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CAVE USE BY AUSTRALIAN PLEISTOCENE MAN

by

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ABSTRACT

It has long been assumed that the prehistoric inhabitants of Australia had always shunned caves, but recent evidence indicates that Pleistocene man made extensive use of deep limestone caves in that continent. Nearly all the Australian sites known to possess such evidence have only been discovered since 1980. The parietal traces of human use described in this paper include three different forms of rock art, the oldest of which is sometimes found together with extensive evidence of chert mining. This subterranean mining of sedimentary silica represents the world's oldest known traces of systematic mining, but it is claimed in this paper that similar evidence is also present in at least one French cave. The oldest of the described anthropic wall markings are identical to the earliest form of cave art in the Franco-Cantabrian region. Although absolute dating is not yet finalized for the Australian sites it has been established that the most archaic markings are more than 20,000 years old. Their discovery and investigation has prompted a hypothesis with which it is attempted to explain the origin of the anthropocentric world view shared by extant humans.

INTRODUCTION

The massive corpus of Australian rock art, numbering many millions of design elements (or figures), has long been thought to be entirely restricted to rock shelters, and to open air sites such as rock pavements, boulders, cliff faces and rock outcrops. Twenty years ago it was still firmly believed that prehistoric Australians had not normally entered caves, let alone engaged in systematic subterranean expeditions. For well over half a century the cave art of western Europe had remained the only evidence of a Palaeolithic predilection for deep caves. The Franco-Cantabrian Stone Age artists not only explored major cave systems, some of their underground journeys must have been quite perilous: consider Montespan and Baume Latrone, for example.

Not surprisingly, the clear evidence for this courageous behavioural pattern has greatly influenced our ideas of these people, particularly as it often contrasts with the attitudes to caves among contemporary peoples. Ethnographic observation frequently confirms an underlying indisposition towards the parietal world. Caves feature prominently in the myths of mankind as the abodes of a multitude of malignant spirits and beings, or as the sources of some evil potencies.

Australia is no exception. The reluctance of the present Aborigines to enter caves – sometimes even deep rock shelters – is attributable to a mythology describing them as the dwelling places of a variety of sorcerers and witches, or as the lairs of the rainbow serpent or other zoomorphic creatures. Since most Australian rock art studies until the mid-1960s were tied firmly to iconological and ethnographic interpretation, neglecting the possibility of great time depth, the apparent

absence of cave art only seemed to verify what ethnography suggested. No thought was given to the possibility that Pleistocene Australians could have held cultural concepts akin to those of Upper Palaeolithic Europeans, although Tindale's work had long demonstrated that the antiquity of man in Australia, as well as of his art, reached back well into the distant past (Hale and Tindale, 1930). When Lane and Richards (1966) reviewed the Australian evidence of a cave art they could only cite the hand stencils in four caves on the Nullarbor karst plain, as the sole examples of what could reasonably be described as 'cave art'. Two more hand stencils were recently located in Old Kudardup Cave, in the southwest of Western Australia (Morse, 1984). But in nearly all these cases the art is located close to the cave entrance and well within the reach of daylight. It does not constitute evidence of a major rock art tradition that survived only in limestone caves.

THE PLEISTOCENE FINGER LINE TRADITION

It should therefore have come as no surprise to Dr Alexander Gallus that there was no shortage of scepticism when he announced in 1968 that extensive wall markings found in Koonalda Cave up to 300 metres from the entrance and in complete darkness were made by humans during the Pleistocene (Gallus, 1968, 1971). He compared the finger markings to those known from French and Spanish caves, the 'macaronis', which are generally believed to predate the earliest figurative art there, and he reported extensive evidence of chalcedony mining from the general vicinity of the markings. Many objections were raised against his first and subsequent reports. Alternative explanations for the finger and abrasion marks included that they had been produced by bats and owls; that they could have resulted from the sharpening of bone points; that they are a dissected maze of solution tubes or, alternatively, surface solution grooves. Even if they are of human origin, it was argued, they could have been made by recent visitors, or produced accidentally by people marking the soft walls with their fingers as they groped their way in the dark.

After studying these human markings from 1959 Gallus had come to the conclusion that they must be prehistoric, and of quite considerable age. His perseverance eventually led to a major investigation of the cave in 1967. Dr R. V. S. Wright's expedition confirmed not only that the wall markings are indeed human, that they had been intentionally produced, and that they occur amidst extensive evidence of prehistoric chert mining; it also confirmed that this use of the cave appeared to be restricted to the Pleistocene. Wright (1971, p. 28) concludes from the results of his excavation that traces of human activity are present from roughly 22,000 to 15,000 bp. The only one of Gallus's postulates he disagrees with concerns the typological description of the chalcedony assemblage found in the cave's floor deposits. Gallus utilized European terminology to describe implement types he believed to be present, whereas Wright interprets the entire assemblage as quarrying *dèbitage* (waste material)

and 'blanks', which were taken elsewhere for refinement. While Wright's interpretation is probably correct he has only presented one half of the evidence required to verify it. If the mined raw material had been taken out of the cave for reworking, the typology of these working floors should reflect the tool industries of the people who mined the parietal silica. There are large deposits of chalcedony stone tools in the vicinity of the cave entrance but Wright reports no details of them.

Wright claims that if one of the radiocarbon ages is omitted from the sequence of excavated charcoal samples and the others are averaged, stratigraphic relative ages agree with radiocarbon ages (Wright, 1971, p. 28). I have argued (Bednarik, 1986a) that:

(*a*) all carbon-14 dates from Koonalda Cave are incompatible at one standard deviation;

(*b*) there is no stratigraphical consistency in the dates;

(*c*) the stratigraphy suggests strongly that the lower part of the passage became inundated around 20,000 bp, which probably prevented human access to the art passage;

(*d*) the final major roof fall, which certainly postdates the wall markings, occurred about the same time as the inundation, and may have been precipitated by it.

Accordingly, I see the events that occurred in Koonalda Cave around 20,000 years ago as *termini ante quem* for the finger markings, not as dating the art as they are often assumed to do. Such a minimum dating favours the view propounded by Gallus, that human use of the art passage extends considerably beyond 20,000 bp.

While the anthropic wall markings in Koonalda, which consist of both finger lines and tooled incisions, are very extensive and certainly authentic, there are also countless animal scratch marks, but these receive no mention as such in any of the many publications on the site. In some cases they have in fact been described as man made (e.g. Sharpe and Sharpe, 1976), and reports of other 'unexplained' markings in Australian caves soon appeared. By the mid-1970s I began to appreciate the necessity of developing expertise in distinguishing natural from artificial cave markings, if debate about the authenticity of archaic rock art were to be avoided. I had observed animal markings in numerous caves already – in Europe, where I had studied the often enormous accumulations of cave bear scratches, as well as in a large number of Australian caves (at the time of writing, over 320 caves have been studied in the course of this project, in six countries; Bednarik, 1986b). When the discovery of finger lines and other marks in a cave near Buchan, Victoria, was announced in 1977 I decided to examine subparallel ceiling marks in Orchestra Shell Cave, near Perth, which Professor Sylvia Hallam had earlier described as having been made by people using hand-held animal claws (Hallam, 1971). Expecting to find true animal marks I was surprised to find in 1978 that most of these markings had been made with fingers, and that they had later become distorted by the deposition of reprecipitated limestone (Bednarik, 1985a, p. 83, 1986c). I realized that the discovery of the existence of such markings near Perth made the

presence of similar sites in other parts of Australia, especially southern Australia, highly probable. I also realized that the parietal finger markings of Australia should be studied together with those of western Europe, because they could no longer be considered as a local phenomenon. It concerns me that almost thirty years after the discovery of human finger lines in Koonalda Cave (in 1957) no one besides myself has compared the Australian markings with those of Europe. No one outside my project has seen more than two of the twenty-seven sites presently known to exist in Australia (twenty-five of which were located by my project). These circumstances preclude informed verification of my findings by researchers outside my project, which may render my more precarious theories (e.g. Bednarik, 1984a, 1984b, 1986d) too vulnerable.

I distinguish two 'styles' or 'generations' of finger flutings in the European caves, which have also been recognized by Drouot (1953), at Baume Latrone. The older consists of complete sets (i.e. of usually four digits) running a predominantly rectilinear course, which are mostly short and form logically inconsistent arrangements. Apparent patterns occasionally formed are probably stochastic in nature and must be expected to occur in any large sample of atectonic linear markings. These *sillons digitaux parallèles* (my 'digital flutings') are easily overlooked because they are extensively obliterated by the later tradition, for which I retain the name 'macaronis'. These are far more common in Europe and of much greater variability. Serpentine, curvilinear and conjunctive elements, and the frequent use of less than four fingers, are characteristic. The sets are generally longer, and at some sites (e.g., Altamira, Gargas, Pech Merle) figurative depictions are incorporated in the arrangements of macaronis.

The described styles of finger markings (in addition to which finger paintings also occur) were produced by drawing the fingers of a hand over the surface of a soft wall or ceiling deposit of *Montmilch* (*Mondmilch* or 'moonmilk'; for definition see Schmid, 1958, p. 19), leaving a set of subparallel grooves (FIGS. 1 and 2; PLATES 1 and 4). Nearly all the surviving markings have been subjected to a variety of alteration processes during the immense time span they have had to survive, which often renders their identification difficult. The earlier style, digital flutings, represents the oldest known artistic tradition in the world (or the earliest tradition of consciously modulated markings). It is the only form of this phenomenon that occurs in Australia, where it has so far been found along the continent's southern coast (FIG. 3). Although circumstantial evidence at most of the sites suggests great antiquity for the Australian finger line tradition, absolute dating has remained elusive so far. However, a minimum age of 20,000 years can be postulated for similar but incised grooves in Koonalda Cave, and these may be contemporary with, or younger than, the finger flutings in the same cave (Bednarik, 1985a, p. 85). For comparison, the parietal finger line traditions of western Europe are often ascribed to the early Aurignacian. It is interesting to note that some of those workers who have examined

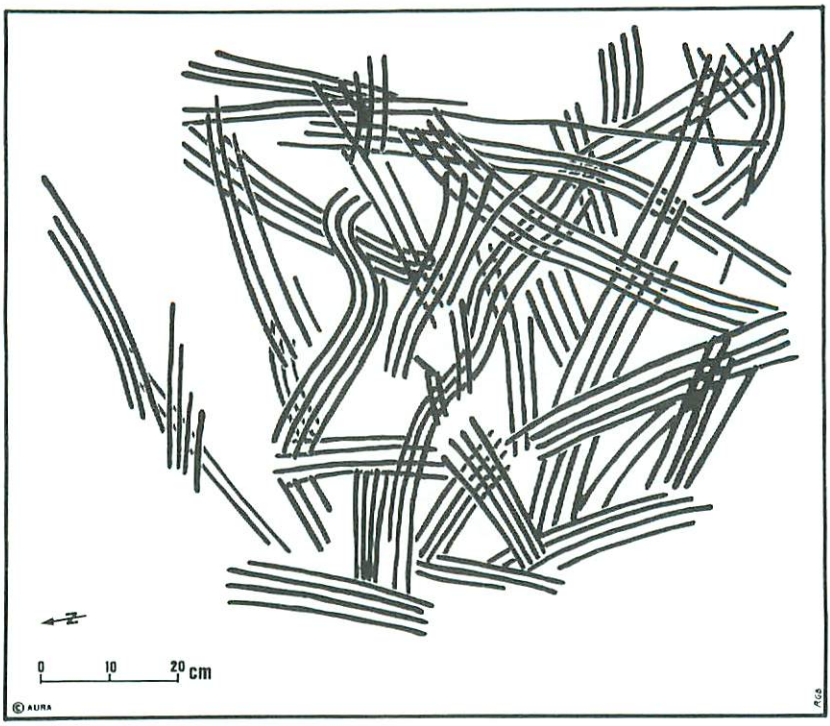

FIG. 1 — FINGER MARKINGS ON THE CEILING OF KOONGINE CAVE, SOUTH AUSTRALIA. THEY WERE PRODUCED BY DRAWING THE FINGERS OVER THE FORMERLY SOFT SURFACE IN THE CAVE. MOST OF THE ARRANGEMENTS REPRODUCED IN THIS FIGURE ARE OF JUVENILE HANDS.
After Bednarik, 1984b

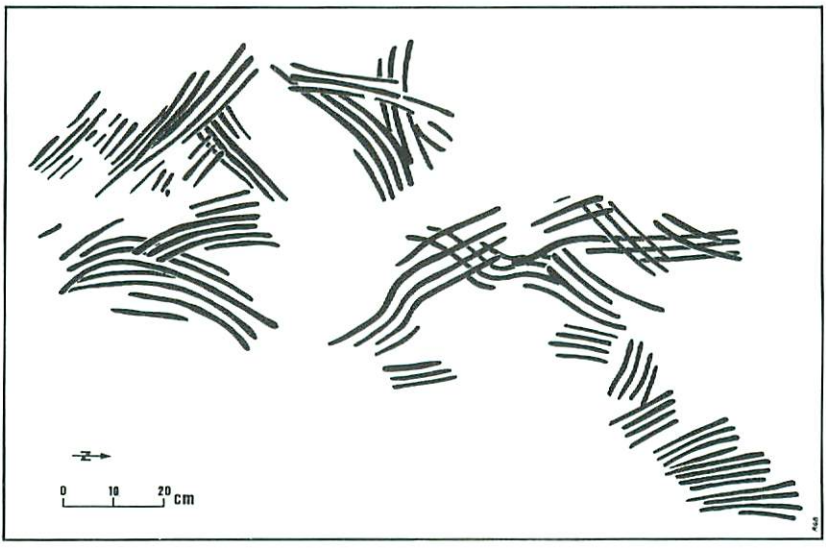

FIG. 2 — FINGER MARKINGS ON THE CEILING OF MALANGINE CAVE, SOUTH AUSTRALIA

them most closely, have suggested that they may in fact date back much further. Marshack first mooted the idea (e.g. Marshack, 1976), and Bahn (1984) reminds us that 'there is no reason whatsoever why this type of decoration may not have originated in the Middle Palaeolithic' at such sites as Gargas. I have pointed out, without advocating a particular antiquity, that the evidence favouring an Aurignacian provenance for the earliest finger flutings of western Europe is no stronger than the case for their interglacial age (Bednarik, 1984c, 1986e).

At many of the Australian sites the finger flutings occur together with, or in the general vicinity of, short linear abrasions or grooves which were produced with a tool (PLATE 2). They usually form groups of subparallel marks, and where they are well preserved very fine, longitudinal striations can often be discerned in them. In some cases these

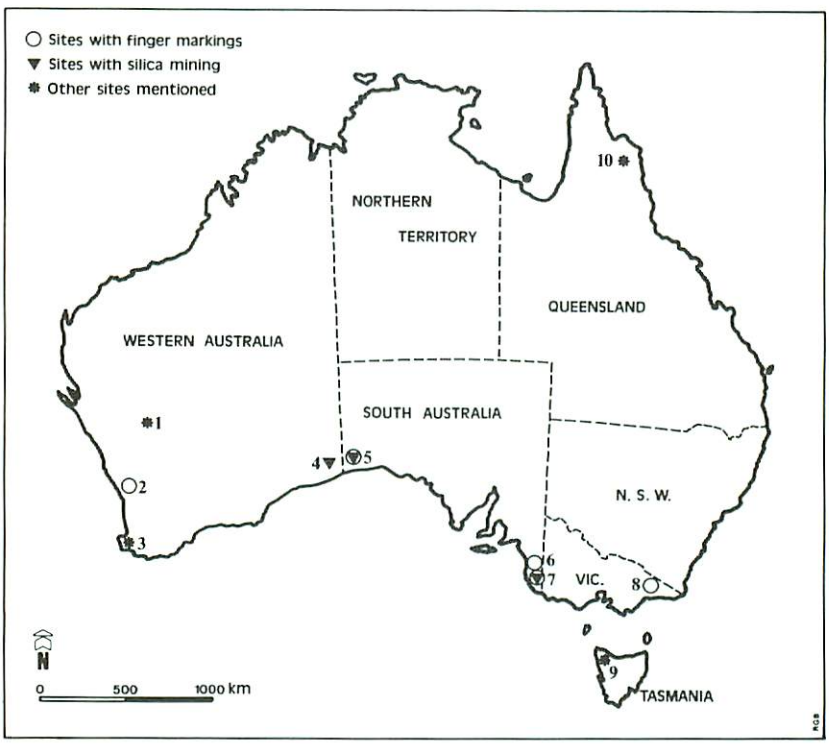

FIG. 3 — LOCATIONS OF THE AUSTRALIAN SITES MENTIONED IN THIS PAPER
1 – WILGIE MIA
2 – ORCHESTRA SHELL CAVE
3 – OLD KUDARDUP CAVE
4 – WEEBUBBIE, MULLAMULLANG AND WARBLA CAVES
5 – KOONALDA CAVE
6 – KARAKE AND PAROONG CAVES
7 – MALANGINE, KOONGINE, KOORINE, GRAN GRAN, PRUNG-KART AND KARLIE-NGOINPOOL CAVES
8 – NEW GUINEA 2 CAVE (NEAR BUCHAN)
9 – NORTHERN TASMANIAN ROCK ART (MT. CAMERON WEST)
10 – EARLY MAN SHELTER

grooves are so distinct that I have been able to determine by experiment that the material used to create them was in all probability the locally occurring, grained aeolian limestone.

Both digital flutings and tooled linear marks tend to emphasize topographical features of the cave walls and ceilings, but their contemporaneity has not been established so far. In all observed cases of superimposition the finger lines precede the tooled incisions. The latter's appearance often indicates an element of impact besides abrasion which has prompted a comparison with the deep gash marks, pits and grooves that occur at a few of the Australian sites. These mysterious marks are sometimes found in dense concentrations near traces of prehistoric chert mining and, if they were produced by the miners, could reasonably be assumed to have ritual significance. However, their chronological position relative to the other traces of human use of these caves remains obscure. Neither do I regard the contemporaneity of finger flutings and chert mining as established, despite the common occurrence of the two phenomena in several caves.

ENGRAVINGS IN AUSTRALIAN CAVES

Fortunately not all relations between the prehistoric traces in these caves have remained as vague. There is a distinct chronological gap between the finger line tradition and the subsequent generation of deeply abraded petroglyphs of the Karake Style. This gap is represented by significant tectonic changes in some caves, by deposits of calcite skins in others. The more conspicuous vestiges of tectonic adjustments in any of these caves all refer to events that occurred *after* the digital flutings were executed. Koonalda, Orchestra Shell, Koongine and Karlie-ngoinpool Caves provide the best examples of this relationship. The subsequent Karake Style, on the other hand, clearly postdates all major tectonic changes to the cave morphology. A period of low sea level has been suggested to be responsible for them, by draining the phreatic reservoirs and thereby affecting the structural stability of the extensive subterranean system.

The Karake Style has been named after the cave where it was first recognized as a stylistically homogeneous tradition (Aslin and Bednarik, 1984a). It consists of a narrow range of motifs which are as a rule deeply carved into the walls, averaging groove depths of ten to twenty millimetres. Their range includes the 'converging lines motif' (consisting of two to five lines that converge towards a common focus where they may either meet or remain unjoined); the dot arrangement; groups of short or long linear, parallel grooves which are usually vertical; radial figures, with several variants; and a variety of circles and vaguely circular forms: oblong or distorted circle shapes, dissected circles, concentric circles, and a variety of mazes and often intricate lattices consisting of circles or incorporating circular or curvilinear elements. At one of the more spectacular sites near Mount Gambier, Paroong Cave (Aslin, Bednarik and Bednarik, 1985), a few additional motifs give the impression that the

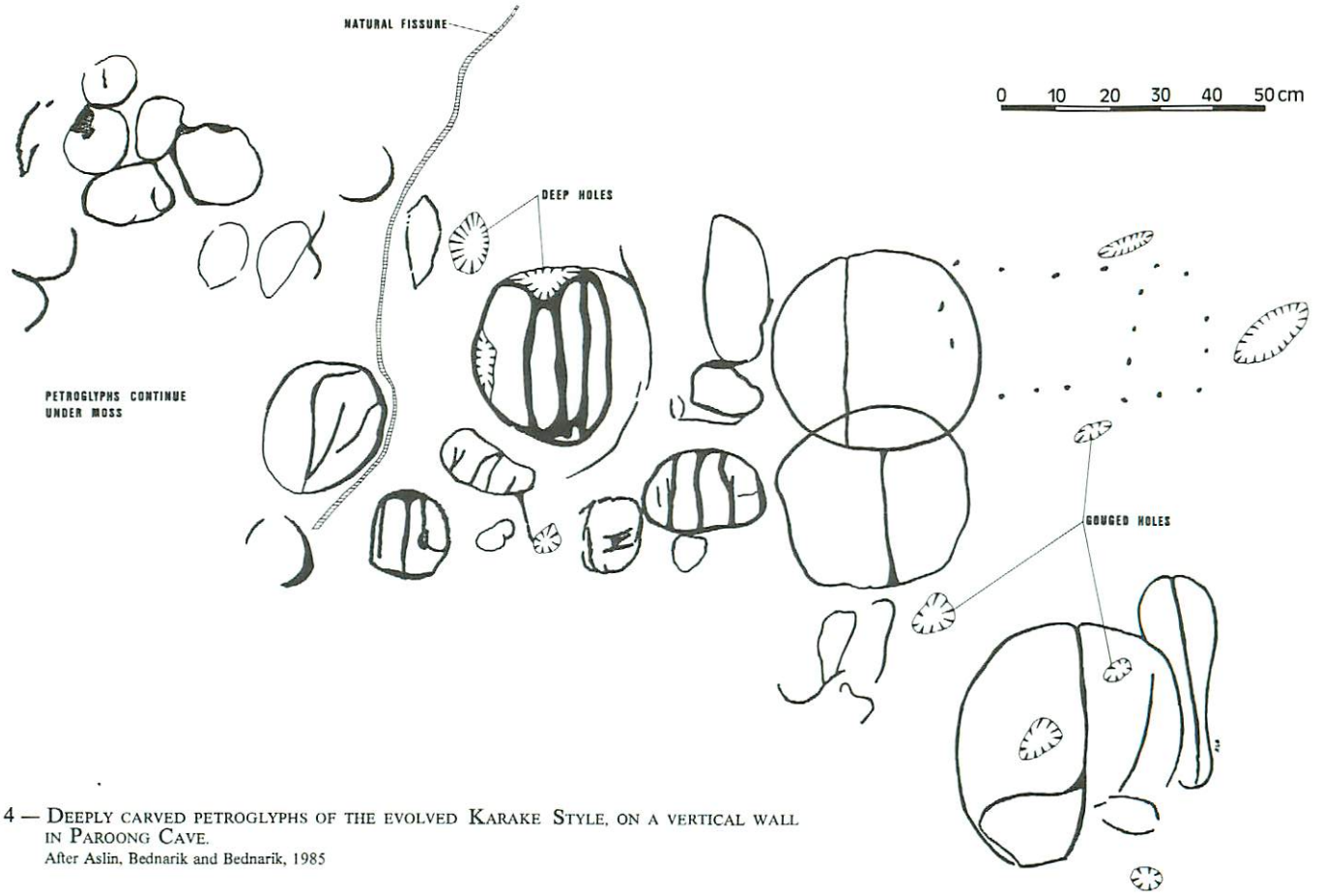

FIG. 4 — DEEPLY CARVED PETROGLYPHS OF THE EVOLVED KARAKE STYLE, ON A VERTICAL WALL IN PAROONG CAVE.
After Aslin, Bednarik and Bednarik, 1985

art at that site is stylistically more evolved. Multiple wave lines occur here, and two motif types each of which combines two of the more archaic types: circle with internal vertical barring (FIG. 4; PLATE 3) and circle with internal lozenge lattice.

A practically identical range of motifs exists among the petroglyphs of northern Tasmania, just across Bass Strait. Tasmania was joined to the Australian mainland during the late Pleistocene, and it has been suggested that the Karake Style, possibly its evolved phase, was introduced into Tasmania via the Bassian Isthmus before the final severance of the island from the mainland. This demands a minimum age of 11,000 years for the Style's late phase (Aslin and Bednarik, 1984a).

My project has been responsible for the discovery of the world's largest regional concentration of cave art, located at Mount Gambier, in the southeast of South Australia (FIGS. 1, 2, 4 and 5; PLATES 1-6). One of the key sites in that area, Malangine Cave, possesses three 'generations' of human markings which are physically separated by laminae of carbonate speleothem. Finger lines, representing the oldest

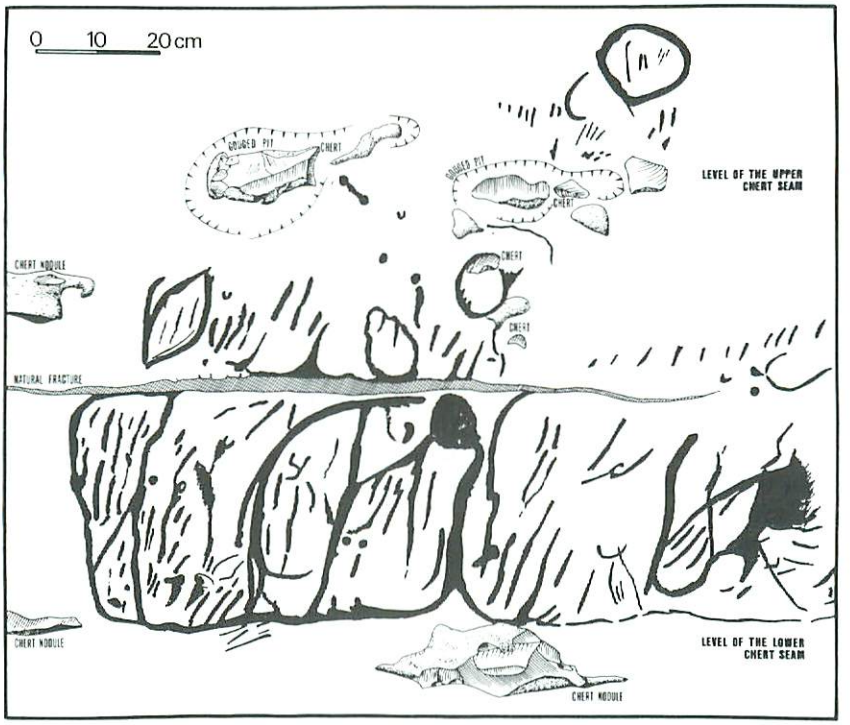

FIG. 5 — DEEPLY CARVED PETROGLYPHS OF THE KARAKE STYLE, ON A VERTICAL WALL IN THE UPPER PART OF KARLIE-NGOINPOOL CAVE. THE LOOSELY CONSTRUCTED MAZE IS ALLIGNED WITH THE HORIZONTAL BEDDING OF THE ROCK AND THE RELATED SEAMS OF SEDIMENTARY SILICA. MOST OF THE CHERT NODULES HAVE PATINATED IMPACT FRACTURES: MANY ARE SURROUNDED BY ARTIFICIAL PITS GOUGED OUT FOR THE REMOVAL OF THE CHERT.
After Aslin and Bednarik, 1984c

tradition, were covered by a deposit of pearly travertine, into which the Karake Style figures were carved. Near the cave's entrance these were covered in turn by a sheet of cutaneous, laminated travertine of about 15 millimetres thickness, which is peeling off in many places. The surface of this second deposit was then marked by more recent artists, whose 'shallow incisions' bear a faint veil of more calcite deposit.

The described stratigraphy of alternate limestone deposition and markings takes on a special significance when one considers that such secondary (reprecipitated) limestone is datable via radiocarbon and uranium/thorium contents, and that its oxygen isotope ratio reveals climatic information about the time the deposit was formed. All three radiometric methods are employed by us in our quest to date the entire sequence reliably. Preliminary results of several C-14 and U/Th analyses suggest a late Pleistocene antiquity for the Karake Style petroglyphs. Not only do these archaic rock carvings resemble those of Tasmania, they appear at many open air sites throughout eastern Australia. Most importantly, they are stylistically close to the petroglyphs in Early Man Shelter, northern Queensland, the most reliably dated site of Australian rock art (Rosenfeld, Horton and Winter, 1981). The markings at that site were covered by well-stratified sediments that are up to 15,000 years old.

Many open air sites in western New South Wales and South Australia present a record of a gradual change from the purely non-iconic motif range of the Karake Style, to styles incorporating figurative elements. The first iconic depictions to appear in this record are always tracks, both animal and human. The development from non-iconic to iconic abstractions may well document the advent of the modern world view, of cognitive perception as we know it. While this development is believed to have been comparatively brief in western Europe (which may in fact not have been the case, as I argued above), it has certainly been slow in Australia, and is probably much better documented here – as we have only recently discovered. For example, I have noted that the motifs of all archaic rock art appear to externalize the two most vivid two-dimensional visual experiences early humans can be assumed to have had. This suggests that they lacked the capacity to reduce three-dimensional sensory information to a two-dimensional image (Bednarik, 1985b, p. 82).

In addition to the deeply carved arrangements of the Karake Style, a few of the caves near Mount Gambier also contain a generation of shallow incisions that were executed with single strokes of a tool, and are much younger again. These engravings appear to indicate a reaction of the artists to the previous art because they are often copies of it, and the older designs are occasionally filled in or modified by the more recent markings. In contrast to the preceding rigid, formal figures, these shallow engravings appear impulsive and spontaneous. Preliminary dating of the carbonate speleothem deposit on which this third generation of cave art has been produced in Malangine Cave suggests that it dates possibly from the mid-Holocene.

SILICA MINING IN THE PLEISTOCENE

Traces of activities related to the mining of chert seams are a fascinating aspect of the prehistoric use of Australian limestone caves. Flint mining is of course a well-known phenomenon in European archaeology, but it belongs to the early ceramic periods there – notably the Neolithic. The concept of systematic Palaeolithic mining activities is new, and has never been discussed in any detail prior to the present paper.

Flint is found embedded in limestone, as cortex-bearing nodules occurring either randomly or in seams that may coalesce to form tabular masses. The term flint usually designates the distinctive chert of the Cretaceous chalk deposits in western Europe, and its lithological meaning is restricted by chronological and possibly geographical connotations as well as physical attributes. Similar nodular silicas are known from other carbonate facies such as Jurassic or Tertiary limestones, and even from gypsum. The practice of describing these microcrystalline and chalcedonic quartzes as flint may reflect their mode of occurrence but it is geologically invalid (Zeuner, 1960, p. 319; Milner, 1962, p. 256), unless they are indistinguishable from flint in every important physical characteristic.

The diagenesis of sedimentary silicas is a complex subject that has attracted much effort (for bibliography, see Bednarik, 1980). The replacement origin theory by Van Tuyl (1918), expanded by many others (particularly Wroost, 1936 and Walker, 1962), is now generally accepted as explaining these formations. The silica in Koonalda Cave has been consistently described as flint by Wright (1971) whereas the site's initial investigator defined it as chalcedony (Gallus, 1968, 1971, 1977). Exposed on the cave walls as a series of horizontal seams it occurs in different forms and I have attributed this heteromorphism to diagenetic factors. Relatively unimpeded growth of continuously oriented crystal lattices is most probably indicated by the chalcedonic variety, and the chert, i.e. the non-porous, white form, owes its properties to the presence of numerous, closely spaced centres of crystallization during carbonate replacement inducing growth of randomly oriented microcrystals with closed interstitial spaces. Trapped water may cause such voids, or simply the repelling character of each growing crystal's negatively charged skin of protruding oxygen ions. Finally, the dull and fully opaque stone is essentially cortex, or the result either of incomplete replacement or of its reversal. Thus the varying degrees of white are basically an optical phenomenon (Bednarik, 1980, p. 48). Wright's description of the silica in Koonalda Cave, as a 'brown, translucent, glassy flint' and a 'white, opaque, non-glassy flint' is unacceptable. The only characteristic the stone has in common with flint is that of being a sedimentary silica, and it had been satisfactorily defined by the site's initial investigator.

Wright did not hesitate, however, to accept Gallus's claims concerning the mining of the silica. In fact he identifies the entire artefact

assemblage in the cave as the residue of quarrying activities 'carried out under the most extraordinary conditions of difficult access, darkness and discomfort' (Wright, 1971, p. 56). Gallus describes two types of mining activities: the exploitation of seams along the walls, and the excavation of mining pits among the floor boulders. He reports that the floor pits are bell shaped and sufficiently large for a crouched man to work in them, that they occasionally contain mining tools and remains of torches, and that one was artificially filled in (Gallus, 1971, p. 119, 1977, p. 379). He attributes the mining of the wall seams to one of the more recent phases of human occupation (1971, p. 131).

My own observations have amply confirmed that chalcedony nodules were laboriously extracted from the walls by gouging away the limestone around them, and knapping them as they became sufficiently exposed (FIG. 5). Not all of these fractures are impact cleavages with positive or negative bulbs of percussion. Some nodules are already naturally fractured, and where such cracks are filled with gypsum, *Salzsprengung* (a process by which a rock crack is enlarged through the formation of salt crystals, such as gypsum) is likely to effect their enlargement. Nevertheless, there are many partially removed nodules with clear impact fractures (PLATE 6). Some of them occur in locations of such difficult access that a form of ladder or scaffolding may have been used. This possibility should not be rejected lightly, in view of the extensive – albeit much more recent – mining operations known to have taken place in the ochre mine of Wilgie Mia (Western Australia), where Aborigines removed several thousand tons of rock right up to ethnographic times, using wooden scaffolds.

The first comment on prehistoric chert mining in Nullarbor caves is by Evans (1919/20, p. 97) who observed 'fire sticks' in Weebubbie Cave. Evidence of underground quarrying of silica seams has also been reported by the Cave Exploration Group of South Australia, from Warbla and Mullamullang Caves (Hill, 1966, p. 33). Since 1980, we have found extensive traces of chert mining in six caves near Mount Gambier. These observations have not been considered in a common context so far, yet they permit a fairly comprehensive assessment of the general phenomenon.

The Miocene limestone forming Malangine and nearby Koongine Cave near Mount Gambier (Bednarik, in press) has locally undergone selective replacement by silica. The nodules so formed contain no flint meal and are encased in a veneer of incompletely silicified rock (or, perhaps, the result of recarbonatization). The almost unbroken, horizontal silica seam lacing the low cave walls protrudes from them, but projecting portions have been broken off with well-directed blows. Extraction of some of the random nodules has also taken place, and there are rare instances of limestone gouging around such nodules. But the chert is of a coarse texture and inferior quality in Malangine Cave, while vast deposits of high-quality silicas occur less than four kilometres away, as a washed-up ridge along the coast (see Witter, 1977, p. 52, for their process of formation). It is therefore tempting to subscribe to the explanation Gallus has offered for the chalcedony mining in Koonalda

Cave, namely that the stone procured from the cave had a special significance for the people mining it.

In the case of Malangine Cave an alternative interpretation appears more plausible. A recent test excavation has produced stone implements from all sediment levels right down to bedrock, but while the upper part of this assemblage consists of dense, cryptocrystalline, flint-like stone, the lower occupation levels have produced only poor quality chert, such as could be obtained within the cave. The coastal silica nodule deposits could not have existed prior to the Holocene, because of the lower sea level then, and this former lack of high quality cherts is apparently reflected in the stratigraphical record of the cave. Since most of the rock art in Malangine Cave is believed to pertain to the Pleistocene that seems only reasonable and logical.

Parietal finger flutings and silica veins occur together in four more caves in the Mount Gambier area, and in each one mining evidence is well-defined. In Koorine Cave, one of the smallest (Aslin and Bednarik, 1984b), an estimated 150 chert nodules protruding from the cave walls have been fractured. Again, fractures were clearly caused by percussion and the antiquity of the resulting surfaces is attested by a dark-brown stain and by reprecipitated carbonates that have formed on some of the cleavage surfaces.

That the silica deposits in Gran Gran Cave have been all but exhausted by prehistoric mining operations has been noticed by Luebbers earlier (1978, pp. 107-8), but he failed to discern the two panels of finger markings in the same cave chamber. Prung-kart Cave is another site where most accessible chert nodules have been broken off, despite the inferior petrological properties of the stone. There are again many fractures with distinct bulbar surfaces, radiate fissures and percussion waves. Some patination is present on them, as are minute limestone precipitates. And again there are extensive finger flutings nearby.

Karlie-ngoinpool Cave has the distinction of possessing the largest known body of non-iconic cave art in the world (Aslin and Bednarik, 1984c). Its extensive traces of chert mining are comparable in magnitude to those in Koonalda Cave. The cave's upper part traverses three distinct, horizontal seams of sedimentary silica. Where the nodules were accessible the limestone matrix has been gouged away around them; many have been prized from their places and removed. Some of the empty sockets display marks that permit inferences about the technique used to extract individual nodules whole. Other, partly removed chert lumps bear the ubiquitous bulbar cleavage scars suggestive of well-directed blows. These are patinated – an indication of great antiquity in a parietal environment (Bednarik, 1980).

Absolute dating of the mining activities in Australian caves has not been possible so far. Circumstantial evidence suggests a great age for the mining traces at every one of the seven caves where they occur together with finger flutings. For example, there appears to have been no human occupation in Koonalda Cave after 14,000 or 15,000 bp. At Karlie-ngoinpool Cave, a visual comparison of mining marks with the most recent petroglyphs suggests the former to be markedly older than the

'shallow incision tradition' which has been tentatively placed in the mid-Holocene. It is intimated that the silica mining in Australian caves is a phenomenon restricted to the Pleistocene.

The coincidence of *Montmilch* finger fluting and parietal silica deposits is not restricted to Australia, however. It exists also at two French sites at least, Bara Bahau and Rouffignac. The cave art at Bara Bahau (Bugue-sur-Vézère, Dordogne; Glory, 1955) is located just before the cave's large passage is blocked by a talus slope, some ninety metres from the entrance. There are four distinct chert seams in the middle part of the cave, and randomly distributed nodules occur throughout the ten-metre long art panel. The left-hand, or eastern section of the panel merits close attention. It is on a steeply sloping part of the ceiling that faces the end of the passage, i.e. the talus slope (FIG. 6). Its soft limestone medium bears many sets of cave bear claw marks, all of which are vertical. Superimposed on them are finger flutings of the archaic type which are oriented at random, and in turn precede the actual animal outlines. Naturally the figurative component of this dense accumulation of markings – scientifically the most trivial – has received most attention, as has so often been the case in rock art studies.

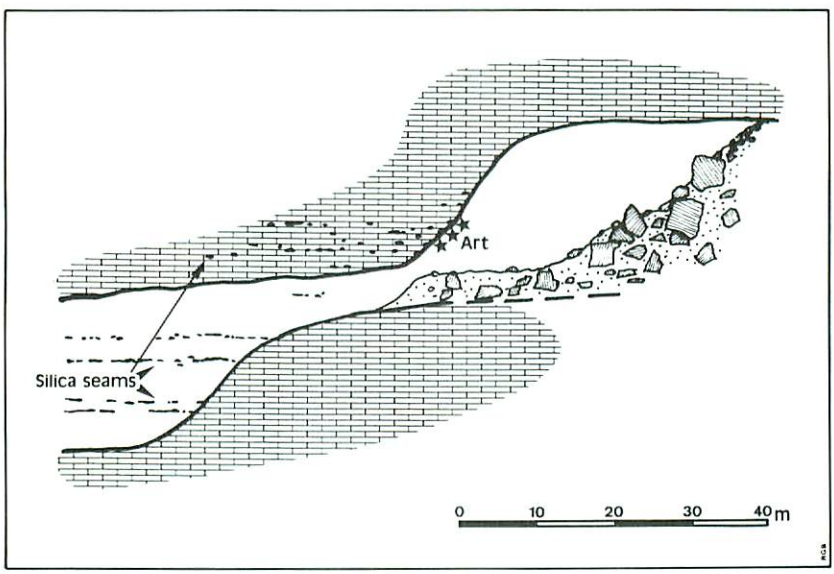

FIG. 6 — BARA BAHAU, DORDOGNE (FRANCE). SECTION THROUGH THE TERMINAL CHAMBER OF THE CAVE, SHOWING THE LOCATIONS OF CAVE ART, CHERT SEAMS AND TALUS SLOPE

Many of the silica nodules in this art panel have been fractured, and close examination of the cleavage surfaces reveals them to be ancient percussion fractures. This appears to have been ignored by previous investigators and when I discussed it with a local prehistorian he insisted that the chert had been fractured by clastics movement. This is not plausible, however. There are no higher-lying cave spaces from which

boulders could have tumbled to gain the necessary force. Alternatively, the kinetic energy required to break the chert could have been produced by a violent, turbulent water flow, but that interpretation is contradicted by several factors. Such fluvial action would have left extensive traces on the soft limestone wall, and the direction of the blows would then be in the direction of water flow, whereas the chert has been fractured parallel to the wall plane. One could argue that the water action occurred at a time before the present wall surface existed, and that exfoliation has removed all abrasion and impact marks from the limestone – but this is also a very tenuous argument. Where nodules have been split almost flush with the present face of the wall the points of percussion would have had to be below the surface to satisfy that construction. I have therefore ruled out fluvial action. Since the cleavage faces are clearly patinated and therefore certainly ancient, since they are definitely not the result of thermal fracture, and since impact appears to have been well-directed and intentional I propose that the blows removing the chert were administered either by tool-using cave bears, or by prehistoric people. I find the second of these two explanations more convincing.

The presence of chert mining traces among the cave art of Bara Bahau, which I have mentioned only briefly before (Bednarik, 1985a, p. 86), is of interest in the light of the extensive surface silica deposits which occur on the steep hillside near the cave entrance. It also raises the question of mining activities in other caves of western Europe. Silica occurs in profusion on the decorated ceilings and walls of Rouffignac (also in the Dordogne; see Barrière 1983 for a recent discussion) and some may have been removed. I have not spent sufficient time at that site to determine whether it, too, could have been a silica source for Palaeolithic cave users.

CONCLUSIONS

Pleistocene parietal finger markings occur together with traces of chert mining, in two regions at almost opposite positions on the globe. This seems even more extraordinary when we consider that the two regions concerned, western Europe and southern Australia, represent the two extreme ends of the territory we know to have been occupied by humans around the time modern man appeared. Yet this evidence would be inadequate to formulate any profound diffusionist conclusions. There is no clear proof for contemporaneity of the two activities at any of the sites. Silica rock played a most significant role in all Stone Age cultures; we know from Australian ethnography what important economic asset a quarry represented to a local population. Palaeolithic visitors to a cave containing silica veins would certainly have recognized the stone, and it seems natural for them to have removed some of it. If the extraction of flint-like materials is a behaviour one would expect to find in any Palaeolithic people we cannot attach special cultural significance to its coincidence with other Palaeolithic practices, such as the production of finger-markings – however tempting this might be at first sight.

Nevertheless, the striking similarity of the early finger markings in Europe, and those now known to exist in many Australian caves, is a different matter altogether. How can we account for it?

Perhaps the more significant realization from the study of the archaic cave art is one of an evolutionary content: it appears that 'art' developed independently in different parts of the world, but by similar psychological processes. I have argued that the finger lines' restriction to parietal *Montmilch* proves that they were restricted neither to caves nor to *Montmilch*; that they are in fact traces of a once-widespread prehistoric behaviour which only managed to survive in the one medium and environment, and even here only in extremely rare instances. I regard their survival in the Franco-Cantabrian region and southern Australia as the result of favourable geological and climatic conditions (Bednarik, 1986e), and their similarity in the two areas as being attributable to a common neural circuitry in hominids at about the time modern man appeared – not as the result of some cultural factor, or as simply coincidence.

One of the aims of my project has been to evaluate the various interpretation attempts of parietal finger markings. I found it necessary to reject all of them, including those I had contributed myself. Some were found to be too subjective, others appeared tenable at some of the sites, but were easily refuted at others. I have demanded a more objective approach (Bednarik, 1986e) and, emulating Gallus's (1977) example of using psychological reasoning, and taking the view that the question of derivation had precedence over questions of meaning, arrived at concepts which have already appeared in embryonic form (Bednarik, 1984a, 1984b, 1986d, 1986e).

The concept of non-iconic art is perhaps only an ethnocentric interpretation, because even the most archaic 'psychograms', as Anati (1981) terms them, appear to be modelled on subconscious images, the phosphenes (Bednarik, 1984a, 1984b). Munn (1966) also claims an iconic association for apparently 'abstract' act. Anati's 'ideograms' generally consist of phosphene motifs, for example the entire Karake Style is made up of them, without a single exception. When the first motifs we recognize as 'figurative' appear on the Australian record they are still two-dimensional, consisting of tracks. The human capacity of abstracting three-dimensional objects to images may have been attained in the manner suggested by Davis only very recently, i.e. by discovering the iconic qualities of natural, non-iconic features (Davis, 1986). Irrespective of this evolutionary model's validity it has become very obvious over the last few years that the circumstances surrounding the emergence of consciously modulated markings, as well as of image making, are better documented in Australia than elsewhere. While it is only reasonable to revere the figurative Ice Age art of western Europe as a significant artistic achievement, we should not lose sight of the fact that the scientific and philosophical potential of these motifs is limited. They relate to the same model of reality as that held by ourselves. The archaic rock art, on the other hand, has received so little attention, yet it is

PLATE 1 — KOONGINE CAVE. SINGLE SET OF FINGER LINES INSIDE A CIRCULAR CEILING DEPRESSION. THE SURROUNDING WHITE MEDIUM (OF MONTMILCH) IS ALMOST DISSOLVED.

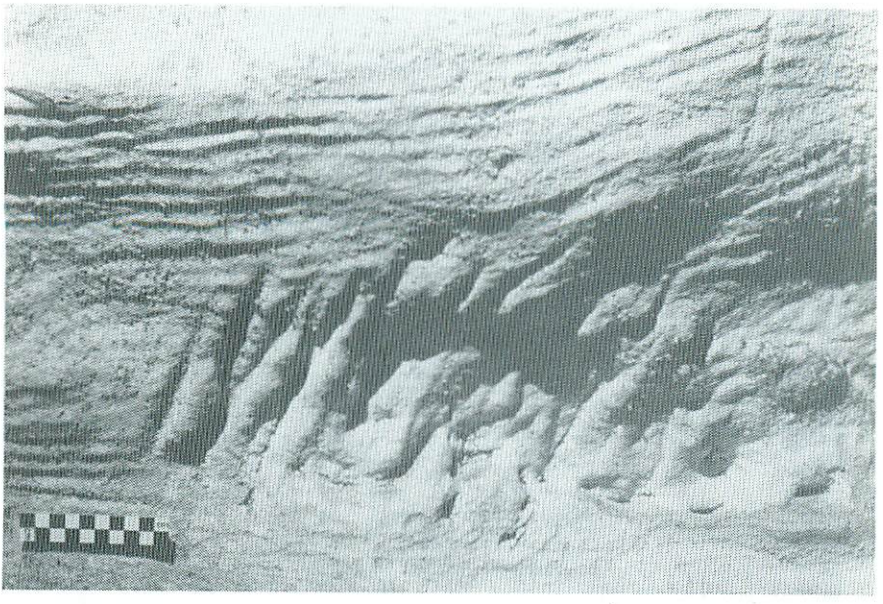

PLATE 2 — KARLIE-NGOINPOOL CAVE. HORIZONTALLY PLACED FINGER FLUTINGS ON A VERTICAL WALL, WITH SUPERIMPOSED DEEP CUTS.

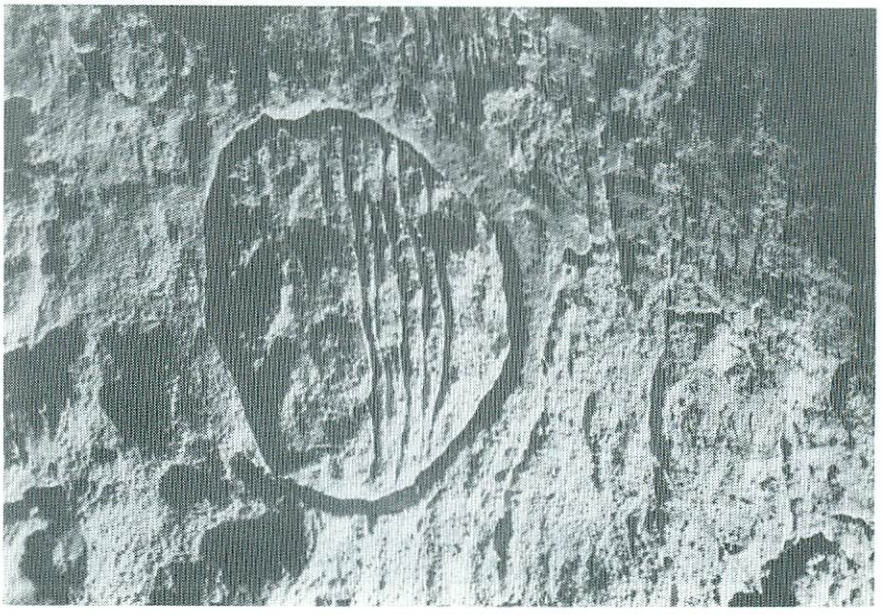

PLATE 3 — PAROONG CAVE. LARGE, DEEPLY ENGRAVED CIRCLE (32CM ACROSS) WITH VERTICAL BARRING, LOCATED ABOUT 4M ABOVE THE PRESENT FLOOR.

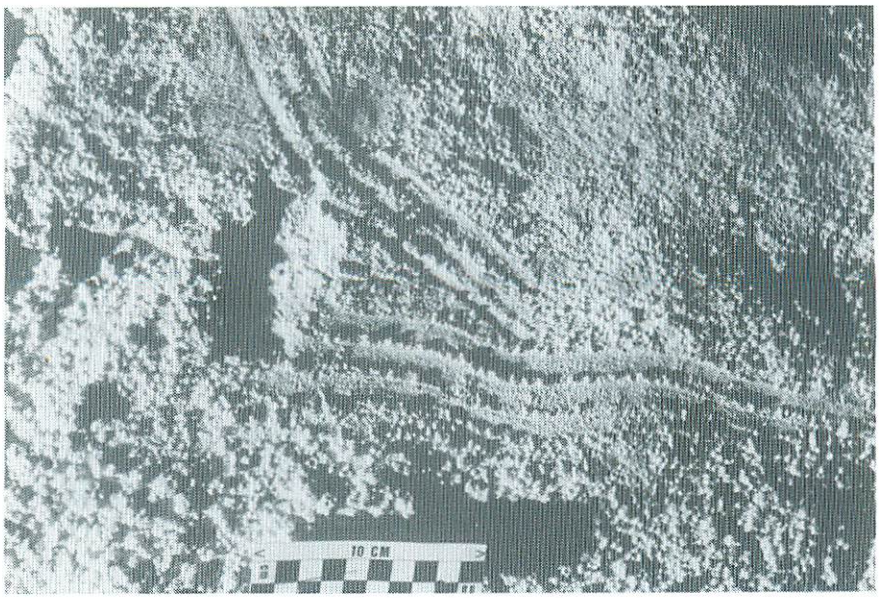

PLATE 4 — KARLIE-NGOINPOOL CAVE. CLOSE-UP OF FINGER LINE SETS. THE FORMERLY SOFT MEDIUM IS COMPLETELY HARDENED WHICH HAS MADE THE PRESERVATION OF THESE MARKINGS POSSIBLE.

PLATE 5 — KARLIE-NGOINPOOL CAVE. DEEPLY CARVED, TYPICAL KARAKE STYLE MAZE OF PETROGLYPHS IN THE UPPER PART OF THE CAVE (JUST UNDER 1.5M WIDE).

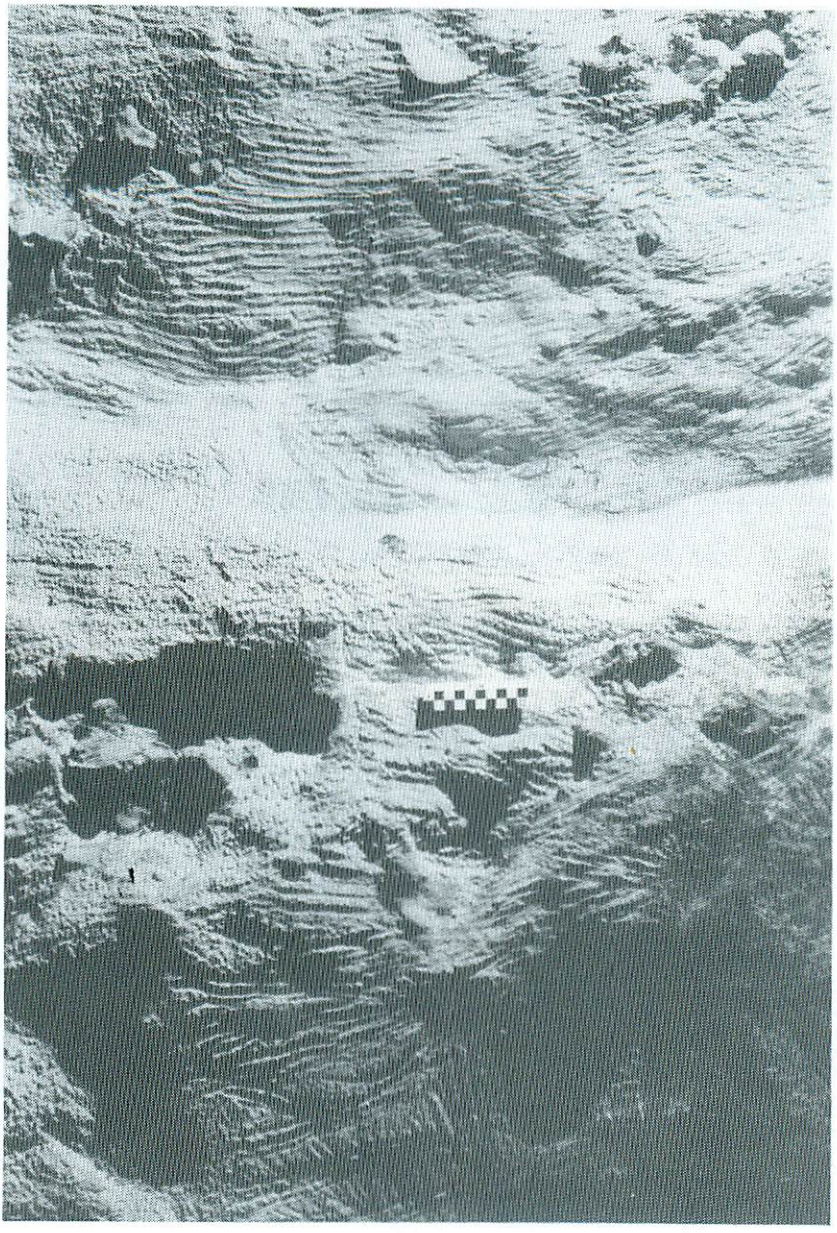

PLATE 6 — KARLIE-NGOINPOOL CAVE. VERTICAL WALL WITH UNUSUALLY WELL PRESERVED FINGER FLUTINGS WHICH ARE MOSTLY HORIZONTAL. SOME OF THE SEVERAL CHERT NODULES IN THIS PHOTOGRAPH HAVE BEEN IMPACT FRACTURED.

infinitely more useful in reviewing the authenticity of our world view – our way of comprehending reality.

In summary, only the more trivial aspects of rock art have so far received attention. This regrettable imbalance is one of the factors responsible for retarding advanced rock art research for so long, but the problem is at last being addressed in Australia.

We have seen in this paper that the prehistoric use of deep limestone caves remained unrecognized in Australia until fairly recently. Established scientific attitudes contributed to the reluctance in accepting the first claim of such cave use. But since 1980 we have made amends by assembling a huge body of evidence showing that Pleistocene cave use in Australia was as widespread as it has long been accepted to have been in Europe. We have found mining traces in seven caves, as well as in one French cave. This represents the oldest evidence of underground mining in the world. The traces occur together with the most archaic rock art known, digital flutings, which has been found in numerous caves along the southern coast of the Australian continent, sometimes together with more recent, but nevertheless still archaic art styles. The chronological sequence found at these sites appears to document the emergence of human cognitive perception and thus human intellect, in a way no other evidence has ever done. The traces of Australian cave use are therefore an archaeological phenomenon of truly outstanding significance.

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