KEYWORDS: **Cave markings - Archaic art - Western Europe - Southern Australia**

PARIETAL FINGER MARKINGS IN EUROPE AND AUSTRALIA

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Abstract. In contrast to the Pleistocene finger lines found in European caves, which have long been known, those of Australia are a very recent discovery. The similarities and differences between the two geographically distinct traditions are discussed here. In both continents the finger markings are found on formerly soft deposits in caves and they chronologically precede other known forms of rock art. In this paper the characteristics of the more than thirty known sites are compared, to form a preliminary basis for an interpretative discussion. The surviving evidence of the Australian tradition of parietal finger lines is more extensive than that of Europe and the markings have experienced less superimposition by later art forms. The prospects for an elucidation of the motives for this archaic form of expression appear better in Australia. In particular, the Mount Gambier district in South Australia has recently become the focus of studies that seek to clarify the origin of the modern human intellect, by investigating the most archaic tradition of rock art.

Introductory Comments

Ever since commencing their systematic investigations early this century, students of Europe's parietal art have encountered a variety of noniconic markings either in association with figurative designs, or by themselves. They have in general, as Marshack (1977: 286) observes, 'not known what to do with this class of marking or image'. Much of the work of early researchers, and most particularly the more popular publications on rock art, has concentrated on motifs that seem the 'most evolved', in the sense that the subject is depicted in the most naturalistic, or aesthetically pleasing manner. Often the emphasis is on those motifs that most readily permit inferences concerning economic, ecological, cultural or spiritual aspects of the Upper Palaeolithic period. It is not uncommon to see the 'artistic merits' of the paintings, petroglyphs or sculptures over-emphasised, ostensibly to demonstrate the sophistication of Ice Age art and the evolved aesthetic perception of their makers.

Ignoring such considerations, and unencumbered by the scholarly mood dominating art history during earlier decades, Marshack started in 1964 to examine objectively nonfigurative representations by what he terms 'intensive internal analysis' (Marshack 1972, 1976, 1977, 1985). In contrast to the concensus opinion which regarded them essentially as subsidiary, he proposed that they may represent the most complex element in the iconography with which they are associated. He combines a number of different types of markings—as diverse as long meandering finger fluting of *Montmilch* (for a definition, see Schmid 1958: 19), rayed figures, and small incised pebbles or plaques—under the summary heading 'meander tradition' (Marshack 1977). He also considers in this context objects as discrepant as Bordes' incised bone from the Acheulian of Pech de l'Azé (in the order of 300 000 years old) and limestone slabs from the post-Würm at Romanelli, an almost unbelievable duration for the 'tradition' (Marshack [1977: 292] admits that his oldest exhibit is too isolated to be more than 'suggestive').

Whilst Marshack's commendable approach marks no doubt a completely new phase in the objective study of rock art (Clegg 1985: 106), there are two minor points I wish to raise. Firstly, a matter of terminology. Genuine meanders (i.e., markings containing the elements of volution and antivolution) do not occur in the Franco-Cantabrian Upper Palaeolithic, as far as I am aware. The carved Middle Magdalenian points from Isturitz (Saint-Périer and Saint-Périer 1952) do include some meander-like elements, but these appear merely to be variations of spiral motifs. The earliest true meanders, therefore, are those on ivory bracelets and other artefacts from Mezin (U.S.S.R.), an East Gravettian context. The term 'meanders' is associated by many Old World archaeologists with certain ceramic periods, whereas some of the motifs Marshack discusses

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with his meander tradition are clearly not meandrous; rather, they are linear and straight, they zig-zag, or form garlanded repeated patterns ('festooned meanders'). I appreciate fully that he uses the term as meaning 'circuitous, random windings' rather than in its strict sense, but in view of the above considerations it may perhaps be more expedient if we substitute some other, less ambiguous term.

My second reservation concerns Marshack's amalgamating various types of markings into a single tradition. It seems that he views the European 'meander tradition' as coherent cultural luggage of outstanding longevity, finding expression in a variety of externalisations. If this postulated connection merely referred to certain common characteristics (e.g., being reifications of subconsciously formed cortical patterns), Marshack's concept would be plausible, but the tradition would then include similarly conceived images found in other continents and periods. Yet Marshack (1979: 305) himself concedes that 'there can be no direct or dispersed relation' between the European and the Australian conventions of parietal finger markings. Whilst the validity of the concept of a single tradition cannot of course be rejected completely, it appears to be remote, and more conceivable that the various types of patterns and compositions arise from some uniformity of human consciousness, intuition or response.

Gallus's important (1977) thesis does, however, support Marshack's concept that the convention or use of noniconic externalisations must be of greater antiquity than that of Upper Palaeolithic figurative art. Gallus suggests that the ability in human populations to communicate what he terms 'engrammes' would have favoured their survival under the pressures of natural selection; it must have been essential for human beings to compensate for the gradual diminishment of intuitive patterns of action (brought about by the corresponding development of logico-rational thinking), by establishing some frame of reference that presumably found expression in a variety of sensually perceptible media.

While the role of language is relevant (see also Marshack 1976), we are only concerned with nonperishable material externalisations in this present context. Most of the scarce 'evidence' available on language origins would suggest, however, that these developments occurred much earlier than the Late Pleistocene. Therefore, one could seek among Mousterian and even older relics, evidence of markings that could be *psychograms* (Anati 1981; Bednarik 1984a), or *self-sufficient marks* (Davis 1986), although such a quest would have to proceed in the most judicious manner; one would have to guard against sliding into purely conjectural premises, based themselves on *a priori* reasoning. It must also be borne in mind throughout that cave markings can be caused by many processes other than through human agency, and, in particular, that portable objects deposited in cave sediments are quite prone to natural processes resulting in markings. The most obvious are the many types of marks found on bone remains. The extent of modification is usually in proportion to the age of such objects, but even osteal remains from a Magdalenian horizon may be densely scored by incisions that would appear humanly-made to some (Bednarik, in prep.). The causes are mostly geological, although teethmarks of carnivores also frequently appear.

Wall or ceiling markings exist in nearly all limestone caves, but it must be emphasised that the vast majority of them, certainly more than 99.9 percent, are natural marks. Most commonly they were produced by animals, with their claws, wings, bodies, even with their horns. Markings caused by plant action or by processes that can be conveniently summarised as 'geomorphological' also occur in caves but they are far less frequent. In view of the recent controversy concerning the identification of cave markings, especially the distinction of natural marks from the most archaic of the cave art I had to establish clear criteria for identifying animal scratch marks (Bednarik in press a). Although I recognise a great variety of them, reliable separation can be achieved by an experienced observer in nearly every instance. However, this is an expert task and should only be attempted by an observer who has studied natural rock markings in at least one hundred caves (Bednarik 1986a).

In investigating the earliest human markings it would be an obvious advantage to focus, at least initially, on those that were demonstrably fashioned by human beings. It is on this basis, and because I am well aware how easily the authenticity of the genuine noniconic rock art can be discredited by any approach short of the most critical and objective that I have singled out finger flutings for detailed scrutiny of their potential to provide 'archaeopsychological' clues. The artificial nature of finger flutings is recognised almost universally—the exception being reports by authors unfamiliar with the subject matter. My study involves first-hand research at all known sites of prehistoric *Montmilch* finger markings in the world; although this has not yet been completed (new sites have been discovered by my project every year since 1979, and my recent findings demand my reinvestigation of several European and Australian sites I had already studied earlier) it is amply evident already that there is much to be gained from such a comprehensive approach. It has become clear that the presently-known sites may be only a portion of the total that have actually survived to the present, and these again are in all probability only a diminutive fraction of those that had once existed. The small surviving sample has experienced a variety of modifying processes, of either additive or deductive consequences, necessitating a broadly-based comparative study. Despite their differences, all these widely dispersed (geographically and, perhaps, temporally) sites are connected by several traits: the markings are executed in the same medium, by the same means, in similar locations, they form similar configurations, are mostly noniconic, and they are of great antiquity. Whilst they probably do not represent a single

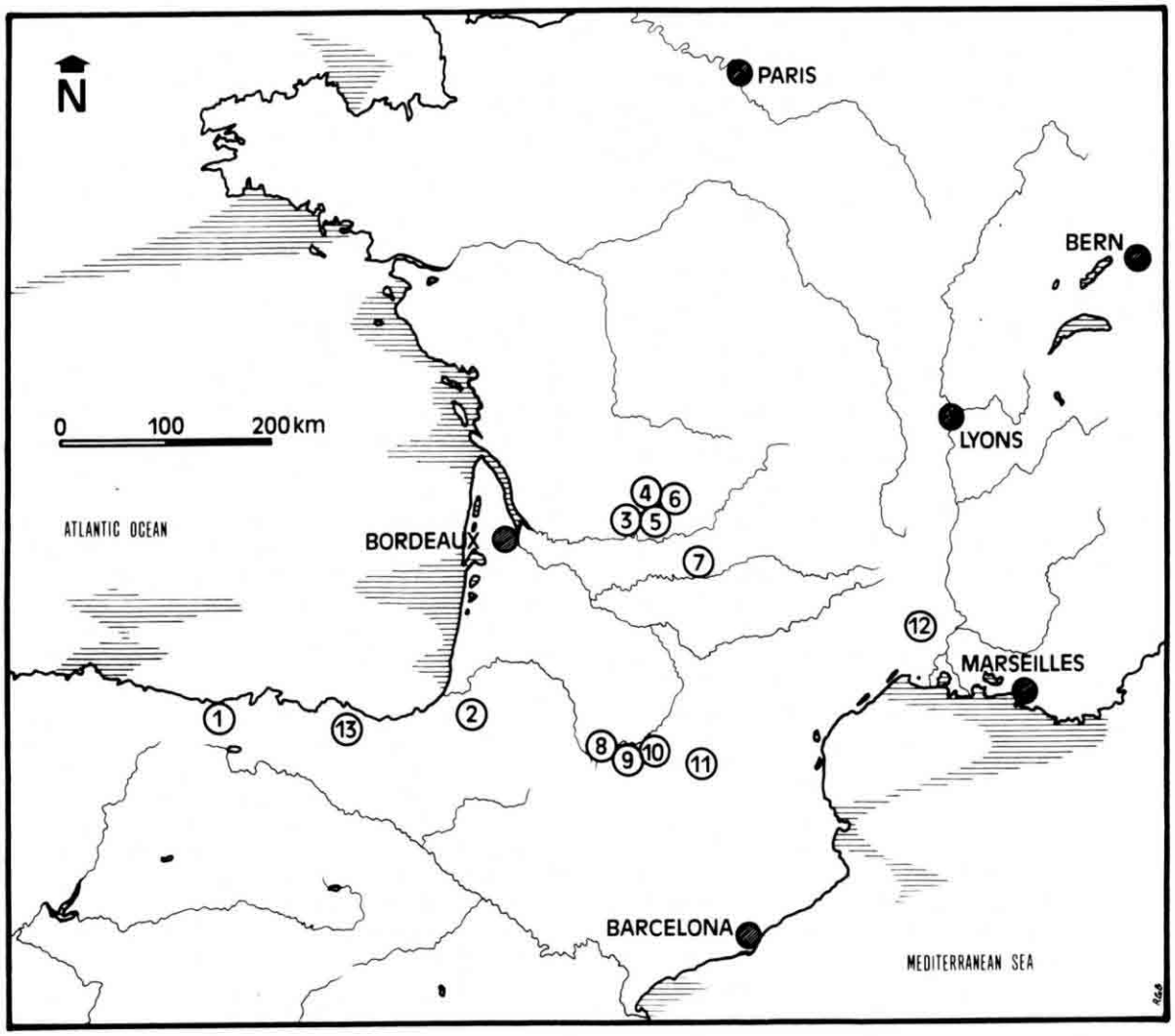

Figure 1. *Sites of western Europe mentioned in text:*

1 - Altamira
2 - Isturitz
3 - Bara Bahau
4 - Rouffignac
5 - Croze à Gontran
6 - Pech de l'Azé
7 - Pech Merle
8 - Gargas
9 - Montespan
10 - Les Trois Frères
11 - Niaux
12 - Baume Latrone
13 - Santamamiñe

'tradition', they do suggest similar patterns of activity, be they conventionalised or spontaneous. It is therefore irrelevant at this stage to ask whether they are related to each other, or to anything else: they can be investigated and analysed by identical methods initially, and with the results of such a preliminary study it should be possible to formulate the objectives of more specific enquiries.

Such a preliminary approach may seem overcautious but it is necessary in view of the complications that have arisen in respect to several Australian sites of parietal markings, and not necessarily of finger flutings. When markings were first discovered in Koonalda Cave (A. Hunt, letter to A. Gallus, 28 January 1958) it was soon suggested that they resulted from the sharpening of bone tools (Pretty 1960), or from solution processes. After Gallus (1968) had drawn attention to the European parallels, finger fluting at another Australian site was described as having probably been executed with a hand-held animal claw (Hallam 1971). Soon more sites of incised designs resembling claw marks emerged, and with them farfetched interpretations of this apparent abundance of anthropic signs. For example, one writer suggested that ritual traditions involving the joint potencies of snake and fire existed in the south and southwest of the continent, and perhaps fire was 'linked with fertility; earth apertures with the uterus of a Fertility Mother; blood, water and snakes with male potency, at once antithetical and essential to earth-fertility' (Hallam 1975: 96). Such interpretations are highly speculative even if the artificial character of all the markings were ascertained. If one was to assume that many, if not most of the incisions so diagnosed are in fact merely animal scratches, one would have cause for serious alarm, particularly considering the tendency for overseas archaeologists to look to Australian ethnographic data for help in constructing explanations for phenomena they encounter at home.

No Australian publication on the subject

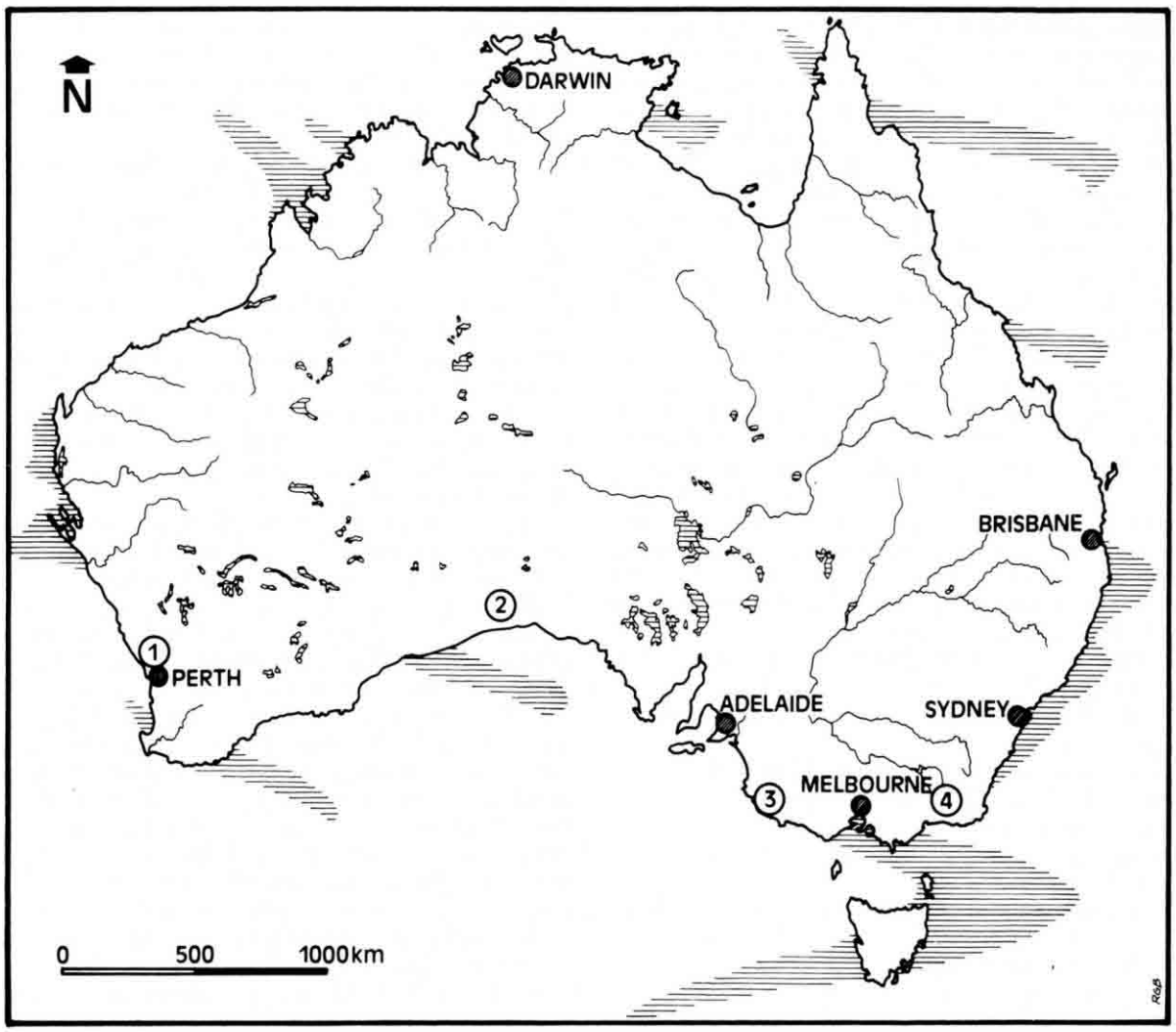

Figure 2. *Australian sites mentioned in the text:*

1 - Orchestra Shell and Ross's Caves
2 - Koonalda Cave
3 - Malangine, Koongine, Karake, Karlie-ngoinpool, Koorine, Prung-kart, Gran Gran, Snake Hill, Drop Drop, Murna, Wando, Karra, Paroong, Snowflake and Kooramo Caves
4 - New Guinea 2 Cave

of 'unexplained' parietal markings has been written by an investigator who at the time had studied more than one single site, or two similar sites in the same area, of either humanly- or animal-made marks. Examples are Walsh (1964), Gallus (1968), Maynard and Edwards (1971), Hallam (1971), Sharpe and Sharpe (1976), Gunn (in press), Sharpe (1982). Excepting Gallus, none indicated familiarity with the bulk of relevant overseas literature (which is not in English). All these enquiries were therefore carried out in isolation, each researcher describing a phenomenon they had never encountered before. To complicate matters, none of the scholars appears to have been conversant with the nature or behaviour of parietal travertine, or with the influence a cave environment could have on the object studied. This is borne out by the fact that only Hallam recognised *Montmilch* as such, while others described it variously as ochre, clay, or limestone powder. (They are not alone in this; their French colleagues also habitually describe *Montmilch* as clay, which is quite unacceptable. Clay is a fine-grained [<0.002 mm] weathering residue that is often water sorted, and consists primarily of hydrated aluminium silicates. *Montmilch* is a pure precipitate of calcium carbonate, at least in one of its two forms. Even *argile blanche* differs from it significantly [see Schmid 1958: 20].) The medium's often secondary calcite nature was not realised by any of the writers, who could therefore not capitalise on its archeologically-significant quality of being datable, by three radiometric methods (see Bednarik in press b; it is to be noted, however, that the *Montmilch* in Koonalda Cave is of the primary form, and thus not datable).

The Sequence of the Rock Art in the Salle Bégouën, Baume Latrone

Australian writers appear to be under the specious impression that the 'macaronis', as the finger flutings are often termed in western Europe, generally merge into iconic images (Maynard

and Edwards 1971: 80), as distinct from the Australian tradition which always remains noniconic. It must therefore be stressed that a number of discrete 'styles', or perhaps stages, can be identified at several French localities. At no site can this be better demonstrated than at Baume Latrone (near Uzes, Gard; Drouot 1953, 1968, 1976; Bégouën 1941), which I regard as one of the three most important sites of finger markings in Europe (the two other being Bara Bahau [Glory 1955], and the little-known and inaccessible small cave Croze à Gontran [Capitan, Breuil and Peyrony 1914]), despite the fact that significantly larger areas decorated with finger lines can be found elsewhere. The compact distribution of the rock art at Baume Latrone, restricted as it is to one single hall of this large cave system, would facilitate the comparison of the several discernible 'styles', but, oddly, there are few instances of superimpositions. However, there are other aspects not explored fully in earlier publications which would assist in the interpretation of stratigraphic relationships.

Drouot (1953, 1968, 1976) distinguishes the following 'styles':

A) Positive hand prints, clay being the pigment.
B) Finger petroglyphs:
   1) *raclures digitales* (my 'digital fluting');
   2) digital meandrous sets ('macaronis');
   3) zoomorphic outlines.
C) Engravings, suggested use of a burin.
D) Paintings:
   1) digital animal outlines, mostly of mammoths;
   2) linear red paintings.
E) Small black signs.

In his later reviews Drouot omits the last division. He considers (1976: 158) that the deep engravings, *'d'un autre style que la fresque principale'* (i.e., the paintings), appear to be slightly younger than the digital paintings. I have not observed evidence for this but I can readily agree that the (presumed) rhinoceros painting postdates the engraving of the mammoth (*op. cit.*, Fig. 84), as *'la peinture . . .remplit les traits de la gravure qu'elle recouvre'*. He notes that the engraving of the duck-billed mammal (which he first identified as a Saiga antelope [1953: 26], and in his later publications as an ibex [1968: 147, 1976: 158]; A. Leroi-Gourhan [1971: 330] describes the figure as a horse) is clearly superimposed over the finger fluting, but he does not stress sufficiently the significant difference between their states of preservation. Although morphological changes to marked *Montmilch* have not occurred, these surfaces have experienced pronounced changes, both biospheric (wing markings by bats) and atmospheric, resulting in much corrosion. But the corrosion experienced by the described animal engraving, which is situated amidst finger fluting, is noticeably less; I estimate it to be only about twenty-five percent of that of the finger lines. This may not be a reliable indication of relative antiquity, but it certainly suggests the lapse of a considerable period of time between the execution of the two forms of marking. The engraving's style hints at an early Upper Palaeolithic age; a twisted perspective, atectonic context, and the *'fil de fer'* ('iron wire') style, suggest neither a 'schematic' nor a 'naturalistically' evolved tradition. Drouot proposes a Lower Solutrean provenience for the engraving.

The spectacular digital outline-paintings (Drouot 1953, Figs 17-27) were executed, with clay as the pigment, on a comparatively hard surface of light-coloured former *Montmilch*. That this was fully desiccated and hardened at that time is clearly evident: some of the contours were first sketched in by shallow incisions that indicate considerable hardness of the surface. Adjacent similarly hardened areas show traces of finger fluting, indicative of a quite soft, clayey consistency. It can therefore be assumed that the 'macaronis' are considerably older than the digital animal outline paintings.

In my view the most conspicuous aspect of the Salle Bégouën is the spatial distribution of the two rock art generations just mentioned.

The paintings are restricted to a portion of the ceiling (see Fig. 3) that is now well beyond human reach, over three metres above the present floor. If they were executed at a time when the floor topography was similar to today's then the artists would have needed an artificial platform; no reasonable quantity of boulders is available as the floor consists of fluvial sands throughout. Besides, the labour required would have been quite formidable, and the use of imported equipment is hardly feasible because of the very difficult access (the site is located over 200 metres from daylight and is reached by negotiating a sheer descent of eight metres, 130 metres from the entrance). The paintings were executed by sweeping movements of hands, and contain marks of some metres in length; thus a working platform would need to be of considerable dimensions. It also excludes the possibility that some sort of human pyramid was employed. Clearly, the most plausible explanation is that the floor in that area had been higher at the time the images were painted. There is even positive evidence to support this view. In the room's westernmost part are remains of a flowstone floor deposit jutting from the wall, about one metre from the present floor. The sand on which this deposit had once rested has been removed, presumably by fluvial action. The flowstone relates to a period of intense moisture supply and—more importantly—denser vegetation on the overlying karst surface; that is, it relates to the wet part of a warm climatic oscillation.

Some of the *Montmilch* flutings are also now beyond human reach, and may similarly relate to an ancient floor. But since they are of greater antiquity than the paintings, it is not possible to determine reliably whether there were one or two modifications of the floor during the period with which we are concerned. The clear demarcation of the two styles suggests that in fact two cycles of sediment degradation occurred (Fig. 3 illustrates how they may have affected accessibility to the ceiling). Interestingly, the floor level at the easternmost wall does not appear to have changed much at all during this

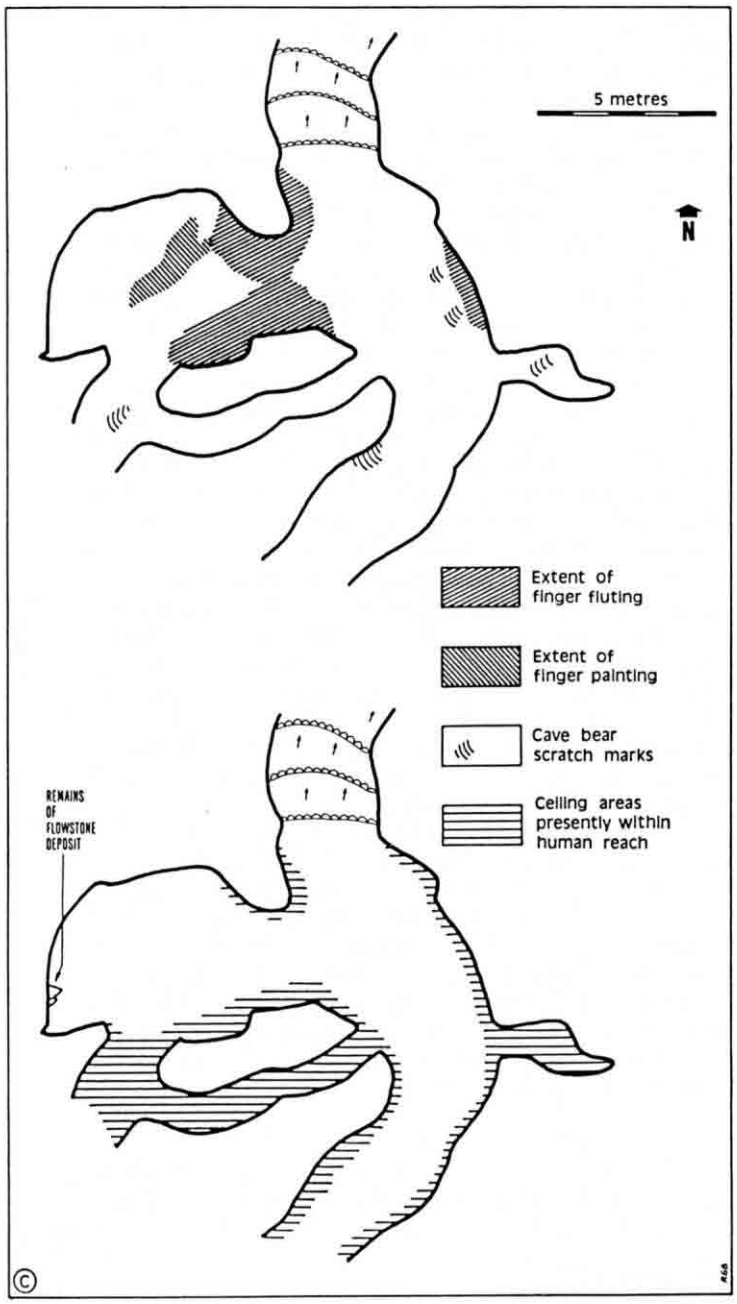

Figure 3.
Plan of the Salle Bégouën, Baume Latrone, near Uzès, southern France.
The spatial distribution of the two major art styles on the ceiling of the Salle (upper figure) is compared with the present accessibility of the ceiling in that area (lower figure).

(It is to be noted that my sketch of the cave room configuration is at odds with all other published plans of the cave, i.e. those by Glory and Mazauric, by Choppy and Le Bret, and by Leroi-Gourhan—all of which differ so much from each other that they appear to represent different caves.)

time, as indicated by rock art and cave bear claw marks, both extending to a height of about two metres.

Thus the rock art sequence at Baume Latrone can be related both to variations in floor levels and to secondary carbonate formations. Most important for dating purposes is the fact that *Montmilch* deposit itself is a precipitate of calcite, because under favourable conditions limestone speleothems can be dated by radiometric methods. The *Montmilch* bearing the finger fluting was formed during a climatic period that was at least as mild as the present, and there was a lot of flowstone deposition throughout the cave, some of it probably during the same Interstadial or Interglacial. Elsewhere in the cave massive speleothem formations are partly buried by substantial deposits of a sediment that my samples reveal as a wind-sorted aggregate with a high micaceous content, and a pronounced steepening of the cumulative grain size distribution curve in the 0.1 to 0.225 millimetres fraction, that is, 'upper coarse silt' grade. It appears to have been imported by vadose waters from the plains above during a very wet period.

Stylistic Considerations at European Sites

Having singled out one of the most important of the finger line sites for a brief examination I shall now compare the European sites of this phenomenon.

Two 'styles' of *Montmilch* finger fluting can be distinguished at some of the European sites, whilst at others only one of them occurs. The older consists of complete finger sets (i.e., usually of four digits) running a predominantly rectilinear course. Curvilinear elements can possibly be attributed to the nature of the particular motion producing the marking, and hence may have no interpretational significance. The sets of these impressions are short—as a rule less than 0.5 metres long—and are in general of logically inconsistent arrangements. 'Claw-like' configurations (commencing with widely spaced grooves that taper together until the fingers are closed, and then continue in that form for some distance; also called 'splayed sets') are commonly found in this style, which conveys the collective impression of energy or excitement, certainly of spontaneity. Apparent patterns occasionally formed by the sets are probably stochastic in nature and must be expected to occur in any large sample of atectonic linear markings. The technique employed is not one of 'engraving', it is not even a 'subtractive process' (Maynard 1977: 391); it is a remodelling of a soft, pliable surface resulting in sub-parallel grooves of rounded section, that is, *sillons digitaux paralleles.* I shall henceforth call this style *digital fluting* (Bednarik 1984b), because this term describes concisely what the markings comprise.

At a few French sites, most notably at Bara Bahau, only this type of fluting is present. Where it occurs with 'conventional macaronis', it always precedes them, and is easily overlooked because its traces are extensively obliterated by the later generation. The two can be clearly distingui-

shed at Baume Latrone and Rouffignac. The latter cave boasts probably the largest occurrence of finger markings known in the world, and, whilst they are mostly of the macaroni style, some digital fluting also occurs. Most of the macaronis at that site appear to be associated with representations of proboscideans (Barrière 1983).

Macaronis are the most common form of *Montmilch* finger lines in Europe. They are of great variability. Serpentine, curvilinear, and conjunctive elements are a characteristic, as is the frequent use of less than four fingers. The sets tend to be longer than in digital fluting and may reach several metres; the longest I have measured extends over 3.4 metres and is drawn with two fingers in one single sweep, horizontally from the right to the left. At some sites iconic representations are incorporated in the arrangements of macaronis, or are obviously intentionally associated with them, for instance at Altamira, Gargas and Pech Merle. Marshack's (1977: 301) premise that these figurative images have not 'evolved' from the macaronis, as Breuil had earlier assumed, is probably best demonstrated at the last-mentioned site. In fact the only reasonably convincing example one could cite in support of the 'evolution hypothesis' is the 'bison' head at Gargas (Leroi-Gourhan 1971, Fig. 304), but even this appears to demand a clear concept of 'picture' in the mind of its maker.

In addition to the two styles of finger markings I have described—digital fluting and macaronis—there is a third type of Palaeolithic finger marking in Europe, occurring, as far as I am aware, only at two localities. It comprises the finger paintings produced by the application of a pigment onto a hard surface with fingers of one hand. The yellow and red ochre examples at Pileta, composed of both iconic and noniconic motifs, have already been evaluated by Marshack (1977). The former suggest affinities with externalisations commonly attributed to the Aurignacian, and the latter an evolved level of conceptualisation compared with typical macaronis. At Baume Latrone, red clay was used in a similar fashion to create Aurignacian-style animal outlines that are clearly much more recent than the adjacent macaronis.

Whilst the macaronis meander about freely and seemingly aimlessly at some sites, the markings are quite straight and tectonically oriented at others. In the Ossuaire (Pech Merle; Lemozi 1929), particularly in the vicinity of the finger-shaped megaloceros image, a large *Montmilch* panel is covered with a barred pattern of parallel vertical finger lines that are sometimes interpreted as palisades. They appear to form a consistent design suggestive of a preconceived strategy aiming at a particular result: perhaps no more than an evenly decorated cave wall, or perhaps something more akin to the more popular interpretations of rock art. Similarly, the meandering (pronouncedly serpentine) or conjunctive, branching macaronis elsewhere appear to involve a cognitive system differing greatly from that suggested by the digital fluting: patterns of conceptualisation appear comparatively evolved and the externalisations so constructed seem to be more than 'enduring neuronal pathways' ('engrammes', Gallus 1977) made perceptible. They appear to represent a tradition of quite conventionalised concepts, though a conscious semantic content is not necessarily indicated. To speak of an evolved tradition seems justified (Marshack 1977).

In contrast, the digital fluting consists of pure psychograms (see Anati 1981). By virtue of being a processed (i.e., visually perceptible) form of a neural structure, such a marking may have been evocative because a similar cerebral structure was presumably also present in the maker's contemporaries, possessing similarly-evolved nervous systems. Thus it may have communicated a nonconscious message, or perhaps a mental stimulus.

The Australian Predicament

This raises questions of far-reaching consequences: in what manner did psychograms relate to early forms of communication? Taking into

Figure 4.
Finger paintings on ceiling in Baume Latrone, France. One of several animal outlines which appear to depict mammoths. These finger paintings are significantly more recent than the finger flutings on the same ceiling.
(The photograph was taken prior to the extensive and very successful restoration work by Jacques Brunet's team.)

Figure 5. *Naturalistic mammoth engraving on vertical wall, superimposed over finger flutings. Several chert nodules are clearly visible, and cave bear scratch marks are visible in the lower part of the photograph. Rouffignac, Dordogne, France.*

account the complexity of evolved linguistic expression, is it possible or plausible, that nonverbal forms of communication were more prominent during the Lower and Middle Palaeolithic periods—particularly when one considers that vocalisation of a concept could only be achieved very much later than cognitive or innate comprehension? (Here, however, Marshack seems to propound two contradicting notions: after observing [1976: 281] that 'language production always marks or describes less than is known, for both speaker and hearer', he suggests [1977: 300] that 'the ability to initiate an image system. . .requires naming and language'. It seems possible that cognitive perception and the use of an image system require no advanced form of verbal communication, and that the latter may be a considerably more recent development.)

Perhaps psychograms such as digital fluting were only local phenomena. But if the hominid nervous system developed in a similar fashion globally, then externalisations related to analoguous behavioural patterns should be found in widely separated regions, representing a roughly similar phylogenetic stage. Could an absence of further occurrences not in fact suggest divergence in hominid neocortical development?

This thought seems worth pursuing further. We are considering evidence of human behaviour which is believed to be related to the earliest appearance of rock art—perhaps the earliest form of consciously modulated markings. The acquisition of artistic concepts is the principal achievement distinguishing Upper Palaeolithic peoples from those of the Middle Palaeolithic, the Neanderthals. If the noniconic finger line tradition was restricted to a comparatively small area of western Europe, should we deduce that artistic perception only evolved in that one area, from which it then diffused? Or should we assume that it must have also evolved elsewhere, but by different means? Perhaps it evolved more or less uniformly among all human populations but the evidence only survived in one region? Whatever the questions, arguments and answers, this is a very weighty issue, because it is intimately related to the origin of human concepts of reality. If a second tradition of such finger markings was discovered in caves at the other side of the globe, in a similar chronological and cultural context, this would certainly pose a challenge. Such a find would clearly establish that we are not dealing with a regional phenomenon based on some culturally determined behaviour. We would then have to accept that something much more fundamental is externalised in these fossilised behavioural traces.

Two spatially discrete traditions of polydigital *Montmilch* fluting are known now, as widely separated as it is possible on the earth, namely in western Europe and southern Australia. Interestingly, these two regions are the two extreme ends of the world colonised by humanity at the time H. sapiens sapiens appeared. So far the

markings have been found at twenty-five Australian sites, in the coastal region spanning from Perth in the southwest, to Orbost, near the continent's southeastern tip. Twenty-three of these sites were discovered or identified by members of my research team. Two thirds of the world's caves with finger line decoration were found in the Mount Gambier district alone, in the few years since 1979. They include most of the important sites: Malangine Cave (Bednarik, in press c), Karake Cave (Aslin and Bednarik 1984a), Karlie-ngoinpool Cave (Aslin and Bednarik 1984b), and Prung-kart Cave (Aslin, Bednarik and Bednarik, in prep.). The number of known cave art sites within a radius of forty kilometres of the town of Mount Gambier exceeds that of the sites near Les Eyzies (France), the 'World Capital of Prehistory'. Further sites will hopefully be found in the near future because many potential sites are currently the subject of an intensive investigation which leaves no doubt; one of the most fascinating archaeological discoveries is in the making here (see also Bednarik 1984a, 1984b, 1985a, 1986b, 1986c, 1986d).

But even the sites presently known in Australia provide a corpus of rock art without equal anywhere. In the Australian caves, different art traditions are easier to distinguish than in Europe and there is more evidence linking particular traditions to geomorphological processes and events that took place within the caves. In particular, at Malangine Cave a sequence of rock art and limestone travertine layers is being analysed, and there are similar prospects at Prung-kart Cave. At Karlie-ngoinpool, Orchestra Shell, Koonalda and Koongine Caves, the finger lines were executed prior to major tectonic changes within the caves (roof collapses and floor subsidences), and at some of the sites the rock art can be related to the floor sediments. It seems only a matter of time before reliable radiometric dating of the finger line, and later noniconic art, tradition is achieved and it is therefore not overoptimistic to hope that, within some years, we will be better informed about the earliest rock art of Australia than that of Europe.

This may sound exciting but what does it actually mean, what heuristic significance does it entail?

For one thing, anthropocentric world views (or conscious perception, or art) appear to have developed at more than one focus, and in different directions. While in my opinion a most provocative and challenging concept, this notion leaves us with a predicament. It is difficult to see the Australian tradition as imported because that would in all probability involve an antiquity of art greater than that presently assumed for western Europe and it would be more plausible and in accord with our present knowledge to attribute the Australian finger line tradition to an autochthonous development. This would imply an independent but identical evolution of subjective perception in populations apparently isolated from each other.

Our predicament now is that we will somehow have to come to terms with a proposition of this kind, and that we are faced with the necessity of having to explain such a phenomenon. Early this century our colleagues in western Europe readily accepted the idea that art first evolved in that region; they had ample evidence for the great antiquity of rock art and Breuil's evolutionary model found ready acceptance. It is the Australian rock art researcher who now has to confront the issues I am outlining, who has to explain the phenomenon of the emerging human consciousness as it is externalised in the archaic rock markings of Australia.

This is indeed a dilemma because Australian archaeologists, who are on the whole of a positivist or empiricist outlook, cannot be expected to be much help in matters concerning the evolution of world views and human intellect. I suspect that they would find the thought that human culture was shaped more by intrinsic values, and less by ecological responses, quite alien and uncomfortable. Matters of archaeopsychology will therefore have to be pursued outside the parameters of conventional archaeology as it developed in this country. Thus the 'Australian predicament' is the need to reconcile the cited Australian evidence with that known from elsewhere, to find a consistent, logical and convincing explanation for the emergence of the modern human intellect in psychological terms, and to have to do this in the context of an archaeological tradition which views such endeavours with some misgivings.

There may of course not be sufficient interest in the origin of the human intellect among empiricists. We in Australia have yet to reach the stage where an eminent academic can describe the empiricist paradigm as a 'degenerating research program', and doubt that it will play any further significant part in rock art studies (Lewis-Williams 1983: 11). Perhaps positivists have reservations about concepts that question the centrality of the human intellect or experience, in an orderly arranged cosmos. One sometimes wonders whether they would prefer not to know why we as a species experience such difficulties in comprehending or perceiving objective reality—assuming that there is such a thing.

Whatever the reasons for wanting to investigate the origin of our intellect, the questions I have just posed are fundamental to this subject matter. It seems difficult to escape the conclusion that the most promising line of enquiry would be to concentrate on the earliest artistic endeavours of humanity, the earliest markings that seem to indicate a state of consciousness, and to see if they can provide us with any useful hints. Since any such theorising would involve a good measure of conjecture it is important to first form a reliable basis from which we can explore. I propose to do this in the remainder of this essay, by discussing a number of collective characteristics of the finger fluting sites. I shall single out the questions of distribution and dating, and then proceed to preliminary considerations of interpretation, developing from them an objective approach.

The Question of Distribution

I have examined *Montmilch* deposits of varying sizes in numerous caves (almost sixty in the European Alps alone) and I almost never observed digital markings other than those generally assumed to be of Palaeolithic origin—except modern additions adjacent to them or defacing them, which I regard as human responses to the prehistoric originals. The entrances of some of these undecorated caves had sheltered peoples not only of the Old Stone Age, but also of the Neolithic, the Bronze and Iron Ages, and of the Roman as well as later historical periods. A few of the caves were visited and explored in various recent centuries, and all are frequented by modern and quite inquisitive speleologists. Many of the visitors that have thus ventured into these subterranean spaces have observed the soft *Montmilch* formations (which were in fact systematically mined in some caves during the Middle Ages), and I have found finger impressions occasionally where the depth or softness of the precipitate had been probed. However, I have not seen any evidence for Maynard and Edward's (1971: 79) suggestion that the finger fluting may be the result of 'an inbuilt tendency in human beings to make marks on blank surfaces'. Many members of Wright's 1967 expedition into Koonalda Cave 'admitted to similar impulses when confronted with the smooth, freshly broken, soft surfaces' but in my view the stimulus to this was provided by the existing markings: Wright's colleagues experienced an impulse to imitate, a human reaction to existing artefacts; a graphic, forceful and somewhat ironic demonstration of their own humanness. In fact an investigation of the psychological forces involved in such responses would be extremely valuable to rock art research.

There are numerous instances of dense concentrations of rock art throughout the world, where successive generations of artists have used the same locality, often the same rock face, over periods of millennia, ignoring similarly suited rock surfaces nearby. As each component of such a sequence reflects the iconographic contents of the culture represented, so do the 'vandalistic' activities of present-day visitors that I have observed at, or near, the large rock art galleries of many countries, the dates, initials, stick people and symbols. They are prompted by the older motifs, not by the blankness of a surface. Similarly, I believe that later additions to Palaeolithic *Montmilch* fluting were nearly always a response to existing psychograms, which themselves were an original response typically of the Palaeolithic, or rather the surviving, visually perceptible part of such a response. Whatever was the motive, the neural circuitry responsible for it seems to be lost in modern people.

Since the Australian sites are thousands of kilometres apart, a mechanism must have existed by which this pronounced tradition was diffused and maintained. Actual *Montmilch* formations are quite rare in Australia (and are far from common in most regions of the world), and the handful of widely-spaced occurrences appear to be patently inadequate to provide the required medium for transmitting this tradition. It may be suggested that many more caves would have been exposed in the coastal region during periods of lower sea level, but this explanation is invalidated geomorphologically since *Montmilch* dates from a warm climatic oscillation, that is, from a transgression phase. Therefore *Montmilch* would probably not have been present in caves now inundated.

The occurrence of two geographically separated regions of the parietal finger lines further underlines the implausibility that these traditions were based on speleothem deposits alone. If it is assumed that they were similarly executed in mediums such as soil, sand, clay, mud, snow, perishable matter and the like (or simply found expression as gestures), their distribution and persistence can be explained quite satisfactorily. At the same time it can be seen that—of all the pliable substances available to Pleistocene people—only *Montmilch* had the potential, under favourable conditions, to survive for tens of millennia. Surfaces of cave clay that have endured since Upper Palaeolithic times are known, but they are exceedingly rare and always extensively corroded. Only a few human footprints are known from them, one in Pech Merle (Nougier and Robert 1954), several series in Niaux (Cartailhac and Breuil 1908), a number at the 'Scene de chasse' and in other parts of the Montespan Cave (Trombe and Dubuc 1946) and a series in the cave of Santamamiñe (Mazonowicz 1974: 49). *Montmilch*, however, may survive if its parietal environment maintains an equilibrium of air humidity, rock hydrology, and other factors, and suffers only moderate superficial alteration. It may even become desiccated, rendering it as resistant as calcareous flowstone.

The material remains that archaeologists study are that part of the detritus of human activities which has survived the variety of selective processes seeking to reduce it to chemical and physical equilibrium with its present environment—after already having aspired to a number of previous environmental averages in the past. From the archaeologist's point of view, the modificatory responses result in eventual destruction of practically all evidence. While the rate of the destruction varies enormously, it is determined by two factors, the nature of the material and of the environment (Bednarik 1980). It follows that archaeology is not—as it sometimes professes to be—a systematic quest to illuminate human life and cultures in past ages; at best it can succeed in being a tool to describe *observations of archaeological relevance*. Often it tries to overcome its explicit limitations by daring interpretations of rather meagre evidence, not always with unequivocal success. The example of the Australian 'meander tradition', which in reality consists largely of natural markings, has been cited. Others that come to mind are the liberal sprinklings of ochre reported from so many graves (often attributable to pH variations around decomposing bodies) and in fact many of the other religious practices deduced from archaeological evidence. A mistake commonly perpetrated by prehistorians is to generalise from isolated observations, to construe

SOME DIFFERENT PRESERVATION FORMS OF PARIETAL FINGER LINES

Figure 6.
The markings were made on a comparatively thin deposit of Montmilch, *and subsequently covered by a slight coating of speleothem growth, which experienced moderate hardening.*

Gran Gran Cave, South Australia.

Figure 7.
These finger markings experienced extensive alteration prior to the stabilisation of the surface. The deposit is completely hardened now.

Koongine Cave, South Australia.

Figure 8.
The finger lines were produced on fairly soft precipitate and experienced no subsequent growth, but extensive surface corrosion, probably by atmospheric factors. The deposit is dry now but it remains very fragile.

Karlie-ngoinpool Cave, South Australia.

attributes and aspects related solely to environmental responses as being of archaeological, i.e., cultural significance.

Let us apply these generalisations to the present context. The sites of digital markings are sometimes taken to be sanctuaries, places of spiritual expression, because they are only found in the depths of caves. This view is arrived at by direct induction, the type of logic usually employed in archaeology. I shall demonstrate how I arrive at precisely the opposite view: that the finger line tradition was restricted neither to caves, nor to *Montmilch*, and least of all to 'sanctuaries'.

Obviously the production of the finger lines presupposes the availability of a soft medium, unless, of course, the activity they accompanied took place without the intent (or result) of leaving an externalisation. The restriction of the only surviving traces of the tradition to the *Montmilch* can be interpretated in three ways:

(1) The lines were actually intended by the makers to survive for periods of geological significance. I find this quite untenable: not only could the permanency of the markings be secured by a far more effective means, but it seems quite unlikely that the hominids concerned possessed the necessary comprehension of

the medium's long term characteristics.

(2) It is pure chance that the lines coincide with the resistant medium. This is not statistically plausible.

(3) The restriction to *Montmilch* is not an essential characteristic of the tradition itself, it being related merely to the potential longevity of the medium.

The third interpretation is of such obvious and overwhelming plausibility that it is probably the most correct.

It is rendered even more convincing by its providing a mechanism for maintaining and diffusing the tradition. The remnant sample has survived in caves, not because the markings were produced only there, but because caves provide the only environment in which such survival is possible at all. We are dealing with the traces of a once-widespread prehistoric activity that (*only just*) survived, in very few places. The restriction of the finger flutings to certain localities and media demonstrates, therefore, that it was restricted neither to caves, nor to *Montmilch*. The occurrence of barely recognisable markings in several small or shallow caves, where their survival chances were considerably smaller than in the deep caves, in fact suggests that they were once far more common in such places than in the so-called 'sanctuaries' of deep caves. The latter type of site is probably the exception rather than the rule, and the current archaeological interpretation of these phenomena has used culturally meaningless environmental responses (related to survival) to construe a cultural significance.

Similarly, the parietal art of Europe was probably not a parietal art at all; it is perhaps only the surviving remnant of the parietal aspect of Upper Palaeolithic art. Its paucity would otherwise seem inexplicable: there are only 2188 identifiable anthropomorphous and zoomorphic figures listed by Leroi-Gourhan (1971) from the caves of France, Spain and Italy, yet they required a period representing some six hundred generations to accumulate. It is difficult to accept that the number of artists active at any time was below the minimum number necessary to ensure the continuation of a tradition, or that individual artists produced less than the number of images required to obtain their skills. Thus the number of works actually fashioned can be assumed to have been quite immense—despite our inability to verify these postulates.

My argument is further strengthened by the common characteristics shared by the finger fluting sites. With one exception (Bednarik, in press b) the roofs of all these caves are conspicuously thin, often measuring less than three metres. The finger lines are in most cases restricted to a subterranean zone between two and eight metres below the surface. Also, there is a considerable climatic similarity between the regions of occurrence, southern France and southern Australia. Only few locations appear to have been really suitable for the preservation of the flutings. They have to be far enough from the surface to permit *Montmilch* formation, but at the same time close enough to the surface to permit external influences (e.g. climate) to suspend the speleothem-forming process after the markings were executed. When one reflects on how precarious the survival of the finger grooves over a geological time span was, how delicate the balance of the contributing factors had to be, one begins to regard the survival of any of these traces as almost a miracle. How many Palaeolithic behaviour patterns did not manage to leave any surviving traces?

Preliminary Considerations of Dating

In general, European scholars have ascribed noniconic finger lines to the Aurignacian and Perigordian periods. This assignment is based on their observed precedence in any superimposition sequence, and on the rather vague association of some finger markings with reputedly early rock art. For example, the engravings at Bara Bahau were superimposed over typical digital fluting; they have sometimes been described as the most ancient rock art in France (Glory 1955; Paturi 1976: 58). There appears to be no compelling reason, however, to assume that the two types of petroglyphs at that site are of a similar age. The clear-cut stratigraphical evidence at Baume Latrone implies that the earliest anthropic markings there are distinctly older than the earliest iconic images, and that the two generations may even be separated by a major climatic oscillation.

The affiliation of the Aurignacian industries with the Göttweig Interstadial (Würm I/II in central Europe, Würm II/III in France, according to the dichotomous sedimentary chronology in the two regions) is indeed well established, prompting Bayer long ago to coin the term *Aurignacien Schwankung* for it. The magnitude of the climatic oscillation was widely underestimated until recently, causing the geological misinterpretation of scores of Palaeolithic sites particularly in the Alpine regions (refer to comments by Brandtner 1956: 134; Pittioni 1957: 62). Although the Göttweig Stage does not appear to have promoted any significant speleothem formation in the Alps (unless the typological interpretation of the Repolust Cave industry and its geomorphological dating are wrong; see Mottl 1951), it certainly produced extensive growth of flowstone and cutaneous travertines in the caves of the Dordogne and in Provence (Miskovsky 1974). It would be expedient to place the finger fluting in the same period, conveniently accommodating the antiquity already mooted for this tradition. However, there is no proof for this or any reliable earlier dating, and no evidence to exclude the possibility of assigning the early *Montmilch* markings to the Eem Interglacial. Where Aurignacian motifs are superimposed over digital flutings the latter are clearly much older, and if psychograms indeed preceded the Upper Palaeolithic—as has been proposed by Marshack (1977), and implied by Gallus (1977)—a Middle Palaeolithic provenience is conceivable for the earliest finger lines. Bahn (1984) observes that there is no reason whatsoever why the 'macaronis' at Gargas 'may not have originated in the Middle Palaeolithic, which

left substantial occupation layers in the site'. I must add, however, that evidence for this magnitude of age is rather tenuous, and only circumstantial at this stage.

The twenty-five known Australian sites of this tradition show no appreciable differentiation in respect to their markings' style. The finger line configurations observed are practically indistinguishable from those common in the digital fluting of European caves. Methods of execution and type of medium both indicate no divergence (but note comments in Bednarik, in press c, on the medium in New Guinea 2 Cave), and both traditions existed during the Upper Pleistocene. If they are both phenomena of a warm climatic interval of the Würm, they could even be of similar antiquity. However, the dating of the Australian sites remains as tentative as that of their Old World counterparts. Consider, for example, the markings in Koonalda Cave. Leaving aside the incised limestone fragment (Gallus 1971, Plate IX; both its contemporaneity with the finger flutings and other petroglyphs, and its artefact nature, require verification, and the cave's wider dating controversy needs resolving), the markings at this site are dated only relatively by subsequent rockfalls which in turn perhaps preceded charcoal sample V-92 (about 20 000 years BP), if its stratigraphic context is correct. Wright (1971: 28) suggests that this sample could 'date the area's most recent use', and I have inferred that around 20 000 BP, or soon after, the passage to the art area became inundated, and that the markings may significantly predate that event (Bednarik 1986a).

Hallam (1971) cautiously avoids the subject of dating, but Orchestra Shell Cave probably provides us with more insight into this topic than Koonalda Cave (in my experience large cave systems often have such complex stratigraphies that correlation between isolated sediment sections is quite futile). Part of its floor area has experienced pronounced subsidence in the geologically recent past, possibly as a result of water table fluctuations. The cave overlooks the swampy Lake Neerabub whose phreatic low pH waters are not far below the cave's floor. 'Material appears to be percolating down into a crevice. . .partly blocked by loose boulders and soil, possibly leading down to lower levels . . .Several other features suggest relative movement between floor and roof' (Hallam 1971: 94). The subsidence would presumably have facilitated the gravitational movement of any sedimentary cave fill into the void below. The establishment of a new floor would conceivably have taken a long time. Human habitation debris is commonly found in sediments that were formed after lower cavities were blocked off by large 'chockstones' that enabled the retention of progressively decreasing grain sizes, eventually sealing off the lower cavities (Bednarik 1970: 119). This appears to have been the case with the occupation remains excavated by Hallam, thought to be up to 6500 years old. The ceiling markings appear to be of considerably greater antiquity because the floor's retreat has rendered some of them well beyond human reach. The finger markings were thus made prior to the obvious tectonic modifications, and are of an antiquity exceeding 6500 years by the time span that lapsed between their execution and the floor subsidence, plus the subsequent period required to seal off the lower cavities and initiate sediment deposition. The magnitude of this time span remains unknown, but a Pleistocene antiquity is probable for the finger lines at this site.

The state of preservation of the markings at Koonalda and Hallam's part of Orchestra Shell Cave differs significantly. Whilst the wall flutings at the first site are very well preserved, particularly as the cave seems susceptible to adjustments of humidity and inductive temperature, those described by Hallam are without exception uniformly masked by a deposit of 'pearly' travertine growth that renders the markings almost unrecognisable. The main panel of markings in Orchestra Shell Cave was only discovered in October 1984 (Bednarik, in press d), and its finger flutings are preserved in near-pristine condition.

The recent discoveries at Mount Gambier and the work they have prompted have shed much new light on the dating issue. At Koongine Cave, a large ceiling collapse appears to postdate the finger markings and the rock mass is buried under some one or two metres of sediment. It

Figure 9.
Wherever parietal finger flutings occur together with other markings—human or animal—they always precede them. In this instance, deeply incised subparallel marks, which were produced with a tool or tools, have been superimposed over horizontal finger flutings on a vertical wall.

Lower part of Karliengoinpool Cave, South Australia.

should be possible to determine the time of the rock fall with some degree of accuracy. At nearby Malangine Cave (Bednarik, in press c) and at Karlie-ngoinpool Cave (Aslin and Bednarik 1984b), at least three distinctive generations of rock art have beer identified, finger lines, deep engravings, and shallow incisions, and they are separated widely in time. At Malangine Cave, that separation is indicated by intervening speleothem deposits which are the subject of radiometric dating, while at Karlie-ngoinpool Cave the finger lines were executed before a phase of floor subsidence. A rock ledge on which finger line artists have stood has since collapsed, and there are engraved circles of the subsequent style on the freshly exposed rock surface. This subsequent 'Karake Style' has been suggested to date from the Late Pleistocene (Aslin and Bednarik 1984a). Its distinct chronological separation from the finger lines corroborates the preliminary minimum dating of the rock art in Koonalda Cave, where the finger line tradition seems to be older than 20 000 years.

In the Mount Gambier area it is tempting to relate major structural adjustments in the caves to the volcanic disturbances of the Holocene eruptions of Mount Gambier and Mount Schank (about 4830 and 1410 years before the present; Blackburn 1966). But the same explanation is not so convenient in the cases of Koonalda Cave and Orchestra Shell Cave which also have experienced major tectonic changes after they were decorated by finger flutings. Whilst volcanic activity could well have caused the ceiling collapse in Koongine Cave, it would be judicious to question the effectiveness of such upheaval in lowering a cave floor if there are no adequate voids beneath it, or if these are filled with water. Perhaps long term climatic variations are more effective in bringing about such changes. If the water table fell significantly, during a dry period of a stadial epoch (a lowering of the sea level would conceivably have drained the limestone plateau dramatically as it emerged), the structural stability of an extensive subterranean system would suffer through the evacuation of phreatic reservoirs. This explanation could not only account for the floor slump in Karlie-ngoinpool Cave, but also for the subsidence in Orchestra Shell Cave, because both systems can be presumed to be close to major phreatic systems.

Ossa's recent excavation at the southern entrance of New Guinea 2 Cave has secured radio carbon dates ranging up to 17 000 years BP (Ossa, pers. comm.) from upper levels of the deposit and it is to be hoped that earlier dates can be assigned to lower levels, concealed by large rock falls. Although there is no guarantee that the art inside the cave can be related to any of the occupation levels, older habitation evidence from this site would certainly be of interest in view of the cave's finger flutings and other markings.

The perhaps most promising site for dating clues on Australia's most archaic rock art is Prung-kart Cave, where *Montmilch* deposition continued after some of the finger markings had been produced. The art traces are thus contained in a lamina of secondary calcite—which is datable.

The type of stone tools found at some of the Mount Gambier caves is also suggestive: they are of often unusually large size and poor retouch, appearing typologically very archaic. Because the sites are usually located on fairly barren outcrops with little soil, implements can be found on the surface, near the entrances of these caves. Their degree of patination has been noted to be well in excess of that observed on presumed Pleistocene tools from the nearby coast, which belong to Witter's (1977: 56) 'Early Prehistoric' series, and which are occasionally found in the Pleistocene red sand unit of the area (Bednarik 1980: 52).

Massive deposits of high-quality silicas occur less than four kilometres from Malangine Cave, as a washed-up deposit along the coast (Witter 1977: 52). A test excavation at the cave's entrance (in the course of installing a steel grid) has produced stone implements from all sediment levels (Aslin, pers. comm.), but while the upper part of this assemblage consists of the dense, cryptocrystalline, flint-like silicas that are procurable from the coast, the lower occupation levels have produced cherts of inferior quality. The latter could be obtained from within the cave, and from surface exposures in the general area, several of which I have been able to locate. This raises an interesting possibility. The older levels in the cave may relate to a period of lower sea level, before the coastal silica nodule deposits had formed, when the shoreline was much further away and probably lacked such marine deposits. This explanation is certainly logical, because the rock markings in the cave are tentatively dated to the Pleistocene, at which time the shoreline silica ridges (there are two, one at the present high water mark, the other marking the Holocene maximum level, about 2.7 metres higher) could certainly not have existed.

Preliminary Considerations of Interpretation

As in the earliest European tradition of finger lines, the arrangements observed at the Australian sites are completely atectonic, that is, they lack an orientation (Eppel 1958). In general, sets measuring less than 0.5 metres dominate in number, but the lengths of the sets as well as their course is probably a function of accessibility and maneuverability more than of any other factor. 'Stylistic' differences, especially between Koonalda and other sites, can be explained in terms of these variables, and according to whether the fluting was executed on a wall or on a ceiling. I have also observed these differences in those European caves that have both wall and ceiling markings. Another common feature is the 'claw like' configurations that attracted Gallus's attention in Koonalda. They occur at most of the Australian sites and are one of the most instructive aspects of the finger line traditions. A truly astonishing Australian parallel to the motifs in the western European caves is the painstakingly-carved image of a human hand in Koongine Cave;

its similarity to the famous hand engraved at the upper left-hand of the frieze at Bara Bahau is amazing. In both figures the thumb is located on the image's left side and is identified by precisely the same method. The French specimen, 'unique in the world' (Glory 1955, Fig. 3), is considered by some to be no less than the most ancient figurative representation known (see Paturi 1976).

The subject of hand images ushers in the question of interpreting the *Montmilch* finger markings. The search for a universally applicable explanation of semantics or purpose, or, if neither is appropriate, for the elucidation of the activities that caused the grooves, is by no means new. Breuil's (e.g., 1952) initial interpretative concepts seemed quite plausible, and therefore remained unchallenged for a long time: macaronis were early random scribbles or incipient symbols, in which intelligible images may have appeared fortuitously and been recognised by the beholders. This view may find support in ethnographic evidence: contemporary hunter-gatherer societies often incorporate natural features in their mythologies because the features resemble particular objects, with the result that images are recognised in natural formations. The same ability is clearly evident in the Upper Palaeolithic artists of western Europe who, in many instances, utilised natural forms for animal representations. Often the images appear to have been prompted by the presence, and cognisance, of such features as particular rock formations, holes or colour patches. The many examples of this practice and several instances of finger line animal figures apparently 'emerging' from arrangements of nonfigurative macaronis, with which Breuil was most familiar, provided him with a plausible basis to accommodate the early finger markings in his evolutionary sequence.

Marshack (1977: 300) levels two arguments against this concept. He observes that 'the ability to see an image in a random cluster (or in a rock or wall formation) requires culture. It is part of a process of description, classification, comparison, and naming. It is a human, cultural activity.' One might argue that the ability to recognise an image is not exclusively human, that it can be found to a greatly varying degree in many species: a considerable range presumably exists from a small mammal's physiologically-fixed capacity to react to the appearance of an airborne likeness of a predatory bird, to the chimpanzee's aptitude for recognising pictorial material. The human ability to perceive an image, for instance a rock shaped like a horse's head (Pech Merle), does not necessarily involve naming. Human proficiency in using a mental template to decide the form of a flint implement, as the artisan rotates an unknapped nodule in his or her hands (i.e., technological competence), is possibly more closely related to the human capacity to associate morphologically an observed configuration and some object, than to naming. Thus it could be argued that the ability to recognise an image is not a function of humanness or culture, but that, among other things, humanness is a function of the degree of competence in perceiving an image. Nevertheless, as I noted above, Marshack's proposition that the animal representations among finger lines do not appear to be 'afterthoughts', can be verified at the sites where these combinations occur. They suggest an evolved concept of the image in question and cannot be construed to be accidental compositions. More importantly, however (as Marshack also points out; 1977: 316), the noniconic macaronis are themselves a sophisticated image system.

There is no fundamental contradiction between these considerations, and an important recent theory that attempts to explain the origin of figurative image making (Davis 1986). Davis's innovative hypothesis resembles Breuil's model, but it argues at a different level. It is through experiences of perceptual ambiguity that Davis explains the discovery of the iconicity of noniconic features. His introduction of psychologically consistent reasoning (Bednarik 1986d) resolves the old tautologies concerning the circumstances generating the conceptualisation of image: did the mind decide what it wanted to depict before it set about finding a way of doing so; or did it find applications for the newly-acquired ability to reduce sensory information to an image? One can anticipate a thought-provoking debate to ensue from the Davis theory.

A number of interpretations have been advanced in recent years for the macaronis; I shall now briefly discuss them and their respective merits. Some of these proposals relate the subject matter to utilitarian, others to nonutilitarian motives, and one explanation demands no motive at all.

The last-mentioned accounts for the markings by attributing them to people groping in the dark when feeling their way along cave walls, striating the soft surfaces in the process. This speculation is decidedly unconvincing. Finger flutings are more commonly found on ceilings, and they occur in caves admitting natural light such as Koongine, Malangine and Orchestra Shell Caves. Where found on walls, vertical sets invariably predominate and, as Maynard and Edwards (1971: 79) have pointed out, they were always produced with finger tips, never with palms, elbows, shoulders or knees. Their distribution relative to the cave's topography, and the actual arrangements of the lines lend no support to the theory of an accidental cause. Several other factors also speak decidedly against it.

Deliberate *Montmilch* removal would suggest utilitarian objectives. This possibility appears plausible where the markings indicate that fingers were tightly closed, performing a mostly gouging action, or where concentrations of such marks occur in small recesses that contain particularly productive deposits of the travertine. Reasons for the intentional removal of *Montmilch* have been proposed by some writers: the white precipitate, clayey to talcum-like depending on its water content, could have served as a body decoration, or as a medium conveying some spiritual essence ('mana'; Webb 1977: 376). In view of the medical use of *Montmilch* in historical times (in Europe), it could have been used as an ophthal-

mic analgesic by prehistoric peoples (Bednarik 1985a). The especially dry Australian climate is apt to cause eye diseases, which are still widespread in Aboriginal populations today.

However, most digital *Montmilch* markings do not suggest an intentional removal for the following reasons. Firstly, spaced fingers, especially as indicated by the splayed sets, are ineffective in removing *Montmilch*. Secondly, most markings are shallow, and more efficient removal could have been easily achieved by focusing on the more substantial deposits. Thirdly, the configurations of the finger tips at the commencement of individual sets frequently demonstrate that the fingers were held more or less outstretched. Finally, microscopic examination of some finger line grooves shows that the argillaceous to downy precipitate is compacted on the bottom of a groove, and was therefore compressed rather than removed.

The several nonutilitarian interpretations remain the most plausible. They range from the rather mundane to those suggesting ritualistic significance. I argued above against Maynard and Edwards' attributing the Koonalda markings simply to a human impulse to 'make marks', suggesting instead that such an impulse is more likely a human reaction to existing markings. This immediately raises the spectre of a first cause: from what were these psychograms initially derived?

One possibility is illustrated by the concurrence of cave bear claw marks and digital fluting at many of the European sites. The former are most prominent at Rouffignac, where thousands of these scratches cover the walls. The finger fluting at Bara Bahau is superimposed over a single panel of cave bear incisions; the same sequence is present on the northeast wall of the Salle Bégouën. Corroborative hints are provided by Pech Merle and Montespan, where bear claw marks and finger markings also occur at a single site, and, generally, by the frequent presence of more or less extensive cave bear markings in many caves of Europe (a comprehensive discussion of parietal bear scratches is in Bednarik in press a). To the highly specialised hunter-gatherer peoples of the Upper Palaeolithic—who would have had a close liaison with those aspects of their environment related to the hunt—any sign pertaining to a potential quarry would have had immediate significance. Even members of comparatively modern societies quite remote from such subsistence-level economies often develop rapport with the object of their hunt (Bachofen-Echt 1931: 715), and, further, the affinities of people in hunt-based ecologies often find expression in their kinship system. The bear, conversely, has played a dominant ritual and kinship role in much of Eurasia up to modern times (Hallowell 1926; Wüst 1956). A Palaeolithic hunter who ventured far into a cave system and was confronted by a wall deeply furrowed by innumerable marks, would very well have recognised them as having been made by that mighty beast, the cave bear (which has been claimed to be the centre of a cult reaching back as far as the Mousterian; see Bächler 1940). It seems unlikely that such a discovery would have produced absolutely no response in the visitor; it seems unlikely that visitors nonchalantly superimposed their own 'claw marks' over those of the bears without them being a response to the existing marks.

Australia has not had a cave bear, but there were many other species of megafauna that could conceivably have produced wall markings. Among the numerous animal claw scratches I have examined in Australian caves there are some that appear to have been caused by large, now extinct species (Bednarik in press a).

While extrapolation from ethnographic observations to the Palaeolithic period is precarious, it can nevertheless be valuable in some circumstances. For example, it seems reasonable to assume that for Palaeolithic peoples, as for hunting communities today, proficiency to read and efficiently to interpret the natural signs of the environment was an important determinant in their ability to occupy successfully a niche in that environment. It was probably an important factor in coping with selective pressures: the survival chance of an individual, or group, would have been enhanced the larger the number of cognitive units associating sign and meaning possessed. It appears likely that natural selection based on this criterion significantly preceded the evolution of advanced linguistic communication. Mere cognisance of signs (scratch marks, foot prints, animal behaviour etc.) must at some stage have been followed by the ability to reproduce or imitate them, and in due course by the capacity actually to contrive the original; here, then, are conceived signs, an evolved mode of nonverbal communication. It is with this concept that Anati (1981: 204-5) seeks to explain the origins and the emergence of art.

Marshack (1979: 305) suggested that the macaronis were connected to a water symbolism but, contrary to his view, the proportion of caves that are decorated in this manner and contain rivers or lakes does not appear to differ sufficiently from the general incidence of water in caves to warrant postulating such a relationship. Koonalda Cave and Drop Drop Cave are the only examples of sites containing both *Montmilch* fluting and a lake, and there is no obvious spatial relationship between these two features at Koonalda Cave. While Gran Gran Cave does contain some small lakes I doubt that prehistoric people managed to reach them. There are only small rock pools at Gargas, there is water in a narrow crevice in Prung-kart Cave, and water may appear seasonally or occasionally in the terminal part of Koorine Cave. New Guinea 2 Cave is the sole known example of a site where finger flutings coincide with running water.

At most of the remaining sites, however, water does not appear to have been present at the time of their prehistoric occupation. That possibility can be practically ruled out for Rouffignac, Croze à Gontran, Bara Bahau, and Malangine, Koongine, Orchestra Shell, Murna, Wando, Snake Hill, Karra, Paroong, Snowflake and Kooramo

Caves. Marshack's comments on this particular aspect appear quite subjective, and they are particularly surprising as he only cites one example—a site he has not himself investigated.

At Koonalda Cave mining of chalcedony has clearly been practised, despite the difficulties involved, and despite the availability of silicas elsewhere in the region. This led Gallus (1977: 380, 382) to suggest that the chalcedony from deep within the cave may have had special significance to the people mining it. His concept of rituals embracing both the mining activities and the digital markings seems plausible, not only in respect to Koonalda, but also for seven other cave sites. Poor quality cherts have been extracted by prehistoric people at Bara Bahau (Bednarik 1985a: 86, 1986c), and possibly at Rouffignac. Most accessible chert nodules remaining in the walls of Malangine, Koongine, Koorine, Prung-kart and Gran Gran Caves show ancient impact fractures, and the evidence of prehistoric chert mining in Karlie-ngoinpool Cave is certainly extensive, and very similar to the mining evidence in Koonalda Cave. All these caves are located in regions abounding with silicas of better quality (excepting the high quality chalcedony in Koonalda) and obtainable from surface quarries. However, there is no definite evidence suggesting that the activities of chert mining and *Montmilch* marking were indeed connected, or even carried out by the same people. One could still argue that the mining of cherts and other sedimentary silicas may have been only one aspect of the mode of cultural behaviour that also produced the finger fluting. It would be a very tenuous argument, however, since it would postulate either a cultural connection between the two distant continents, or alternatively, an almost incredible parallel yet independent evolution of cultural expression. The same argument, incidentally, applies to the suggested relationship between finger lines and water symbolism.

Leroi-Gourhan (1958) sees the French macaronis as subsidiary masculine externalisations, but his concept, based as it is on the statistical data of a sample that is itself already the outcome of selective elimination processes, brings to mind Beninger's (1959: 75) warning against 'trying to be more Palaeolithic than the Ice Age hunters'. The flaws in the system of sexual dichotomy are somewhat similar to those in earlier interpretations of European parietal art: the surviving sample could not possibly be representative (it has been subjected to significant selection processes), and we cannot postulate anything resembling cultural continuity for the various artistic traditions found in the Upper Palaeolithic, a period that lasted at least five times as long as the historical period. For example, there is no necessity to relate the digital fluting itself to any other style, or to accommodate it in any system or tradition; it probably precedes all other anthropic markings, possibly by many millennia.

Webb (in Gallus 1977) raises the concept of noncommunicating psychograms by suggesting that merely the act of touching the cave wall may have been of ritual significance, the resulting lines lacking any semantic content. Again this requires similar cultural practices in widely separated regions, and it is obviously more plausible to attribute the geographical distribution of the digital fluting phenomenon to some general

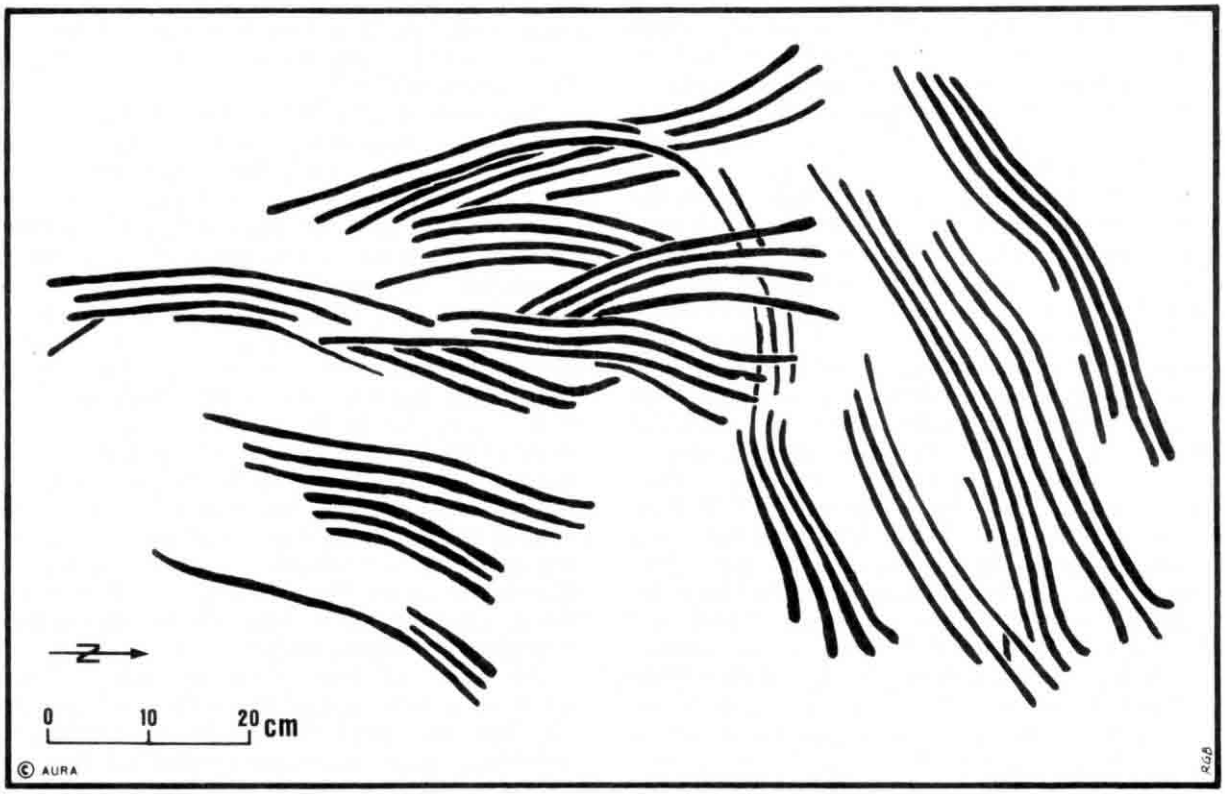

Figure 10. *Typical arrangement of finger flutings, featuring some 'splayed sets'. Ceiling of Malangine Cave, South Australia.*

evolutionary mechanism, rather than to identical cultural patterns of behaviour that were either diffused, or were a random result of unconnected cultural development. Also, if taken literally, Webb's concept suggests that the makers of the markings ignored the perceptible result of their action, or derived no satisfaction from producing certain shapes in the medium; if we could detect meaningful patterns in the seemingly random scrawls this explanation would become irrelevant. It should also be noted that, if the object was merely to touch the cave wall, markings such as those in the 'Scene de chasse' (Montespan) would have sufficed (Trombe and Dubuc 1946).

Sharpe (1982) considers the prospects of a semantic interpretation and suggests a strategy of structural analysis of the streams and clusters formed by the 'meanders' in Koonalda Cave, to isolate repetitions or patterns that could be construed as expressing myths (i.e., that they are a form of writing). Gallus (1971: 128, 131) in a more general way also suggested an ideographic content, but only his later, more developed concepts are examined here.

Towards an Objective Approach

Gallus (1977) introduced advanced psychological argument to the subject by proposing a model linking the 'meanders' to the early human ability to communicate neural structures. According to him, the evolving human cognitive ability led to a dramatic increase in enduring or 'congealed' neural pathways that partly inhibited physiologically-fixed patterns of action. To the same degree as the hominids lost the security of only having to rely on automatic stimulus-and-response circuits, their emerging logico-rational ability required the conscious formulation of their position in the environment. Natural selection favoured groups that were able to secure permanency for the accumulated cognitive knowledge by externalising what Gallus terms 'engramme complexes': genetically-fixed neural structures that are able to command some action or response. He in fact suggests (1977: 374) that 'externalisation appears as a biological necessity, a functionally necessary part of the cognitive apparatus of man. It acts as an unchanging frame of reference for consistent, conscious decision making', when orientation or action are demanded by environmental stimuli.

Discussion of Gallus's thesis has not been as fruitful as one would have hoped. This is probably due to the general leaning of Australian prehistorians towards the naive realism of neopositivism, and their lack of appreciation of the fecund cultural background of central Europe on which Gallus is able to draw. He could certainly muster some support from European writers, at least for part of his thesis. His 'evolutionary stages of mythic thinking' were in my view foreshadowed by Riegl as far back as 1893 (in Beninger 1959; see also Hauser 1953: 512). Gehlen (1956) defines 'schamanism' as an attempt to maintain the stability of reality through the externalising act. Gehlen's 'motive structures' seem to correspond to concepts of safety by a constellation familiar through collective bonds, or the personal subconscious of collective experience. The same concept is expressed eloquently by Eppel (1958: 55): '*Dieser Aberglaube* [that an action to which a substitute object is subjected is executed on the represented object] *ist ein in der unbegreifbaren, verwirrenden Mannigfaltigkeit des Lebens bestimmende Einheiten stiftender und Sicherheiten gewährender Kulturfaktor der Altsteinzeit*'. We thus arrive at Gallus's (1977: 374) 'a mythic framework establishes stability in the perception of the environment and forms a common frame of reference for a human group'.

Gallus's concepts emphasise the futility of all attempts to determine the *meaning* of archaic rock art. One can reasonably hypothesise about its *function*, but it seemed to me that it would be most productive to initially focus on the question of derivation. What was the source of the described tradition of marking soft media with fingers? Direct interpretation of such chronologically remote phenomena as *Montmilch* finger flutings (or, for that matter, any Palaeolithic art) amounts to no more than very precarious speculation. I am not persuaded by any one of the interpretative attempts discussed above, despite the fact that some were contributed by myself. Some can be easily refuted or rendered wholly unconvincing, others remain pronouncedly subjective, or relate to associations that apply at some of the sites but not at others. If we are to shed further light on this fascinating evidence of hominid behaviour that has barely survived to our time, we should abandon attempts to isolate and define its meaning or purpose. As a more promising line of enquiry I suggest we first consolidate all we know about it, admitting only highly plausible deductions. Such information on the phenomenon as a whole—hopefully comprising a high proportion of correct premises—is my objective in comparing all sites. Through such a study we can address the issue of derivation, a topic from which we stand to gain more than from speculating about the 'meaning' of the flutings.

Practically every known occurrence of the finger lines has some clue indicating their great antiquity. The arrangements may be found in spaces rendered inaccessible by tectonic changes or rising sediment levels; they may be corroded, patinated, worn by the wings of bats, or extensively modified by one of several geomorphological processes. They are present in caves offering no sign of human presence postdating the Old Stone Age, and in one case have been sealed off completely for a long time, possibly since the Upper Palaeolithic. In general they appear to precede other rock art. Superimposition, tentative dating, speleothem growth, and circumstantial evidence all indicate very great antiquity for the flutings at almost every site I have examined in both Europe and Australia.

The high proportion of juvenile marks among the finger scrawls is conspicuous (Bednarik, in press a), again in both continents. It has been interpreted, needless to say, as evidence of initiation rites in the 'sanctuaries' deep within the

caves. But the only reliable deduction from this observation is that, assuming the surviving sample's composition has not been distorted by selective obliteration (for example, the sample's composition may be related to location, among other things), the behavioural or cultural impetus prompting the making of the lines was a common trait, present in both juveniles and adults.

Some writers have, quite rightly, drawn attention to the difficult, and in at least three cases even quite hazardous access to the sites. Clearly, the Palaeolithic visitors possessed the necessary lighting and were undaunted by the long subterranean journeys required in some of the caves. But this observation permits no objective interpretative inferences. Once again I must stress that it is impossible to infer the substance of a complex archaeological phenomenon from its surviving attributes.

After I had examined about twenty caves with prehistoric finger flutings, some common characteristics began to emerge none of which could have been apparent after investigating only, say, half a dozen of the sites. These observations are fairly subjective at this stage and statistical verification is required where possible. For this purpose I will revisit several of the Australian and European sites from which my statistical data is incomplete. This necessity was inevitable because the methodology for studying the described phenomenon simply did not exist, it had to be developed as I proceeded with my work. Not surprisingly, when I look back at my early investigations at these sites, I find it amazing that certain consistencies and common characteristics had escaped my attention for so long, that I had not thought of looking for certain types of clues earlier.

Some of the concepts that emerged from my project only recently are concerned with the medium, and similar aspects, and they are treated elsewhere, in the discussion on the influence of speleothems on the finger lines, for example (Bednarik, in press b). One concept that is more relevant in the present context is the observation that adult markings may dominate in the more accessible caves, or parts of caves, while juvenile markings appear to be more conspicuous in locations of more difficult access, or in the remote part of a large system. This occurred

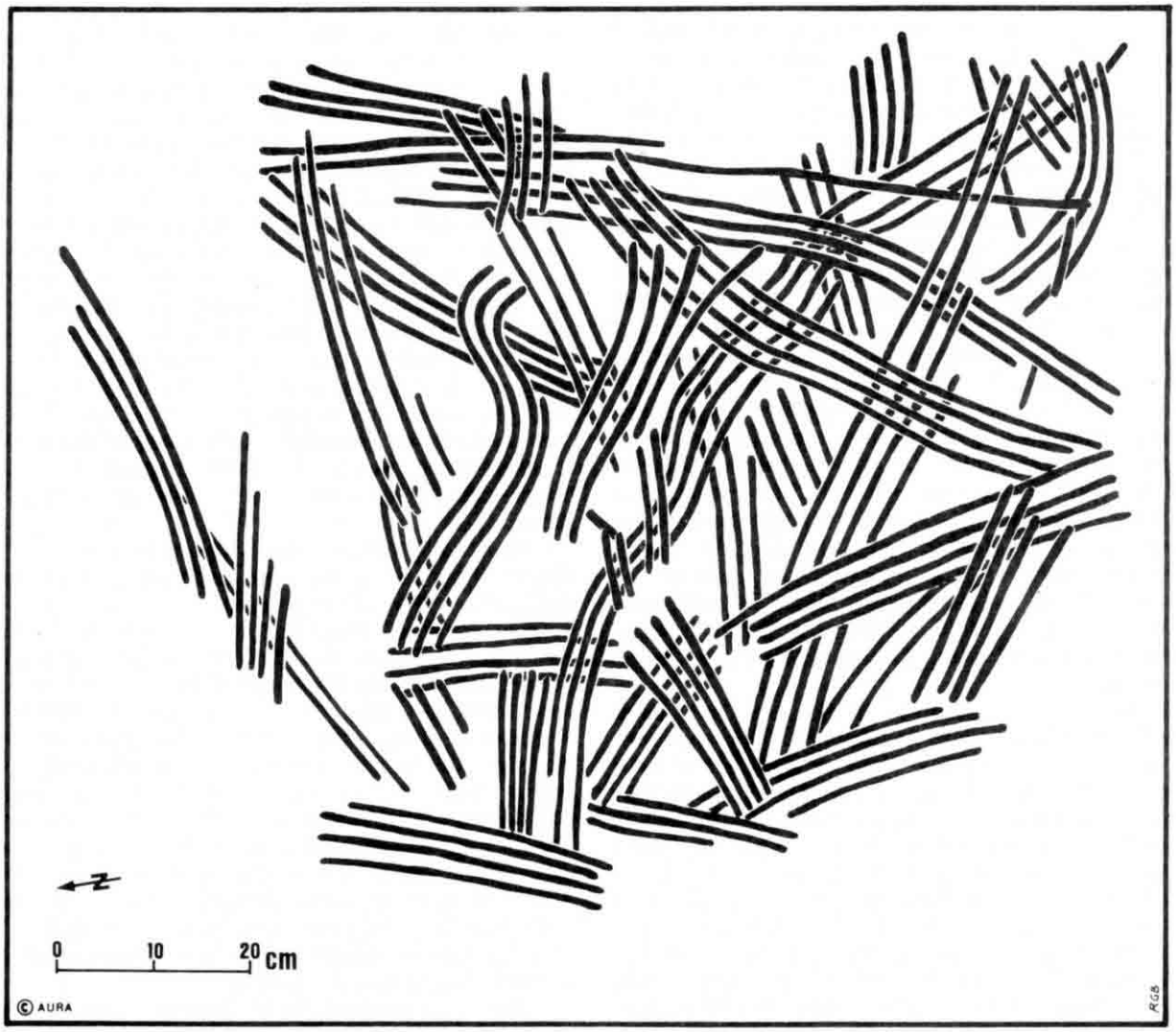

Figure 11. *Section of the large decorated panel on the ceiling of Koongine Cave, South Australia. It has been attempted to reconstruct the sequence in which the individual sets of finger lines were made.*

to me only recently, when I first surveyed the newly-discovered markings in Snake Hill Cave. Finger flutings are found in different parts of this extensive cave system, and I noted that the westernmost occurrence produced comparatively high line spacings and finger size values (although this is not particularly well expressed in the mean spacing of 14.7 millimetres, for a sample of thirty-five measurable sets, which is because the same also includes some quite small spacings). I realised that this particular occurrence is one of the largest known within twenty metres of the entrance of any of these caves, and I remembered that I had observed consistently high values also in other readily accessible caves.

This peculiarity should not surprise us. In all probability, the younger people were more agile, adventurous or reckless, and penetrated deeper into the caves. They entered narrow spaces, and perhaps found for themselves chambers not frequented by the adults. The older people may simply have been more reluctant to penetrate deeper into the parietal environment. Naturally, the evidence had a much greater chance of surviving in the remote parts of a cave. This suspected trend is therefore but another nail in the coffin of the 'sanctuary concept', and the commonly observed juvenile markings were probably favoured in their survival by geomorphological factors. The statistical composition of the surviving archaeological evidence is therefore probably not a culturally, or archaeologically significant criterion, but one of selective conservation.

Marshack's (1972, 1977) 'internal analysis' can be applied to finger flutings, to analyse the sequence in sets of markings superimposed upon each other. Microscopic examination as Marshack has employed for the analysis of incision marks is not necessary here, although a handlens is often useful. Generally, if the sequence cannot be determined with the unaided eye, magnification will not resolve the relationship. However, most finger flutings cannot be investigated with this method. They are either covered by subsequent speleothem growth which masks any clues related to sequence, or they are so badly corroded that they are barely visible.

Where the grooves have been preserved well enough it is often possible to determine how they were made, particularly where the physical position of the artist can still be inferred (for example, where an original floor such as a rock ledge remains intact). Many sets have been observed that could have only been executed from a particular position, with a particular movement. Such observations can be useful, for example in deciding whether a set has been executed with a left hand or a right hand. Many sets could have been produced easily with one hand, but only with much difficulty with the other. In this way I have been able to determine, for instance, that presumably right-handed sets predominate in Prung-kart Cave.

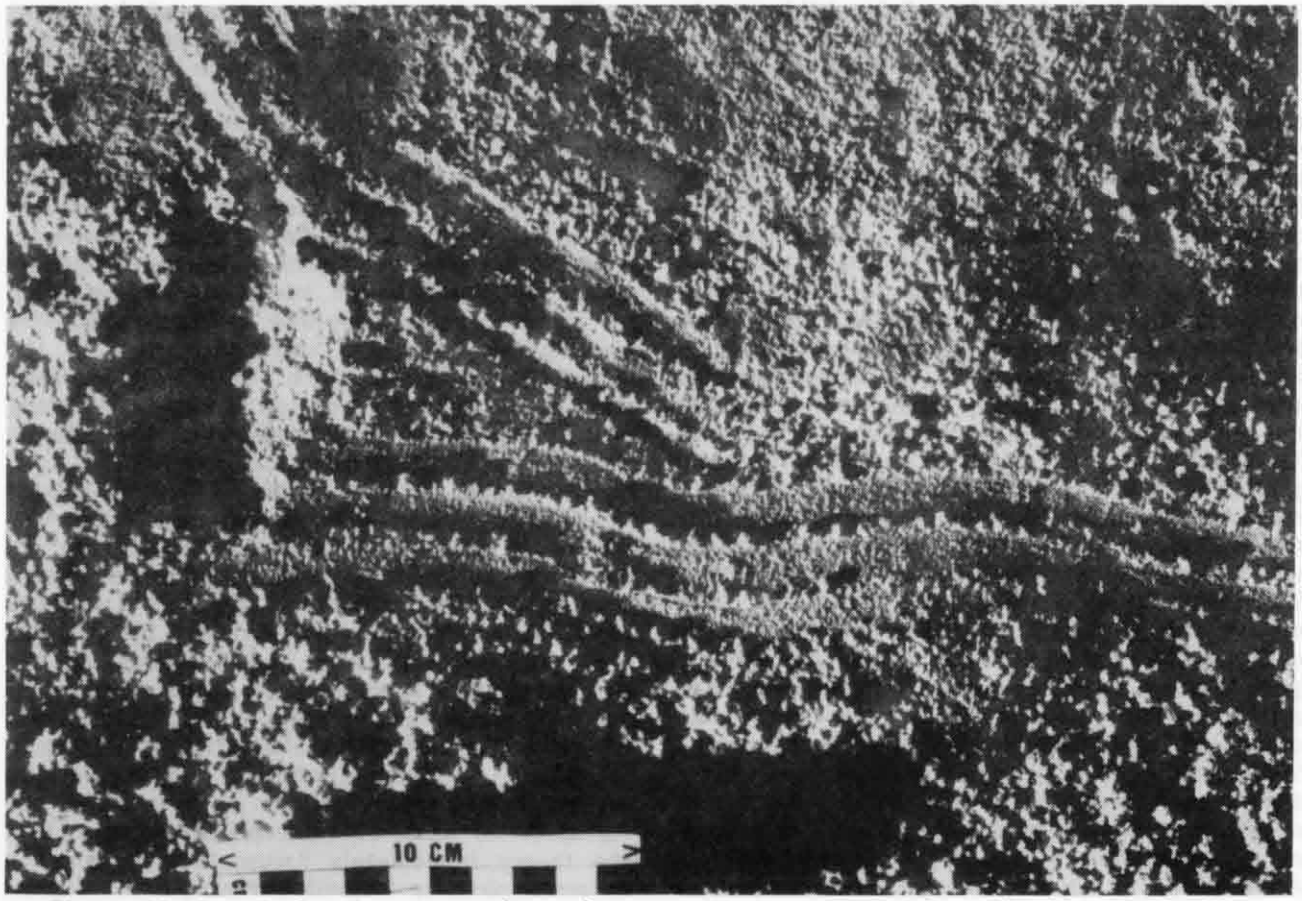

Figure 12. *Detail of well-preserved finger flutings in Karlie-ngoinpool Cave, South Australia. The slight subsequent cover of speleothem formations is particularly conspicuous along the ridges separating individual finger grooves.*

My intensive investigations of the finger markings in Malangine Cave led to the view that they were at the same time patterns and nonpatterns. Repetitive configurations appear to be only fortuituous, and none of those I have seen appear arranged in a preconceived manner. If a group of sets appear as if done by the same hand it may at best suggest an amoeba-like, formless shape. And yet, there *are* overall patterns in all finger flutings: the sets are generally of four subparallel grooves, the short curved sets appear frequently, as do the claw-like arrangements. Longer sets may be wavy, and where two sets intersect they naturally form a lattice.

Why were in all cases several fingers used together, why not just one finger? Did the artists derive any satisfaction from obtaining a multiple result from a single action? What effect, if any, would the discovery of the principle of mass production have had on the hominid intellect? Is not the beginning of the Upper Palaeolithic the dawn of mass production?

Rather than becoming unduly absorbed in the accumulation of quantitative data, and the disappointingly inconsequential conclusions one could draw from the same I have turned my attention to a more intuitive approach since 1981 and this prompted the Phosphene Theory in the same year. It occurred to me that the most archaic rock markings might be related to the advent of cosmological awareness; that they might document the emerging conscious cognition of early man. I began to look at how Palaeolithic people could have formed the concept of a motif, or, for that matter, discovered the elements making up motifs or images. Particularly in Australia there seemed to be a long tradition of purely noniconic markings which I had investigated at many sites in South Australia and western New South Wales since the early 1970s. The oldest of these engravings and peckings include only one presumed figurative element: compositions believed to portray animal tracks, most notably bird tracks. But during 1983 and 1984, the presence of a second tradition of Australian cave art became apparent at the Mount Gambier sites. The Karake Style is stylistically identical to the deeply carved petroglyphs in northern Tasmania; it seems related to the archaic petroglyphs of northern Queensland; and it clearly resembles the older phase of the so-called Panaramitee style. I found that the 'trident' motifs, which are usually described as 'emu tracks' or 'bird tracks', occur commonly with two, four or five 'toes' at Mount Gambier. Often the individual lines of such an arrangement are not actually joined, they merely converge. Even three-toed motifs hardly resemble actual tracks in most cases—yet they certainly do so in much of the 'Panaramitee style'. I had to consider the possibility that these arrangements did not depict tracks at all, but were 'noniconic'. Rosenfeld arrived at a similar view at about that time (Rosenfeld *et al.* 1981: 33, 54), introducing the noninterpretive term 'trident'. In view of the range at Mount Gambier I call this design element 'converging lines motif', and it was this figure that first prompted me to speculate about the role of phosphenes.

An amazing thing happened next. At the time I prepared my initial draft for 'On the nature of psychograms' (Bednarik 1984a), my accompanying Figure 1 excluded three of the motifs that were eventually shown in the column 'S.E. Australia'. Instead the table featured several empty spaces. But before the paper went to print these motif types were found in a newly-discovered site. I recalled that, when the periodic table of the elements was discovered in 1869, its empty spaces represented unknown elements of predictable properties, which were identified in due course. Here was an analogous situation: every time a new motif was found it matched a phosphene type, and the empty spaces in my table continued to be filled. After the publication of the table we discovered three further motif types in new sites, two types of 'Combined Figures', and the 'Multiple Waves' motif. It follows that only one of the phosphene types I had initially listed, the 'Spiral', does not appear to occur at Mount Gambier. The spiral seems the conceptually most complex of the phosphene types, and since it occurs at both Tasmania and in the early phases of the Olary tradition (Nobbs 1984; Bednarik 1985b; see also Morwood 1985) it is possibly a later addition. Its appearance may approximately coincide with the advent of track motifs, perhaps between 10 000 and 15 000 years BP, in southern and eastern Australia.

The more important consequence of the recent finds in the caves of South Australia is their dramatic effect on the Phosphene Theory. What was initially proposed as an academic premise has been confirmed with unexpected consistency. Among the thousands of petroglyphs in the caves around Mount Gambier there is not one single arrangement or design element that is clearly figurative. Every single motif either represents a phosphene type or it consists of two combined phosphene types—unless markings are made up by mazes of phosphene-like arrangements. This also applies without a single exception to the earlier finger line tradition. While such evidence may not amount to conclusive proof, it *would* justify a prudent consideration of the effects the theory would have—should it be valid.

Essentially, the Phosphene Theory relates the earliest artistic externalisations to subjective images in the human visual cortex, which did not need to be communicated by other means because they are present in the neural systems of all humans (one form of them are the patterns one 'sees' when pressing the eyeballs). At the first level, the theory seeks to explain the emergence of human consciousness (and its relationship to art) as the result of the adoption of a common frame of reference (Bednarik 1984b). But its effects reach much further. By identifying the metaphorical basis of anthropocentric cosmology the theory immediately focuses on the question of nonempiricist, 'objective reality'. Its logical philosophical end product seems to approach nihilism, and its perhaps most troublesome consequence is that it tends to confirm what has long

been suspected by philosophers: there are very valid, rational reasons for our continuing dilemma in coming to terms with reality. During the twentieth century the field of theoretical physics has demonstrated that, whilst we no longer know what the world is, we *should* know that the conceptual corner stones of the cosmological model we have developed since the Aurignaco-Perigordian (i.e., empiricism) have, on the whole, little or no meaning when applied to reality. They are only relevant in the anthropocentric, empiricist world, and our cosmos derives its validity only from the organisms that relate to it, both within species and between species. Modern humans have attained the ability to communicate their common experience, an ability that is the quintessence of being a modern hominid, and that led directly to control of the environment. If the most archaic rock art is any indication, that ability has been acquired by communicating autogenous sensory experiences, and the finger line tradition I have described in this paper marks an early stage in this process—apparently the earliest.

We have thus arrived at 'archaeopsychology', which some will no doubt reject as not being objective enough to meet the rigorous demands of positivism. Yet I feel it would be more appropriate to consider what the 'archaeopsychologist' (who will no doubt emerge on the scientific battlefield during the next century) is likely to think of positivism.

COMMENTS

By WHITNEY DAVIS

This paper is an extremely important synthesis, elaboration, and clarification of Bednarik's earlier work on 'noniconic' parietal finger markings (e.g. Bednarik 1984a, 1985a). It consolidates his position as one of the foremost students of this problem. I hope the paper will be read carefully by all students of Palaeolithic graphic activity and, more widely, of the 'origin of the modern human intellect'. Close study of finger markings may have substantial implications for the study of early symbol-making systems in *Homo*, particularly if, as Bednarik feels, digital flutings may be the earliest parietal marks of any kind in the archaeological record. Bednarik has fairly indicated the trickiness of the material and to my mind presents just the right blend of cautious empirical and imaginative interpretive analysis.

A comprehensive empirical study of digital flutings and other 'meanders' or 'macaronis' must be the *sine qua non* of any historical or philosophical conclusions. Like Marshack in his studies of mobiliary materials (e.g. 1972), Bednarik has studied a vast amount of evidence at first hand and with descriptive precision. I will not repeat, or comment at length upon, this element of the paper. Other commentators may wish to take up details of the geomorphology, archaeology and so forth. On the basis of my own experience in examining parietal images, I tend to accept Bednarik's closely reasoned observations about juvenile mark making, handedness, the accessibility of different surfaces, and so forth. In particular, I am persuaded by his arguments that digital flutings may be the earliest parietal marks we have, although I am not willing to say whether they could be earlier than the Upper Palaeolithic. Throughout, Bednarik presents many useful descriptions and empirical conclusions. Any interpretation or explanation must be able to handle these.

At a certain point in his research Bednarik apparently began to feel the limits of a purely descriptive or 'natural-scientific' approach to the evidence. Some questions simply cannot be asked or answered 'empirically', at least in a straightforward way. Most particularly, although it might tell us about (say) the handedness of its maker, no amount of close work with a meter stick or handlens will tell us whether a set of digital flutings is a sign or what kind of sign it might be.

Despite the pessimism of many archaeologists, there are indirect but nonetheless empirical means of answering questions about the referential, aesthetic, or other 'unexhibited' properties (Dickie 1974) of artefacts. I believe that it is necessary to turn to formal characterisations of different types of symbol-systems, such as maps, drawings, scripts, diagrams or scores (e.g. Pierce 1932; Goodman 1971; Eco 1976). Each of these systems is organised morphologically and syntactically in a particular way, with minimum units, discrete or continuous characters, and so forth. A general formal grasp of these specifications—of the 'conceptual logic' of representational systems (Davis 1986)—may help us to penetrate an unknown symbol-system. Although progress is bound to be difficult, with treacherous hazards for the unwary, I believe we can begin to separate representational from nonrepresentational marks (see Davis 1986) or notational from non-notational marks (see Krampen 1983) on a purely empirical morphological and structural basis, that is, without relying on what seems representational or notational (or not) *to us*. However, formal characterisations are not enough; they must *always* be supplemented by *a history or archaeology* of symbols. The context and use of a sign are often determining—in one context, a sign is a hieroglyph, in another a picture—and it is therefore imperative to have accurate information about siting, variations in production, correlations with other signs or with features of the surrounding environment of the sign-vehicle, and so forth. Bednarik's research is now our primary source for this evidence respecting Upper Palaeolithic finger markings. Whether or not we accept Bednarik's own preferred reading, his data forms the background of any syntactic or semantic 'decipherment'.

The very term *noniconic mark* raises a number of problems which take Bednarik right to the

heart of the matter. Most minimally, the digital flutings might be instances of what I have called *self-sufficient marks* (Davis 1986). Like the scribblings of apes and monkeys (e.g. Smith 1973), they might not stand for anything at all: they could be the by-product, meaningless in themselves, of a creature's interest or pleasure in the activity of mark making—which may be intense and somehow implicated in the motor-cognitive development of the organism.

However, Bednarik does not seem very happy with this minimal characterisation of digital flutings. Rather than being merely self-sufficient, clearly for him the flutings of the Upper Palaeolithic already have *semantic* value. They stand for something. Probably we need an even more explicit argument for this proposition. Perhaps we cannot imagine someone in Upper Palaeolithic society making marks in a deep cave without some expressive or representational purpose. (As Bednarik rightly says, perhaps we should not make too much of the caves: the fact that the marks we now have are in caves may misrepresent the true distributions.) Considering that *earlier* marks in the record, such as might have been made by ancestral primates (e.g. Whiten 1976) or by archaic hominids or premodern *Homo* (e.g. Bordes 1969; Marshack 1976), seem *not* to be semantic, I would like to see a detailed study of the internal morphological and structural reasons for taking some similar-looking later marks to be semantic. However, for the moment we can certainly proceed by hypothesis, and simply assume that (whatever the status of earlier marks) the Upper Palaeolithic flutings have semantic value.

We have not yet gone very far. The flutings might stand for something in several modes—iconically *or* noniconically, and if noniconically, perhaps emblematically, notationally, or in some other way. For example, (1) the flutings could be *iconic* if they are imitations (representations) of cave bear claw marks or of water and water courses; (2) they could be *noniconic 'emblems'* if they functioned as property marks or signposts of mineral deposits. Bednarik rules out these possibilities on reasonable morphological, structural and contextual grounds. Not imitations of claw marks: there are no cave bears in the Australian prehistory, although the Australian flutings resemble the European. Not water symbolism, at least in the simple formats of the earliest flutings: the connection between cave waters and flutings in various contexts is unestablished or vague. Not signposts of important deposits: again, the necessary associations cannot be found frequently enough. Probably not property marks: to function well as such, they would have to be recognisably different one from the next.

More subtle possibilities must also be tested. For example, the flutings could be (3) *notations* if they recorded the performance of a certain activity in the cave, the presence of certain participants, and so forth, and/or (4) *representations*, in the strict sense, if they depicted aspects of the world or of experience. (There is no incompatibility between the two hypotheses: a notation (3) may certainly use representational signs (4), as in pictographic or hieroglyphic writing, although it need not do so.) Bednarik leans toward accepting some combined version of these two possibilities. The morphological, structural and contextual evidence does seem to favour his approach. An ordinary nonpictographic digital notation (such as a tally or calendrical statement) usually depends upon clear-cut groupings of visibly differentiated characters. By contrast, Palaeolithic flutings do not universally resolve into a finite number of invariable groups, nor is it easy to extract discrete, digital information from them, since they can meet up or divide, are often very long (cannot be seen all at once), and sometimes intertangle or interpenetrate (at least in the 'meanders' and 'macaronis'). They seem *continuously modulated*—exhibiting many potentially meaningful changes of direction or pressure, which implies that they may have some expressive or representational status (see further Bach 1970; Goodman 1971; Davis 1986 on this central feature of images).

It is fair to ask, then, what digital flutings denote or depict. Bednarik feels that whatever significance they might have had was not, in his words, a 'regional cultural phenomenon'. In this, presumably the flutings are quite different from the signs catalogued by Leroi-Gourhan, from the mark-making 'traditions' studied by Marshack (e.g. 1977), or from figurative images, ineluctably tied to the environments of particular regions and human experiences there (such as the Aurignacian-Magdalenian experience in southwestern France). The flutings from European and Australian parietal sites are remarkably similar—a term we probably use too casually—and therefore Bednarik feels they must reflect 'analogous behavioural patterns', the 'independent but identical evolution of subjective perception in populations apparently isolated from each other'.

However, we cannot rule out the logical possibility of iconographic disjunction (Panofsky 1960; Kubler 1964). In two different locales or phases of a culture or in two different cultures, similar forms may have altogether individual and specific 'regional' significance. Is it possible that digital flutings signified one thing in Europe and another in Australia? Semantic disjunction should lead ultimately to visible morphological and syntactic divergences as well. Apparently no divergences of this consequence can be clearly observed between European and Australian markings. 'Stylistic' differences are explained by Bednarik—in a step of the argument which requires more defense—as due to environmental and technical constraints rather than to semantic differences.

In sum, transregional morphological similarity coupled with the lack of evidence for semantic disjunction suggests we should look not for a locally specific referent but rather for some kind of common or 'universal' significance, which may, of course, be fully 'cultural', that is, possessed of some status in the global culture of *Homo sapiens sapiens* in the Upper Palaeolithic. Although anthropological archaeologists are bound to be

uncomfortable with the suggestion, as Bednarik argues, 'the various types of pattern and compositions arise from some uniformity of human consciousness, intuition, or response'.

Over the years a number of writers have suggested what this uniformity might be. Perhaps digital flutings, meanders and macaronis are the result of *a universal human impulse to make marks*. Complex graphic symbol-systems (like representational image-making or notational scripts) have sometimes been claimed to derive ultimately from this simple tendency, alleged to possess an archaic evolutionary origin in the environmental curiosity, manual dexterity, and 'tool using' or 'technology' of higher primates and hominids. Although narratives of this kind are not necessarily misconceived, they must be handled cautiously, and require supplementary assumptions.

Briefly, that a creature makes marks does not entail that these marks have symbolic value—that they represent through conventions of resemblance or other modes of reference. The 'impulse' to make marks could be explained without requiring a creature with symbolic abilities and intentions, for it might be pure play, the synthesis, extension and testing of developing sensorimotor skills. The terms 'impulse' or 'instinct' even suggest the activity is reflexive.

Again, specific morphological, structural, and contextual circumstances suggest the reality of the matter is more complex. As Bednarik shows, digital flutings are sometimes positioned in relation to pre-existing marks or features of the cave; Marshack (1977) has documented the 're-use' of meanders by cumulative addition or wiping; the length, complexity and modulation of many flutings, although not yet completely analysed, suggest that sophisticated syntax or expressive purpose might have regulated production.

Such considerations, of course, only dramatise the central questions of origins and meaning. How did mark making ever acquire a symbolic dimension? What was the nature of this conceptual transformation, wherever and whenever it occurred? What did early symbolic marks actually symbolise? Bednarik offers an account accommodating a number of relevant logical and empirical conclusions. His 'phosphene theory' (see also Bednarik 1984a, 1984b) is an explanation of the origin and significance of the earliest parietal marks in the archaeological record.

In an earlier study, Bednarik (1984a: Fig. 1) presented a table of similarities in form between some phosphenes (that is, 'subjective light images' or 'the perception of patterns not resulting from viewing external objects [Knoll, Kugler, Höfer and Lawder 1963: 201; see generally Oster 1970]) documented in experiments by Knoll and Kugler (1959) and finger lines recorded in Australian rock art. Similar correlations between phosphenes and other phenomena have been investigated by other writers. For instance it has been suggested that ninety percent of the Knoll-Kugler phosphenes, classified by them into fifteen 'form-groups', can also be identified in the first non- or prefigurative 'geometric' scribbling of young children (Kellogg, Knoll and Kugler 1965) and, more recently, that the pattern preferences of newborns might be explained by 'prior visual experience with these patterns during intrauterine life', in which, conceivably, pressure phosphenes may have been 'experienced' by the fetus (Anderson 1975). Leaving aside other correlations, in brief the parietal finger lines might be seen, in Bednarik's word, as 'externalisations' of phosphenes. This intriguing proposal deserves careful scrutiny.

Phosphene experiences (for which I prefer the term *entoptic phenomena*, 'to mean visual sensations whose characteristics derive from the structure of the visual system' [Tyler 1978: 1633]) can be induced in a variety of ways and apparently vary according to the character of the stimulant (mechanical, electrical or chemical) and the subject's physical and psychological state. Knoll and Kugler's initial experiments, building on the observations of early scientists of vision, uncovered only a fraction of the full range of entoptic phenomena subjects have reported. Knoll and Kugler's phosphenes were elicited by stimulation via temporal electrodes in the electroencephalographic frequency range; numerous other electrically stimulated phenomena might be considered as well (see Brindley and Lewin 1968; Brindley 1973). Stimulated by cranial electrodes and chemical agents (such as mescaline or lysergic acid-diethylamide), at least one subject reported very complex and often figurative entoptic phenomena—the typical 'hallucinations' of drug users (Knoll, Kugler, Höfer and Lawder 1963: Figs 1-19), in some respects parallel, for instance, to the vivid transformational experiences reported by trance dancers of the San and possibly represented in southern San rock art (Lewis-Williams 1981). Interestingly, hypnotic trance can be induced in a subject by having him focus intently on entoptic phenomena (Hunchak 1980). No doubt electrically and chemically stimulated phosphenes are an unusual or limiting case. However, even 'binocular deep pressure patterns'—phosphenes elicited by pressing the fingers or palm of the hand against the eyeball—'are complex' (Tyler 1978: 1638); Tyler (1978: e.g. Fig. 2) records various swirling patterns and complicated grids. Some of these patterns 'can be elicited by viewing a uniform field flickering at appropriate rates' (Tyler 1978: 1638) or may appear in fatigue (see further Knoll *et al.* 1963: 201-2, with references); in other words, phosphenes can appear spontaneously without any mechanical stimulation.

These considerations suggest one possible problem for the phosphene theory. For 'externalisation' in graphic media, early mark makers may have *selected particular instances or a particular group from the full range* of possible entoptic phenomena. Many phosphenes are not paralleled in any graphic activities undertaken anywhere; in fact many are extremely difficult to record graphically in the first place. (Conversely, I suspect that not every kind of early finger line, meander, macaroni or other 'noniconic' mark can be paralleled somewhere in the range of entoptic phenomena.)

This problem of correlation requires some thought, but need not be fatal to the phosphene theory. Perhaps the earliest mark-making technology—fingers and hands— only allowed the 'externalisation' of some but not all entoptic experiences of the makers. Perhaps human entoptic experience in the Upper Palaeolithic was limited to just and only those forms which appear in parietal markings, that is, to a few of the simpler pressure phosphenes. However, if we exclude these possibilities as unprovable or implausible, and given the variety and complexity of entoptic phenomena, then we must ask *why* mark makers invariably presented some but certainly not all entoptic phenomena in a remarkably uniform way. In other words, what is the nature of 'externalisation', Bednarik's preferred term for the mark maker's activity?

Let us recall that because we happen to have vivid 'mental images' of our parents does not mean we can produce satisfactory likenesses of them using a particular graphic technology. Because we can visualise a complex polyhedron does not mean we can draw it. Because we see a swirling pattern when pressing our tightly closed eyes does not mean we can open them and successfully reproduce this experience with pen and ink. In general: just because our visual system is operating as it ordinarily does under various stimulations—of light entering the lens of the eye, of mechanical pressure on the cornea etc.—does not mean we can design and use an extrasomatic representational system which preserves any of this information. Further conditions and processes must clearly be specified to take us from perceptual to graphic abilities and experiences. A relation of reference must be forged between graphic marks (or other media) and perceptual experience, such that, for instance, the marks denote or depict experience when this relation holds in a particular way. But how is this relation established in the first place? (On these questions, see further Davis 1986, with comments and bibliography.)

The phosphene theory, I am suggesting, may amount to the hypothesis that digital flutings and other early marks *represent* entoptic phenomena through particular graphic means. Therefore the theory requires—although perhaps only as a founding assumption—some view about the origin of representational reference in this or some other activity and an account of the selection of the graphic means themselves. Why represent entoptic phenomena? Why employ digital flutings to do so? How did a mark maker know or discover that flutings could stand for entoptic phenomena, and how did anyone else (if they were inspecting the flutings) know or discover that this is what they did signify?

Some of these questions are approached in Bednarik's paper, and I look forward to further debate. Bednarik suggests that 'modern humans have attained the ability to communicate their common experience' in a specific way, namely, 'by communicating autogenous sensory experiences'—entoptic phenomena, arising within the human visual system, sometimes believed to be the result of exciting 'neuronal chains preformed in the brain' (Knoll *et al.* 1963: 216) or to 'reflect the neural organisation of the visual pathway' (Oster 1970: 83). Perhaps *Homo* could recognise digital flutings as an 'externalisation' or representation—even in the absence of a tradition of representational conventions—just because flutings were sufficiently similar to a universal and hard-wired (reflexive or innate) psychological experience not bound in any direct way to knowledge of the external world. The architecture and function of the brain of *Homo* therefore was the basis for the production of symbols in more than a routine material sense, for the earliest symbols were in fact *symbols of* aspects of that very architecture and function. Speculations along these lines, arising out of Bednarik's presentation, deserve our attention and criticism.

Bednarik's account helps resolve some puzzles about the 'origins of the modern human intellect' and raises new questions as well. It is very difficult to posit cognitive abilities or psychological experiences on the basis of material evidence we hope to explain by referring to just those abilities or experiences. Fortunately, in addition to archaeological study of the material remains of thought, many of the relevant questions can be investigated formally (e.g. Goodman 1971), experimentally (e.g. Kosslyn 1980) and philosophically (e.g. Block 1983). As Bednarik's paper suggests, through careful empirical work and interdisciplinary synthesis there is every reason to hope for some progress.

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By P. G. BAHN

This paper is an important contribution to the problem of the earliest form of parietal marking, since its author is in the unique position of having a detailed knowledge of this phenomenon in both Europe and Australia; if he can succeed in dating it accurately, cave art studies will have taken a major step forward.

As he points out, I have put forward the view that the 'macaronis' at Gargas (and other French caves) were assigned to the Aurignacian quite subjectively—as, indeed, were the hand stencils at this cave—and there is no reason why they may not have been made earlier than that period, and perhaps even much earlier.

Although I believe that studies of taphonomy and bone trampling—most notably by Koby—has put paid to almost all evidence of a Middle Palaeolithic cave bear cult, I agree that claw marks on cave walls are the most likely source of inspiration for many of the digital figures; indeed, in the most recent work on this topic in Europe, the Dellucs (1983) have investigated the figures in La Croze à Gontran, and found that while

some marks were made with fingers, others seem to be neither finger nor claw marks but man-made imitations of claw marks.

With reference to a connection with water symbolism, I would stress that the modern presence of lakes or rivers in the caves is not the only factor to bear in mind—my own research led me to postulate (1978) a correlation between some cave art and 'abnormal water': primarily with springs, and especially thermal springs. There are too many cases of southern French and northern Spanish decorated caves being close to thermal springs for it to be coincidence, although one cannot prove the connection absolutely. There are exceptions, of course, but no explanation for any aspect of Ice Age art is ever all-embracing. However, I feel it is virtually certain that water—and therefore probably water symbolism—played a major role in whatever ceremonies and beliefs lay behind parietal markings.

Finally, I applaud the swing away from a fruitless search for meaning to a consolidation of all we know about the art. It is my impression that in Europe we are rapidly moving away from the ideas of Breuil and Leroi-Gourhan, with their excessive homogeneity and continuity through space and time, to a concentration on an objective restudy of each cave in depth, on regional differences, and on different traditions. Once the data base is improved in this way, it may be possible to assemble a new synthesis on less speculative foundations than before.

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By DAVID R. MOORE

Bednarik's article is complex, thought provoking, and contains a number of far-reaching implications. Before commenting on details of his hypotheses, I would like to make some general observations that are of relevance to the whole subject.

Firstly, there is no evidence so far that any hominid except *Homo sapiens sapiens* ever inhabited Australia. The earliest human remains found in Australia (Mungo I and Mungo III) are dated to c. 30 000 BP and are *Homo sapiens sapiens* in all respects. Therefore we have to assume that all finger flutings, of whatever age, were made by 'modern man' with a fully developed brain.

Secondly, I cannot agree with the author that making marks on soft cave walls is not a natural instinct of man. There have been graffiti in all ages from which relics have survived. In any case, once somebody made a mark, whether accidentally or deliberately, others would certainly follow suit.

Thirdly, just as the natural signature of a preliterate people on a hard wall is the hand print or stencil, on a soft surface finger marks are the obvious alternative. But why more than one finger? The hand, endowed with four fingers and a thumb, is the principal agent of human action: what is more natural than to use the whole of this remarkable instrument rather than part only? I would suggest that just as any member of a tribe could recognise who had made a hand print or stencil, from the combination of features represented, so everyone in a group would know whose fingers had made parallel flutings. In fact, when such marks are in a good state of preservation it should be possible even now to distinguish individuals, by careful measurement of breadth of fingers, spaces between fingers, length of parallel lines or convergences etc. This is an aspect of finger flutings that might well be worth investigating.

And fourthly, can it be pure chance that ethnographically the areas where parallel flutings on artefacts were an important decorative and ritual motif coincide so closely with the occurrence of cave meanders? I refer, of course, to the fluted sacred boards and spearthrowers of the Western Desert, the ground designs, cave paintings, and stone tjurunga of central Australia, the incised giant ritual boomerangs of western New South Wales and northwest Victoria, and some surviving everyday artefacts from various parts of Victoria.

It is worth noting that wherever explanations of parallel flutings have been obtained from Aboriginal informants, meander designs have been described as maps of ancestral journeys, the grooves representing river courses, or parallel lines of sand dunes, or mountain ranges. Similarly the concentric circle or spiral motif in central Australia has often been stated to represent a waterhole or campsite (the two being usually synonymous). Elsewhere in the world such symbols are generally considered to be a Bronze Age development, but this can hardly apply to Australia where they occur commonly in the centre but not in the north and northwest. The concentric circle and spiral are not irrelevant to the subject under discussion, because two elementary incised spirals occur in Koonalda Cave, at the entrance to the 'Squeeze' at the farthest extent of the finger markings (Maynard and Edwards 1971).

After which lengthy preamble, I should like to offer some comments on a few of the specific points made in the article.

Bednarik points out, quite rightly, that in Europe only a very small sample of cave finger markings can have survived and that unless one has examined all known occurrences in detail, it is premature to draw conclusions. I agree entirely with this, and of course the same applies in Australia. Although limestone karst areas are rare here, the fact that Bednarik and his associates have been able to find such a galaxy of marked caves within only a few years points not only to their assiduity but also to the fact that undoubtedly there must be many other such caves to be located right across southern Australia.

It is suggested that all finger flutings represent similar patterns of activity. I would dispute this, drawing on the analogy of hand stencils, which have only recently been recognised as having been used to convey a great variety of messages

(Moore 1977; Walsh 1979; Morwood 1979; Wright 1985). I would suggest that finger flutings are likely to have been used to transmit many types of information, though it is unlikely that we will ever be able to interpret them in any detail. Incidentally, the discovery of an engraved hand in Koongine Cave is most intriguing; it would almost appear to be a precursor of the hand stencil.

I am not trained in psychology and so do not feel competent to comment on Gallus's 'engramme complexes' or Bednarik's 'autogenous sensory experiences' as explanations for finger flutings. We cannot possibly interpret with any confidence the symbols used by any culture other than our own, unless we have either verbal or written information. In dealing with human manifestations probably at least 20 000 years old the dilemma is absolute, because we have no conception of how the people concerned communicated. Personally, I find it difficult to imagine such a complex activity as stone implement manufacture being carried out and passed on from generation to generation without some form of language. Equally, I believe that all deliberate human markings on cave walls were intended as a form of communication, at the very least saying 'X was here', or 'good flint up above'. Nor do I believe that because the western European caves seem to have been used for religious purposes, the Australian sites are necessarily 'sanctuaries'. The combination of quite elaborate flint mining and finger marks at Koonalda would seem to provide some argument for a secular use of limestone caves. Gallus's 'stelae' (Gallus 1971) could well be merely markers to guide people to certain parts of the cave, or may be natural rockfall, marked in some cases under the same impulse as the wall markings.

Although speculation can often be productive, detailed scientific examination and comparison of wall markings should have first priority and any hypothesising should be capable of ultimate scientific verification. While applauding Bednarik's valuable summing up of the hypotheses of others and the stimulating new theories he propounds himself, I would also like to see statistical methods applied to finger flutings, in the way they are now being used to extract information from surface rock engravings.

The fact that finger fluting apparently developed quite independently in Australia is not surprising, if one accepts that it is a natural human way of marking soft walls. I venture to predict that when the new information from here becomes widely disseminated, occurrences of finger fluting will eventually be discovered in limestone karst areas elsewhere in the world. But for the moment we have two extensive examples at opposite ends of the globe to study and compare. Bednarik's pioneer work in this field will undoubtedly stimulate rock art researchers everywhere to look carefully in areas where likely conditions exist.

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By HUGH CAIRNS

This article is a major survey of world meander-type material. Enlightening in its analyses of the various concepts and interpretations such as subconscious reifications, engrammes, psychograms and the phosphene theory, it is exciting both in its introduction to the vast breadth of empirical research (including the author's own) and in its commitment to bear always in mind within ancient evidence the great questions of 'the advent of cosmological awareness' and 'the emerging conscious cognition of early man'.

I was particularly interested in the neotony-type interpretation concerning the ability of young people to dare deeper into the caves, and in the 'claw-like arrangements'. Such interpretations move close to 'people-as-we-know-them', seen, I believe, in another context in John Clegg's 1985 work on modern graffiti. Anything which takes us away from the layers of *a priori* interpretation centred on concepts of historic religion, towards concepts of religion and culture which base themselves in the reality-testing, empirical mind of imaginative, dreaming man—early man, but also very modern man—is to be appreciated. But Bednarik does much more than this: he opens to us a vista of the possibility of extremely complex scientific reflection on 'very recently grown' material, but with major sensitivity to the imaginative creativity of humans. The rock art codings of the mind(s) of early humans may very well be broken by way of the massive, multidisciplinary work done in Australia over the last thirty years; and the present volume of research and writing by Bednarik will surely have a major place in this, if it happens. For many of us, this present article will be part of our attempts to meet the challenge.

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By ALEXANDER GALLUS

One wholeheartedly concurs with Bednarik's insistence that the parietal finger flutings in Palaeolithic caves of Europe and Australia raise fundamental questions about the emergence of 'anthropocentric cosmology', i.e. conscious concept building ('awareness') about the nature of surrounding reality and consciously ('intelligently') adjusted behaviour instead of genetically-fixed action circuits.

One also agrees with the immediate necessity for the compilation of a corpus of all available observational material and subsequent categorisation of patterns, including a rigorous analysis of common characteristics detectable in the Australian and European material.

Obviously then, until such preliminaries have

been accomplished it must appear premature to try to formulate any views with finality. Nor is that my intention here.

Since any in situ observational knowledge at my disposal about the archaeological material in question derives solely from my excavations in Koonalda Cave, and since new relevant material has accumulated after the 1971 publication (Wright ed. 1971) it seems useful to attempt a reassessment of the question of relative and absolute chronology of that site.

I. *Situation*

One enters the cave via a sinkhole, from the floor of which a steep slope leads down to a huge chamber, the 'dome'. Daylight still filters through the entrance and it is here that my Trenches I-III were placed. Excavation discovered remains of intensive mining and workshop activity, but no traces whatsoever of markings.

From the 'dome' one gains access to a particular arm of the cave, the Art Passage which is filled by a huge rock fall along its entire length. In order to reach the area of the wall markings one has to ascend the steep slope of the rock fall. The markings follow the passage along the top of the rock fall until its end, where it forms again a slope, which descends to the 'squeeze area'. Both the Art Passage and the Squeeze are in total darkness (for plans and sections see Wright [1971: Fig. 2], and Maynard and Edwards [1971: Fig. 9]).

I regard it as significant that human activity in the Art Passage was totally isolated within the cave by the slopes at both ends, and was restricted exclusively to the application of 'markings'. This means that chalcedony mining and workshops in the 'dome' and marking in the Art Passage were locality-bound.

The Squeeze area at the far end of the rock fall in the Art Passage (at the foot of its slope) contains both, mining and markings, but here the two activities were not necessarily contemporaneous.

The above interpretation became reinforced by the discovery, after 1971, still exclusively in the Art Passage, of slightly incised linear markings which cover the surfaces of large boulders, embedded in the top of the old rock fall already mentioned, all along between the walls of the passage. A careful area survey by Christine E. and Kevin J. Sharpe revealed the presence of a structured 'ceremonial floor' (Sharpe 1973a, 1973b, 1976; Sharpe and Sharpe 1976a, 1976b, 1978; Sharpe *et al.* 1976).

II. *Chronology*

The overall stratification of the cave is complex and every unit mentioned (the 'dome', the Art Passage and the Squeeze area) has its own stratigraphy with independent features. Probing into depth was only done with Trenches I and III, but still without having reached basal rock. I have tried to co-ordinate in Trenches I and III four 'depositional cycles' (Gallus 1971: 90, 92-3, 98 and Figs 1 and 2. Compare Wright 1971: Plates 8-10).

My 1971 attempt (pp. 89-93, 96-8) at stratigraphic and chronological clarification was done without access to Wright's much simplified stratigraphic and chronological sketch (1971: 24-8 and Fig. 4). Nor was there as yet any knowledge about the 'ceremonial floor', the presence of which has important chronological connotations. Obviously then the 1971 speculations are clearly out of date and a revision is long overdue.

III. *Relative and Absolute Chronology in the Art Passage*

Excavation probed only the last few erosional layers which cover the actual surface of the old rock fall or rock falls already mentioned.

TIME LEVEL I:

(1) *Old rock fall or rock falls*, which slant both sides towards the walls. At some parts that old rock fall or rock falls appear to have covered up the markings on the wall surfaces (Maynard and Edwards 1971: 68-70).

(2) *Collapse from roof of an old passage* with water-worn walls. The result was an extensive covering of the older surface with large limestone blocks, showing hard, water-worn, polished surfaces.

TIME LEVEL II:

(3) *Formation of floor* over the whole surface of the Art Passage under humid conditions, i.e. the stone rubble in between the blocks and the bases of the fallen blocks are sintered (cemented) together.

(4) *Powder erosion* at some places over this floor, which contains decayed twigs and pieces of charcoal. This is the first trace of human presence in the soil of the Art Passage so far found. It must be pointed out, however, that no excavation was made under the deposit of event No. 3.

(5) *Locally present, loose red-stained rubble.*

(6) *Floor of human origin*, spread over the remains of events 4 and 5, containing twigs, bundle of twigs with burned ends ('torches'), dispersed charcoal and particles of bone.

(7) *Floor No. 6 is covered* by a single level of red-stained stones, often flat with red-stained crystals.

(8) *Further powder erosion* with twigs and 'torches'. Carbon-14 date is 18 200 ± 300, ANU-1205. The latest human event on this level was the construction of 'ritual theatres', surrounded by incised rocks and marked by a low setting of stones. These settings contain a few specimens from the white-coloured rock fall No. 9.

(9) *Major rock fall*, white, showing fresh, jagged surfaces. They do not bear any incised lines. The incisions are all on the polished, hard, water-worn surfaces of the rock fall listed as No. 2 and are so faint that they escaped notice during the first expeditions. At places, the rock fall (No. 9) has deeply buried Floor 8 and the associated marked rocks. A reconstruction of the original Floor 8 by clearing away this rock fall is feasible.

Gallus 1971	Wright 1971	Carbon-14
(a) **Depositional Cycle II, Trench III.** (See Note 1) **Floor 4.** (i) 'Assemblage 5'. A workshop heap of debris and artefactual material. Charcoal collected from this feature only. The 'heap' rested in a shallow depression on the surface of Floor 4. (ii) Charcoal collected by Wright all over the surface of Floor 4. (Please note: 'Floor 3' on Gallus 1971: Fig. 2 should read 'Floor 4'.)	'Top fire'	GaK-510 13 700 ± 270 BP ANU-70 15 850 ± 320 BP
Charcoal between Floors 4 and 5.	'Middle fire'	ANU-71 19 300 ± 350 BP
Floor 5. (i) 'Assemblage 9' on Floor 5. Workshop with debris, nucleus and artefactual material, in a depression on the surface of 'plastic white'. (Please note: 'Floor 4' on Gallus 1971: Fig. 2 should read 'Floor 5'.) 'Fire place' underlies 'workshop'. Charcoal collected from the 'fire place' on Floor 5, i.e. on the surface of 'plastic white', to the right of the 'workshop' and not to the left, as Wright's sketch implies. (ii) Charcoal collected by Wright apparently from the same fire place as above, and its continuation as discovered during extension C of Trench III. (See Note 2)	'Bottom fire'	V-82 31 000 ± 1650 BP V-96 19 300 ± 720 BP ANU-245 21 900 ± 540 BP
(b) **Depositional Cycle II, Trench I.** Layer 4b.		GaK-511 18 200 ± 1650 BP
(c) **Depositional Cycle IV, Trench III.** Lowest part of Depositional Cycle IV.	Lowest part of 'Red' reaching 'Bottom White'	ANU-148 19 400 ± 450 BP ANU-244 23 700 ± 850 BP
Floors 8-9. Immediately under Depositional Cycle IV, in a layer of small cobbles (matrix red clay), over a massive rock fall which was mined. The charcoal was collected from all over the floor and from a mining pit. The floors extend along the slope of the rock fall. The lowest part reached (Floor 9) is approximately 6.4 metres under the present surface. This rock fall seems to be the lower part of the huge rock fall mentioned when analysing the carbon-14 date registered under V-82.	Not reached by Wright's excavation	ANU-1201 Indicated age 29 400 $^{+11\,600}_{-4600}$ Radiocarbon age >20 450 (See Note 3)

NOTE 1: Wright excavated only three additional sections to Trench III (A, B and C, cf. 1971: Fig. 3, and pp. 22-3), and disregarded in his chronological sketch important microstratigraphic detail (compare Wright 1971: Fig. 4 and Gallus 1971: Fig. 1).

NOTE 2: There is a substantial contradiction between R. V. S. Wright's and my own recording of the *stratigraphy* involved; observe the strong slant away from the cave wall of the 'plastic white' accumulation (Gallus 1971: Fig. 1). On Wright's sketch (1971: Fig. 4) this discontinuity is omitted and a horizontal dividing line is assumed between 'top white (compact)' and 'top white (loose)', which unfortunately does not exist, except immediately at the cave wall. (Actually the slanting surfaces within Depositional Cycle II are correctly recorded by the slanting lines of the last two fire places.)

The contrast in the time levels between the carbon-14 dates represented by V-82, V-96 and ANU-245 is rather puzzling, but might have been due to a mobility of particles along slopes and rock faces, and the close contact between several independent depositional events:

(i) The workshop heap ('Assemblage 9') and the fire place on Floor 5 reached the immediate vicinity of a large rock fall, of unknown age, but certainly previous to Floor 5. The proximity of the rock fall suggests that the slope was mined for chalcedony. (In the 'dome', in every instance, the rock falls were mined and not the walls of the cave.) Mining or mobility along the slope might have been responsible for the mixture of earlier and later particles of charcoal.

(ii) 'Assemblage 9' and the fire place occupied a spot where the Depositional Cycles Nos II, III and IV met. According to Wright's sketch the fire place and Floor 5 reached Depositional Cycle IV, and was even 'dug' into, as discovered during Wright's extension of Trench III. But whatever the explanation of V-82, it cannot be disregarded since, at least in a general way, it still dates the antiquity of human activity in the 'dome' area.

NOTE 3: Personal comment by H. A. Polach, The Australian National University, Radiocarbon Dating Laboratory, Canberra, Report on Radiocarbon Age Determination, 10 December 1974:

'Low C^{14} activity of your sample combined with small sample size does not allow us to define an absolute age ± error in conventional terms. However, the detected C^{14} activity places the radiometric age within the minimum age given and 52 000 BP, with 95 percent probability with an INDICATED AGE of 29 400 BP +11 600/–4600 BP.'

Table 1. *A co-ordination of Depositional Cycles, stratigraphy and radiocarbon dates, Koonalda Cave.*

The Squeeze area contains mining activity, which disturbed the stratification. Charcoal samples range between 24 000 - 13 000 BP (ANU-917, ANU-180, V-92 and ANU-736).

There are a few important points which can be made as deduced from observations in Koonalda Cave:

(A) The 'behavioural syndrome' of the line markings has a substantial time depth and, at least in Koonalda Cave, has evolved in two steps.

(B) In doing so, it remained locality bound, i.e. the locality and the activity remained in association for a substantial time.

(C) This raises the question whether certain characteristics of the locality (e.g. 'darkness', 'inside the earth' etc.) and certain characteristics of the activity itself (e.g. 'making a sign', 'touching the rock') did not actually belong into the context of the 'engramme' which governed the 'behavioural syndrome' we investigate.

(D) The faintness of the engravings of the boulder 'theatre of activity' suggests that they had not to be 'seen' or 'read', but their effectiveness might have depended on the action itself of making them. One may quote the jumbled images on plaques found in European caves.

(E) The very substantial antiquity of human activity in Koonalda Cave and the obvious time depth of the markings in the Art Passage give us at least circumstantial evidence for the possibility of dating the beginning of finger fluting in Australia at a time level which is equivalent to the late Middle Palaeolithic in Europe. Please note that the carbon dates from Trench III in Koonalda Cave are from an excavation which did not yet reach the rock base.

(F) Bednarik has certainly tilted the discussion of the finger flutings and line engravings into the only direction where an understanding of the behaviour in question can be achieved, by moving the discussions away from an object-morphological level to a level of 'archaeopsychology'.

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INTERIM REPLY

By ROBERT G. BEDNARIK

Further comments are being prepared by several other eminent specialists in this field, and Dr Lorblanchet has indicated that he will respond to my paper with a full-size article on the finger markings in Pech Merle. Not only will this debate spill over into our November issue, it is also likely to widen as more overseas scholars participate. I had already prepared the draft for my response to the comments by Davis, Bahn, Moore, Cairns and Gallus when I became increasingly alarmed about the rather considerable space I was going to occupy in this issue of *RAR*. My guilty conscience persuaded me to omit my response altogether, for the time being.

At this stage I merely wish to express my gratitude to the present commentators. I am confident that readers will derive as much enjoyment as I do, from the high level of debate characterising these responses. Sophisticated comments such as the present one by Davis, or important data such as that just provided by Gallus make this journal what it is: a periodical charting the development of advanced rock art research.

Speaking of 'charting': it is no coincidence that my paper follows the one by Cairns. It represents, in my view, a practical example of the concepts Dr Cairns is trying to convey. My investigation of the archaic cave markings emulated empirical principles for several years, until the severely limited prospects of such a 'solidly based' approach to such a complex theme became apparent to me.

I thank the present commentators for their superb arguments and assure them that my response to each query and comment will appear in the November issue, together with the further comments. Like the present debate between Marshack and his reviewers, this debate promises to be extremely productive, stimulating and challenging, breaking new ground with every page. All readers who feel they could contribute to it are invited to participate in its continuation.

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Résumé. *Par contrast avec les très nombreuses lignes Pleistocènes tracées avec les doigts trouvées dans les caves Européennes, qui furent longtemps bien connues, celles d'Australie sont une très récente découverte. Les similaritées et différences entre les deux traditions géographiquement distinctes sont discutées ici. Dans les deux Continents les marques de doigts sont trouvées dans des caves sur de tendres gisements d'autrefois et chronologiquement précèdent d'autres formes connues de l'art rupestre. Les caractéristiques de plus de trente sites connus sont comparées dans ce journal, formant une base préliminaire pour une discussion interprétative. La preuve subsistante de la tradition Australienne des lignes pariétales tracées avec les doigts est plus étendue que celle de l'Europe et les marques ont rencontré moins de superpositions par les dernières formes d'art. Les perspectives pour un éclaircissement des motifs pour cette forme d'expression archaïque parait meilleure en Australie. En particulier, la région du Mount Gambier au sud de l'Australie est récemment devenue le point de concentration d'études qui cherchent à clarifier l'origine de l'intelligence humaine moderne, en examinant en détail la tradition la plus archaïque de l'art rupestre.*

Zusammenfassung. *Zum Unterschied von den in europäischen Höhlen zu findenden pleistozänen Fingerlinien, die schon lange bekannt waren, handelt es sich bei denen Australiens um eine Neuentdeckung. Die Ähnlichkeiten und Unterschiede zwischen den geographisch isolierten Traditionen werden hier besprochen. In beiden Kontinenten werden die Fingerzeichen an vormals weichen Ablagerungen in Höhlen gefunden, und erscheinen zeitlich vor allen anderen Formen von Felskunst. In diesem Artikel werden die Merkmale der über dreiszig bekannten Fundorte verglichen, um eine präliminäre Basis für interpretierende Erörterung zu schaffen. Die verbliebenen Anhaltspunkte über die australische Tradition parietaler Fingerlinien sind reichhaltiger als die Europas, und die Zeichen erfuhren weniger Überlagerung durch spätere Kunstformen. Die Aussichten für eine Aufklärung über die Beweggründe dieser archaischen Ausdrucksform scheinen besser in Australien zu sein. Besonders das Mount Gambier Gebiet in Südaustralien wurde kürzlich der Mittelpunkt von Studien, die den Ursprung des heutigen menschlichen Verstandes zu klären suchen, indem sie die urtümlichste aller Felskunst-Traditionen untersuchen.*

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