survive, this model has to deny any evidence suggestive of complex technologies and, most particularly, of symboling abilities prior to 45 ka ago in Europe. It has done this by several strategies. First, most reports of advanced hominin abilities predating the advent of "Moderns" have been rejected out of hand, either as being unreliable or as being susceptible to alternative explanations. Those finds that could not be swept under the carpet were grudgingly accepted as flukes, as the work of unusually gifted individuals, even as evidence of "running ahead of time" in human development (Vishnyatsky 1994). Their claimed small number was often cited as being enough reason to ignore them,<sup>7</sup> because for them to be of significance, "the use of symbolism must be systematic, often repeated." When in response it was pointed out that the number of known instances was actually very much greater than assumed (Bednarik 1992), the response was that this still made no difference.

This is one of numerous instances of the application of double standards in assessing possible palaeoart finds or purported evidence of symbolism. For instance, the two fragmentary bone objects from layer II ab in the Geißenklösterle (Hahn and Münzel 1995) are less convincing as flutes than the more completely preserved Mousterian specimen from Divje Babe I in Slovakia (Turk 1997; Lau et al. 1997), but as well as one of the ten examples found in Isturitz (Buisson 1990) they come from Aurignacian layers. That, rather than the objective evidence inherent in the objects, rendered their interpretation as flutes acceptable. The (false) premise of this accommodative thinking is that the Aurignacian is by "Moderns"; therefore, finding flutes is acceptable. Precisely the same applies to thousands of other finds, such as figurines, beads, or engravings, which are not judged by their inherent characteristics but invariably by their age – as if we already knew what the abilities of the humans concerned were. For instance, a set of neatly engraved parallel marks on a bone, readily accepted as symbolic – even as notational – if from the Upper Palaeolithic, would inevitably be rejected from a Middle Palaeolithic or earlier context by many. Such finds were routinely prejudged, based on their assumed age, as was sometimes also the case with human remains. The Hahnöfersand specimen, for

<sup>7</sup> Chase and Dibble 1987; Davidson and Noble 1989; Noble and Davidson 1996.

instance, was judged Neanderthaloid, based on its postulated age of about 35 ka. While the consideration of uniqueness was not deemed an issue in the acceptance of a fake such as Piltdown, it was with an authentic specimen such as the Kleine Feldhoferhöhle remains, explained away as a “Cossack” and so forth. Yet, it is more likely that a single unique human specimen lived than it is that a single bead, for instance, could have been used by a society. Such unique symbolic artifacts are a logical impossibility, which alone renders the argument of “number of known instances” irrelevant.

The practice in Pleistocene archaeology of applying different standards to manifestations of symbolism as a function of their purported age is an interesting epistemic phenomenon, particularly in view of the many cases when archaeologists misdated palaeoart. To name just one example, most of the petroglyphs of the lower Côa valley, in Portugal, are in the order of two to four centuries old, yet all commenting archaeologists judged them to be 20 ka to 30 ka old. These instances of attributing entirely false ages to rock art, of which examples have occurred widely (Bednarik 1995c), invite two observations: that the commentators are poorly equipped to estimate the ages of most palaeoart, and that their inclination to be guided by age in the interpretation of controversial specimens is detrimental for two reasons. First, we do not know what the faculties of past human populations were, we have merely weak hypotheses; second, even if we did know this, the demonstrated inability of archaeologists to estimate the age of much palaeoart would need to be taken into account in considering their claims. In anthropocentric and humanistic disciplines, the definitions of what indicates characteristics such as culture or language are routinely revised in response to the threat that such characteristics might be attributed to nonhuman interloper species. In this case, the practice is extended to “premodern” hominins that need to be excluded from some perceived exalted status of modern humans. There can be no doubt that humans do not possess one single definable, measurable, or observable characteristic that is not shared by another species. The humanist inclination of maintaining, perhaps subconsciously, a qualitative separation between humans and nonhuman animals (or archaic *H. sapiens*) is ultimately attributable to the religious-cultural individual reality scholars exist in.

As it happens, the issue is easy to resolve. To explain the sudden appearance of undeniably sophisticated cave and mobiliary art at Chauvet, in the Swabian Alb, and at Galgenberg, all about 32 ka old, three basic possibilities could be considered.

One is the arrival of a new people with a new culture; another the extraordinarily precipitate local development of these magnificent faculties; or thirdly, a taphonomic, if not to say metamorphological (Bednarik 1995b), explanation. The first of these notions would presume the existence, along the route taken by this intrusive population, of examples of their artistic (or any other) proficiency. No such evidence has ever been found anywhere along any potential route from Africa – or anywhere else, for that matter. Unless we were to consider that the artistic sensibilities of these invaders were only aroused after they settled in central Europe and southern France, which would contradict their claimed prior superiority, this would exclude the replacement model.

Our second potential explanation looks somewhat more plausible, particularly if we consider the known distribution of what we regard as figurative Pleistocene art. With the exception of the Tolbaga animal head and one mammoth engraving (Bednarik 1994a), there are no pre-LGM (Last Glacial Maximum) iconic depictions anywhere in Asia or eastern Europe, i.e., east of the Rhine. Even after the LGM, with great proliferation of iconic art, for the rest of the Final Pleistocene it is almost wholly restricted to a small geographic region. There are substantial occurrences of Pleistocene rock art elsewhere, particularly in Australia, but they look generally nonfigurative to the Western observer. Consequently, in situ development of the predominantly southwestern European traditions is very much more realistic than introduction from outside. However, it renders any tale of African invaders redundant.

The third explanation is evidently the most parsimonious, the most readily testable, and the scientifically most persuasive. It contends that the “sudden appearance” of the art is a result of a combination of changes in cultural practices, taphonomic processes, and metamorphological factors related to the evidence-gathering strategies of archaeologists. I have long sought to emphasize several aspects of this art of the Final Pleistocene that suggest the involvement of taphonomic selection. Cave art, for instance, has survived primarily in regions of negligible cryoclast cave deposits, i.e., in relatively stable speleoclimatic environments. The world over, rock paintings have not survived from the Pleistocene, unless they were either located in deep caves, or were concealed by mineral accretions (e.g., silica or oxalate). Yet, the practice of applying pigments to rock surfaces can be demonstrated to have existed for hundreds of millennia, as shown by hematite crayons with striated wear

facets (Bednarik 1990, 2003). Nearly all of the portable art objects of the Pleistocene consist primarily of dentine, calcium carbonate, or calcium phosphate, i.e., substances that would only survive in high-pH sediments. They have indeed only survived in loesses and limestone caves, which does of course not mean that such art only existed where these sediments occur. Rather, the evidence of these art traditions must be severely truncated by taphonomy, because the logical alternative explanation, that such art objects were only deposited in regions of sediments suitable for their long-term preservation, would be absurd. It follows from these and similar considerations of taphonomic logic (Bednarik 1994b) that the distributional, compositional, and statistical indices of palaeoart are all fundamentally irrelevant to the interpretation of this evidence.

This third possible explanation for the claimed sudden appearance of undeniably very complex art 32,000 carbon years ago is the most plausible, but it also negates the notion of a population replacement. The conceptually most complex art of the “Upper Palaeolithic” is that of its early part, the Aurignacian, including the two therianthropes from Swabia (Hohlenstein-Stadel, see Schmid 1989; and Hohle Fels, see Conard et al. 2003), the anthropomorph from Galgenberg (Bednarik 1989), the extensive parietal art from Chauvet Cave (Chauvet et al. 1995; Clottes 2001), the older phase of Baume-Latrone (Bégouën 1941; Drouot 1953; Bednarik 1986) and the engravings of l’Aldène (Ambert et al. 2005: 276 f.; Ambert and Guendon 2005). No credible explanation has ever been offered by the Eve camp as to how such sophistication could have suddenly appeared, or where it came from. As I have pointed out decades ago, it is impossible that the surviving sample of Upper Palaeolithic art, a few thousand instances spread over some 25,000 years, could account for the complexity of these systems, hence it is only a tiny remnant of what was once created. The cave art is best seen as the taphonomic remnant of the relatively few instances when activities that normally took place out of caves were conducted in such protective sites. This art could only survive in caves, and the concept of an art endemic to caves is almost certainly a fallacy. The sudden appearance of the art on the “archaeological record” simply marks the time when a convention developed of occasionally creating wall art subterranously.

Art-like products, such as geometric engravings, pendants and beads, cupules and linear petroglyphs, proto-figurines, and other such material has long been known from periods of the Mid-

dle and even Lower Palaeolithic. The thousands of examples I have described (Bednarik 1992, 2003) provide a cognitive and semiotic background that rendered the developments in the second half of the Aurignacian possible, by showing that the human capacity to create entirely nonutilitarian products is hundreds of thousands of years old. These finds, demonstrating the storage of symbolic information external to the human brain, range from the solidly dated 530 Acheulian cupules at two Indian sites (Bednarik et al. 2005) to the several hundred Acheulian *Porosphaera globularis* fossils indisputably used as beads (Bednarik 2005b); and from the Bilzingsleben engravings (Bednarik 1995a), now confirmed to be deliberate (Steguweit 1999), to the earliest iconographic image currently known, of the Micoquian (Bednarik 2006b). This substantial corpus of evidence, supplemented by the demonstrated use of red pigment for hundreds of millennia, and by the evidence of hominin seafaring ability by 840 ka ago at the latest (Bednarik 1999), provides strong evidence that the cognitive, intellectual, technological, linguistic, and cultural abilities of hominins have been massively underestimated by orthodox archaeology.

### Let There Be Ignimbrite!

The failure of the replacement advocates to properly consider the extensive evidence provided by palaeoart resembles their neglect of alternative models to account for the gradual Late Pleistocene shift from typical Mousterian traditions to EUP ones and, subsequently, the even more specialized tool industries after 28 ka B.P. Similarly, blind trust in the Eve model has prevented meaningful discussion of alternative explanations for the gracilization of humans in Europe. Nevertheless, there *are* alternative explanations, and they *are* far more persuasive than the simplistic replacement notion. Most obviously, if there had been some cataclysmic event in Europe that had forced both technology and genetics through the bottleneck of an environmental disaster, this could have produced a noticeable change in the trajectories of both human and technological evolution.

The greatest disaster in Europe’s Late Pleistocene was the Campanian Ignimbrite (CI) event in southern Italy (Barberi et al. 1978; Fedele et al. 2002). The best available <sup>14</sup>C determinations for the CI eruption place it between 35,600 ± 150 and 33,200 ± 600 carbon years B.P. (Deino et al. 1994). However, the true age of the event is thought to be 39,280 ± 110 B.P., derived from a large series

(36 determinations from 18 samples) of high-precision single-crystal  $^{40}\text{Ar}/^{39}\text{Ar}$  measurements (De Vivo et al. 2001). Alternatively, Fedele and Giacchio (2007) have proposed that a significant volcanogenic sulfate signal in the GISP2 ice core, occurring precisely 40,012 B.P., represents the Campanian eruption. Thus the CI volcanic event falls precisely in the crucial millennium, which particularly in southern Italy witnessed extraordinary cultural developments. Fedele et al. (2002, 2003) have shown how the volcanic stratum appears inserted between the first recognizable EUP traditions of Europe (Early and Proto-Aurignacian, Szeletian, Bohunician, Uluzzian, Châtelperronian) and the later Aurignacoid or Gravettoid (Spitsyn, Pavlovian). In southern Italy and possibly also in parts of southeastern Europe, the CI event is succeeded by a period showing no human occupation initially, which in view of the effects of the event may well indicate temporary depopulation. The CI event also marks the beginning of Heinrich Event 4, the climatically certainly most extreme of the six sharp cooling episodes detected on the Tyrrhenian palaeotemperature record (Heinrich 1988). Moreover, it coincides with the Laschamp geomagnetic excursion, an event marked by an exceptional peak in several cosmogenic nuclides ( $^{10}\text{Be}$ ,  $^{14}\text{C}$ , and  $^{36}\text{Cl}$ ). The projected impact gradient of the CI eruption suggests that its greatest effect, apart from the devastation of southern Italy, was to the northeast, with the ignimbrite layer still clearly defined at Kostenki, on the Don river, Russia. In much of the area affected, the pyroclastic cover is thought to have been of sufficient thickness to severely influence life cycles in various ways: through the collapse of the herbivore grade in the food chain, the change in the availability of staple plant foods, and the change in hydrological regimes (Fedele et al. 2003). The catastrophic CI eruption and subsequent collapse of a caldera of 230 km<sup>2</sup> area near Naples (Orsi et al. 1996) was accompanied by a pyroclastic flow extending over 30,000 km<sup>2</sup> (Fisher et al. 1993). Following the initial phreatomagmatic explosions, a plinian eruption column is thought to have risen to a height of up to 44 km. This was the largest European volcanic event for the last 200 millennia.

I have studied a similar, though much less dramatic and more recent sequence in the far southeast of South Australia. In the region of Mount Gambier, a series of volcanic eruptions around the middle of the Holocene covered the surrounding landscape with a thin layer of ash and tephra, whose thickness is a direct function of distance from each vent. Wherever the relevant strata are exposed,

Aboriginal stone tools occur, sometimes in profusion, below the pyroclastic layer, and right up to it. Above it, however, occurs a sterile layer until the stone tools reappear further up in the sequence. In this case we even have eyewitness accounts of these volcanic eruptions. An Aboriginal story collected in the mid-19th century (Smith 1880) describes the full details of the eruptions correctly. In this case, too, the deposition of volcanic debris was followed by depopulation, the result of ecological stress and collapse of the trophic chain.

The abandonment of EUP occupation sites in southern Italy suggests that the certainly much more dramatic effects on the ecosystem there, of the CI event and the immediately subsequent Heinrich Event 4, had a great impact on the human population. The CI tephra coincides with a similar hiatus, sometimes of millennia, in the record of human occupation over a large area of the Mediterranean and southeastern Europe. The noticeable changes in stone tool technology over the subsequent millennia, Fedele and his colleagues suggest, are the effects of a bottleneck induced by environmental conditions demanding changes and improvements in technology. The dynamics are likely to have involved significant adjustments to demography, and attendant stresses or interactions among human groups facilitating rapid adaptation. That very same mechanism could very plausibly affect genetics and human morphology in much the same way. A sharp reduction in gene pool size is the most effective factor in the acceleration of phylogenetic change in a population, particularly if it is combined with genetic drift across contiguous populations subjected to demographic adjustments. Certainly, there is no evidence that the humans concerned were anything other than very late Neanderthals; there is no indication of the presence of "more modern" types in Europe at that stage (40 ka to 35 ka B.P.). Nor are the pre- and post-IC event assemblages sufficiently different to postulate any involvement of intrusive populations.

The diversification and specialization of Mousterian traditions certainly precedes the IC event by a significant margin, and the acceleration of this process immediately subsequent to the event produced no fundamental change in the direction of this development. Aurignacoid traditions occur before it in several regions of Europe, and they continue for another ten millennia. This provides no evidence of an intrusive population; it supports the model of in-situ development. If the people concerned between 40 ka and 35 ka ago were Neanderthals, as currently appears to be the case, then we have no reason to assume that they were re-

placed at any time between 35 ka and 28 ka B.P. On the contrary, based on stone tool technology, there was only gradual change then, and we still have a number of Neanderthal remains from the period – including together with EUP tool assemblages as noted above. If there had been a sudden change in either technology or human population, it would have had to occur around 28 ka B.P.: the appearance of the Gravettian and of human types that are morphologically closer to modern people than to Neanderthals. However, this raises two issues, each of which leaves the African Eve protagonists with a dilemma.

The first problem is that there are several finds of human remains between 35 ka and 25 ka that are too robust for typical “modern” humans, but also too gracile to count as Neanderthals. Rather, they appear to be intermediate, often with the males being very robust, the females considerably more gracile. Not only does this, as we have seen above, suggest a continuum between the two perceived subspecies (or interbreeding, if that less plausible explanation is preferred), it would also explain why the Aurignacoid cultures continued through much of this period. This scenario obviously refutes the replacement hypothesis.

The second quandary the Eve advocates find themselves in is that they have long accepted that during the period from 35,000 to 28,000 carbon years ago, highly sophisticated art was produced in various regions of Eurasia. Until now, Eve’s supporters have believed these to be the work of intrusive and superior colonizers from Africa. As the evidence now stands, that is not a realistic possibility, because the principal culture concerned, the Aurignacian, appears to be a tradition either of Neanderthals, or of somewhat less robust direct descendants of Neanderthals. Both options again refute the Eve model.

### Neanderthals at Chauvet?

Now that the only securely dated “reasonably modern” (but not fully modern) human remains in Europe are 27,700 years or later, and older dated finds are considered to be of Neanderthals or “intermediate” forms, it is timely to enquire: could the parietal art of such places as Chauvet Cave or the mobiliary art of Galgenberg and Vogelherd be the work of Neanderthals? It is true to say that we cannot assign *any stone tool tradition of the entire first half of the so-called Upper Palaeolithic* – including the entire Aurignacian – to anatomically modern people. European Pleistocene archaeologists need

to adjust to this new scenario, and unless they can demonstrate that Chauvet was made by what they call “Moderns” or “Cro-Magnons,” they are obliged to equally consider the possibility that this art is the work either of Neanderthals or of their descendants who might have experienced genetic drift rather than “replacement.” Science works by falsification, and the proposition to be tested now is that the Chauvet art *was not created by “fully moderns.”* To refute that proposition it is required to present anatomically modern human remains from an unequivocal EUP context.

One desperate avenue to avoid having to face this issue would be to argue that the dating of Chauvet is false, and that the art is Magdalenian rather than Aurignacian. A few archaeologists have already presented this argument (Zuechner 1996; Pettitt and Bahn 2003).

Chauvet Cave in the French Ardèche (Chauvet et al. 1995; Clottes 2001) is the most painstakingly studied and the most pristine Palaeolithic cave art site known. The standard of the fieldwork being carried out there is peerless (Bednarik 2005a). The site’s rock art is also the best dated of the Palaeolithic sites so far subjected to any form of direct and scientific dating (Clottes et al. 1995; Valladas et al. 2004). It is very healthy to subject scientific propositions to falsification attempts, and all current dating claims for rock art, anywhere in the world, are tentative and based on experimental methods. They are presentations of testable data, and need to be interpreted in the context of the considerable qualifications that apply to them all (Bednarik 2002a). However, the use of stylistic argument (i.e., rhetoric based on untestable cognitive processes involving autosuggestion), the only basis of the contentions of Zuechner (1996) and Pettitt and Bahn (2003), needs to be questioned. The issue is not whether stylistic constructs are valid; they are intuitive and untestable, they relate to neurophysiological processes taking place within the brain of the interpreter. To see how such revisionist efforts fare in the case of Chauvet Cave, I offer the following points for consideration.

Among the 3,703 identified faunal remains found on the floor surface of the extensive cave, those of the cave bear account for 91.8% (Philippe and Fosse 2003), and there are about 315 identifiable cave bear hibernation pits preserved in the cave. Clearly it was a bear hibernation site, like thousands of others across Europe (Bednarik 1993), and probably so for tens of millennia. The most recent cave bear finds in the main cave are about 24 ka old, while the Salle Morel appears to have remained accessible to that species until 19 ka ago.

The timing of the collapse of the cave entrances is confirmed by the recent dating to 18 ka B.P. of a stalagmite grown on one of the uppermost collapse boulders inside the blocked original main entrance. The collapse must have occurred significantly earlier, and since about 24 ka ago, the main cave was only entered by small animals, such as snakes, martens, and bats. On present evidence, a Magdalenian age of the rock art is therefore precluded by this context. Moreover, the occurrence of numerous clear depictions of *Ursus spelaeus*, a species that was extinct in the region at the time of the Magdalenian (Rabeder et al. 2000), renders the art's attribution to that tradition a priori inappropriate.

So far, three instances of anthropic deposition of cave bear remains have been observed on the cave floor, two in the Salle des Bauges and one in the Salle du Crâne (Clottes 2001; Bednarik 2005a). They are of importance to the relative dating of human activity in the cave. Evidence for cultural placement of cave bear skulls and long bones has been reported from many caves, especially in central Europe, but it is temporally restricted to the final Mousterian and specific EUP traditions, most notably the Olschewian.<sup>8</sup> This cave bear “cult,” as it was unfortunately called in the mid-20th century, remains unrefuted (Bednarik 1993), despite the endeavors of Koby (1951, 1953; Koby and Schaefer 1961) and others (Jéquier 1975). Generally, this evidence is in excess of 30 ka old at the known sites, and if the finds in Chauvet are of the same tradition, which seems very likely, the first phase of the cave's human use should also predate that time. That does not necessarily prove that the cave's early rock art phase has to be of the same period, but the onus to demonstrate that it is not is on those rejecting the Aurignacian attribution of this art. No such refuting evidence has been offered; traditional stylistic reasoning alone inspires the doubters.

However, even their stylistic arguments are mistaken. For instance, why do they assume that Aurignacian rock art must “look pretty crude and simple” (Pettitt and Bahn 2003), when portable art of the same age is so obviously sophisticated? Other rock art that is of the Aurignacian (such as that of L'Aldène) is quite similar, and other rock art considered to be of similar age (such as that of Baume

Latrone) is just as complex. We know from various sites that “Aurignacians” seem to have been somewhat interested in “dangerous animals” and vulvae, and these motif types feature prominently enough in Chauvet.

In the absence of skeletal human remains, two other means of reviewing the issue of the art's authorship can be considered. One is the width of the finger flutings found in the cave, because Neanderthals are thought to have had thicker fingers than “Moderns,” but this cannot provide conclusive evidence. Many moonmilk finger markings, in both Europe and Australia, are clearly by juveniles (Bednarik 1986). The second direct evidence concerns the footprints, which are very numerous in Chauvet Cave (Salle des Bauges, Salle du Crâne, Galerie des Croisillons). While ichnological evidence may not be conclusive in this respect, its consideration is worthwhile. The superbly preserved human tracks I have examined in the cave are, in my view, more likely to be of Neanderthaloids than of “Moderns,” for a number of reasons. In most if not all “Neanderthal” skeletal remains, it appears that the big toe is shorter than the second toe, whereas the converse applies to the known “Cro-Magnon” remains as well as footprints. This may of course be coincidence, both versions can be found among modern Europeans. However, in the case of the supposedly 8 to 10-year-old child that strode through the cave, the second toe is not only longer, it is offset above its two neighbors. In a child not used to wearing tight footwear, this might be a diagnostic feature. Moreover, the Chauvet tracks also show other characteristics that differ from most modern human tracks. The ratio of the widths across heel and front of foot is markedly greater, and more pressure has been applied to the outside margin, which is perfectly straight (Clottes 2001: fig. 28). This suggests a somewhat bow-legged gait, which may be more consistent with Neanderthals. Finally, the Chauvet footprints are naked, and I would have thought that the racially superior African invaders would have worn jackboots.

None of this provides conclusive evidence that Neanderthals walked in Chauvet, and even if it did, that would not prove that the art is also theirs. Nevertheless, based on the available data it would be premature to exclude Neanderthaloids from consideration, simply because of a manifestly false cultural construct of archaeologists that assumes all art must be by “Moderns.”

So, if we ignore the revisionist endeavors by those trying to save the African Eve model by rejecting the dating of Chauvet or other Aurignacian art, what are we left with? We know that the radio-

8 Abel 1931; Andrist et al. 1964; Bächler 1940; Bayer 1924, 1928, 1929a, 1929b, 1930; Bednarik 1993; Bégouën and Breuil 1958; Brodar 1957; Cramer 1941; Ehrenberg 1951, 1953a, 1953b, 1956, 1957, 1958–59, 1959, 1962, 1970; Kyrle 1931; Malez 1956, 1958, 1965; Mottl 1950; Rabeder et al. 2000; Rakovec 1967; Stehlin and Dubois 1916; Trimel 1950; Trombe and Dubuc 1947; Tschumi 1949; Vértes 1951, 1955, 1958–59, 1965; Zotz 1939, 1944, 1951.

carbon dates, of southern Europe at least, during the *European Late Pleistocene Shift* (Fedele et al. 2003) are fundamentally flawed, because of the effects of the Campanian Ignimbrite event and the Laschamp cosmogenic radionuclide peak. Therefore, in southern France, carbon isotope dates only marginally lower than the carbon age of the CI event may well be several millennia too low, and the true age of the early Chauvet rock art phase could theoretically be as high as 36 or 37 ka B.P. Even the most dedicated Eve supporters would be hard pressed to defend the notion of a presence of Eve's prodigy in Europe at that time. This does not, of course, exclude the possibility that such evidence will be found one day, but we can only consider evidence in hand. What we do have is a high probability that the early rock art in Chauvet Cave was made either by Neanderthaloids or by their direct descendents. The point is moot, because ultimately, all subsequent Europeans are descended from Neanderthals, contrary to the dominant archaeological dogma. Moreover, the very concept of "Neanderthals" is false; these people were not a discrete species, as shown by the supposed Neanderthals who are in reality of the Holocene (see above). Rather, we have lumped together quite diverse archaic *Homo sapiens* individuals from Eurasia according to a historically contingent formula of how different their crania are from our own (for a cogent critique of this practice, see Tobias 1995). All contemporary humans in Africa, Asia, and Australia are also descended from archaic *Homo sapiens* types. That has been obvious for a century, and the European replacement hypothesis is merely an aberration. There is no evidence of replacement in either eastern Asia or Australia, or even in Africa. Therefore, the answer to the question, was the Chauvet rock art created by "Neanderthals," probably depends on how one chooses to define them.

## Epilogue

Human culture is what determines humanness, and overemphasized cranial differences are totally unrelated to what made us human. The endless interpretations of trivial skeletal differences between robust and gracile *H. sapiens* populations lacking appreciable cultural differences are of little relevance to questions of recent human evolution. The study of those factors that made us human has been neglected because of this fixation. We have yet to see a similar evolutionary obsession with the cranial structure of a species such as the dog, which shows far wider morphological variation than the

domesticated human (an animal that presumably "domesticated itself" in the Final Pleistocene by introducing selective breeding patterns determined by cultural factors). The most disappointing aspect of the discussion of the supposed "EUP cultural revolution" at some unspecified time between 45 ka and 32 ka B.P. is the unwillingness of the short-range protagonists to learn from evidence conflicting with their dogma.<sup>9</sup> Their inability to make any concessions is well illustrated by the latter author, who still believes that "perforated animal teeth, shells, beads, and other personal ornaments" and notation begin with what he defines as the Upper Palaeolithic. So-called personal ornaments can be traced back hundreds of millennia, while there is no conclusive proof of notation in the entire Pleistocene. Quite possibly notation was used then, but this has not been proved by Marshack, d'Errico, or anyone else, because it cannot be demonstrated that two engraved markings were made by two different stone tool points (Bednarik 1991). Concerning the "explosion" of this "Upper Palaeolithic," there is no evidence that the rate of technological development in Europe between 45 ka and 28 ka, the time still dominated by Neanderthaloids, was greater than the rate during the second half of the period so named. This is so even before we consider the highly distorted nature of all Pleistocene records, which omit, for instance, all evidence of the presumably more advanced half of the human world population. That half of humanity lived on seashores, in deltas, and along the lower reaches of the major rivers. Because of the subsequent rises in sea level, we have no knowledge of the cultures, technologies, or human morphology of any Pleistocene coastal people. If the presumably more sedentary coastal populations in Europe had been more gracile than those more mobile tribes of the hinterland – the only ones we can have any evidence of – this could easily account for the available data, much in the same way as the cave art is a result of taphonomically truncated evidence. This and other possible scenarios have never been considered as alternatives to the replacement model. Instead, Mellars and his many supporting colleagues perceive an "explosive revolution," yet most of the innovations they cite were in place many tens, even hundreds of thousands of years earlier, in Europe or elsewhere. Significant "revolutions" occurred subsequently, in the Gravettian, Solutrean, and especially Magdalenian innovations,

<sup>9</sup> E.g., Chase and Dibble 1987; Davidson and Noble 1989; Mellars 2005.

and in a much shorter time. After all, the Aurignacian alone lasted as long as the remainder of this “Upper Palaeolithic.” After sea levels approached their present height, during the Holocene, we see yet another “revolution” invented by archaeology, the Mesolithic. Yet, its appearance is at least partly attributable to coastal people for the first time becoming visible on the archaeological record. So much of prehistoric archaeology seems to be made up of such misinterpretations of essentially taphonomic factors.

Constructive dialogue is very difficult in this epistemological environment dominated by false deductions and accommodative reasoning. If models were framed in terms of falsifiability, their inherent flaws could be detected by refutation. The models created by Pleistocene archaeology seem to be inert to such practices. This is well expressed by the differences in standards applied according to putative age. If it were to be demonstrated conclusively that Neanderthals made the Chauvet art, it would prompt some hurried tinkering with the dogma, but would not lead to its abandonment. This accommodative thinking, which so dominates Pleistocene archaeology, is obviously a significant barrier to scientific status. In science, one does not propose hypotheses and then look for confirming evidence; one looks for disconfirming evidence, something Pleistocene archaeologists seem averse to doing. There are also distinctive overtones of a belief system here: we already know that all humans other than graciles were of inferior abilities, so we need to find evidence confirming this notion.

This is particularly obvious in the case of the eager acceptance of the African Eve hypothesis, a model that is contradicted by all available archaeological data and is supported only by questionable and controversial numbers crunching of *some* geneticists, rejected by others. It is no coincidence that this hypothesis is framed within Biblical metaphors: the mitochondrial founding mother, the Y chromosome Adam, replete with a sub-Saharan Eden, and the experimental evolutionary tree scenarios termed “Deluge runs.” We have the Exodus of the Moderns, first from Africa to the Levant, then to Europe. The media rather than the researchers often coin these facetious terminologies, but fundamentalists of all shades eagerly absorb them. The African “lost tribe of Israel” that colonized Europe between 40 and 30 ka ago (or whenever), this technologically, cognitively, and intellectually superior human species is not a harmless fad of archaeology, it reflects that discipline’s subconscious practice of reinforcing or addressing contingent social, political, and racial prejudices in modern society

(cf. Trigger 1989). Instead of examining these currents, which we could do with some qualification, we prefer to construct fantasies about ancient social life (Gamble 1999). We use inadequate and distorted data that were created only to reinforce a false model to disprove Gordon Childe’s dictum that the reconstruction of Palaeolithic social life is doomed by the data (1951: 85). We only succeed in confirming it, as shown by Gamble’s unsuccessful endeavors to provide the entirely emic “Palaeolithic societies” of Europe with a social framework.

What appears to have occurred in the checkered development of the replacement or short-range hypothesis is that, when geneticists became involved in the model-building of archaeologists, these were not satisfied with theoretical models of what may have happened. They wanted tangible answers to questions, particularly concerning timing. Without fully realizing that they were being drawn into an old controversy of palaeoanthropology, geneticists saw themselves challenged to provide “dates,” but unable to do that, they gave dates tailored to the expectations of the questioners. In theory, their models may be valid, but the time frame that suited the dominant archaeological dogma is the result of circular reasoning, and is in all probability false. In the present article I have shown that the current palaeoanthropological data from Europe alone suffice to refute the short-range model. Next, I have argued that the technological evidence from Europe during the period in question completely mirrors that derived from human skeletal finds: there are no sudden developments, and no notable evolutionary changes coincide with the supposed appearance of “Moderns.” The Aurignacian seems to begin as an industry of “Neanderthals” and accounts for the production of the greatest artistic masterworks of the Pleistocene era. This leads to my third proposition, that the record of palaeoart amounts to a refutation of the short-range, African Eve hypothesis. Nothing on this record, which begins several hundred thousand years ago, suggests the involvement of an intrusive population, because these developments are clearly local phenomena, having no external precedent, least of all in Africa or the Levant. I have also critically examined the replacement model based on its own evidence, and have detected no credible support. Indeed, if the Aurignacoid and other EUP traditions were the work of either Neanderthals or their immediate descendants, the replacement model would stand entirely without substantiation – except some dubious speculations about DNA mutation rates.

One question remains: how did this precipitate hypothesis ever gain currency? If we consider the

hominin evidence from Narmada (a pygmy hominin, besides one of exceptionally large brain size) and Flores, it becomes apparent that our knowledge of human evolutionary dynamics in the Asian theatre is negligible, Asia having been so severely neglected for over half a century. Indeed, the road that led to the African Eve fad began with Howells' (1942) misinterpretation of Weidenreich's "trellis" model of human evolution. Howells mistakenly read it as a "cantilever" model (Bednarik and Kuckenbun 1999). This led to the dichotomy that has determined all debate since, an apparently insurmountable obstacle to meaningful dialogue. When Protsch presented his first false datings of German fossils, the replacement model became possible. Now that the rug has been pulled from under Eve's feet, it remains to be seen how those whose credibility is under review will respond. Eve's champions have in the past always eclipsed their opponents in the public arena, being more facile, more effective communicators and academically more influential. Anyone expecting that they will concede any point needs to appreciate that their model has no more room for compromise than Protsch has shown (Schulz 2004). The African Eve model is an all-or-nothing affair; it has no room to maneuver. It would be fascinating to examine the politics and power dynamics of Pleistocene archaeology, these currents of the many extrinsic factors that have determined what today passes for a history of the Ice Ages. We are very aware of the sensibilities of those who exercise judgment, how they respond to challenges of their dogma, and how they place personal reputation, especially their own, above veracity.

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