

BECOMING HUMAN: INNOVATION IN PREHISTORIC MATERIAL AND SPIRITUAL CULTURE

Edited by

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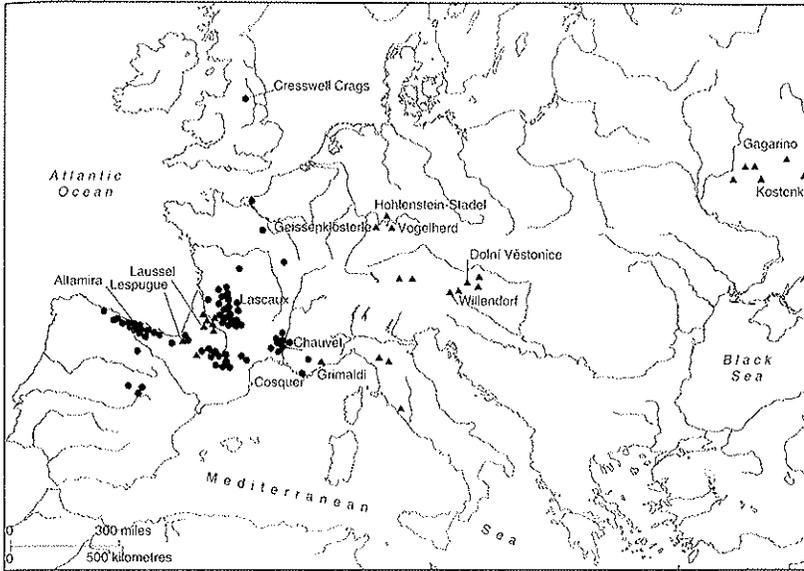
Cognition and climate: why is Upper Palaeolithic cave art almost confined to the Franco-Cantabrian region?

Paul Mellars

Les Hommes du Paléolithique supérieur restent pourtant les premiers à nous laisser le message d'une humanité parvenue sur notre sol au dépassement spirituel qui conduit à la création artistique. (Denise de Sonneville-Bordes 1960: 500)

Unquestionably the most dramatic – if enigmatic – expression of human spirituality in the course of early human development is provided by the extraordinary concentration of cave art hidden deep inside the interiors of over a hundred separate caves in southern France and northern Spain. The social, symbolic, and spiritual ‘meaning’ of this art has occupied a large part of the archaeological literature over the past century (Leroi-Gourhan 1968; Ucko & Rosenfeld 1967; Lewis-Williams 2002). To say that the cognitive meanings of this art remain highly controversial is no doubt an understatement, as several of the papers in the present volume show. Even so, few would dispute that the art must reflect some kind of deeply ‘spiritual’ belief systems, presumably reflecting beliefs in some forms of spiritual entities, gods, or other ‘supernatural’ forces, which can fairly be described as early forms of ‘religious’ expression.

In many ways the most remarkable aspect of this art however is its geographical concentration (with a few notable exceptions) within one very restricted area of western Europe, extending from the Loire valley of central France to the Cantabrian mountains of northwestern Spain (see Figure 14.1). The present paper focuses specifically on this aspect. What, in short, were the underlying social, demographic or other factors which led to this extraordinary eruption of cave art over such a comparatively restricted geographical zone of Upper Palaeolithic Europe?



14.1. Distribution of Upper Palaeolithic cave art in Europe (black circles) showing the massive concentration in the Franco-Cantabrian region. Occurrences of Upper Palaeolithic portable art are indicated by triangular symbols. (Adapted from Stringer & Andrews 2003)

Part of the answer to this question of course lies in geology. The extensive limestone formations of southwestern France, the Pyrenees and Cantabrian Spain evidently provided ideal conditions for the formation of underground cave systems, which in turn provided the essential prerequisite (in a sense the essential artistic canvases) for the production of the art. But the occurrence of similar geological formations in many other parts of Europe demonstrate beyond any doubt that geology alone can never provide more than a small part of the explanation for the remarkable concentration of cave art within the so-called Franco-Cantabrian region.

Even if geology alone cannot provide the answer, I would argue that the ultimate causes for the concentration of cave art within these regions must be sought in some form of broadly environmental factors. In brief, I will suggest that the explosion of this art within this particular region can be seen as a reflection of various demographic mechanisms directly related to the special nature of climatic and associated ecological conditions within the region throughout the time span of the Upper Palaeolithic period – that is, during the later part of the last ice age, between ca. thirty-two thousand and thirteen thousand years ago in ‘raw’

(i.e. uncalibrated) radiocarbon terms, or between ca. 36,000 and 14,000 BP (before present) in actual calendrical years (Hughen et al. 2004, Fairbanks et al. 2005). In the first section below I will look at the special ecological features of this region under ice-age conditions, while in the second part I will look at the apparent impact of these features on particular aspects of the demographic and social dimensions of the contemporaneous Upper Palaeolithic societies. In the third section I will attempt to suggest – more speculatively – some of the potential cultural mechanisms whereby these social and demographic patterns could have led to the extraordinary florescence of the Franco-Cantabrian cave art. Throughout the paper the emphasis will be primarily on the classic southwest French region, though it can be argued that closely similar factors can be extended to both the Pyrenean region and the adjacent, ecologically similar areas of Cantabrian Spain. The discussion draws on a number of my own earlier papers (Mellars 1973, 1985, 1996) together with other important studies by Jochim (1983), Hayden et al. (1987), Mithen (1990) and others.

Environmental factors

I would suggest that there were three particular features of climatic and environmental patterns within the southwest French region during the Upper Palaeolithic period which directly underlay the remarkable concentration of both Upper Palaeolithic occupation and the florescence of cave art. Briefly, these can be summarized as follows.

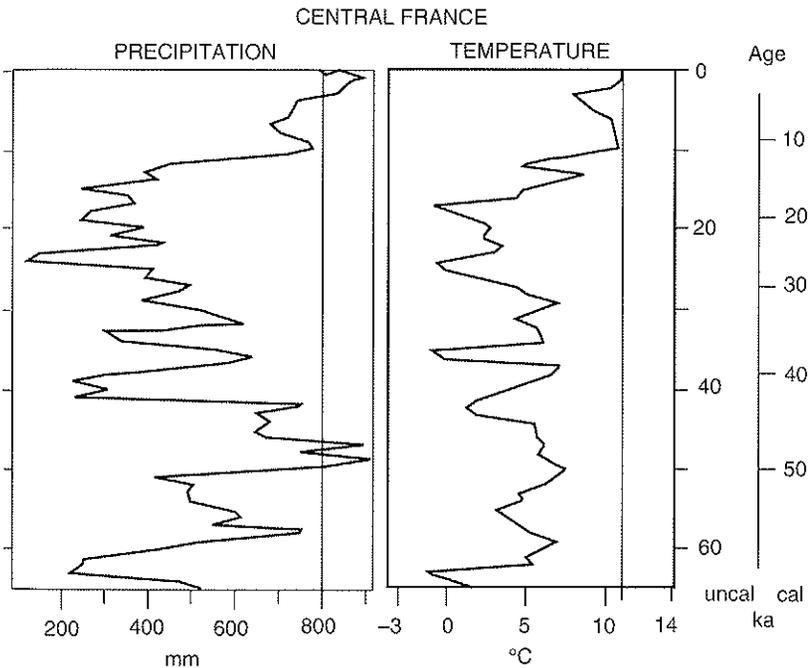
CLIMATIC PATTERNS

In climatic terms the critical features of the southwest French region derive from its extreme oceanic position along the western Atlantic coastline of Europe. At the present day this is reflected in summer-season temperatures which are much cooler than those in the more central, continental regions of Europe and – equally if not more significantly – substantially warmer winter temperatures. At present, summer temperatures in this region are around 5°C cooler than in the more continental regions, with winter temperatures up to 8°C warmer. The extrapolation of these temperature contrasts into the Upper Palaeolithic time range is inevitably more hypothetical, and of course varied with some of the rapid climatic oscillations which have now been documented from the deep-sea core and ice-core

oxygen-isotope records and associated pollen sequences over this time range (see Figure 14.2) (Dansgaard et al. 1993, Shackleton et al. 2000, Sanchez-Goni et al. 2002, van Andel & Davies 2003). Nevertheless, the combined evidence from these climatic records suggest that the overall temperature range within the oceanic, southwest French region varied between ca. -2°C in winter and 12°C in summer, compared to ranges between -10°C and 18°C in the interior areas of central and eastern Europe (van Andel & Davies 2003).

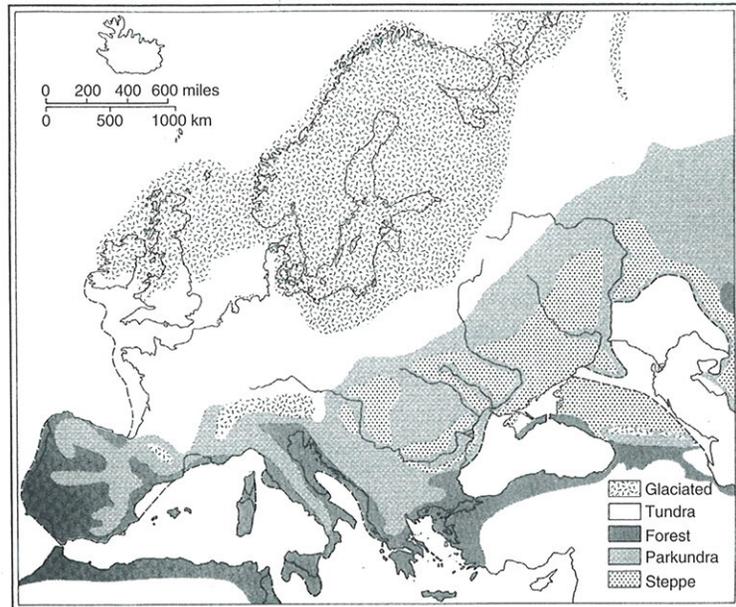
VEGETATION PATTERNS

The most direct impact of these temperature regimes was on the character of the vegetation within southwestern France – and in particular on the density of tree cover. Tree growth in general is dependent much more on summer than on winter temperatures, and it is now clear that



14.2. Reconstructed climatic fluctuations in central France over the past 60,000 years, based on a long pollen sequence from the Massif Central. Note the occurrence of significant oscillations during the course of the Upper Palaeolithic period (ca. 40,000–12,500 BP) and the sudden onset of much warmer conditions at the time of the Magdalenian to Azilian transition around 12,500 (radiocarbon years) BP. (Reproduced from Van Andel & Davies 2003)

the relatively low summer temperatures experienced throughout southwestern France during at least the greater part of the last glaciation would have led to the virtual elimination of significant tree growth in all except the most sheltered, south- or west-facing valleys (Huntley et al. 2003, Leroi-Gourhan 1977). What this means in geographical terms is that these southwestern areas of France and the adjacent regions of Cantabrian Spain would have supported the most southerly areas of essentially open, tundra or steppe/tundra-like vegetation encountered anywhere in Europe during the last glaciation (Figure 14.3) (Butzer 1971; Iversen 1973; Van Andel & Tzedakis 1996). At the same time, however, these very southerly areas of steppe/tundra would also have benefited from significantly greater sunlight than those in the more northerly regions of Europe, and accordingly a much richer and more productive growth of all forms of low-growing vegetation – together with a correspondingly longer period of growth into the late autumn, winter and early spring months. As Karl Butzer (1971: 463) pointed out over thirty years ago, combined with abundant rainfall, these southwesterly areas of Europe are likely to have



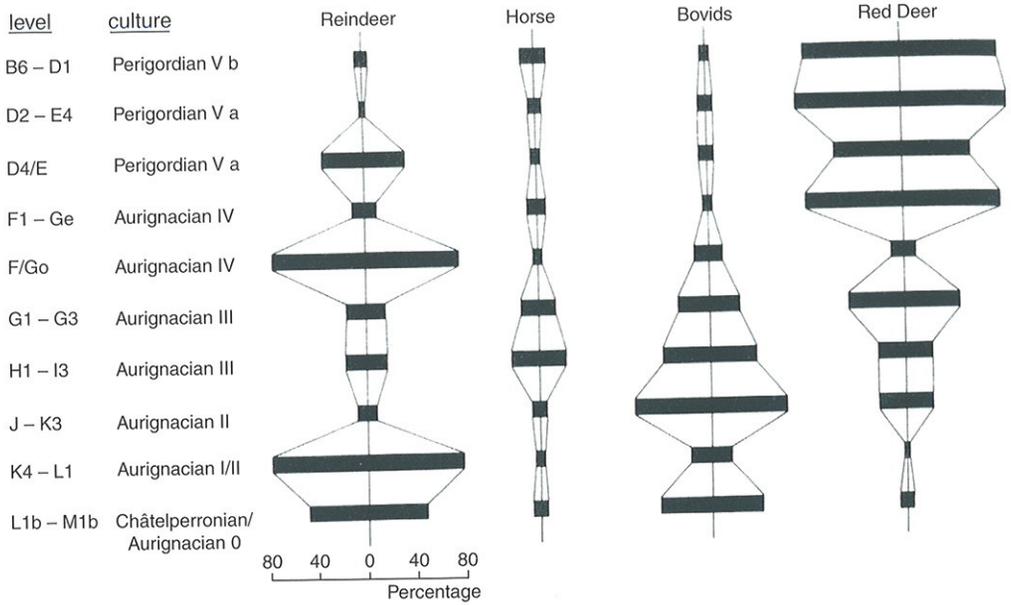
14.3. Reconstructed distribution of vegetation zones in Europe at the time of the maximum of the last glaciation, around 20,000 BP. Note how the distribution of open, tundra-like vegetation extends much further to the south in southwestern France than in other regions of Europe. (Adapted from Iversen 1973)

experienced some of the richest conditions (i.e. the highest productivities) for the growth of herbaceous tundra and steppe vegetation available anywhere within the European landmass during glacial times.

ANIMAL COMMUNITIES

From the standpoint of the contemporaneous human communities, the most significant impact of these combined climatic and vegetational conditions would have been to provide almost ideal conditions to support rich and dense populations of various herbivorous animal species, on which the subsistence and survival of the Upper Palaeolithic populations clearly depended. To visualize southwestern France as a kind of last-glacial Serengeti game reserve would no doubt be an exaggeration, but not necessarily on an overdramatic scale. We know from the actual faunal assemblages recovered from many southwest French Upper Palaeolithic sites that the faunal communities included not only vast herds of reindeer (supported by the rich tundra vegetation, with growths of mosses, lichens, etc.) but also a range of other open-country species including the wild horse, wild oxen (aurochs), steppe bison and red deer (Figure 14.4), together with more sporadic species such as ibex, chamois, mammoth, rhinoceros and (at least during the milder, interstadial episodes) wild pig, roe deer and giant elk – all species well represented in the Palaeolithic cave art itself (Delpech 1983; Boyle 1990; Leroi-Gourhan 1968).

Perhaps the most significant feature which evidently played a crucial role in the Upper Palaeolithic occupation of southwestern France however was the presence of exceptionally rich and migratory populations of reindeer. In almost half of the documented Upper Palaeolithic sites in this region reindeer accounts for over 90 percent of the total faunal remains, and in several sites reaches frequencies of between 95 and 100 percent (see Figure 14.5) (Boyle 1990; Mellars 1973, 2004). The migration patterns of reindeer in this region have stimulated some debate, but there is now increasing evidence from direct seasonality studies of growth-ring patterns in reindeer teeth that these herds must have been present within the major river valleys of the Perigord and adjacent regions throughout most of the winter months, with a probable migration up into the higher elevations of the Massif Central (or conceivably onto the plateaux regions between the main river valleys) during the mid-summer months (Bouchud 1966; Spiess 1979; Gordon 1988; Pike-Tay 1991; Burke & Pike-Tay 1997). It was clearly this particular food resource



14.4. Frequencies of different species of animals (reindeer, horse, red deer and either bison or oxen) recorded through the different levels of Upper Palaeolithic occupation at the site of La Ferrassie (Dordogne) between ca. 40,000 and 25,000 BP. This demonstrates that all of these species were clearly present in the southwest French region throughout most if not all of the Upper Palaeolithic sequence. (From Mellars 1985)

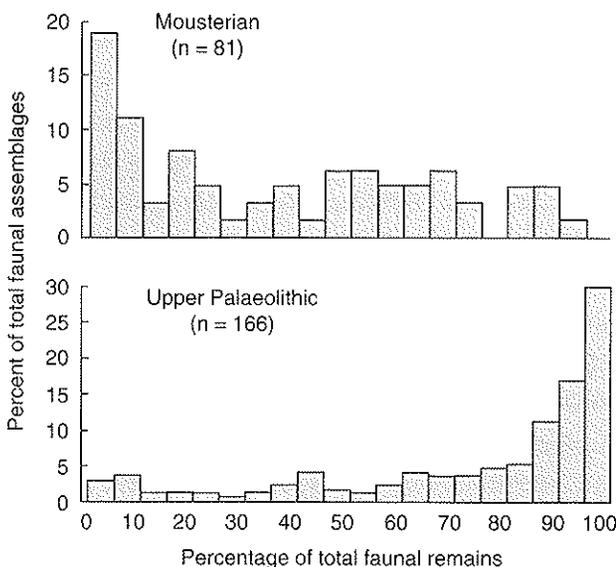
that provided the mainstay of the diet of Upper Palaeolithic groups throughout at least the autumn, winter and spring months of the year.

Demographic and social patterns

POPULATION DENSITY

The most obvious and direct effect of the various climatic and ecological factors outlined earlier would have been to support the concentration of unusually/exceptionally high densities of human populations within the southwest French region throughout most if not all of the last-glacial period – as the sheer wealth and density of the archaeological record in this region clearly reveals (de Sonneville-Bordes 1960; Mellars 1973; Laville et al. 1981; Demars 1996; Boquet-Appel & Demars 2000). I am assuming here of course that in the final analysis it is primarily Malthusian demographic mechanisms which provide the primary determinant for the varying levels of hunter-gatherer populations in different regions – an assumption which many different analyses of recent hunter-gatherer

populations would appear to bear out (Birdsell 1968; Kelly 1995; Pennington 2001; Binford 2001; Read & LeBlanc 2003). The important caveat in this context is what is sometimes referred to as the ecological law of the minimum (or 'Leibig's law'), which asserts that the critical control exerted by environmental factors on biological populations is not so much the *overall* productivity of the ecosystem on a long-term basis, but rather the densities of population that can be supported during periods of maximum scarcity – whether these occur on a regular seasonal or more occasional and unpredictable long-term basis (Read & LeBlanc 2003). In other words, there is little to be gained by populations expanding dramatically during periods of economic 'abundance', if the populations are subsequently cut back by intervening episodes of resource scarcity. In this context therefore the main point to be stressed is not simply the exceptional 'wealth' of animal food resources available within the southwest French region as a whole, but the relative *diversity* of these resources in ecological and economic terms (Delpech 1983; Mellars 1985; Boyle 1990). It is this factor which must have provided the essential safety net for population survival during the occasional periods when the regular migration of large reindeer herds through the valleys of the Dordogne, Vézère and elsewhere failed, as a result of the notorious tendency of reindeer and caribou populations to 'crash' as a result of factors



14.5. Percentages of reindeer remains recovered from Upper Palaeolithic sites in southwestern France (upper diagram) compared with those from preceding Mousterian (Neanderthal) sites. Over half of the documented Upper Palaeolithic occupation levels show overall frequencies of reindeer greater than 90 percent of the total animal bone assemblages. (From Mellars 1996)

such as the sporadic icing-over of tundra vegetation during the winter months, the effects of vegetation fires in the summer, or indeed the over-exploitation of the reindeer herds by the human groups themselves (Burch 1972; Spiess 1979; Jackson & Thacker 1997). The devastating effects of icing-over of reindeer food supplies experienced a few years ago over large areas of northern Siberia provides a graphic illustration of this. As noted above, the archaeological record clearly reveals that although reindeer provided the overwhelming bulk of winter-season food supplies throughout the greater part of the Upper Palaeolithic, there were always several other animal species present (horse, bison, aurochs, red deer, etc.) which could be exploited during occasional seasons when the reindeer populations failed (Figure 14.3). Unless all these animal species were affected simultaneously by climatic or other factors, the human populations would almost certainly still have been able to survive on these other species, until the reindeer populations recovered. It is this factor, I would suggest – rather than the occasional exploitation of salmon or other fish resources, as suggested by Johim (1983), though as yet with little archaeological support (Mellars 1985; Hayden et al. 1987) – which accounts for the impressive densities of human populations which could be supported within the southwest French region throughout most if not all of the Upper Palaeolithic time range.

GROUP SIZES

A second probable consequence of the unusual wealth and concentration of animal populations within the southwest French region would be in the formation – for at least part of the annual cycle – of relatively large social and residential groupings, possibly (though more debatably) oriented towards the large-scale communal hunting of the migrating reindeer herds (Kelly 1995; Binford 2001; Lee & DeVore 1968; Demars 1996). Here, of course, it must be acknowledged that incontrovertible evidence for these large social aggregates remains much more difficult to demonstrate from the archaeological data alone, since it is clear that in some cases apparently large, extensive occupation areas in cave and rock shelter sites could conceivably be the products of many repeated visits to the sites by comparatively small groups, as opposed to simultaneous occupation of the entire settlement areas by much larger groups (Mellars 1973). Even so it is difficult to visualize that the very large occupation areas documented at sites such as Laugerie Haute, the Abri Pataud,

Laussel, La Madeleine and elsewhere in the Vézère valley – in some cases extending between seventy and two hundred metres along the adjacent cliff face (Mellars 1973; Laville et al. 1981) – can be attributed entirely to the activities of very small human groups. This is especially the case when (as at the Abri Pataud) several of the occupations seem to have been characterized by large, more or less evenly spaced hearths (Movius 1966). There are also cases (as in the rich, early Aurignacian levels in the closely adjacent sites of Abri Blanchard, Abri Castanet, and La Souquette in the Castelmerle valley) where there are strong suggestions that a number of adjacent rock shelters may have been occupied simultaneously (de Sonneville-Bordes 1960: 41, 146; White 1989). As noted above, the question of how far these sites may reflect the use of large-scale communal hunting strategies for the exploitation of the migrating reindeer herds remains more controversial (Spiess 1979; Enloe 1993; Demars 1998). But even so it is hard to escape the impression that at least some of the social aggregations in these large reindeer-hunting sites must reflect something more than the activities of just three or four nuclear family groups.

SEDENTISM

Thirdly, it is equally difficult to escape the impression that at least some of these large reindeer-hunting settlements reflect occupation over substantial parts of the annual cycle, probably representing periods of at least several weeks, if not several months. Tooth-sectioning and other seasonality studies can rarely achieve a very fine level of chronological resolution, but there are at least strong hints from these studies that sites such as the Abri Castanet, Abri Pataud and La Madeleine were occupied over a substantial part of each winter season, probably extending from around December or January to March or April (Spiess 1979; Gordon 1988; Pike-Tay 1991; Burke & Pike-Tay 1997). In support of this one could also note the evidence for the excavation of sunken, pit-like living structures at sites such as the Abri Pataud and Fourneau du Diable, and the tendency (noted earlier) to arrange hearths in a fairly regular, evenly spaced way (Mellars 1973; Movius 1966). The sheer wealth, density and concentration of all kinds of occupation debris (lithic artefacts, animal bones, hearth deposits, etc.) documented in many of the sites (Laville et al. 1981) could also argue in the same direction. It is as yet difficult to cite evidence for any equally dense and intensive patterns of Upper Palaeolithic occupation in other regions of Europe, with the notable

exception of some of the open-air Gravettian and Pavlovian settlements in central Europe (Dolní Věstonice, Pavlov, etc.) or perhaps some of the broadly similar sites at Kostenki and elsewhere on the South Russian plain (Gamble 1999; Soffer 1985).

TERRITORIALITY AND ETHNICITY

Finally, one could advance a number of arguments that all of the demographic and social patterns discussed above would have acted as a strong incentive towards the emergence of some fairly sharply defined territorial and ethnic divisions between the different Upper Palaeolithic communities in southwestern France (David 1973, 1985; Mellars 1985, 1996). In the anthropological literature, this point has been argued in several different ways. Dyson-Hudson and Smith (1978) argued that any situation of potential or actual competition or conflict for essential economic resources would lead almost inevitably to more sharply defined territorial boundaries, if only as a means of minimizing infringements and potential conflict between adjacent groups over the exploitation of scarce resources (see also Keeley 1988; Read & LeBlanc 2003). The point has also been made that only groups who *were* living in relatively high population densities would in fact be capable of exercising any kind of effective control or 'policing' over the adherence to territorial boundaries. However these social and economic mechanisms operated, there is a large amount of direct ethnographic evidence that language and kinship-based 'tribal' groupings among hunter gatherers tend to occupy smaller and more tightly defined areas in regions of relatively high population densities than among more sparsely distributed groups – best reflected perhaps in Birdsell's (1968) correlation between dialectical tribal group areas and annual rainfall values in different regions of Australia, and by the supposedly 'magic number' of ca. five hundred individuals for the modal size of many hunter-gatherer tribes (Lee & DeVore 1968; Wobst 1974; Peterson 1978; Kelly 1995).

In archaeological terms, some attempts to define a number of potential dialectical or tribal groupings of this kind were provided in Nicholas David's study of the Noaillian (i.e. later Gravettian) industries within different areas of western and central France, and in similar studies by Philip Smith of the later Solutrian industries (David 1973, 1985; Smith 1966). Nevertheless it should be noted that in all these cases there was substantial evidence for the apparent exchange of various items of

material culture (such as high-quality varieties of flint, or decorative prestige items such as sea shells) between these separate regional populations (Taborin 1993; Demars 1998). Arguably these could be seen as a further way of mitigating potential sources of conflict over territorial boundaries and shared resources between the adjacent groups, and perhaps creating what Clive Gamble (1983, 1999) has aptly described as 'alliance networks' to allow some potential sharing of either resources, information or even economic territories, during occasional episodes of seasonal or more long-term resource scarcity (see also Shennan 2002; Read & LeBlanc 2003).

The social foundations of Upper Palaeolithic art

The final, and most central question, of course, is what relevance all of these social and demographic patterns may have as a potential explanation for the dramatic proliferation of elaborate cave art within the Upper Palaeolithic communities of the Franco-Cantabrian region. Here of course the arguments inevitably become more speculative, and open to a variety of different theoretical perspectives. Briefly, at least three different theoretical scenarios can be visualized in this context.

First, one could see the cave art at least partly as a reflection of the ethnic or territorial divisions within the Upper Palaeolithic groups. As discussed above, the tight packing of Upper Palaeolithic populations within relatively small geographical areas in southwestern France could be argued as promoting more tightly defined territorial and social divisions between the different groups, with a corresponding emphasis on various forms of ethnic symbolism to reflect and reinforce these social and territorial divisions (Wiessner 1983, 1984). Seen in broadly 'phenomenological' terms, one could see the location of the principal cave art sites as an attempt to legitimate and perpetuate these socio-territorial divisions – perhaps representing territorial markers in broadly the same way as is often envisaged for, say, the megalithic tombs and round barrows in later prehistory – although clearly in this case with not such an immediate visual impact on the surrounding landscape. In certain ways perhaps this perspective would recall some of the earlier notions of tribal 'totemic' symbolism (Ucko & Rosenfeld 1967; Lewis-Williams 2002), as a factor underlying the distribution and expression of different forms of cave art.

A second perspective would be to see the art as a particularly graphic reflection of the power of religion and ritual as a means of integrating and consolidating social groups, particularly under the impact of potential competition for territories and resources from adjacent groups, and perhaps even more so under the threat of periodic economic crises resulting from seasonal or more long-term fluctuations in the availability of reindeer or other critical resources – for the various climatic and ecological reasons discussed earlier. Religion and associated ritual in this context could be seen as a powerful psychological force, not only for integrating the social groups and reinforcing adherence to group social norms and values (as it clearly does in the case of present-day religious groups) but also as a psychological force to reduce personal anxiety in the face of various unpredictable risks and dangers to the survival of the society as a whole. At times of personal danger, human groups do perhaps tend to resort to religion and appeals to other ‘supernatural’ forces more often than in times of social and economic security.

Thirdly, we could see the art much more directly as a reflection of the power and authority of particular individuals within the Upper Palaeolithic communities, and acting as a powerful ritualistic means of reinforcing the status and authority of these individuals among other members of the groups. The individuals in question could presumably have been either shamans (as David Lewis-Williams and Jean Clottes have argued very effectively in their papers elsewhere and in this volume) or more general ‘big men’ who were able to emerge within the relatively large and perhaps semipermanent residential groupings postulated for many of the larger Upper Palaeolithic settlements within the southwestern French region. Whichever way the situation is envisaged, there can be little doubt that much of the cave art can be attributed to the activities of specialists, either working directly to support their own status and prestige within society, or as an ancillary part of the power structure of other individuals (Lewis-Williams 2002). Once again, one is reminded of the importance of ritual, art and impressive symbolic centres (such as cathedrals or mosques) in reinforcing the power-base of religious and political leaders within historic and modern societies. As argued earlier, powerful individuals of this kind would seem far more likely to emerge within the context of relatively large and semi-permanent residential units than in the context of very small, dispersed and highly mobile hunter-gatherer groups (Johnson 1982; Keeley 1988; Kelly 1995; Shennan 2002).

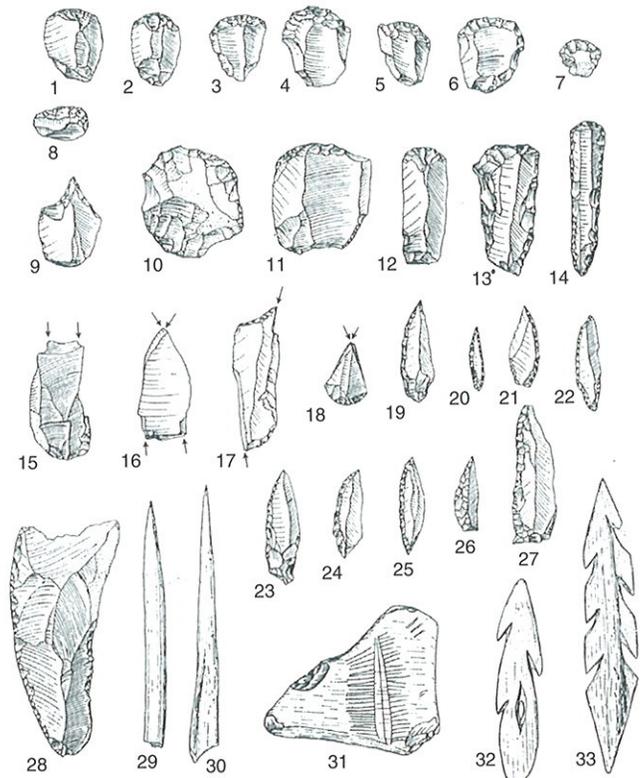
No doubt all these speculations could be pursued much further. And of course we should beware of falling into the simplistic assumption that a single explanatory principle can account for the total spectrum of the art, as opposed to a range of more complex (and probably more realistic) multicausal explanations. My purpose here has simply been to show how a variety of what could be termed largely 'functionalist' explanations could be invoked to account for the extraordinary proliferation and diversity of cave art within one small region of Western Europe, and to argue that the most critical single factor underlying this proliferation is likely to have been the exceptional density and concentration of human populations within this region, which were dependent ultimately on the special combination of climatic and environmental conditions within these oceanic regions of Western Europe.

If one is looking for a final demonstration of the powerful role of ecological factors in promoting the extraordinary eruption of cave art within the Franco-Cantabrian region, then this is provided most graphically by the remarkably sudden and abrupt disappearance of the cave art at almost precisely the time when the special combination of climatic and associated environmental features discussed above disappeared at the end of the last-glacial period, at around 12,500 BP in radiocarbon years, or ca. 14,000 BP in 'absolute' calendrical years. This is the period of the transition from the classically 'Upper Palaeolithic' culture of the late Magdalenian to the essentially 'Mesolithic' culture of the immediately succeeding Azilian – now dated closely to around 12,500 BP in radiocarbon terms (Mellars 1994; Housley et al. 1997; Mithen 2003). At this time we know that temperatures in western Europe rose sharply by at least 8–10°C (see Figure 14.2) (van Andel & Davies 2003), followed by the rapid invasion of fully forest vegetation into southwestern France, and the equally rapid extinction of the typically open-country, 'glacial' animal communities on which the subsistence of the whole of the Upper Palaeolithic cultures had depended. Reindeer disappears totally from the faunal assemblages of the Azilian sites, to be replaced by a range of typically woodland, or mixed woodland/open species such as red deer, roe deer, aurochs and wild boar (de Sonneville-Bordes 1960; Delpech 1983; Boyle 1990). From present-day ecological studies we know that these animals would have been living under very much lower overall densities than were the preceding open country species (due to the much lower productivity of low-growing plant

communities in the closed-canopy forests: Butzer 1971) while the large migratory herd movements of the reindeer – which had formed the mainstay of the economy and associated demographic and social structures of the Upper Palaeolithic groups – suddenly disappeared (de Sonneville-Bordes 1960: 498–500).

The impact of this change can be seen in all aspects of the archaeological transition from the late Magdalenian to the Azilian: the occurrence of much fewer (and above all much smaller and more ephemeral) occupation sites; a sharp reduction in the size and complexity of both stone tool and bone/antler technology; and the virtual disappearance of all forms of art – with the exception of the enigmatic painted pebbles and a few geometric or simple animal engravings on bone or stone (Figure 14.6) (de Sonneville-Bordes 1960; Mellars 1994; Mithen 2003). The small sizes of the Azilian groups would arguably have allowed little scope for the role of specialist craftsmen or artists. The effectively one-to-one correlation of all these striking social, technological and artistic

14.6. Characteristic stone and bone tools of the Azilian period in south-west France (ca. 12,000 BP) showing much simpler forms than those of the immediately preceding Magdalenian period. (From Mellars 1992)



changes with the simultaneous changes in climatic and ecological conditions is beyond dispute. Overall we could see this as perhaps the most graphic illustration in prehistory of a rapid 'degeneration' in technology and the complexity of material culture in the face of environmental change. Stated bluntly, studies of the symbolic and cognitive dimensions of human culture – even in the twenty-first century – will ignore the critical role of strongly environmentally controlled factors at its peril!

What environmental factors cannot explain of course are the specific *forms* taken by the Palaeolithic cave art, and the deeper symbolic and perceptual meanings which lay behind the conception and production of the art. But this is the focus of the discussions of other contributors to this volume.

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