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Archaeology and the Population-Dispersal Hypothesis of Modern Human Origins in Europe

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Archaeology and the population-dispersal hypothesis of modern human origins in Europe

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SUMMARY

The transition from anatomically 'archaic' to 'modern' populations would seem to have occurred in most regions of Europe broadly between *ca.* 40 and 30 ka ago: much later than in most other areas of the world. The archaeological evidence supports the view that this transition was associated with the dispersal of new human populations into Europe, equipped with a new technology ('Aurignacian') and a range of radical behavioural and cultural innovations which collectively define the 'Middle-Upper Palaeolithic transition'. In several regions of Europe there is archaeological evidence for a chronological overlap between these populations and the final Neanderthal populations and, apparently, for various forms of contact, interaction and, apparently, 'acculturation' between these two populations. The fundamental behavioural adaptations implicit in the 'Upper Palaeolithic Revolution' (possibly including language) are thought to have been responsible for this rapid dispersal of human populations over the ecologically demanding environments of last-glacial Europe.

1. INTRODUCTION

Archaeology is concerned – by its nature and by definition – with the evidence for the behaviour of early human populations, rather than with their biology or genetic history. Archaeological evidence can however have a very direct and relevant bearing on the demographic structure and organization of prehistoric groups, and on their potential ancestry and relationships with other groups. The aim of the present paper is to examine the bearing of the available archaeological evidence from the European continent on two of the most central and currently controversial issues posed by the present symposium.

1. How far – if at all – does the archaeological evidence support the hypothesis of a rapid dispersal of new human populations into Europe associated with the first appearance of 'anatomically modern' anatomy? Conversely, can this evidence be accounted for equally if not more economically in terms of the alternative scenario of essentially continuous biological and demographic development over the period of the archaic-to-modern human transition?

2. If we accept the implications of the current 'population dispersal' scenarios of modern human origins, how far can we recognize any patterns of coexistence, contact or interaction between the hypothetically intrusive populations of anatomically modern humans and the indigenous populations of anatomically archaic (i.e. 'Neanderthal') hominids in the different regions of Europe?

One of the central assumptions underlying this paper is that the archaeological evidence is no less relevant to addressing these issues about the relationships between archaic and modern populations than is that provided by the more 'direct' evidence of the skeletal remains themselves. The obvious limitation of the skeletal evidence, of course, lies in the sheer incompleteness of this record: the relatively small number of specimens available, the highly fragmentary state of many of the remains and (in many cases) the degree of ambiguity surrounding the chronology and precise associations of the different finds. By any standards of comparison, the archaeological evidence provides a record of human development over the period of the archaic-to-modern human transition which is not only much more detailed and complete than that of the skeletal material, but also much better documented and more fine-grained in chronological terms.

2. THE ISSUE OF POPULATION REPLACEMENT VERSUS POPULATION CONTINUITY

The issue of population continuity versus population replacement has of course formed the core of the debate over the transition from anatomically archaic to anatomically modern populations in Europe throughout virtually the whole of the present century: effectively since the initial publication of the famous Neanderthal skeleton from La-Chapelle-aux-Saints by Marcellin Boule in 1909. Although there are no doubt a range of essentially intermediate positions which could potentially be taken on this issue (involving varying degrees of gene flow, interbreeding, accultu-

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ration, small scale population shifts, etc. between adjacent regions: cf. Smith *et al.* (1989); Smith (1991)) the interpretations of the recent DNA studies of modern human populations have tended to present this issue as an opposition between two fairly stark alternatives: either a fairly rapid, abrupt and effectively total replacement of one population by another (e.g. Cann *et al.* 1987; Stoneking & Cann 1989); or alternatively a largely continuous process of demographic and evolutionary development, in which episodes of population dispersal, migration and ultimately replacement were, at best, on a relatively localized and demographically minor scale (e.g. Wolpoff 1989; Thorne & Wolpoff 1992; Clark & Lindly 1989; Clark 1992). In terms of the theme of the present symposium, therefore, it is appropriate to examine the implications of the archaeological evidence from Europe primarily in terms of these two, sharply dichotomized points of view.

Reviewing the literature which has appeared on this topic over the past ten years, it is probably fair to say that a clear majority of archaeological opinion in Europe is now in favour of the population dispersal scenario of modern human origins, even if a significant and vociferous minority would still argue for the population continuity hypothesis (cf. Allsworth–Jones 1986, 1990; Kozlowski 1988, 1990; Demars & Hublin 1989; Demars 1990; Hublin 1990; Harrold 1989; Mellars 1989*a*, 1991; Mussi 1990; Goia 1990; Farizy 1990; Bischoff *et al.* 1990; versus Clark & Lindly 1989; Clark 1992). The central component in these arguments rests fairly critically and pivotally on one basic correlation: namely the assumption that all of the earliest, typical and securely documented occurrences of fully anatomically modern hominids within the different regions of Europe are associated with one specific archaeological entity: namely with the grouping of so-called Aurignacian industries. Totally explicit associations of this kind are perhaps not quite as abundant or unambiguous as one might hope, once allowance has been made for the limitations of earlier excavation techniques, and the uncertainties of some of the associated stratigraphic and dating evidence. Nevertheless there is at present little dispute that essentially clear and well documented associations of this kind can be recognized in at least four or five separate localities in different regions of Europe, notably at Vogelherd in Germany, Mladeč in Czechoslovakia, Velika Pečina in Yugoslavia, and Les Rois in France, with highly probable associations of the same kind at a range of other sites (Cro-Magnon, Le Crouzade, Fontéchevade, Isturitz, etc.) (Smith 1984, 1991; Stringer *et al.* 1984; Howell 1984; Gambier 1989; Hublin 1990). Certainly, no well documented claim has ever been made for an association between distinctively Aurignacian assemblages and characteristically Neanderthal skeletal morphology in Europe. Clearly, to clinch this particular argument there is an urgent need for direct absolute dating of the relevant skeletal remains, presumably based on direct accelerator mass spectrometry (AMS) dating of small samples from the skeletal remains themselves.

If this critical association between culturally 'Aurignacian' assemblages and anatomically 'modern' skeletal morphology is accepted, then of course the whole of the archaeological aspect of this debate hinges essentially on the evidence for the specific origins and mutual interrelationships of the Aurignacian industries within the different regions of Europe. Specifically, do these industries appear to reflect the dispersal of a demographically 'new' population over the different parts of the continent, or do they reflect simply a diversity of essentially local patterns of technological and cultural development, deriving directly from the immediately preceding Middle Palaeolithic/Neanderthal populations within each region? As noted above, most of the recent reviews of the archaeological evidence have opted fairly strongly in favour of the former (population dispersal) hypothesis, based essentially on the following range of observations.

1. Archaeologically, one of the most striking features is the remarkable uniformity of Aurignacian technology, extending from the extreme western fringes of Europe (i.e. Cantabria and western France) through effectively all areas of central, eastern and southern Europe, and reaching into at least the northern parts of the Middle East (northern Israel and Lebanon), in all a span of almost 4000 km (see figure 1). As Bordes (e.g. 1968, p. 200) and several other workers have pointed out, many of the typically 'Aurignacian' industries from sites such as El Wad and Hayonim in Israel are virtually indistinguishable in general typological and technological terms from those recovered from many of the 'classic' Aurignacian sites in southwest France or northern Spain. This is reflected not only in a range of highly distinctive stone tool types (i.e. various forms of steeply-retouched nosed and 'carinate' scrapers, edge-retouched Aurignacian blades, and small, inversely retouched Dufour and Font-Yves bladelets), but also by the occurrence of even more esoteric forms of bone tools, in the form of both 'split-base' and 'biconical' bone points (the former recently recovered from two separate Israeli sites: Bar-Yosef & Belfer-Cohen (1988)). Significantly, this uniformity can be documented during at least two separate stages of the Aurignacian sequence. Thus a basic chronological succession from split-base bone points to simpler lozangic and biconical forms (both apparently used as functionally similar missile heads) can now be documented in areas ranging from extreme western Europe (southwest France and northern Spain), through various parts of central and eastern Europe, into the Balkans. Similar chronological trends can be documented in several regions in the relative frequencies of nosed versus carinate scraper forms, and in the occurrence of forms such as typical Font-Yves points and edge-retouched Aurignacian blades (Kozlowski & Otte 1984). These and other features point strongly to the conclusion that some kind of close social and cultural links were maintained between Aurignacian populations within the different regions of Europe throughout, apparently, the whole span of the Aurignacian development. At no other point in the Upper Palaeolithic sequence can one demonstrate such a remarkable uniformity in culture

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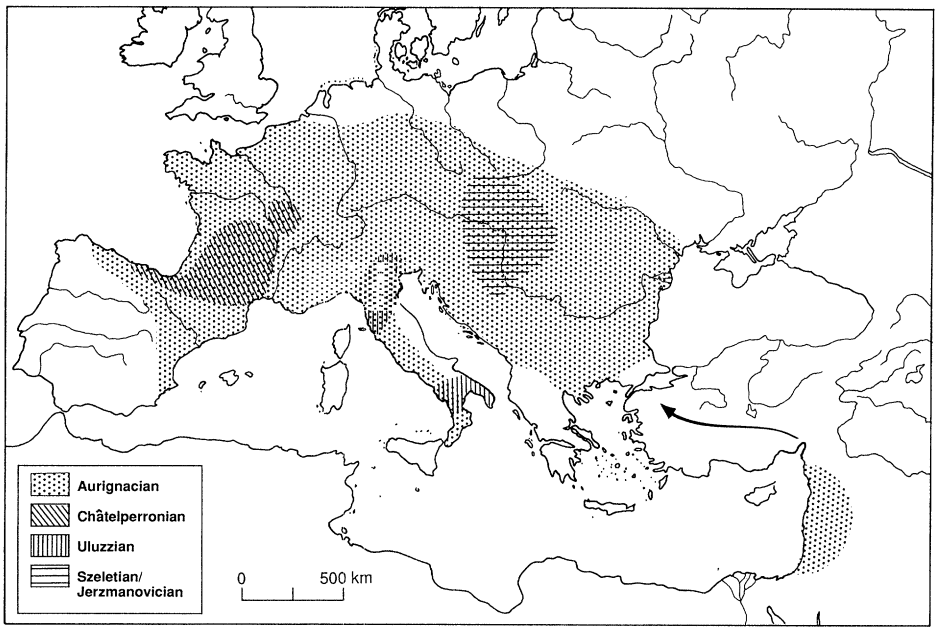

Figure 1. Geographical distribution of Aurignacian industries in Europe and the Middle East, compared with the distribution of Châtelperronian, Szeletian and Uluzzian industries. Based on Kozlowski (1992) and other sources. In addition to the distribution shown, further occurrences of apparently Aurignacian industries have been reported from Portugal, Britain, Sicily, southern Russia and Afghanistan.

and technology extending over such a wide diversity of contrasting topographic and ecological zones. Whether or not this uniformity would have been possible without some corresponding uniformity in language patterns across this broad region remains, no doubt, an intriguing point for speculation.

What makes this geographical uniformity of Aurignacian technology especially impressive is the sharp contrast with the highly varied patterns of technology documented over the same areas of Europe during the immediately preceding stages of the Middle Palaeolithic sequence. As Kozlowski (1992) has recently emphasized, it is now clear that the final stages of the Middle Palaeolithic in the different regions of Europe were characterized by a range of sharply contrasting technologies, ranging from the classic 'Mousterian of Acheulian tradition' industries of western Europe, through various forms of 'Micoquian', 'Eastern Charentian' and 'leaf-point' industries of central and eastern Europe, 'Denticulate' industries (apparently) in Italy and northeastern Spain, to the much more Levallois (especially Levallois point) dominated technologies of southeastern Europe and the Middle East. As discussed further below, it is this striking diversity of technological patterns documented during the final stages of the Middle Palaeolithic sequence which makes it particularly difficult to visualize the Aurignacian as a purely indigenous development within the different regions of Europe, emerging directly from the immediately preceding Mousterian technologies in the same regions.

2. The difficulties of identifying convincing local origins for Aurignacian technology have been emphasized by a range of different authors for almost all the individual regions in Europe: by Kozlowski (1982, 1988, 1992), Allsworth–Jones (1986, 1990) and others for the industries of central and eastern Europe; by de Sonneville–Bordes (1960), Bordes (1968), Demars (1990) and others for western France; by Hahn (1977) and Otte (1990) for north–central Europe; by Mussi (1990) and Goia (1990) for the Italian industries; and by Bischoff *et al.* (1990) for northern Spain. In all these regions the earliest Aurignacian industries seem to appear as a relatively sudden and abrupt break in the local patterns of technological development, without any clear or convincing technological antecedents within the immediately preceding Middle Palaeolithic industries: a pattern reflected not only in the basic 'technology' and 'typology' of the industries, but also (in many cases) in the specific geological sources exploited for raw materials (Kozlowski 1988, 1990). Only very rarely have arguments been advanced for a potentially local origin of Aurignacian technology, as for example by Valoch (1983) for some of the industries in Czechoslovakia, and by Cabrera Valdes and Bernaldo de Quiros (1990) for the succession at El Castillo in northern Spain. These suggestions however have been contested by other workers, and hardly take full account of the more general patterns of Aurignacian technology documented over Europe as a whole. As noted above, the most obvious obstacle to any notion of an essentially independent of Aurignacian technology within the different regions of Europe is posed by the sheer diversity of the technological patterns documented within these regions during the final stages of the Middle Palaeolithic/Mousterian succession. How such a remarkably uniform technology could emerge – rapidly, consistently, and over such an immense area – from such a diversity of technological roots remains, as yet, to be explained. At present the most plausible origin for Aurignacian technology would seem to be provided by a number of

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sites in the Middle East, most notably by the long succession at Ksar Akil in the Lebanon, which appears to show a gradually evolving sequence of Aurignacian and Proto-Aurignacian industries extending over a total time span of at least 8–10 ka (Copeland 1976; Marks & Ferring 1988; Ohnuma & Bergman 1990; Mellars & Tixier 1989).

3. The relative and absolute chronology of the earliest stages of the Aurignacian in different regions of Europe is clearly crucial to any notion of population dispersal, and is of course central to the specific theme of the present symposium. At this point we inevitably encounter all of the problems of the inherent 'credentials' of radiocarbon dating in the 30+ ka time range (i.e. the problems of contamination effects, large standard deviations, the inter-comparability of radiocarbon with other dating methods, etc.) which have been discussed in other papers in this volume (e.g. Miller; Schwarcz; Aitken & Valladas). What can be said with some confidence however is that there is now fairly explicit evidence that early forms of essentially 'Aurignacian' or 'Proto-Aurignacian' technology were already established in most regions of Europe by between 35 and 40 ka BP, and in certain areas were apparently present substantially before this date. The most significant dates in this context are those obtained for early Aurignacian levels at El Castillo and l'Arbreda in northern Spain, at Willendorf, das Geissenklösterle and Krems-Hundsteig in the Rhineland, Istállóskö in Hungary, and Bacho Kiro and Temnata in Bulgaria (see figure 2). Whether or not one can speak an overall 'cline' of dates running progressively from east to west across Europe is no doubt too early to say. However, there seems no reason to doubt the date of more than 43 ka BP obtained by the Groningen laboratory on a large charcoal sample from the earliest Aurignacian levels at Bacho Kiro in Bulgaria, the date of 44 330 ± 1900 BP for a level with abundant split-base bone points at Istállóskö in Hungary, or the recently obtained thermoluminescence (TL) dates of 45 000 ± 7000 and 46 000 ± 8000 (though with large standard deviations) for the early Aurignacian levels at Temnata in Bulgaria (Kozlowski 1982, 1992, personal communication; Allsworth-Jones 1986, 1990). All of these dates are at present substantially earlier than any of the dates so far secured for early Aurignacian horizons in western Europe. In the Middle East there is at least a possibility that the initial stages of the Aurignacian sequence go back to a similar if not even earlier date, as for example in levels XII-XIII at Ksar Akil in Lebanon, tentatively dated to around 42–44 ka BP (Mellars & Tixier 1989; Ohnuma & Bergman 1990). If this pattern of dates is accepted at face value, it

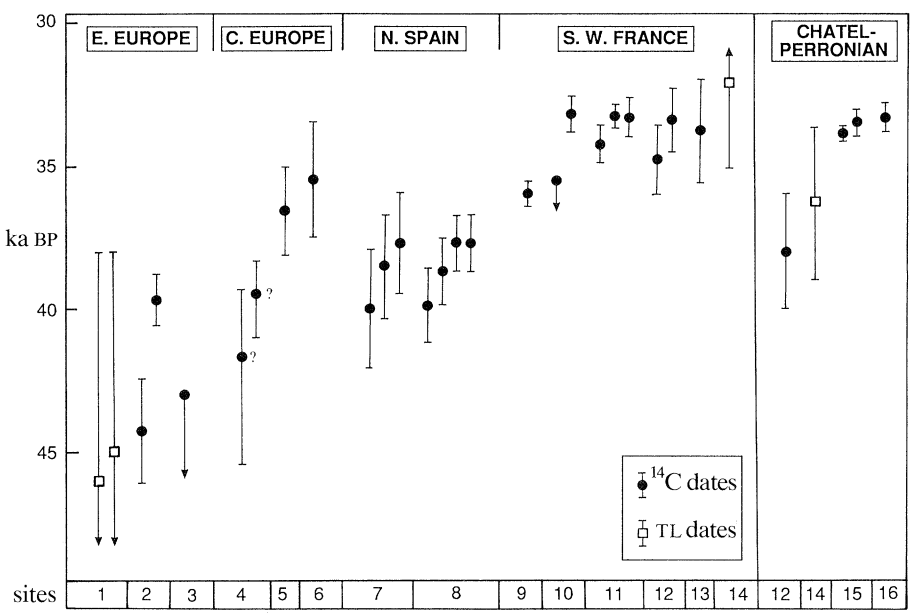

Figure 2. Absolute age measurements for early Aurignacian industries in eastern, central and western Europe, and for Châtelperronian industries in France. For the radiocarbon dates (indicated by circles) the graph includes only the oldest dates available from each region, on the assumption that these are likely to show patterns least affected by problems of residual contamination with more recent, intrusive carbon. Thermoluminescence dates are indicated by square symbols. Vertical bars indicate one standard deviation. Vertical arrows indicate 'greater than' ages. The sites shown are: 1, Temnata (Bulgaria); 2, Istállóskö (Hungary); 3, Bacho Kiro (Bulgaria); 4, Willendorf (Austria); 5, Geissenklösterle (Germany); 6, Krems (Austria); 7, Castillo (N.W. Spain); 8, L'Arbreda (N.E. Spain); 9, La Rochette (France); 10, La Ferrassie (France); 11, Abri Pataud (France); 12, Roc de Combe (France); 13, Le Flageolet (France); 14, Saint-Césaire (France); 15, Arcy-sur-Cure (France); 16, Les Cottés (France). The dates are taken from the following sources: Allsworth-Jones (1986); Bischoff *et al.* (1989); Cabrera-Valdes & Bischoff (1989); Delibrias & Fontugne (1990); Haesaerts (1990); Kozlowski (1982, 1992); Leroi–Gourhan (1964); Mellars (1990*a*); Mellars *et al.* (1987); Mercier *et al.* (1991); Movius (1975). Note that radiocarbon dates in this age range are likely to be systematically younger than those produced by other dating techniques, perhaps by *ca.* 3000 years (Bard *et al.* 1990). The precise taxonomy of the industries from Willendorf remains to be clarified.

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would clearly accord well with the hypothesis of a gradual dispersal of Aurignacian technology – and potentially of the associated human populations – progressively from east to west across Europe. Curiously – and potentially most significant of all – this technology seems to have penetrated into the most 'classic' region of western Europe (i.e. the Perigord and immediately adjacent areas of southwest France) only at a substantially later date of around 34–35 ka BP (figure 2).

4. Finally, it is now generally recognized that the Aurignacian (and specifically the earlier stages of the Aurignacian) shows the earliest well documented occurrence of most if not all of the distinctive technological, 'symbolic' and other cultural innovations which are generally regarded as the diagnostic behavioural hallmarks of fully 'Upper Palaeolithic' culture. The details of these behavioural innovations have been discussed more fully elsewhere (e.g. Mellars 1989*a*,*b*, 1991; Kozlowski 1990), but it can be said that they include not only the earliest manifestations of fully developed 'punch' blade technology and an associated range of characteristically Upper Palaeolithic tool forms (i.e. typical end scrapers, new forms of burins, small retouched bladelet forms etc.) but also the earliest examples of extensively shaped (and highly complex) bone, antler and ivory artefacts, the earliest occurrences of explicit personal ornaments (in the form of perforated animal teeth, sea shells, and carefully shaped bead forms, deliberately manufactured from stone, bone and ivory), expanded networks in the procurement and distribution of high-quality flint and other raw materials, far-travelled marine shells, and the earliest examples of complex and remarkably sophisticated naturalistic art and geometrical decoration (Kozlowski 1988, 1990; Hahn 1972, 1977; Delluc & Delluc 1978; Mellars 1973, 1989*a*,*b*, 1991; White 1989; Bosinski 1990). As the evidence stands at present, it would seem that all of these cultural innovations make their first well documented appearance specifically in early Aurignacian contexts in the different regions of Europe and (with a number of very rare and highly debatable exceptions: cf. Marshack (1972, 1990), versus Chase & Dibble (1987)) are conspicuously lacking from earlier, Middle Palaeolithic contexts in the same areas. In at least certain regions there are indications that the earlier stages of the Aurignacian also witnessed a substantial increase in human population densities (marked by a sharp increase in the total numbers occupied sites), the formation of larger and perhaps more permanent social groupings, and the appearance of more highly specialized patterns of faunal exploitation focused on the intensive hunting of a single, migratory herd species (Mellars 1973, 1989*a*).

Exactly what these innovations signify in more general behavioural and cultural terms is of course still a matter of lively debate. Few prehistorians however would question either the scale and complexity of the behavioural changes involved (extending apparently into almost all spheres of human activity) or the evidence for a dramatic 'explosion' in various forms of explicitly symbolic behaviour (e.g. White 1989). Most workers agree that these changes would be inconceivable in the absence of some form of relatively complex, highly structured language among the early Aurignacian groups. Needless to say, radical and wide-ranging behavioural innovations of this kind cannot be taken as an automatic reflection of population dispersal or replacement in the archaeological record, since it is clear that in certain contexts episodes of rapid behavioural and cultural change can occur either through processes of simple cultural diffusion, or indeed through rapid and multivariate patterns of purely internal cultural change. Nevertheless, the point hardly needs labouring that the close association of all these radical and wide-ranging behavioural innovations with the first appearance of Aurignacian technology within the different regions of Europe – and apparently with the earliest occurrences of fully modern skeletal anatomy – is at least consistent with the hypothesis of an actual population dispersal at this point in the archaeological sequence, even if the archaeological evidence cannot be held – in isolation – to conclusively demonstrate this.

On the basis of the various lines of evidence outlined above it could be argued that the total spectrum of the archaeological evidence for the Aurignacian phenomenon within the different regions of Europe coincides closely, if not precisely, with the pattern that one would reasonably predict from the implications of the current population dispersal scenarios of modern human origins. Whether the same body of data could be held to be equally consistent with the population continuity or 'multiregional evolution' hypothesis is much more open to debate. How in this case would one account for the striking uniformity of Aurignacian technology over such a vast area of Europe and the Middle East, superimposed on so much diversity in the technology of the immediately preceding Middle Palaeolithic populations in the same regions? How would one explain the very sudden and apparently abrupt way in which this technology appears in so many different regions without, apparently, any clear or convincing technological origins or antecedents in the preceding technologies in the same areas? Or indeed the sheer range, diversity and magnitude of the various cultural and behavioural innovations involved? In the classic region of western France at least there can no longer be any serious dispute that the appearance of the Aurignacian reflects the intrusion of an essentially new human population, reflected not only in the totally sudden and abrupt appearance of this technology (clearly later than its appearance in the immediately neighbouring areas of northern Spain and the Mediterranean coast) but also in the explicit evidence that the earliest Aurignacian communities in this area clearly persisted (and apparently coexisted) for some time alongside the latest Mousterian/Neanderthal populations in the same region (as discussed further below; cf. Mellars (1989*a*); Demars & Hublin (1989)). If we accept this kind of population intrusion within the fully documented region of southwest France, we should presumably be prepared to give the same hypothesis equal consideration in the other regions of

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Europe, where the overall spectrum and character of the archaeological evidence appears to show a broadly similar pattern.

3. POPULATION INTERACTION

One element which is of course implicit and ultimately inescapable in the current 'population dispersal' models for the appearance of anatomically modern populations is that there must, inevitably, have been some period of chronological overlap, and presumably certain forms of contact and potential interaction, between the earliest (hypothetically intrusive) populations of anatomically modern humans within the different regions of Europe and the latest populations of anatomically archaic hominids. However these population dispersal – replacement models are visualized or expressed, this is clearly an inherent and ultimately inescapable prediction for the archaeological and biological record, if this particular scenario is to be upheld. The issue, in archaeological terms, is how far we can identify any evidence for this kind of situation within the archaeological record itself.

Over the past decade, evidence for this kind of chronological overlap, contact and apparent 'interaction' between the final archaic and earliest anatomically modern populations has indeed been claimed from several different regions of Europe (e.g. Allsworth–Jones 1986, 1990; Kozlowski 1988, 1990; Harrold 1989; Otte 1990; Mussi 1990; Goia 1990; Valoch 1990; Demars 1990; Demars & Hublin 1989; Hublin 1990; Mellars 1989*a*, 1991). By far the strongest and best documented evidence in this context comes from the extreme western fringes of Europe, centred on the Perigord and adjacent provinces of southwest France. The evidence resides essentially in the demonstrable contemporaneity in this region of two quite distinct and sharply contrasting technological patterns, represented on the one hand by the classic 'Aurignacian' industries (discussed in the preceding section), and on the other hand by those of the so-called 'Châtelperronian' or 'Lower Perigordian' group. Briefly, the relevant observations in this context may be summarized as follows.

1. On the basis of simple technological and geographical criteria alone, there can be no serious doubt that the Aurignacian and Châtelperronian industries were the products of distinct human populations within the southwestern French sites. The distinctive 'type fossils' which define the two industrial groups (i.e. Châtelperron points in the case of the Châtelperronian, versus several forms of nosed and carinate scrapers, Aurignacian blades, Dufour and Font Yves bladelets, split-base bone points, etc. in the Aurignacian) seem to have mutually exclusive distributions (at least in material from the most recently excavated sites) and there is also evidence that both the basic techniques of flake and blade production and the specific sources exploited for lithic raw materials in the two variants were markedly different (de Sonneville-Bordes 1960; Harrold 1989; Demars 1990; Demars & Hublin 1989; Pelegrin 1990). Perhaps most significant, the overall geographical distributions of the two industries are radically different: whereas (as noted above) the Aurignacian has a distribution extending over effectively the whole of western, central and eastern Europe, the Châtelperronian is restricted to a relatively small zone confined entirely to the western and central parts of France (to the west of the Rhône valley) and penetrating for a short distance into the adjacent areas of the Pyrenees and northern Spain (see figure 1).

2. The existence of a substantial period of overlap between the Aurignacian and Châtelperronian industries can now be demonstrated from several different aspects of the chronological data. In addition to correlations based on the detailed climatic and vegetational sequences recorded in individual sites (Saint-Césaire, Quinçay, Trou de la Chèvre, Roc de Combe, Les Cottés, les Tambourets, Arcy-sur-Cure, etc.: cf. Leroyer & Leroi-Gourhan (1983); Leroyer (1988)) there are now at least three sites known in southern France and northern Spain where discrete levels of Châtelperronian and Aurignacian industries have been found clearly interstratified within the same stratigraphic sequences: notably at Roc de Combe and le Piage in southwest France, and Cueva Morín in northwest Spain (Harrold 1989; Demars 1990). The direct evidence from radiocarbon dating admittedly remains rather sparse, and potentially ambiguous, at least for the southwest French sites (see figure 2). From the immediately adjacent areas of both northwest and northeast Spain however there is now clear radiocarbon evidence that typically Aurignacian industries were present (as noted earlier) by at least 38–40 ka BP: i.e. clearly preceding by at least 4000–5000 years the dates for the occurrence of equally typical Châtelperronian industries at sites such as Les Cottés (Vienne) and Grotte de Renne (Arcy-sur-Cure, Yonne) (Bischoff *et al.* 1989; Cabrera Valdes & Bischoff 1989; Harrold 1989; Farizy 1990). Combining all of the available palaeoclimatic, stratigraphic and radiocarbon evidence, there can be no doubt that the time ranges of the Aurignacian and Châtelperronian industries must have overlapped within these extreme western zones of Europe over a period of at least several thousand years.

3. The critical importance of this demonstrable chronological overlap of the Aurignacian and Châtelperronian industries in western Europe lies in the fact that there is now strong, if not conclusive, evidence that these two technologies were the product of sharply contrasting biological populations within this region. As discussed earlier, all of the current skeletal evidence (from both France itself and other regions of Europe) suggests that the Aurignacian industries were the product of fully anatomically modern populations (Howell 1984; Stringer *et al.* 1984; Smith 1984; Gambier 1989; Demars & Hublin 1989; Hublin 1990). By contrast, there is now explicit evidence from the skeletal remains recovered from Saint-Césaire (as well as from the series of human teeth recovered from the earlier excavations at Arcy-sur-Cure) that the populations responsible for the Châtelperronian industries were of distinctively archaic, essentially 'classic' Neanderthal type (Lévêque & Vander-

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meersch 1980; Stringer *et al.* 1984; Leroi-Gourhan 1958). If this evidence is accepted at face value, then we would seem to have direct and explicit evidence for the effective coexistence of these two biologically contrasting populations within these extreme western fringes of Europe, over a very substantial span of time.

What has not always been so clearly recognized in the earlier literature is that these specifically archaic, Neanderthal associations of the Châtelperronian industries had already been effectively predicted – several decades before the discovery of the Saint-Césaire hominid – purely on the basis of the technology of these industries. As long ago as 1954 Bordes argued that several of the distinctive technological features of the Châtelperronian industries (such as the character of the steeply backed 'Châtelperron points', as well as the occurrence in these industries of typical side scrapers, denticulates, and even small, bifacial hand-axe forms) showed obvious links with the preceding Mousterian industries of the same region especially with those of the Mousterian of Acheulian tradition ('MTA') group (Bordes 1954–55, 1958, 1968, 1972). In a later paper, I added a number of further components to these arguments, by pointing to the closely similar geographical distributions of the Châtelperronian and MTA industries (both confined strictly to areas to the west of the Rhône valley in France, and both extending into the adjacent areas of northern Spain) and arguing that the MTA industries represented the final stages of the local Mousterian sequence in southwest France, immediately preceding the emergence of the Châtelperronian industries (Mellars 1973). As pointed out elsewhere (Mellars 1989*a*) these arguments for a purely local origin for the Châtelperronian could no doubt be summed up most succinctly by observing that since the geographical distribution of the Châtelperronian is effectively restricted to these extreme, western fringes of Europe, it would be bordering on the perverse to seek an origin outside this region. In short, the arguments for believing that the Châtelperronian industries are the product of entirely indigenous (i.e. Neanderthal) populations within western Europe can be supported equally strongly on the basis of both the direct skeletal associations of the industries (at Saint-Césaire and Arcy-sur-Cure) and the basic technology, chronology and spatial distribution of the archaeological material itself.

4. The final point to be emphasized here is that this period of overlap between the Aurignacian and Châtelperronian populations in western Europe would appear to be reflected in various forms of interaction or 'acculturation' between the two populations. As discussed in more detail elsewhere (e.g. Harrold 1989; Mellars 1973, 1989*a*, 1991; Farizy 1990) it is now clear that while the basic technological roots of the Châtelperronian industries seem to lie clearly within the immediately preceding Mousterian industries (as discussed above), many of the more specific features of these industries are of clearly Upper Palaeolithic type. This applies not only to the relatively strong component of typically blade technology documented in the majority of the Châtelperronian assemblages, but also to the presence of highly typical and relatively abundant forms of both end scrapers and burins and – in at least some sites – a range of simple but extensively shaped bone and antler tools, and even 'personal ornaments', in the form of carefully perforated animal teeth (Harrold 1989; Farizy 1990; Leroi–Gourhan & Leroi–Gourhan 1964). The most important point to recognize in this context is that all of these specifically Upper Palaeolithic elements in the Châtelperronian would appear to have developed at a chronologically late stage: certainly long after the initial appearance of fully Aurignacian industries in northern Spain, and most probably while Aurignacian populations were already present in at least the southeastern parts of France (Leroyer & Leroi–Gourhan 1983; Leroyer 1988; Cabrera Valdes & Bischoff 1989). Exactly how these processes of interaction and apparent 'acculturation' between the final Neanderthal and earliest anatomically modern populations should be visualized remains, perhaps, one of the most enigmatic and intriguing issues in recent human evolution (see Graves (1991) and associated comments for further discussion of this point). But there seems little doubt that this emergence of typically Upper Palaeolithic technological features amongst the final Neanderthal populations of western Europe can be explained much more economically by the action of various contact and acculturation processes of some kind than by a purely spontaneous 'invention' of Upper Palaeolithic technology on the part of the final Neanderthal communities themselves.

How far similar interaction and acculturation patterns between the final Neanderthal and earliest anatomically modern populations can be identified in other regions of Europe still remains a matter for lively debate. Allsworth–Jones (1986, 1990), Kozlowski (1988, 1990), Valoch (1990) and several others have put forward precisely this argument for the emergence of the Szeletian and related Jerzmanowician and Bohunician industries of central and eastern Europe, arguing once again that the time-range occupied by these industries almost certainly overlaps with that of the (apparently intrusive) Aurignacian industries within the same regions, and that the existence of strictly local roots for these distinctive forms of 'leaf-point' industries can be documented very clearly from the technology – and spatial distribution – of the archaeological industries themselves. Mussi (1990), Goia (1990) and others have presented similar arguments for the emergence of the 'Uluzzian' industries within the Italian peninsula – again almost certainly contemporaneous with the presence of typically Aurignacian industries within the adjacent areas of the Mediterranean coast, and again showing a tightly restricted geographical distribution within the Italian sites (figure 1). Further to the east, similar patterns may be reflected in the dichotomy between the Streletska and Spitsinskaya industries of the south Russian Plain (Soffer 1985, Hoffecker 1988).

To summarize, recent research into the earliest stages of the Upper Palaeolithic now seems to be revealing a broadly similar pattern within the dif-

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ferent regions of Europe. In each area there is evidence for the presence of apparently intrusive, characteristically 'Aurignacian'-type industries, apparently associated with fully anatomically modern hominids, and appearing in most regions between *ca.* 43 and 35 ka BP. Closely alongside these industries – and apparently at a broadly similar date – there is evidence for the emergence of a range of sharply contrasting forms of early Upper Palaeolithic technology, each restricted to a relatively limited and sharply prescribed geographical range (see figure 1), and each showing a number of strong and obvious links with the latest Middle Palaeolithic/Mousterian technologies in the same regions. As yet it is only in western Europe that these 'local' technologies have been found in association with substantial and well documented human skeletal remains, but in this particular case (i.e. the Châtelperronian) the skeletal remains are of explicitly archaic, Neanderthal form. Proponents of the population dispersal hypothesis would argue that this pattern coincides closely, if not precisely, with the situation that one would predict from the scenario of a rapid dispersal of entirely new populations over the different regions of Europe, combined with varying degrees of chronological overlap, contact, and eventually 'acculturation' with the local, indigenous population of 'archaic' humans within the different regions.

4. COLONIZATION SCENARIOS

The final question of how and why a major episode of population dispersal should have occurred at this particular point in the Upper Pleistocene has been discussed in more detail elsewhere (Mellars 1989*a*, Zubrow 1989). From the results of the recent dating of the skeletal remains from Skhul and Qafzeh in Israel it is now clear that populations of essentially anatomically modern type had become established in the Middle Eastern zone by at least 100 ka, and must therefore have coexisted (in a broad geographical sense) alongside the Neanderthal populations in the immediately adjacent areas of Europe over a period of at least 50–60 ka (Bar-Yosef, this symposium). The potential reasons for the prolonged coexistence of these two populations may not be difficult to discern. If – as most scenarios still suggest – the anatomically modern populations had evolved initially in the tropical and subtropical environments of southern Africa, then they could hardly be expected to possess the necessary range of either biological or cultural adaptations to allow the rapid colonization of the sharply contrasting range of glacial and perigacial environments which made up the greater part of Europe during Upper Pleistocene times. By contrast, the Neanderthal populations had evolved, and evidently flourished, in these particular environments over a period of at least 100 ka if not 200 ka (Stringer *et al.* 1984; Hublin 1990). As I have argued elsewhere (Mellars 1989*a*), it was almost certainly the range of technological and other cultural innovations which took place in the Middle Eastern region around 45–50 ka BP – the so-called 'Upper Palaeolithic Revolution' – which eventually gave some strong adaptive advantage to the anatomically modern populations in this region, and equipped them not only to colonize a complex range of entirely new glacial environments, but also to compete effectively with the local Neanderthal populations in these regions. Although inevitably speculative, the possibility that the development of highly structured, fully syntactic language played some crucial role in this event (with its attendant consequences for almost all spheres of human behaviour and organization) demands serious consideration (Mellars 1989*a*, 1991; Clark, this symposium).

Regardless of the initial stimulus, the actual process of population expansion may well have been at least partially facilitated by the pattern of climatic and ecological events around the middle of the last glaciation. It is now clear that the period centred on *ca.* 50–30 ka BP (i.e. the later part of stage 3 of the oxygen-isotope sequence) was marked by a series of major climatic oscillations, during which average temperatures in many regions rose by at least 5–6°C, and allowed the expansion of temperate woodland into many areas of Europe which had previously been dominated by periglacial tundra or steppe (Guiot *et al.* 1989). To groups who were ecologically adapted – both biologically and culturally – to the temperate environments of the east Mediterranean zone, these ecological changes would inevitably have made a process of population expansion into areas lying to the north and west easier to achieve – especially if (as the present archaeological evidence suggests) this process of population expansion extended initially along the north Mediterranean littoral zone, from the Balkans, through northern Italy, to northern Spain. It could no doubt be argued that the same ecological changes might well have served to destabilize some of the specific ecological and cultural adaptations of the local Neanderthal populations in these regions, leading either to significant shifts in the geographical ranges occupied by individual groups, or perhaps even to major episodes of population decline. Zubrow (1989) has recently argued that it would require little more than a relatively minor shift in relative birth and death rates between the two populations (i.e. Neanderthal on the one hand, versus anatomically modern on the other) to lead to a process of effective population replacement of one population by the other within specific regions of Europe within a span of at most 1000 years.

Whether or not such a process of total demographic and biological replacement did in fact occur – in Europe or any other part of the world – remains, of course, the most centred and controversial element in the current debates. It is now clear however that such a process of population replacement is by no means inconceivable in either cultural or demographic terms, and could well have been achieved without any of the more dramatic scenarios of 'confrontation' – let alone mass genocide – which have been envisaged in some of the more fanciful recent discussions of the origins and dispersal of modern humans.

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