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The cave bear in Chauvet Cave

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Abstract. This paper reviews briefly the evidence for cultural use of cave bear remains, especially skulls, in central and western Europe, during the time of the European Late Pleistocene Shift (formerly called the Middle/Upper Palaeolithic transition). The new evidence from Chauvet Cave, France, is then examined, the rock art as well as other features in that cave, such as wall and floor markings. The controversy of the dating of the anthropic use of the cave is considered and it is shown that one of the key elements of the site's relative dating consists of evidence of intentional placement of cave bear remains. This cultural behaviour is typical of a discrete period of European pre-History, being limited to the time from about 40 000 years ago to 30 000 carbon years ago, perhaps especially the late part of this window in time. This as well as many other factors seems to exclude an attribution of the Chauvet cave art to the Magdalenian.

Introduction

Chauvet Cave, near Vallon Pont d'Arc, in the French Ariège (Chauvet et al. 1995; Clottes 2001; Valladas et al. 2004), is not only regarded as the aesthetically most beautiful rock art site in the world, it offers in addition to its unusually well preserved cave art also an overwhelming quantity of other scientific data. Much of this wealth of information is in some way related to the rock art. Of particular significance is the extraordinarily well-preserved cave floor, featuring not only cave bear hibernation pits, hearths and a variety of culturally mediated arrangements, but also a multitude of floor markings. Unparalleled in their preservation, they include tracks of both human visitors and other animals, and thousands of claw marks, especially of the cave bear. Claw marks, again dominated by those of the cave bear, are also featured frequently on the walls of the extensive cave system, and there is also polishing of walls through the traffic of cave bears evident in various locations.

Practically all caves in the world contain some form of wall markings. On a number of islands, such as those of New Zealand, obvious faunal limitations until the most recent past mean that animal scratch marks, notably those of mammals, are largely lacking. Among the many types of wall markings found in caves, animal scratches of mammalian species are by far the most common (Bednarik 1991).

One of the difficulties to contend with in the study of wall markings in caves and in their discrimination is that they tend to be subjected to a great variety of alteration phenomena over time, of both biospheric and atmospheric nature. A cave is rather like an organism, experiencing a birth, life and death in its history, and one might compare the cave wall to the skin of an organism: it bears the traces of many life experiences, while other traces have disappeared, or their scars have been so distorted over time that they become almost unrecognisable. For instance, finger flutings on soft speleothem (called moonmilk in English, and in Europe *Monmilch* [by Gesner in 1555], *Montmilch*, *Mondmilch*, *Bergmilch*, *Nix* and *Galmei*) are often so altered that they are almost unrecognisable. This is because the speleothem can be subjected to one or more of a number of processes subsequent to being marked by humans (Bednarik 1986), and the finger flutings, which have so far been found in France, Spain, Australia and Papua-New Guinea, may be beyond recognition. The same may apply to other types of cave markings.

All secondary cave markings (i.e. those not related to some inherent characteristic of the rock support; cf. Bednarik 1998a) are a type of response of lithospheric materials to conditions determined by speleo-atmosphere, hydrosphere or biosphere. In order to determine whether a doubtful marking can be of human 'cultural' origin, one needs to effectively negate any possible 'natural' origin. There is a wide range of natural wall markings to be found in caves, the most common being animal scratch marks, and among them those of Chiroptera are by far the most numerous. They occur in almost all caves, and while they are usually very faint, they are of such ubiquity that they sometimes allow the student of Palaeolithic petroglyphs in caves to distinguish different art traditions from the amount of wear by airborne bats. Generally speaking, scratch marks of larger animals are most common in Australian caves, but

Figure 1. *European sites and regions mentioned in the text, and some other cave bear lairs:*

1 - Swanscombe
2 - Furninha
3 - Salemas
4 - Pyrenees
5 - Montespan
6 - Les Trois Frères
7 - Rouffignac
8 - Bara Bahau
9 - Grotte des Endrevies
10 - Pech Merle
11 - Baume Latrone
12 - CHAUVET CAVE
13 - Aldéne
14 - Paris
15 - Furtins
16 - Cotencher
17 - Saint Brais I-II
18 - Chilchli Cave, Ranggiloch, Schnurenloch
19 - Drachenloch
20 - Wildkirchli, Wildenmannlisloch
21 - Hohler Fels
22 - Reyersdorfer Cave
23 - Gudenus Cave
24 - Salzofen Cave
25 - Drachenhöhle
26 - Repolust Cave, Kugelstein Cave II, Grosse Badl Cave
27 - Kölyuk Cave, Istállóskö Cave, Hillebrand Jenö Cave
28 - Homoródalm ser Cave
29 - Veternica Cave
30 - Potocka zijalka, Mornova Cave
31 - Rotes Feld Cave, Crni kal Cave
32 - Caucasus
33 - Urals

they can be found in most other parts of the world. Claw marks are the most common, but parietal markings of tusks (elephants in Kenya), antlers, horns, wings (particularly of primaries of birds near their nesting sites) are also widely distributed. Numerous species have polished cave walls with their bodies, the most prominent case being cave bears, producing the *Bärenschliffe* so ubiquitous in European caves. Many mammals entered caves involuntarily and produced wall markings in their attempts to escape confinement, and I have considered the behaviour of various mammals in such predicaments (Bednarik 1991: 31–3), as deduced from my palaeontological studies in various continents. Finally, markings of many non-vertebrate origins occur in most caves of the world, and their effective identification is again a specialist task.

The cave bear in space and time

Out of the great variety of natural and human cave markings I have studied in the caves of all continents except Antarctica (395 caves in Australia alone), I select here just one type for detailed assessment: the parietal markings of the cave bear (*Ursus spelaeus* Rosenmüller and Heinroth). This is probably the palaeontologically best-known species of central Europe (Rabeder et al. 2000). Its remains have been found in vast numbers in numerous caves, and details deducible from skeletal remains (physiological, pathological) had been so thoroughly studied by the early part of the 20th century that it was better known than its human contemporaries. Among the animal claw marks of European caves, those of the cave bear are by far the most prominent (Bachofen-Echt 1931; Bednarik 1991, 1993; Bégouën 1936, 1941;

Nougier and Robert 1959; Sharpe 2004). In order to assist archaeologists in distinguishing them from human engravings in caves I have described them, and the circumstances surrounding their production and survival. After all, the question of distinguishing animal markings from cave petroglyphs, which has been studied most extensively in Australia, is of renewed interest in Europe, in view of the 'Palaeolithic engravings' found in southern Germany (at Hohler Fels; Hahn 1990; Bednarik 1992a; but see Bednarik 2002) and which were located on *Bärenschliffe* (the panels of polished wall surfaces produced by cave bears). Also, certain finds in Chauvet Cave, France, have re-opened the issue of the 'cave bear cult' in the 'early Upper Palaeolithic', as I will argue below. It is also of particular concern that there are many 'engravings' in western European caves that should be considered to be bear scratches rather than petroglyphs.

The cave bear's range included, at some stage between the Mindel-Günz interstadial and the early Holocene, much of Europe from Portugal to Russia (Figure 1). The distribution map of Koby and Schaefer (1960) is inaccurate. For instance it ignores the widespread occurrence of the species in Russia, with over sixty sites in the Urals and Caucasus alone. The map ignores the Rissian finds in the Cantabrian Mousterian, the Portuguese finds (at Furninha and Salemas), those in central Spain, the numerous sites in southern Italy, while on the other hand the map shows all of France to have been occupied by the species when in fact there are no reliable finds from the entire northern half of the country, with one doubtful find in the Paris alluvium from 1925. Also, in claiming the presence of the animal in Britain it should be remembered that there appear to be no confirmed Würmian finds, and that most of the bear remains described in Britain as *U. spelaeus* are in fact *U. arctos*, *U. taubachensis*, *U. deningeri* or *U. savini*. The two finds from Swanscombe, which Kurtén (1959) insists are of *U. spelaeus*, are of the penultimate interglacial.

In contrast to other carnivores, the feeding habits of the cave bear (Figure 2) were almost exclusively vegetarian. Its dental wear patterns suggest that grass was the staple component of its diet (Ehrenberg 1962), an overspecialisation that apparently contributed to the animal's extinction (Vértes 1959: 153) soon after the end of the Pleistocene. It seems to have been common for this species to die during hibernation, and the caves once frequented by it now contain the remains of many individuals, numbering tens of thousands at some localities. These often very large caves also contain massive quantities of chiropterit, a phosphate-rich sediment formed largely by bear faeces, decomposing carcases and bat guano. In some regions, virtually every cave of suitable dimensions appears to have been occupied by the cave bear, at elevations of up to 2500 m above sea level (Abel 1931; Kyrle 1931; Kyrle and Ehrenberg 1936; Mottl 1950a, 1950b). In some of them, skeletal remains of specimens between the ages of three to nine months are conspicuously absent, a circumstance suggesting that the caves were only used during the winter half of the year (Ehrenberg 1951: 99). Furthermore, the sites located at high altitudes could have only been occupied during a mesocratic climate oscillation, which is why many researchers have equated such occupations with the last interglacial. This also applies to occupations of the sites by the mysterious 'cave bear hunters', Palaeolithic people who are said to have stalked this formidable beast in its hibernation haunts, but whose cultural and genetic affiliations remain unclear. Together with the geochronological position of their 'Alpine Palaeolithic' tradition these issues are among the most enigmatic in European Palaeolithic research.

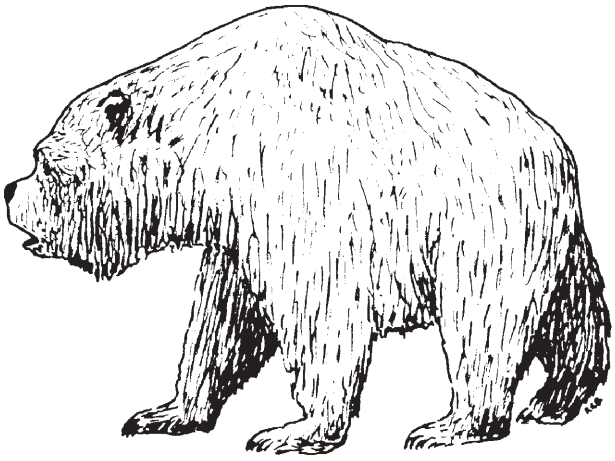

Figure 2. *Reconstruction of the cave bear.*

Bächler (1940) first identified the Alpine Palaeolithic in Switzerland, describing deposits of bear remains (particularly skulls) in vaults constructed of rock slabs. Numerous European caves have yielded deposits of human occupation that have a number of characteristics in common: they are embedded in large deposits of cave bear remains which are, practically without exception, fractured. Lithic implements are very scarce, and are fashioned from poor quartz and quartzites in most cases; bones and teeth have been claimed to have been used extensively for tool manufacture; sites occur commonly at high elevations and in very mountainous terrain; and many sites have been suggested to provide evidence of a bear cult.

Since Bächler's industry had been assigned to the Mousterian of the last interglacial, there was a tendency to attribute every similar discovery also to the Middle Palaeolithic. The objections of various writers (Hilber 1922; Bayer 1929a; Adametz 1935; Zotz 1944) went unheeded for decades, and the correct antiquity of many of these sites has been accepted either with reluctance, or remains controversial. Austrian prehistorians, in particular, have been particularly slow in accepting that the Göttweig, or Würm I/II interstadial, approached optimum climatic conditions comparable to those of the Holocene. For instance, Pittioni (1957) conceded this only in the face of overwhelming evidence, thus abandoning by implication most of his chronology of the Austrian Palaeolithic three years after its publication (Pittioni 1954). A site's high altitude in the European Alps does not necessarily indicate an interglacial antiquity for its occupation evidence (see Schmid 1963 concerning the snow and forest limits during the Würm stadials). Most of these sites had been dated purely on the

basis of faunal evidence, sometimes supplemented by the identification of tree species from charcoal (Bednarik 1990). Yet a perusal of the faunas of all eastern Alpine Palaeolithic stations reveals no typical pre-Würmian elements, with the exception of a few sites, such as Repolust Cave, Kugelstein Cave II and Badl Cave, all in Styria and only a short walk apart. These reservations are widely accepted today, and such prominent sites as Potocka zijalka, Drachenhöhle and Salzofen (Bayer 1929b) are almost universally acknowledged as belonging to the Upper Palaeolithic. Nevertheless, this does not prevent the continued propagation of earlier misrepresentations (and the frequent faux pas of confusing Drachenloch and Drachenhöhle) in popular publications, even in those written by supposedly competent archaeologists (e.g. Neugebauer and Simperl 1979).

Both the hypothetical 'osteal culture' and the bear 'cult' have been the subject of much contention, perhaps the most prominent objections being raised by Bayer (1930), Koby (1953), Cramer (1941) and Jéquier (1975). While there is no objective support for the 'Protolithikum', the hypothetical industry based on bone tools (this excludes of course such bona fide artefacts as the Lautsch/Mladeè point), some of the evidence for 'ceremonial' deposition of bear remains is so pervasive that it should be re-examined. At least in some instances it is difficult to brush aside all aspects of the reports as being merely the result of wishful thinking. Among these might be Drachenloch (Bächler 1940), Reyersdorfer Cave (Zotz 1939), and especially Veternica Cave (Malez 1956, 1958, 1965). The 'cave bear hunters' have also been credited with the earliest musical instruments (at Istállóskö and Potocka; see Horusitzky 1955; Bayer 1929b: 84; Zotz 1944: 25) — ignoring here the controversial and doubtful specimen from Divje Babe I, Slovenia — and an early form of needle. However, many aspects of the 'Alpine Palaeolithic' remain contentious, and this 'industry' may in fact indicate local or seasonal adaptations of various peoples that are of quite diverse chronological, technological and ethnic affiliations (a possibility originally propounded by L. Zotz). While in the western Alps, these were initially claimed to be with the Mousterian (Bächler 1940; confirmed by Schmid 1958; but previously questioned by Bayer 1924; 1928: 5; and Zotz 1951: 121), they appear to be with early Aurignacian cultures (the Olschewian) or the Szeletian at most of the sites in the eastern Alps (Bayer, 1929a, 1929b; Zotz, 1944: 35; Brodar, 1957: 151; Ehrenberg 1959: 23; Movius 1960: 361; Mottl 1950a, 1950b, 1950c, 1951; Murban and Mottl 1955; Bednarik 1989, 1993).

Bächler's (1940) dating of his Swiss sites to the Riss/Würm interglacial has only been rendered possible for the Drachenloch, where layer 3 has provided a radiocarbon date of older than 49 000 years BP (Andrist et al. 1964), and it may still be valid for Wildkirchli (Tschumi 1949). However, in the Schnurenloch, Wildenmannlisloch and Chilchli Cave, the occupation strata have been re-assigned to the Würm by pollen and radiocarbon dating, while layer 3 in Ranggiloch, attributed by Schmid (1958) to the interglacial, yielded a radiocarbon date of only about 9500 BP. Similarly the supposedly interglacial occupation layer of the Austrian Salzofen Cave provided a radiocarbon date of c. 34 000 year BP (Movius 1960: 361), which is of the early Upper Palaeolithic. Of the many cave bear sites in the eastern Alps that contain evidence of human occupation, only four seem to warrant consideration as pre-Würmian occupation sites: Repolust Cave, Grosse Badl Cave, Kugelstein Cave II, and the Gudenus Cave with its handaxe-dominated Acheulian from its lowest of four Pleistocene human occupation phases (Bednarik 1992b). Interestingly, the latter site is also one of very few central European Palaeolithic cave sites that are not located in a karst region.

In considering the distribution of the 'Alpine Palaeolithic' and of the large cave bear sites with their enormous quantities of skeletal remains, it is self-evident that it coincides significantly with the extent of limestone karsts across Europe (Bednarik 1993). This phenomenon has been widely neglected by palaeontologists as well as archaeologists. Taphonomic reasoning would lead to two arguments of relevance:

(1) If a class of remains is found in environmental conditions that are conducive to their survival, but not in environmental conditions that are not, than it is highly probable that the extant record is a result of environmental conditions (high sedimentary pH, sheltered location, focal archaeological locality are all taphonomic selection criteria; Bednarik 1994) and not of former distribution of the class of remains. In other words, both cave bears and the type of human behaviour that has been linked with them were probably distributed beyond limestone karsts, but only the karsts provided suitable conditions of preservation, combined with a likelihood of discovery.
(2) Such selective survival and reporting of evidence is also likely to lead to the creation of biased ethological models: it may create the illusion that cave bears generally hibernated in caves, even that they frequently died in caves.

While the first proposition, which questions distributional data, can only be tested by theoretical argument (but is logically convincing), the second can be tested by examining specific aspects of the data. If cave bears died mostly in the caves, there should be distinct statistical patterns in the sexual and age characteristics of the remains, otherwise we must assume that there were selective processes at work. Similarly, there would be representation of warm and cold climate oscillations commensurate with their durations. Neither index is what it should then be in most caves, which suggests that there has been very considerable variability in the behaviour of the animal and that taphonomy has selected heavily in favour of cave-related behavioural evidence.

About cave bear hunters

Koby (1951), a principal opponent of both the concepts of cave bear hunt and 'cult', propounded the argument that the paucity of bear representations in Pleistocene art relative to other species refutes a systematic hunt of the bear by Palaeolithic people, for which '*on n'a pas des preuves certaines*' (Koby 1951). This view invites several

comments:

(a) Charred and smashed cave bear bones have been recorded at numerous cave hearths, and worked bones and teeth of this species have been found in ample quantities. Although the adult animal would have been a formidable quarry, it may have been easy prey during its hibernation, in a season when other game may have been hard to hunt and when the cave bear would have been fattened. It seems likely that humans would have taken advantage of this comparatively reliable protein source, harvesting it annually.

(b) Whilst bears are, admittedly, not among the most common subjects of the Palaeolithic artists, they are not quite as neglected as Koby proposed. Of the identifiable mammals in Europe's parietal art listed by Leroi-Gourhan (1971: 463), 1.75% are in fact bears — a proportion exceeding, among others, that of the woolly rhinoceros, lion and megaloceros, and exceeded only by the mammoth, Bovidae, horse, ibex and Cervidae — the principal quarries of Upper Palaeolithic hunters. However, on portable art objects of the western European Upper Palaeolithic, the bear accounts for 7.4% of all identifiable mammal representations, and its proportion in the rock art (like that of the cave lion and the rhino) has significantly risen through the discovery of Chauvet Cave.

(c) During at least twenty-three millennia of European Upper Palaeolithic art there were several distinctive traditions, cultures or peoples that practised forms of artistic expression of which only *some* have survived. The total number or proportions of illustrations of a particular subject are of little scientific importance, as they may have been determined by any number of taphonomic (in the widest possible sense) factors. Moreover, cultural association of most rock art depictions of bears is only tentative, most specimens are undated now that stylistic and simplistic archaeological dating of this art corpus is no longer accepted (Bednarik 1992b, 1995).

(d) There is no evidence that cave bear hunters necessarily practised iconographic art (cf. Ehrenberg 1954: 58), and since some of them were of the late Middle Palaeolithic rather than the early Upper Palaeolithic it is likely that they produced no images. Hence Koby's argument on the basis of frequency of depiction is hardly relevant. It is more relevant that not even the most representative sites of the Olschewian have yielded a single hint of an iconographic tradition, nor have any of the Szeletian sites of central Europe, or any other 'Aurignacoid' traditions prior to 32 000 BP (e.g. the Bohunician), the age of the sophisticated tradition of sculptures in southern Germany and Austria (Hahn 1971; Marshack 1985; Bednarik 1989).

(e) Complete lack of bear depictions during a particular phase of parietal art would not necessarily constitute conclusive evidence that the people concerned did not hunt the animal; for example, a taboo may have prohibited its representation. Historical accounts of bear cult rituals and ethnographic evidence of such a cult are available from many parts of Eurasia (Vértes 1959: 165; Hallowell 1926; Wüst 1956; McNeil 2005), and a salient aspect of these cults is usually an inhibitive element, such as a forbiddance to pronounce the bear's name. Other common features of these recent bear cults include ritual killing and eating, deposition of the head and other parts of the body, and assumption of a blood relationship of the bear to people, or to a particular moiety. While such ethnological evidence must not be applied to Pleistocene evidence, it does illustrate that simple explanations may not do justice to complex cultural phenomena. Moreover, as Bahn (1991) has argued, the role of Palaeolithic art in depicting subjects connected to the hunt may have been over-emphasised, and I would add that it is not rational to assume that this art was a Palaeolithic 'shopping list' for food, and to see proportional species representation as indicating hunting preferences. Otherwise we would have to expect a far greater number of depictions of fish, fowl and vegetable foods, and an absence of species that are unlikely to have been food sources (such as the cave lions and other 'dangerous' species in Chauvet Cave).

(f) The find of a hornfels flake embedded in the of os frontale of a cave bear skull in the Rotes Feld Cave near Triest (Zotz 1951: 120) seems to provide conclusive evidence that the animal had a traumatic experience with humans.

Neither the Palaeolithic art of Europe nor the archaeological record provides support for Koby's view. On the other hand, objective support for cave bear hunting is also limited. Two adjacent petroglyphs at Les Trois Frères (Bégouën and Breuil 1958) appear to depict bears lying on their sides, with marks at their muzzles that may (or may not) depict an issuance, and their bodies 'pierced' with numerous holes and covered with arrow-like marks. H. Bégouën (pers. comm. to L. Zotz, see Ehrenberg 1954: 48) reported cave bear skulls from the site that appeared to be intentionally deposited. The near-life size clay model of a bear in the Galerie Casteret, 300 m deep in Montespan Cave (Trombe and Dubuc 1946: 45–6), is punctured with forty-one holes. At Pech Merle (Lemozi 1929), 15 m from the entry to the main gallery is a petroglyph of a well-detailed bear head with two lines crossing the neck in a manner suggesting severance of the head. However, none of these and other examples provide conclusive evidence, at best they are suggestive.

Evidence offered in support for a 'bear cult' includes the striking positioning of ten bear skulls in the Caverne des Furtins, France (Leroi-Gourhan 1947), and similar finds in the Hungarian caves Homoródalm ser, Istállóskö (Vértes 1951, 1955) and Kölyuk Caves (Vértes 1959: 160–2); in the Salzofen Cave, Austria (Ehrenberg 1951, 1953a, 1953b, 1954, 1956, 1957, 1958, 1959; Trimmel 1950; Schmid 1957) and in Mornova Cave, Slovenia (Brodar 1957: 154–5; Zotz 1944: 29), in addition to suspected depositions at other localities already mentioned above.

In summary, there was adequate evidence prior to the discovery of Chauvet Cave to consider the possibility that a cultural use of cave bear remains was practised during a

period commencing in the final Middle Palaeolithic of the western Alps and extending into the early part of the Upper Palaeolithic, with some evidence available from a wide area including France and central Europe (Bednarik 1993). The use of the term 'cult' is in this context perhaps premature; defining the related behaviour as a cultural practice might be more appropriate. What is of particular importance, however, is that this practice is not a general feature of the Palaeolithic period, but that it seems temporally confined to a quite specific window of time, most particularly of the early Aurignacian. The many sites where evidence for a practice of depositing cave bear skulls has been reported share a number of features: they are always spacious caves with large entrances and passages, they contain ample evidence that they were used as hibernation sites by cave bears (hibernation pits, skeletal remains of specimens that died naturally, scratch marks of the animals on walls and floors), and they contain in most cases quite limited evidence of the presence of human visitors. With possibly a few exceptions, the caves in question feature no rock art.

The case of Chauvet Cave

Chauvet Cave, however, presents a very different picture. Here, at long last, the extensive traces of a cave bear lair coincide with extensive rock art and other evidence of human presence in both time and space. Soon after its discovery in 1994, Chauvet Cave became one of the most celebrated rock art sites in the world, and quite justifiably so. But the magnificence of the rock art overshadowed several other outstanding features of the site, such as the ichnological (concerning tracks) evidence, which seems to eclipse the total sum of all known sites of the European Palaeolithic, or the extensive animal scratches. Because the cave was effectively sealed during the Final Pleistocene, and then promptly protected and closed soon after discovery, its extensive floor of around 20,000 square metres has been preserved like no other cave floor we know of. With the exception of the places where the discoverers of the cave walked in late 1994 (Chauvet et al. 1995), the placement of the walkways (resting on epoxy-resin pads) and the single one-square metre test excavation currently being undertaken (which is still shallow, about 20 cm deep in 2005, and has yielded a decortication flake about 70 mm long), the ground has remained entirely undisturbed throughout the huge cave. It bears literally thousands of tracks, mostly of cave bears and humans, but also of other species. There are countless scratch marks of bears on the floor, complementing those on the walls. A small number of flint implements have been found on the surface, and there are several hearths, scattered deposits of charcoal and some stone arrangements that look so fresh they could be just a few years old. A stone slab appears to have been placed artificially, and another arrangement of several slabs piled together manually appears to be a marker cairn. There are at several key points in the galleries red pigment marks that also seem to be location markers.

In some parts of the cave, especially in the elevated part of the Megaceros Passage (Figure 3), there occur a good number of unusually well preserved hibernation pits of cave bears. In all, approximately 315 hibernation pits can

Figure 3. *Plan of Chauvet Cave, showing the main features and the location of three cave bear bone arrangements.*

be identified in Chauvet Cave. Their spatial distribution relative to the cave's morphology is consistent with what has been observed in other cave bear lairs. In terms of the occurrence of tracks, both human and animal, Chauvet Cave is peerless, no doubt because so much detail is so well preserved in the fine cave loams, of which two different facies occur, one reddish and the other more blackish. The most common tracks found are of cave bears, followed by those of humans.

Among the 3703 bones found in various parts of the extensive cave, those of the cave bear account for 91.8%

(Philippe and Fosse 2003). In some cases, remains occur in articulation, or at least there are various body parts represented. In all probability, these animals died in situ. However, the occurrence of isolated skulls of *Ursus spelaeus* on the surface is most conspicuous, especially locally. There are 190 skulls of this species on the surface, most of them are preserved completely, and in some of them canines and incisors have been removed. Some have become encased in calcite, one very thickly so. It is conspicuous that the majority of these skulls occur in the upright position. One of them is perched on the edge of the upper, platform-like, horizontal surface of a conspicuous, table-like boulder in the Salle du Crâne. The angular block originates from the ceiling, 5 or 6 m higher, from where it fell, as did five others that are lying around the largest fragment. This rock remains in the same orientation as it was on the ceiling, i.e. the horizontal fracture surface formed when it was claimed by gravity came to form the top of the 'table', and its narrow base is stuck in the cave floor. It now protrudes about 70 cm above the floor, which has remained as it was between 25 000 and 30 000 years ago. This prominent feature is located about 6 m west of the famous horse panel, among a collection of 52 further cave bear skulls on the floor, most of them surrounding this boulder. Underneath the elevated skull, which was indisputably placed on this 'table' by humans, occur small charcoal fragments, probably from torches. The skull, slightly smaller than most others, rests with its upper premolars on the edge of the block, its canines pointing down (cf. Clottes 2001: Figs 202, 203).

There are two other clear examples of deposited cave bear bones in Chauvet, both found in the Salle des Bauges. This is a very large hall close to the original entrance, containing only four skulls (Figure 3). In two cases, only about 10 m apart and perhaps 30 to 40 m from the former, now collapsed entrance, occurs the combination of a cave bear skull with a cave bear humerus. In both cases the skulls are placed upright, and the humeri have been inserted into the ground vertically so that they are at least half submerged in the sediment. In one case the long bone is located close to the skull, in the other it is about a metre away, but precisely aligned with its longitudinal axis and in front of it. There are no other bones in the vicinity. In both cases the surrounding surface is fine-grained sediment, fairly flat, with only very little fluviatile action indicated. It is extremely unlikely that these two placements are random, natural effects. Initially the French cave bear palaeontologists were reluctant to accept this explanation, but the geologists convinced them that this could not possibly be a fluviatile phenomenon.

The cave bear is among the most conspicuous species apparently depicted in Chauvet Cave, and is shown in very naturalistic figures. Its hibernation pits occur mostly in the deeper parts of the cave, and there are outstanding examples of its tracks, scratch marks on the floor, and scratch marks on walls. The claw marks within individual sets are spaced from 20–50 mm, and individual claw grooves are always smooth-bottomed and rounded. They range from 3–5 mm width at the base, but are somewhat wider where they are more deeply incised. Among many cases that I examined, I found only a single instance of a cave bear claw mark with a striation, apparently from a damaged claw. All others were rounded and smooth, although some seem to be quite non-symmetrical (claws worn unevenly). *Bärenschliffe* do occur in this cave, but they are far less extensive than in numerous other sites across Europe. They are not found on major flat wall panels, but occur on projecting wall features. On present evidence the wall polishes are limited to the deeper parts of the system. Several areas of the cave cannot be examined because walking on sediment is forbidden, and in some other wall sections there has been too much vadose solution. Most notably, *Bärenschliffe* occur on part of the west wall of the Galerie des Croisillons and along most of the walls of the Galerie des Mégacéros, and they continue into the Salle du Fond. Nevertheless, where they do occur, the polished patches are often beautifully preserved (Figure 4), ivory-like, lack any weathering, and show distinctive random scratches from quartz grains embedded in furs. These scratch marks are finer than most others I have observed (generally under 0.5 mm width), particularly of the coarse fraction of those in Hohle Fels in Germany (Bednarik 2002) and several of the Alpine caves, and they are of both horizontal and vertical direction.

Figure 4. *Typical* Bärenschliffe *(wall areas polished by the bodies of cave bears, with sand embedded in their fur acting as abrasive) on the east wall of the Galerie des Mégacéros. Photograph by Jean Clottes.*

The dating of the Chauvet rock art

The comprehensive dating of some of the rock art of Chauvet Cave (Clottes et al. 1995) has recently been challenged by a few authors, essentially because it severely

contradicts the former stylistic chronology of Upper Palaeolithic rock art in western Europe (Bednarik 1995). In claiming that the Chauvet Cave must be of the Magdalenian, these authors seem to be unaware of a number of factors, including the following points:

1. The direct carbon isotope dates obtained from several charcoal paintings are not the only dating information, and all of that secured from the site so far is internally consistent.
2. A radiometric date from a stalagmite grown on one of the uppermost collapse boulders inside the blocked original entrance of about 18 ka indicates that the collapse closed the cave much earlier than this date.
3. The carbon dates secured from cave bear remains range from about 24 ka to over 40 ka, suggesting that the cave bear occupation of the main cave ended abruptly 24 ka ago. The Salle Morel, a small side-chamber adjacent to the old entrance, remained open, however, at least until 19 105 years ago, before its separate entrance also collapsed.
4. The dating of the early phase of the cave art, about 33–30 carbon ka BP, is confirmed by the younger age of two samples from soot-marks that are stratigraphically separated from the early art by a flowstone deposit.
5. The second art phase, around 26 ka ago, could not have been followed by any significant activity in the cave, because of the undisturbed state of the floor.
6. After 24 ka, only a small number of specimens of small sizes, such as snakes, martens and bats entered the cave.
7. In arguing that the dates must be much too high, as argued by a few authors, they may be overlooking the fact that all radiocarbon ages between 40 and 30 ka from southern Europe may need to be considered as being too low, for a variety of reasons. Among them are the effects of the Campanian Ignimbrite eruption.
8. Their claim that Chauvet Cave would be an anomaly as an early site is spurious. Most other Pleistocene art sites remain undated, and there are definite contenders for a similar magnitude of age. For instance, my study of Baume Latrone (Bégouën 1941; Drouot 1953; Bednarik 1986) suggests that its older art phase has considerable similarities with Chauvet, and another contender for Aurignacian age is the cave art in d'Aldène (Cathala 1953).
9. When compared with portable art of Aurignacoid sites in central Europe, such as Galgenberg in Austria (Bednarik 1989) or the Lone valley sites (Bednarik 2002), there are numerous similarities, in sophistication as well as in content. The Lone valley sites are not much over 500 km from Chauvet Cave.
10. The rock art images include features traditionally considered to be Aurignacian: pubic triangles or vulvae, animals in archaic schematic style, *fil-de-fer* treatment and twisted perspective.

The overall impression in the deeper part of the cave is that there was initially much engraving, generally to about 2.5 m above ground, with fingers where the medium was soft enough, with objects such as stone tools and perhaps spears (some images are so high that a long tool must have been used) where it was harder. Where extensive pictogram panels have been added, the previous art was extensively erased, except the highest figures, and the black paintings were executed against this white abraded background. While it cannot be certain that all the engraved figures are older, stylistic continuity is also evident. A classical example are the double arcs used to depict rhino ears, which look more like 'flying birds' than the ears of rhinos. There is no clear indication of a time separation between these two treatments, and they would seem to fall into the 30 ka to 33 ka bracket. However, there is a distinctly later phase of rock art, much less extensive, sometimes superimposed over the older, consisting of simple to more complex 'signs', including perhaps the presumed directional signs in passages. There is, nevertheless, no clear technological separation between engravings and charcoal drawings. In several cases it is clear that engravings were done with charred sticks, as there is ample charcoal along the groove, and there are instances where a clear charcoal drawing is executed as slight grooves. Where the two distinctive phases occur in close vicinity, there is always a pronounced difference in the appearance of the charcoal, the more recent phase looking much fresher and darker, and never bearing any reprecipitated calcite skin. The middle part of the horse panel in Salle du Crâne offers excellent separation, where the older phase is partially coated by thin brown calcite flows, which in turn bear recent, fresh-looking markings by charcoal.

The test excavation currently under way seems to confirm what has been evident from the exposed sediment sections in the substantial floor collapses: the evidence of human occupations appears to be limited to the deposit's uppermost couple of centimetres. At the floor collapses, caused by lower convacuational spaces, it is evident that the occupation by cave bears began significantly earlier, while human presence seems limited essentially to the present floor level. These exposures render almost three metres of sediment strata accessible to inspection (Figure 5). The cave and its contents therefore seem almost frozen in time, a veritable 'Palaeolithic time capsule' (Bednarik 2005).

One in my view particularly relevant line of argument concerning the age of the cave art in Chauvet Cave relates to the main topic of this paper. Arrangements of deposited cave bear skulls have been found in numerous sites, mostly in central Europe. All of them date from the earliest Aurignacian, possibly the final Mousterian, and from similar industries of the interface between the purported Middle and Upper Palaeolithic phases. Therefore, if the same kind of behaviour were demonstrated in Chauvet, it would secure solid dating to a period of between roughly 40 ka and about 30 ka, which confirms the dating results of Clottes and colleagues. There is no evidence, to the best of my knowledge, of a suspected behaviour of intentionally placing cave bear skulls and long-bones in caves of the Gravettian or later industries (see above). If this is correct, and if the evidence cited here for behaviour of this kind in Chauvet is correct, then the first phase of the human activity in that cave can safely be assumed to be more than about 30 000 years old.

Figure 5. *The author in the large floor collapse (subsidence) in Salle Hillaire, examining the sediment strata. Cave bear remains are numerous below floor level, but evidence of human presence seems to be limited to the uppermost few centimetres of the deposit, especially to the actual surface. Photograph by Jean Clottes.*

Therefore a key issue in the interpretation of Chauvet Cave concerns the interaction between the human and the ursine inhabitants of the site. If it were correct that some of the very 'early Upper Palaeolithic' (or 'epi-Middle Palaeolithic'?) hunting societies specialised in harvesting fattened and drowsy cave bears as a relatively reliable annual food source, and perhaps attached some ceremonial practices to this activity, then Chauvet would need to be considered in that context. The preoccupation with 'dangerous animals', so prominent in the parietal art of this cave (Clottes 2001), is also reflected in some of the central European evidence of the same period. The therianthropes from Hohlenstein-Stadel (Schmid 1989) and Hohle Fels (Conard et al. 2003) alone should suffice to dispel any notions that the early Aurignacians lacked sophisticated beliefs and artistic abilities. They are among the conceptually most complex productions of the entire Upper Palaeolithic, and their cultural and temporal attribution is uncontested. Therefore the assertion by the detractors of the Chauvet attribution to the Aurignacian, that Aurignacian rock art "looks pretty crude and simple, a long way from Chauvet", is profoundly false: some of the art of this period is more sophisticated than anything that followed in the next twenty millennia.

There are two further issues I wish to canvass here. One concerns the effects of the Campanian Ignimbrite (CI) eruption. This cataclysmic event not only had profound environmental effects, and probably contributed significantly to precipitating the *European Late Pleistocene Shift* (Fedele et al. 2002) — as the presumed change from purported Middle to Upper Palaeolithic traditions should be described more appropriately — it also affected the region's atmospheric carbon isotope regime. As a result of this and the cosmogenic radionuclide peak at about 40 ka BP, all radiocarbon determinations in southern Europe from the period between 40 and 30 ka BP may be distorted. The best available ^{14}C determinations for the CI event place it between 35 600 ± 150 and 33 200 ± 600 carbon-years BP (Deino et al. 1994), but much earlier and later dates are also available. However, the true age of the event is thought to be 39 280 ± 110 BP, derived from a large series (36 determinations from 18 samples) of high-precision single-crystal $^{40}Ar/^{39}Ar$ measurements (De Vivo et al. 2001). To what degree the Chauvet carbon dates have been affected by the CI event is unknown, but what this means in practical terms is that the true ages of the analysed charcoal pictograms are perhaps not about one half of those proposed, as the opponents of these results suggest, but in fact that they are very probably higher. In the extreme case, these images may not be 32 or 33 ka old, but could theoretically be as old as 36 or 37 ka.

The next issue derives directly from this. A decade back I pointed out that there is no evidence that the Early Aurignacian is the work of 'moderns' (Bednarik 1995: 627). In the light of the recent placing of the Vogelherd human in the Holocene and the re-dating of the Cro-Magnon specimens to the Gravettian, and in view of the very doubtful status of the Mladeè group (Bednarik and Oliva in prep.),

Figure 6. *The author descending into the entrance shaft of Chauvet Cave. Photograph by Jean Clottes.*

this statement was quite prophetic. We can now state, unambiguously, that there is currently no evidence that *any* Aurignacian is the work of 'moderns', or Cro-Magnons. We have already known for some time that the Châtelperronian is a tradition of the Neanderthals. But their ornaments, we were told, were not their own work, they were scavenged from the 'invading' 'moderns'. After all, Neanderthals were primitive brutes, without language, symbolism or complex social systems, how could they possibly have produced palaeoart. Suddenly, the tables have turned in the most dramatic way possible. Today we simply do not know what kind of people the Europeans were between 40 ka and 25 ka ago, but the fact of the matter is that all human remains we can securely place between the 'beginning of the Upper Palaeolithic', 40 000 years ago, and its middle, 15 000 years later, are considered to be of Neanderthals. If we were to assume that this is a reflection of the real circumstances, not a fluke of recovery bias, then we are led directly to some very disturbing deductions.

For one thing, this would mean that Neanderthals or their direct descendants were responsible for fully one half of the Upper Palaeolithic in Europe. This alone would be hard to swallow for the vast majority of Pleistocene archaeologists. But this scenario would also demand that the German lion-headed therianthropes were made by Neanderthals (or their descendants), the same people who 'scavenged' pendants and ivory rings at Arcy-sur-Cure. Moreover, the most sophisticated rock art of the Palaeolithic period, the magnificent art of Chauvet, would then be the work of Neanderthals. And the pinnacle of creation, *Homo sapiens sapiens*, would once again have usurped the credit for one of humanity's greatest achievements.

In short, the dating of the human occupation evidence in Chauvet Cave opens a Pandora's box for Pleistocene archaeologists, especially those who have closed their minds to alternative interpretations. I have shown here that crucial to it is the issue of the reaction of the Aurignacians to the other occasional inhabitants of the cave, the cave bears.

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